

# Summary of AHRQ Health Information Technology Portfolio-Funded Projects as of 2008

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## Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Health Information Technology (IT) Portfolio, sponsors a variety of contracts, grants, and cooperative agreements that examine the impact of health IT implementation and use on quality, safety, and other important health care outcomes. This inaugural report features 124 grant-specific and 26 contract-specific project summaries of AHRQ-managed health projects, as well as a summary of activities in the Health IT Portfolio as of 2008. This summary does not include the Health IT Portfolio's Interagency Agreements (IAA) to support projects managed by other Federal agencies or IAA from other Federal agencies to contract for projects to be conducted by the National Resource Center (NRC) for Health IT.

AHRQ is quite grateful for contractor and grantees' regular provision of timely, informative reports, and their participation in this inaugural initiative to generate project-specific calendar-year summaries.

We welcome comments on the utility of the summary of the Health IT Portfolio provided in this report and of the Web-based 150 project-specific summaries. Comments may be sent by mail to the Program Officials named below at: Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, MD 20850, or by e-mail to [Angela.Lavanderos@ahrq.hhs.gov](mailto:Angela.Lavanderos@ahrq.hhs.gov).

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## Structured Abstract

**Objectives:** To develop a summary of Agency for Healthcare Research and Quality (AHRQ)-managed activities of the Health Information Technology (IT) Portfolio and to develop easy-to-access Web-based project-specific summaries for the 124 grants and 26 contracts funded through the Health IT Portfolio as of 2008.

**Data Sources:** Under the direction of AHRQ staff, contractors with the National Resource Center for Health IT (NRC) reviewed pre-existing grantee- and contractor-prepared documents, including project proposals, final reports, grantees' quarterly reports, some elements of annual requests for continuation of grant funding, and final reports. Additional information about principal investigators' (PIs') grant histories was extracted from the IMPAC II (see Appendices B and C for details). The staff of the NRC leveraged existing content of the NRC Web site, including type of health IT technology used and the identification of awardees' publications and presentations, to enhance content of project-specific summaries.

**Methods:** The staff of the NRC assigned one of three Health IT Portfolio strategic goals (Medication Management, Enabling Patient-Centered Care or Health Information Exchange (PCC or HIE), or Improved Decisionmaking) and one of three AHRQ business goals (Knowledge Creation, Synthesis and Dissemination, or Implementation and Use) as primary goals for each of the projects (see Section II. A. Project Classification). Many of these projects address multiple strategic goals and, to a lesser extent, business goals. In 2009, AHRQ staff, in cooperation with NRC staff, generated templates for the unique content elements of the grant-specific and contract-specific summaries. The NRC staff drafted summaries to reflect project status as of the end of calendar year 2008 based on information reported as of April 15, 2009. As necessary, the NRC staff conferred with PIs to seek clarification of content and approval of project-specific summaries.

**Results:** AHRQ's Health IT Portfolio funded 124 grants and 26 contracts in 2008. The vast majority of these projects were multi-year in duration. In total, AHRQ will provide nearly one-quarter of a billion dollars in support over the lifetime of the projects. AHRQ lifetime funding for these grants is \$151 million and for these contracts is \$70 million.

In 2008, organizations in 39 States and the District of Columbia had active Health IT-sponsored projects. Since 2004, organizations in all 50 States have received Health IT Portfolio-sponsored projects.

The most common Health IT strategic goal in the portfolio was enabling Patient-Centered Care or Health Information Exchange (PCC or HIE), which was ascribed to 69 projects (13 contracts and 56 grants), which comprise 46 percent (69/149) of Health IT Portfolio-sponsored projects as of 2008.<sup>1</sup> In total, AHRQ will provide these 69 projects \$102.7 million in funding over the lifetime of the projects.

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<sup>1</sup> Does not include the 5-year multi-million dollar contract for the National Resource Center (NRC) for Health IT, which supports activities across all of the strategic and business goals.

The next most common strategic goal among the Health IT Portfolio was Improved Decisionmaking, which was ascribed to 47 projects (10 contracts and 37 grants) and contributes 32 percent (47/149) of the Health IT Portfolio-sponsored projects as of 2008. In total, AHRQ will provide these 47 projects \$54.7 million in lifetime funding.

The 33 projects (2 contracts and 31 grants) with Medication Management as their strategic goal comprise 22 percent (33/149) of the Health IT Portfolio-sponsored projects as of 2008. In total, AHRQ will provide these 33 projects \$41.5 million.<sup>2</sup>

Implementation and Use was the dominant business goal for both grants and contracts at 69 percent (86/124) and 52 percent (13/25), respectively. Among grants, Knowledge Creation was the second most frequent business goal at 35 percent (43/124), followed by Synthesis and Dissemination at 16 percent (20/124). Among contracts, Synthesis and Dissemination was the second most popular business goal at 28 percent (7/25) followed by Knowledge Creation at 20 percent (5/25).

In part, the difference in distribution of business goals is a result of the types of information sought for certain types of mechanism (grant or contract).

While 15 percent (23/149) of the individual Health IT Portfolio-sponsored projects have the business goal of Dissemination and Synthesis, this small number should not be interpreted to indicate an undervaluing of dissemination or synthesis activities. On the contrary, dissemination of results is a requirement specified in each Health IT Portfolio-sponsored project. In addition, AHRQ's Office of Communications and Knowledge Transfer (OCKT) and the National Research Center for Health IT (NRC) are actively engaged in numerous syntheses and dissemination activities to support the Health IT Portfolio (see Section V. Dissemination).

The Health IT Portfolio included a diversified pool of grantee PIs. There were 116 unique PIs among the 124 active grants.

Largely due to the intent of the Transforming Healthcare Quality Through Information Technology (THQIT) initiative to engage with rural hospitals and community health center one-time Request For Applications (RFA), 53 percent (29/55) of the THQIT grants active in 2008 had been awarded to individuals who had not previously served as PI on an NIH- or AHRQ-sponsored grant. The Ambulatory Safety and Quality (ASQ) RFAs focused on use of health IT in ambulatory settings, emergency departments, or transitions in care. Among the 69 ASQ grants active in 2008, 25 percent (17/69) were awarded to first-time PIs. All 12 PIs who received funding in 2008 in response to the ASQ RFA, Improving Management of Individuals with Complex Healthcare Needs through Health IT (HS-08-002), were experienced PIs. Five of these PIs had previously received career (K) awards or training (T-32) grants.

Among the 86 grants that continued on into 2009, 17 percent (15/86) address Medication Management, 30 percent (35/86) address Improved Decisionmaking, and 54 percent (46/86)

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<sup>2</sup> Although not reflected in this summary, through Inter Agency Agreements (IAA) the Health IT Portfolio provided the Centers for Medicare and Medicaid Services (CMS) \$1.5 million dollars to conduct a CMS-led Electronic Prescribing Pilot and a \$422,503 CMS-led Care Management Performance Demonstration project.

address PCC or HIE. The dominance of projects with PCC or HIE as a strategic goal is, in part, a result of the Health IT Portfolio's focus (2004-2008) to fund new PCC projects through its Ambulatory Safety and Quality FOA and to fund HIE research and development through the THQIT initiative.

Readers are encouraged to peruse the project-specific summaries of interest to them using the Project Tables in this report. Summaries are organized by Health IT Strategic and AHRQ Business Goals (see Section VII Grant-Specific Summaries and Section VIII Contract-Specific Summaries), as well as by Principal Investigator's last name (see Appendix A). AHRQ intends for the summaries of both concluded and ongoing projects to be informative references for implementers of health IT, prospective research applicants, and others interested in the challenges and successes of real world health IT implementation, use, and evaluation.

Among the 40 (2 contracts and 38 THQIT grants) Health IT Portfolio-sponsored projects that ended in 2008, a few examples illustrate the variety of issues addressed and progress realized through these projects.

- **Holly Jimison, Ph.D., “Barriers and Drivers of Health Information Technology Use for the Elderly, Chronically Ill and Underserved.” (Contract: 290-02-0024-9)**  
**Highlights:** Oregon Health Science University reviewed and synthesized available literature on the barriers and drivers of health IT use for the elderly, chronically ill, and underserved. The team found that several types of consumer health IT were usable and effective in many settings with all of the study's populations of interest. Convenience and ease-of-use were important drivers of system use, especially if the interventions could be delivered on technologies that users already had an interacted with on a daily basis. Perceived benefit, system trust, anonymity for sensitive conditions, and rapid clinician feedback were also important factors influencing the successful use of interactive consumer health IT. Complete report is available at: <http://www.ahrq.gov/downloads/pub/evidence/pdf/hitbarriers/hitbar.pdf>. Accessed September 2009.
- **Timothy G. Ferris, M.D., M.P.H., Improving Pediatric Safety and Quality with Healthcare Information Technology, (HS-04-012, R01 HS015002).**  
**Highlights:** Clinical decision support (CDS) within an electronic health record (EHR) used within pediatric practices was found to significantly improve medication safety, practice efficiency, guideline adherence for provision of care of children with chronic conditions, and documentation. At the end of this 4-year grant, improvements were found in all three clinical domains, preventive services, acute illness care, and chronic illness care. Low usage of CDS limited the effectiveness of the interventions. The reduction in dosing errors was partially offset by errors resulting from improper use of the CDS. Further improvements in quality and safety are possible through increased use of CDS, but this will require physician willingness to change their workflow as well as improvements to EHR software. ([see 2008 grant-specific summary](#)).

- **David Lobach, M.D., Ph.D., M.S., “Showing Health Information Value in a Community Network.” (HS-04-012, R01 HS 015057).**

**Highlights:** This 4-year grant focused on using health IT to enable patient-centered care among Medicaid recipients through the use of health IT to share information in a community setting using a population health management care model. The study found that e-mail notices sent to care managers on a weekly basis were well received and are reported to enhance productivity. The net effect of the intervention was a decrease in emergency department (ED) use and inpatient reimbursements (for ED and hospital care) for patients whose care managers received weekly e-mail notifications about sentinel events. Feedback reports sent quarterly to clinic managers did not impact ED use or hospitalizations, nor did letters sent to patients. Several valuable lessons were learned through the development, implementation and operational support of this population health management system. In the area of system development, resolving political issues related to the exchange of clinical information and identifying resources to implement the data exchange are often more challenging and time consuming than the technical aspects of information exchange. However, once the exchanged information was in use for proactive care management, clinical sites began to offer their information to the Health Information Exchange so that they could reap the benefits of the proactive care notices. ([see 2008 grant-specific summary](#)).

- **Susan Horn, Ph.D., “Nursing Home Information Technology (IT): Optimal Care and Medication Delivery.” (HS-04-011, UC1 HS015350).**

**Highlights:** Through this 4-year cooperative agreement, health IT and quality improvement activities were implemented in a targeted and coordinated effort in 15 skilled nursing facilities. This project featured a transition from paper-based medical records to the implementation of an electronic medical record (EMR) system that included best practices decision support modules and a digital pen system to record information into the EMR. The impact of coordinating IT implementation with targeted quality improvement activities in nursing homes was evaluated in terms of care processes; resident health outcomes, including pressure ulcers (PrUs); and staff efficiency and satisfaction. Facilities experienced positive impact on workflow and staff morale: improved documentation completeness, reduced time gathering and compiling information, improved access to information and multi-disciplinary communications, and staff satisfaction with technology versus paper processes. There were overall decreases of 18 percent in the Centers for Medicare and Medicaid (CMS) high-risk PrU and weight loss quality measures in 18 months. The learning from this grant was incorporated into the development of the “On-Time Quality Improvement” program, which combined health IT with quality improvement. The “On-Time Quality Improvement” program for the prevention of pressure ulcers has been expanded to include 55 nursing homes in California, New York, Idaho, Maryland, Arizona, North Carolina, and Washington, DC, through AHRQ contracts and various co-funding sources and partners including California Healthcare Foundation, New York State Health Department, and Delmarva Foundation. ([see 2008 grant-specific summary](#)).

**Conclusions:** There is a high overall level of detail and robustness in the project-specific summaries. They provide insight on real-world barriers, challenges, and mitigating factors encountered. All of these summaries are available through the search engine at AHRQ’s NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)) or within the respective section of this document. The Health

IT Portfolio will continue to review the 2008 project-specific summaries in detail to identify potential topics for technical assistance and other opportunities to increase success in completing health IT research and implementation projects, and to identify topics which should be explored further. With the release of three Health IT Portfolio-sponsored Program Announcements (HS-08-268, HS-08-269, and HS-08, 270) and a Special Emphasis Notice (NOT-HS-08-014) for career development grants in 2008, AHRQ expects continued and expanded work across the Health IT strategic goals and the AHRQ business goals, and the development of new researchers for years to come.

## I. Purpose

The purpose of this project was to assemble and distribute information on the Health IT Portfolio as of the end of 2008 at both the portfolio and project-specific level. Through this exercise, AHRQ sought to understand the state of the Health IT Portfolio, inform the development of similar reporting for subsequent years, and provide the public with easy-to-access Web-based project-specific summaries for calendar year 2008.

This report summarizes the 150 projects that were directly funded by the AHRQ Health IT Portfolio in calendar year 2008. We recognize that there are AHRQ-funded projects with an important health IT component that were funded through other Agency funds during this time that are not included.<sup>3</sup>

The Health IT Portfolio is summarized in terms of the broad categories of projects, including: Health IT Portfolio strategic goals; AHRQ business goals; mechanism type (grant or contract); total funding from AHRQ over project period (i.e., AHRQ Lifetime Funding); duration of grants; PI's experience as a PI; State funding history; and usage rates of the NRC Web site ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)).

One hundred and fifty project-specific summaries of projects sponsored by the Health IT Portfolio provide the public with easy-to-access Web-based summaries synthesizing individual projects' first-hand experience in the implementation, use, and evaluation of health IT to improve health care outcomes. The summaries include highlights of the challenges; mitigating factors; status of specific aims (ongoing, upcoming, achieved); awardees' pertinent publications and presentations; preliminary findings, as appropriate; and grantees' overall progress of the projects in terms of spending pattern and meeting milestones.

- Each of the 150 project-specific summaries is currently available through the AHRQ-funded project search tool at AHRQ's NRC ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)). Hyperlinks to these project-specific summaries are also included in the Project Tables (see Section VII Grant-Specific Summaries and Section VIII Contract-Specific Summaries) and in the Index of PIs' Research Projects in Appendix A.

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<sup>3</sup> Although not reflected in this summary, through Inter Agency Agreements (IAA) the Health IT Portfolio provided Centers for Medicare and Medicaid Services (CMS) \$1.5 million dollars to conduct CMS-led Electronic Prescribing Pilot and a \$422,503 CMS-led Care Management Performance Demonstration project.

## II. Background

AHRQ supports a series of interrelated health services research programs that individually and collectively seek to improve the quality, safety, efficiency, and effectiveness of health care for all Americans. In 2008, intramural and extramural activities (i.e., grants and contracts) were organized into one of six AHRQ portfolios:

- Comparative Effectiveness
- Health Information Technology (IT)
- Innovations/Emerging Issues
- Patient Safety
- Prevention and Care Management
- Value

Health IT is broadly defined as the use of information and communication technology in health care to support the delivery of patient or population care or to support patient self-management. Health IT can support patient care-related activities such as order communications, results reporting, care planning, and clinical or health documentation.<sup>4</sup> Health IT applications can use a variety of platforms, such as desktop computer applications, cellular phones, personal digital assistants (PDAs), touch-screen kiosks, and others. Examples of health IT applications are, electronic health records (EHRs), EMRs, personal health records (PHRs), telemedicine, clinical alerts and reminders, computerized provider order entry, computerized clinical decision support (CDS) systems, consumer health informatics applications, and electronic exchange of health information. Health IT is recognized as a tool that, if appropriately designed, implemented, and used, may help mitigate a variety of challenges in the delivery of health care services and result in improved health care processes and outcomes.

### A. Project Classification

In 2008, Health IT Portfolio-funded grants and contracts were categorized into one of three portfolio strategic goals and one of three AHRQ business goals:

#### *i. Health IT Strategic Goals:*

1. **Medication Management:** To develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.
2. **Patient-Centered Care (PCC) or Health Information Exchange (HIE):** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

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<sup>4</sup> Shortliffe EH and JJ Cimino, "Biomedical Informatics: Computer Applications in Health Care and Biomedicine." Third Edition. 2006.

3. **Improved Decisionmaking:** To develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

## **ii. AHRQ Business Goals:**

1. **Knowledge Creation:**
  - Collecting data on and producing measures of the quality, safety, effectiveness, and efficiency of American health care and health care systems.
  - Fostering the development of knowledge about improving health care, health care systems, and capacity (training, placement).
2. **Synthesis and Dissemination:**
  - Creating tools and synthesis of evidence (including knowledge, measure, and data).
  - Disseminating information to multiple stakeholders to improve the system.
3. **Implementation and Use:**
  - Partnering with stakeholders to implement proven strategies for health care improvement, including empowering Americans to be proactive patients.

## **B. Mechanisms**

There are a variety of mechanisms available to the Health IT Portfolio for funding projects that will further its goals. Each award mechanism specifies the content, format, and timeline for deliverables, including periodic reporting requirements for completion of milestones and budget updates. Four of the more common mechanisms used at AHRQ to carry out a wide variety of directed health services research and administrative activities are:

### **i. Grant:**

A financial assistance support mechanism providing money, property or other direct assistance in lieu of money, or both to an eligible entity to carry out an approved project or activity in support of a public purpose and not the direct benefit of the Government. A grant is used whenever the Operating Division (OPDIV) [health IT Portfolio] anticipates no substantial programmatic involvement with the recipient during performance of the financially assisted activities.<sup>5</sup>

### **ii. Cooperative Agreement:**

A financial assistance support mechanism used when there will be substantial Federal programmatic involvement. Substantial involvement means that OPDIV program staff will collaborate or participate in project or program activities as specified in the Notice of Grant

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<sup>5</sup> Page B-6 of the HHS Grants Policy Statement ([http://www.hhs.gov/grantsnet/docs/HHSGPS\\_107.doc](http://www.hhs.gov/grantsnet/docs/HHSGPS_107.doc))

Award. The difference between grants and cooperative agreements is the degree of Federal programmatic involvement rather than the type of administrative requirements imposed. Therefore, statutes, regulations, policies, and the information contained in this policy statement that are applicable to grants also apply to cooperative agreements, unless the award itself provides otherwise.

For purposes of this report, the term grant is henceforth used to include both grants and cooperative agreements.<sup>6</sup>

### **iii. Contract:**

Contracts may be awarded by AHRQ pursuant to the Federal Acquisition Regulation (FAR). A contract is an agreement, initiated by the Government, to acquire an identifiable product or service under specified terms.

### **iv. Interagency Agreement:**

Interagency Agreements (IAAs) are used to provide to, purchase from, or exchange goods or services with another Federal agency.

## **C. Health IT Portfolio**

AHRQ's Health IT Portfolio is both an organizing construct for research and a designation for a collaborative team of AHRQ staff mainly located in AHRQ's Center for Primary Care, Prevention, and Clinical Partnership. P. Jon White, M.D., Director, Health IT Portfolio, works with a core team of eight full-time employees. This team is the proverbial "tip of the iceberg" of the Health IT Portfolio at AHRQ. The ballast of the Health IT Portfolio is provided by myriad staff across AHRQ who serve as project officers and staff in the Office of Communications and Knowledge Transfer (OCKT); the Office of Performance, Accountability, Resources, and Technology (OPART); and the Office of Extramural Research, Education, and Priority Populations (OEREP), as well as others who support the activities of the Health IT Portfolio, and the numerous recipients of health IT-sponsored grants and contracts, including the multi-year contract to support the NRC.

In 2008, under the leadership of Jon White, the health IT team applied its skills and dedication to the Health IT Portfolio in various ways: served as project officers on health IT-sponsored grants and contracts; managed the portfolio; set forth strategic and business goals for the portfolio; conducted intramural research; published peer-reviewed manuscripts; issued three new grant Funding Opportunity Announcements (FOAs); issued a series of requests for contracts; and participated in and presented at numerous interagency and public meetings.

Each of the 124 grants and 22 of the 26 contracts active in 2008 were multi-year projects (see Table 1). Collectively, AHRQ's lifetime funding for these projects is substantial—nearly one-quarter of a billion dollars. Thirty-eight of the grants and two of the contracts ended in 2008. The remaining 110 projects continued into 2009.

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<sup>6</sup> Page B-4 of the HHS Grants Policy Statement ([http://www.hhs.gov/grantsnet/docs/HHSGPS\\_107.doc](http://www.hhs.gov/grantsnet/docs/HHSGPS_107.doc))

**Table 1: Counts and Lifetime AHRQ Funding for Health IT Portfolio-Sponsored Grants and Contracts Active as of 2008**

Mechanism	Count	Lifetime AHRQ Funding <sup>7</sup>
Grants <sup>8</sup>	124	\$151.3
AHRQ Project-Specific Contracts <sup>9</sup>	25	\$47.6
5-Year Master Contract for the Health IT National Resource Center	1	\$22.4
<b>Total</b>	<b>150</b>	<b>\$221.3</b>

## i. Grants: Funding Opportunity Announcements

Proposals for grants and cooperative agreements are submitted in response to AHRQ’s issuance of an FOA. One-time FOAs are known as Request for Applications (RFAs) and recurring FOAs are known as Program Announcements (PAs). An RFA is a one-time funding opportunity issued to solicit specific research projects quickly. A PA allows applications to be submitted over multiple years at one of three submission cycles in a given year. (See standard due dates at <http://grants1.nih.gov/grants/funding/submissionschedule.htm>.) Unlike RFAs, which do not allow unfunded applications to be revised and resubmitted, PAs may allow up to two resubmissions.

Since 2004, the Health IT Portfolio has issued 11 FOAs distributed across three waves of funding (see Table 2). All of the grants active in 2008 had been awarded through now closed one-time RFAs.

**1. Transforming Health Care Quality through Information Technology RFAs.** AHRQ’s Health IT Portfolio’s THQIT initiative includes grants funded through four RFAs. The THQIT projects were funded by AHRQ in order to support different aspects of organizational and community-wide activities to support health IT implementation and to elucidate various stakeholders’ perspectives and/or demonstrate the value of health IT implementation and use with a focus on rural hospitals and community-based health care settings.

- The THQIT planning grants (HS-04-010) were designed to support the planning phase and development of health IT infrastructure for those communities interested in preparing for effective exchange of health information within the community across multiple health care organizations.

<sup>7</sup> In millions of dollars.

<sup>8</sup> Not included are projects sponsored by other AHRQ portfolios, e.g., Comparative Effectiveness, Innovations and Emerging Issues, Prevention/Care Management, Patient Safety, and Value, which may feature health IT components.

<sup>9</sup> Includes six Health Information Exchange State and Regional Demonstration (SRD) projects, two clinical decision support (CDS) contracts, and 17 other individual contracts.

- The initial THQIT implementation grants (HS-04-011) were intended to assess the extent to which health IT implementation contributes to measurable and sustainable improvements in patient safety, cost, and overall quality of care.
- The second set of THQIT implementation grants (HS-05-013), referred to here as post-planning implementation grants, have the same objectives as the initial THQIT implementation grants. These awardee institutions had the benefit of receiving and completing a planning grant prior to pursuit of the implementation grant.
- The THQIT value grants (HS-04-012) sought to generate insight on the value of health IT, which includes clinical, safety, quality, financial, organizational, effectiveness, efficiency, or other direct or indirect benefits that may be derived from the use of health IT in the delivery of health care. These value assessments according to the FOA were to be from various stakeholders' perspectives including patients, providers, purchasers, payers, policymakers, or other important stakeholders and decisionmakers.

In total, 118 THQIT grants were funded by AHRQ. As indicated in Table 2, 55 of the THQIT grants were still active in 2008 and contributed 44 percent (55/124) of the active grants in that year. In 2009, the Health IT Portfolio will award a contract to synthesize the findings and evaluate the success both within and across the four RFAs that comprise the THQIT Initiative.

2. **Ambulatory Safety and Quality RFAs.** In 2007 and 2008, the Health IT Portfolio issued a series of RFAs (HS-07-007; HS-07-006; HS-07-002; HS-08-002) to support grants to improve the safety and quality of ambulatory health care in the United States, known as the Ambulatory Safety and Quality (ASQ) initiative.<sup>10</sup>

- The purpose of the Enabling Patient-Centered Care Through Health IT RFA (HS-07-007) was to support grants that investigate novel methods or evaluate existing strategies for using health IT to create or enhance patient-centered models of care in the ambulatory setting. Applicants were expected to demonstrate how patient-centered care can improve health outcomes, patient safety, and patients' reported experience with care. Applicants were encouraged to consider projects that focus on: shared decisionmaking, patient-clinical communication, PHRs, integration of patient information across transitions in care, or patient self-management of chronic conditions. There were three areas of research with set aside funding: primary care Practice-Based Research Networks (PBRN), projects that serve vulnerable populations, and medication management. Regardless of set aside research focus, all of these grants were assigned PCC or HIE as their Health IT Portfolio strategic goal because of the dominant theme of enabling PCC of the RFA.
- The purpose of Improving Quality Through Clinician Use of Health IT (IQHIT) (HS-07-006) was to support grants that investigate novel methods or evaluate existing strategies for clinician use of health IT in ambulatory settings to improve outcomes through more effective CDS, medication management, or care delivery. Applicants were encouraged to demonstrate the ability of EHRs and medication management systems to effectively move evidence-based clinical information to providers and participants in HIE. There were three areas of research with set aside funding: primary care PBRNs, projects that

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<sup>10</sup> A fourth ASQ RFA, called the Ambulatory Care Patient Safety Proactive Risk Assessment (HS-07-003), was issued by the Patient Safety Portfolio.

serve vulnerable populations, and medication management. Health IT Portfolio strategic goals were selected based on the primary objective of a given grant.

- The purpose of the Enabling Quality Measurement (EQM) Through Health IT RFA (HS-07-002) was to support grants that develop safety and quality measures in ambulatory care settings, automate quality measurement, demonstrate the ability of electronic data systems (such as EHRs or claims data merged with EHR data) to expand potential safety and quality measures, and demonstrate improved ability to export data for reporting performance on measures and improvement.
- The purpose of the Improving Management of Individuals with Complex Healthcare Needs through Health IT RFA (HS-08-002) was to support the development of health IT that assists clinicians, practices, systems, and patients and families in improving the quality and safety of care delivery for individuals with complex health care needs (e.g., multiple chronic diseases) in ambulatory care settings with a particular interest in high-risk care transitions. The long-term goal of this effort is to ensure that patients receive the appropriate care and management for the prevention and treatment of priority conditions.

3. **Health IT-Oriented Program Announcements (PA).** In September 2008, AHRQ issued its continuum of three PAs (HS-08-268; HS-08-269; HS-08-270) to support research that examines how health IT can be used to improve health care quality in a progressively more complex fashion. Through these PAs with varying levels of expectations and other outreach efforts, AHRQ seeks to support the development and diversification of research infrastructures and individuals engaged in solving the important remaining challenges in health IT implementation, use, and evaluation as it relates to improving the health of all Americans.

Applications responsive to these PAs must focus on implementation of health IT in one or more of the following care settings: ambulatory setting(s), transitions in care between ambulatory settings, or transitions in care between an ambulatory and nonambulatory setting. For the purposes of these PAs, ambulatory care settings include: health care clinician offices; outpatient clinics; outpatient mental health centers; outpatient substance abuse centers; urgent care centers; ambulatory surgery centers; community-based, school, or occupational health centers; safety-net clinics; pharmacies; homes; independent living centers; and long-term residential care facilities. For more information, please see the [notices](#). Given the lag time between publication of an FOA and awarding of grants, the first grants from these PAs will be funded in September 2009.

Also in 2008, the Health IT Portfolio issued a Special Emphasis Notice (NOT-HS-08-014) articulating its commitment to support the career enhancement of researchers focused on health IT through the funding of K-awards and research dissertation grants (R-36).

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**Table 2: AHRQ-Sponsored Health IT Funding Opportunity Announcements and Special Emphasis Notice Published, 2004-2008**

Publication Number	Title and Hyperlink	Year Awarded	Number of Grants Active as of 2008	New Grant Proposals May Be Submitted
RFA-HS-04-010	<a href="#">Transforming Healthcare Quality Through Information Technology (THQIT)—Planning Grants</a>	2004	None <sup>11</sup>	No
RFA-HS-04-011	<a href="#">Transforming Healthcare Quality Through Information Technology (THQIT)—Implementation Grants</a>	2004	19	No
RFA-HS-04-012	<a href="#">Demonstrating the Value of Health Information Technology</a>	2004	20	No
RFA-HS-05-013	<a href="#">Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology—Implementation Grants</a>	2005	16	No
RFA-HS-07-007	<a href="#">Ambulatory Safety and Quality: Enabling Patient-Centered Care through Health IT (R18)</a>	2007	16	No
RFA-HS-07-006	<a href="#">Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (R18)</a>	2007	24	No
RFA-HS-07-002	<a href="#">Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (R18)</a>	2007	17	No
RFA-HS-08-002 (HS08-002)	<a href="#">Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (R18)</a>	2008	12	No
PAR-HS-08-268	<a href="#">Small Research Grant to Improve Health Care Quality through Health Information Technology (IT) (R03)</a>	2009 <sup>12</sup>	None to date	Yes <sup>13</sup>
PAR-HS-08-269	<a href="#">Exploratory and Developmental Grant to Improve Health Care Quality through Health Information Technology (IT) (R21)</a>	2009	None to date	Yes
PAR-HS-08-270	<a href="#">Utilizing Health Information Technology (IT) to Improve Health Care Quality (R18)</a>	2009	None to date	Yes
NOT-HS-08-014	<a href="#">Special Emphasis Notice: AHRQ Announces Interest in Career Development (K01, K02, K08) and Dissertation (R36) Grants focused on Health Information Technology (IT)</a>	2009	None to date	Yes

## ii. Contracts

The Health IT Portfolio uses various contract mechanisms to solicit requests for proposals including one-time Request for Proposals (RFPs) and Requests for Task Orders (RFTOs) when a

<sup>11</sup> The 39 THQIT planning grants finished in 2004 and 2005. Sixteen of the institutions that received a THQIT Planning Grant also received an HS04-011 Implementation Grant.

<sup>12</sup> These Health IT FOAs were published in September 2008; AHRQ anticipates awarding initial grants to these FOAs in late summer 2009.

<sup>13</sup> The three active Health IT FOAs and Special Emphasis Notice have an expiration date of November 17, 2011. AHRQ will consider renewal of them as appropriate.

master contract has been issued. Master Contracts are a special type of RFP that are issued to a group of well-qualified contractors who are then eligible to compete for a subsequent series of RFTOs that are issued through the Master Contract. Full text of closed AHRQ RFPs issued since 2000 are available at <http://www.ahrq.gov/fund/contrarch.htm>. Requests for Task Orders (RFTO) are provided to Master Contract awardees for a given program, such as the Primary Care PBRN. Nine of the Health IT Portfolio's active contracts in 2008 had been awarded through three one-time RFPs and 17 RFTOs issued through seven master contracts. The year the contract began and the number of Health IT Portfolio contracts, by mechanism, are shown below:

- One-time Request for Proposals (RFPs)
  - 2004, State and Regional Demonstrations in Health Information Technology (<http://www.ahrq.gov/fund/contarchive/rfp040015.htm>), n=6
  - 2004, Master Contract [Health Information Technology Resource Center \(HITRC\)](http://www.ahrq.gov/fund/contarchive/rfp040016.htm), now known as the Master Contract to Support the National Resource Center for Health IT (<http://www.ahrq.gov/fund/contarchive/rfp040016.htm>), n=1
  - 2007, Clinical Decision Support Services (<http://www.ahrq.gov/fund/contarchive/rfp0710045.htm>), n=2
- Master Contracts through which active Health IT Portfolio Task Orders (TO) were issued and awarded:
  - 2007 and 2008, Program Evaluation and Analysis Task Order Contract (PEATOC), n=1
  - 2007, Department of Health and Human Services Program Support Center (PSC ), n=2
  - 2007, Primary Care Practice-Based Research Networks, n=3
  - 2007, Evidence-Based Practice Care Centers, n=1
  - 2007 and 2008, Accelerating Change and Transformation in Organizations and Networks (ACTION), n= 8
  - 2008, Blanket Purchasing Agreement (BPA) for Support Services, n=1
  - 2008, National Quality Forum, n=1

In 2008, AHRQ announced its intent to issue a new series of Master Contracts stratified across four domains to support the National Resource Center for Health IT. That RFP, the Health IT Portfolio-issued AHRQ National Resource Center for Health Information Technology (IT) (Solicitation No. AHRQ-2009-10003), was published in January 2009 (<http://www.ahrq.gov/fund/contarchive/rfp0910003.htm>). These master contractors, through yet-to-be-awarded RFTOs, will provide support and help refine and reshape the construct and output of AHRQ's NRC for Health IT. As needed, in 2009 onward, the Health IT Portfolio will issue new RFPs and RFTOs through the most appropriate contract mechanism.

### iii. Interagency Agreements

This report summarizes only Health IT Portfolio-sponsored projects managed by AHRQ. It does not include the Health IT Portfolio's IAA to support projects managed by other Federal agencies or IAAs from other Federal agencies to contract for projects to be conducted by the NRC.

In 2008, through IAAs, the Health IT Portfolio funded three projects that were managed by other Federal agencies. Two IAAs provided Centers for Medicare and Medicaid Services (CMS) \$1.5 million dollars to conduct a CMS-led Electronic Prescribing Pilot and \$422,503 to conduct a CMS-led Care Management Performance Demonstration project. Through a third IAA with the National Institutes of Health (NIH) and the National Library of Medicine (NLM), the Health IT Portfolio provided \$133,000 to an NLM-sponsored grant for the development of CDS guidelines.

## III. Methods

AHRQ staff, in cooperation with NRC staff, developed processes for the drafting of 124 grant and 26 contract project-specific summaries. Staff from the NRC, with assistance from grantees, contractors, and AHRQ staff, drafted the project-specific summaries. For specific information on sources and methods, see Appendices B and C. Appendix B describes the process for developing each grant-specific summary. Appendix C describes the process for developing each contract-specific summary. AHRQ acknowledges that most of these project-specific summaries are snapshots of ongoing multi-year research projects. They neither preempt nor replace the thorough and thoughtful peer-reviewed publications of findings that are generated after conclusion and analyses of projects. Rather, these project-specific summaries articulate the challenges, milestones, and outputs from an array of ongoing and concluded (2008) Health IT Portfolio-sponsored initiatives in an unprecedented, more timely fashion. AHRQ intends for the summaries to be informative references for implementers of health IT, prospective research applicants, and others interested in the challenges and successes of health IT implementation and use in terms of research and practical application.

## IV. Results and Discussion

Through these 150 projects, AHRQ is supporting the development and dissemination of evidence on how health IT can be used to improve the quality, safety, efficiency, and effectiveness of care in a variety of health care settings. The distribution of grants and contracts active in 2008 by Health IT Portfolio strategic goals, AHRQ business goals, and AHRQ lifetime funding are presented. There are a variety of databases that provide additional characteristics about grantees and grants that are not consistently available for contractors. As such, additional information about grantee characteristics is discussed, including grantees' self-reported performance in terms of spending and overall status of grantee-specified milestones, and PI's history of having served as a PI for a grant.

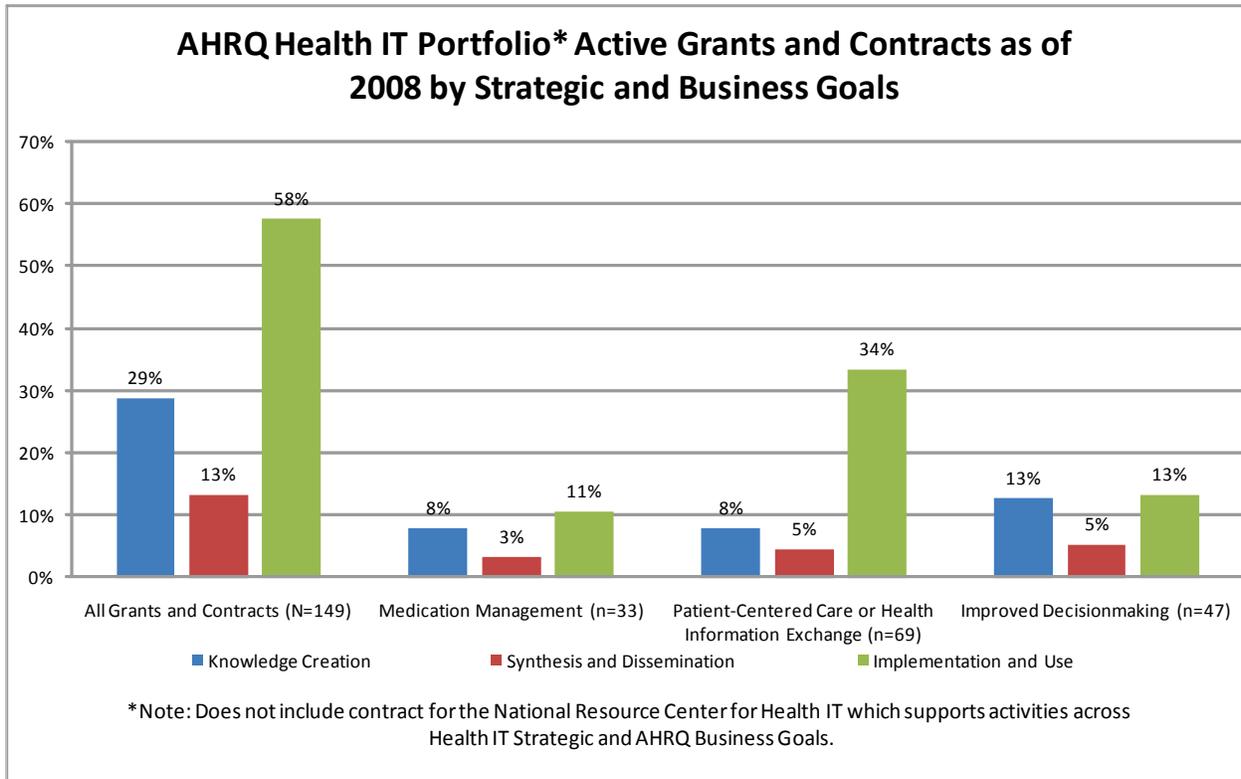
## A. Health IT Portfolio Active Projects (Grants and Contracts)

### i. By Strategic and Business Goals

Forty-six percent (69/149) of projects active in 2008 were primarily focused on the strategic category PCC or HIE (see Figure 1).<sup>14</sup> The next most popular strategic goal category was Improved Decisionmaking (32 percent; 47/149), followed by Medication Management (22 percent; 33/149).

The relative dominance of projects ascribed to have Implementation and Use as an AHRQ business goal (58 percent; 86/149), is notable. Knowledge Creation was the second most common AHRQ business goal category (29 percent; 43/149). Only 20 of the 149 projects (13 percent) were classified to have the AHRQ business goal of Synthesis and Dissemination.

**Figure 1: AHRQ-Sponsored Health IT Grants and Contracts by Strategic Goals as of 2008**

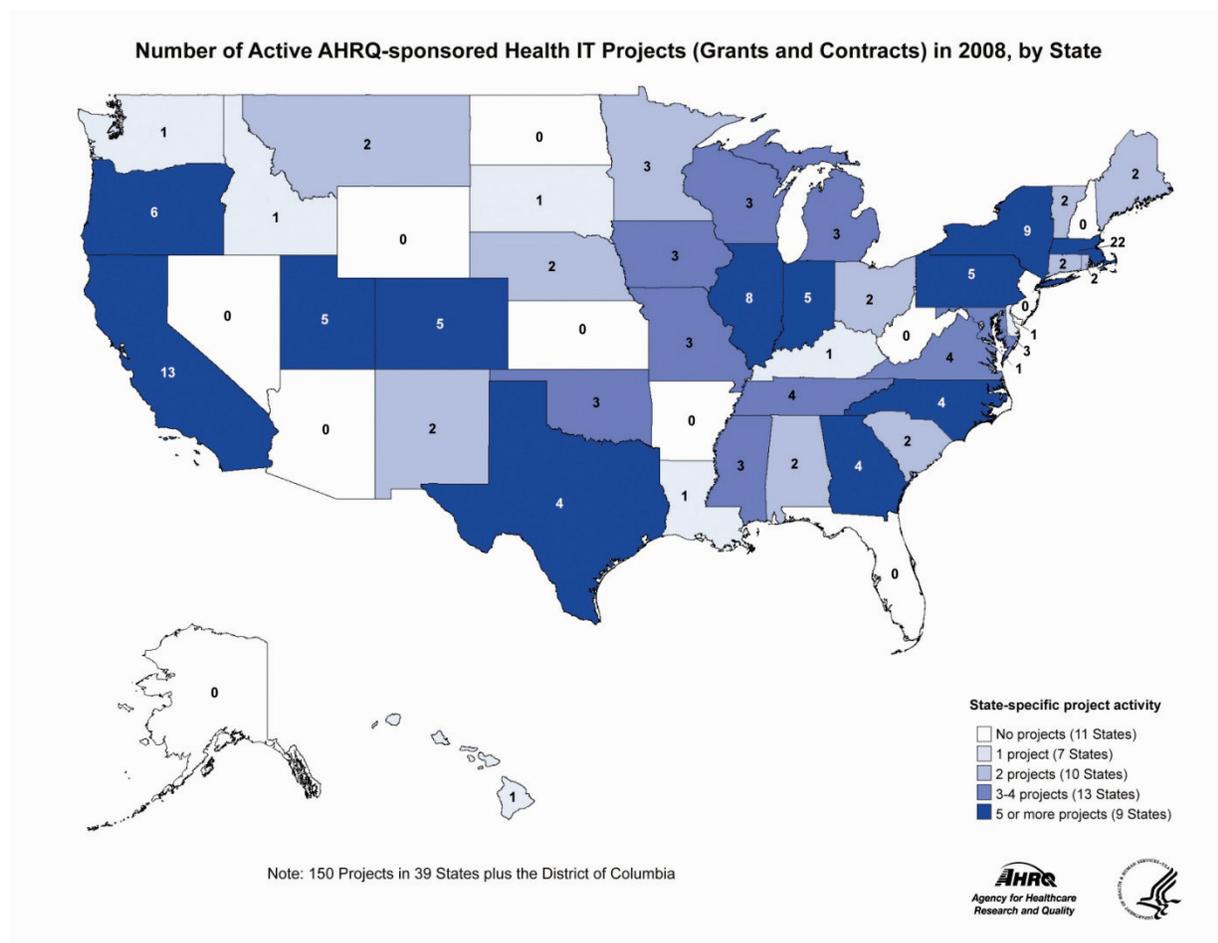


### ii. Geographic Distribution of Active Projects

<sup>14</sup> Does not include the 5-year substantial master contract for the NRC, which supports activities across strategic and business goals.

At least one research organization in each of the 50 States has received a health IT-sponsored project at some time during the program, 2004-2008 (see Figure 2). In 2008, the active recipient project institutions represented 39 States across the country. The level of project activity varied quite a bit from State to State. Massachusetts had the highest number of active health IT projects at 22. California had the next highest level, with 15 active health IT projects, followed by New York, which had 9. Indiana, Utah, Tennessee, Wisconsin, and New York are also examples of States with longstanding research programs dedicated to health IT funded by AHRQ.

**Figure 2: Number of Active Projects Sponsored by AHRQ's Health IT Portfolio as of 2008, by State**



## B. Grants

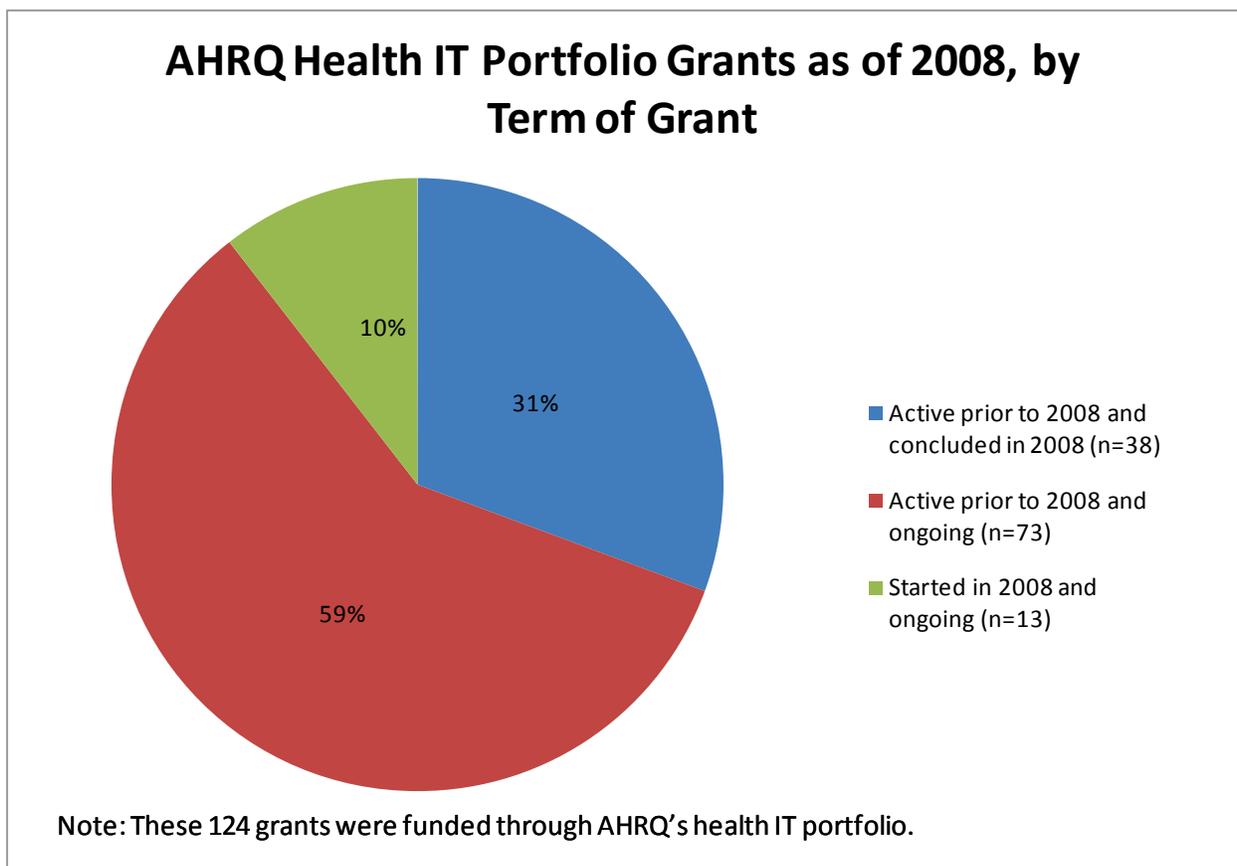
### i. Term of Grants

Each FOA specifies the maximum project period for a grant. All of the Health IT Portfolio-sponsored grants active in 2008 were multi-year grants. Grants that were issued under expanded authority are able to issue a no-cost extension of up to 12 months beyond the grant project period without prior approval by AHRQ, as long as there were no changes in scope. Grants, including

cooperative agreements, that were not issued under expanded authority may request no-cost extensions of up to 12 months. Among the 55 THQIT grants active in 2008, 96 percent (53/55) were functioning under a no-cost extension. As of the end of 2008, all of the ASQ grants had at least several months, if not years, until they were eligible to request a no-cost extension. The Health IT Portfolio will continue to monitor the duration of and extent to which no-cost extensions are used among health IT grantees.

The disposition of grants, in terms of whether they had concluded in 2008, started in 2008, or were begun prior to 2008 and continued on through 2009, are presented in Figure 3. As demonstrated by this figure, there was a net reduction in the number of active Health IT Portfolio research grants at the end of 2008, with 38 THQIT grants concluding and only 13 ASQ grants beginning. With the release of the new Health IT Portfolio PAs in 2008, we expect continued and expanded grants in the years to come.

**Figure 3: Health IT Grants, by Term of Grant as of 2008**



## ii. Grants: Lifetime AHRQ Funding by Term of Grant and Strategic Goals

Lifetime AHRQ funding refers to the total support (direct plus indirect costs) that AHRQ obligates to provide to a grant during the project period, as long as the grantee's performance

indicates continuation of the grant. The project period and award amount for a grant are defined at the time that the Notice of Grant Award is made. In the event that, at the end of a grant, a grantee has spent less of the money than it was awarded by AHRQ, this money is retained by AHRQ and may be applied to support new grant activities, or it may be returned to the Treasury. Among the 124 grants active in 2008, the strategic goal of enabling PCC or HIE dominated with 56 grants at \$69.6 million lifetime AHRQ funding. Comparable funding amounts were found for the 31 Medication Management grants at \$40.1 million lifetime AHRQ funding and 37 Improved Decisionmaking grants at \$41.6 million lifetime AHRQ funding.

Over time, the relative increase in the number of grants with a strategic goal of PCC or HIE is seen. Forty-seven percent (34/73) of the grants that were begun prior to 2008 and continued into 2009 had PCC or HIE as their strategic goal. Ninety-three percent (12/13) of the grants funded in 2008 had a PCC or HIE strategic goal. This is expected, given that the focus of the sole open FOA in 2008 (HS-08-002) was to support health IT implementation and use for patients with complex medical needs.

The grants that ended in 2008 included: 16 grants with a strategic goal of Medication Management and \$22.6 million lifetime AHRQ funding; 12 grants with a strategic goal of Improved Decisionmaking and \$16.7 million lifetime AHRQ funding; and 10 grants with a strategic goal of PCC or HIE and \$13.7 million lifetime AHRQ funding (see Table 3). In part, these research areas reflect the types of health IT that were better developed and more widely utilized—such as health IT to support medication management—at the time of the award of these grants in 2004 and 2005.

With the release of new Health IT Portfolio-sponsored PAs in 2008, AHRQ expects continued and expanded work across the health IT strategic goals and AHRQ business goals for years to come.

Going forward, as the 86 active grants roll over into 2009, only 17 percent (15/86) will be addressing Medication Management, 30 percent (25/86) will address Improved Decisionmaking, and 54 percent (46/86) will address PCC or HIE.

**Table 3: Counts and Lifetime AHRQ Funding for Active Health IT Grants as of 2008, by Term of Grant and Strategic Goals**

Grant Term	Medication Management		Patient-Centered Care or Health Information Exchange		Improved Decisionmaking		Total	
	n (%)	AHRQ Funding* (%)	n (%)	AHRQ Funding* (%)	n (%)	AHRQ Funding* (%)	N (%)	Total AHRQ Funding* (%)
Active Prior to 2008 and Concluded in 2008	16	\$22.6	10	\$13.7	12	\$16.7	38 (31%)	\$52.9 (35%)
Active Prior to 2008 and Ongoing	15	\$17.5	34	\$41.6	24	\$24.0	73 (59%)	\$83.1 (55%)
Started in 2008 and Ongoing	0	\$0.0	12	\$14.3	1	\$1.0	13 (11%)	\$15.3 (10%)
<b>Total</b>	<b>31 (25%)</b>	<b>\$40.1 (27%)</b>	<b>56 (45%)</b>	<b>\$69.6 (46%)</b>	<b>37 (30%)</b>	<b>\$41.6 (27%)</b>	<b>124 (100%)</b>	<b>\$151.3 (100%)</b>

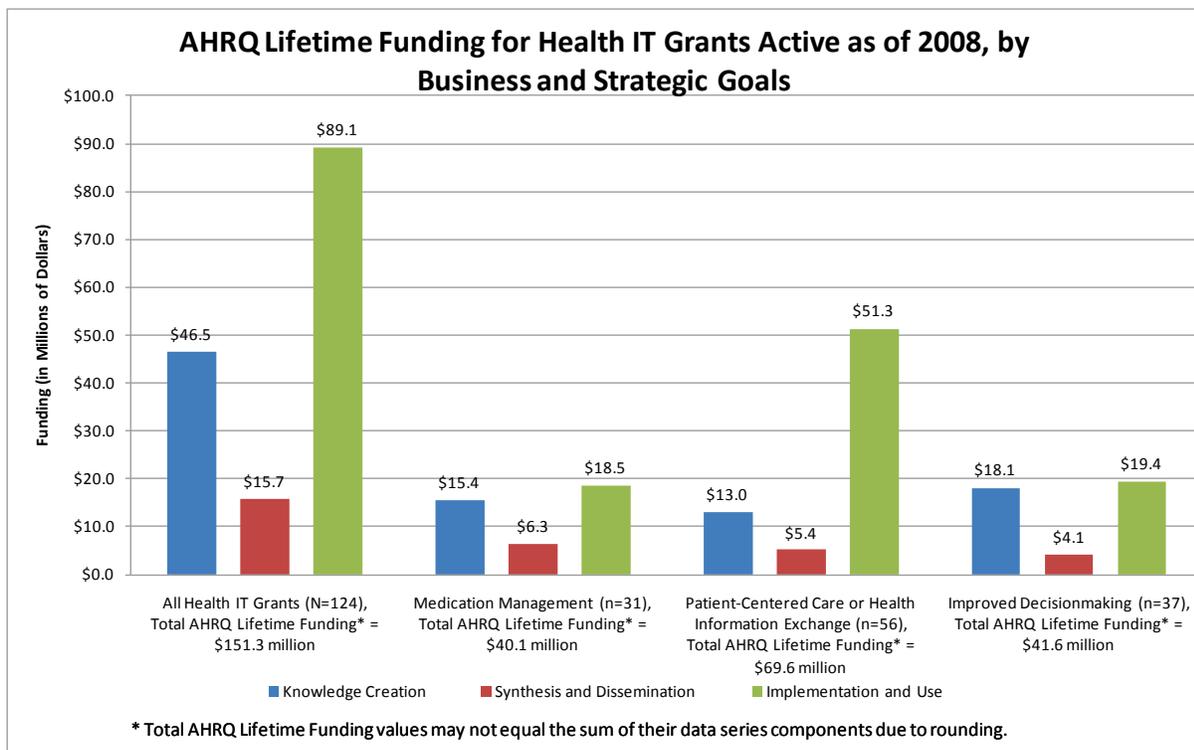
\*In millions of dollars

The distribution of AHRQ lifetime funding by business and strategic goals is shown in Figure 4. Grants that focused on implementation and use of health IT dominate the portfolio in terms of number of grants (56 percent; 73/124) and percentage of AHRQ lifetime funding (59 percent; \$89.1/151.3 million). There were nearly equal numbers of 55 THQIT grantees with business goals of Implementation and Use (n=24) and Knowledge Creation (n=25).

Grants that are ascribed to have a business goal of Knowledge Creation constitute 31 percent (38/124) of the grants and account for 31 percent (\$46.5/151.3 million) of the AHRQ lifetime funding for grants. Knowledge Creation is a growing focus of the Health IT Portfolio as reflected in the purpose and scope of the currently open health IT PAs that were published in 2008.

Only 10 percent (13/124) of grants have the business goal of Dissemination and Synthesis. This small number should not be interpreted to indicate an undervaluing of dissemination or synthesis activities. On the contrary, dissemination of results is a requirement specified in each FOA and Notice of Grant Award. At a minimum, each grantee is encouraged to work with the NRC to share with them the status of the grant on a quarterly basis, to post materials on the NRC Web site, to notify AHRQ’s OCKT when and where manuscripts are to be published, and to participate in the annual AHRQ-sponsored grantee meeting. However, these requisite dissemination requirements would likely be secondary to the business goals assigned to many of the grants.

**Figure 4: AHRQ Lifetime Funding for Health IT Grants as of 2008, by Business and Strategic Goals**



### iii. Grantees' Most Recent Self-Reported Project and Spending Status

In an effort to understand grantees' experience and performance in reaching their specific project milestones, on a quarterly basis AHRQ Health IT Portfolio grantees report their project progress and challenges using the electronic AHRQ Research Reporting System (ARRS). Included in quarterly reports are self-reported categorical variables for grantees to report the extent to which they are on track reaching overall milestones and spending plans. Since these self-characterizations are reported quarterly, we anticipate some fluctuation may occur from quarter to quarter for a given project. AHRQ also recognizes that, through the course of the grant process, unexpected delays (e.g., loss of key personnel, additional time to ensure the Institutional Review Board's approval of plans for protection of human subjects, delays in software development, installation, or interfacing with pre-existing software) may occur that could temporarily impact research milestones and spending plans. AHRQ is mindful of the importance of early identification and remediation of challenges, especially in health IT implementation research projects.

AHRQ-sponsored health IT grantees' self-reported status regarding overall goals for calendar year 2008 were (see Figure 5):

- 14 percent (17/124) progress is completely on track
- 52 percent (64/124) progress is mostly on track
- 27 percent (33/124) progress is on track in some respects
- 2 percent (3/124) progress in meeting many milestones is stalled
- 0 percent (0/124) progress across the project is stalled
- 6 percent (7/124) did not report

In general, these grantees report a high level of reaching grant-specified milestones. AHRQ accepts that periodic delays in grant processes may occur. AHRQ is engaged in outreach efforts to facilitate grantees' reporting on this issue in a meaningful manner. Five of the seven grantees that did not report by the cutoff date were funded under the THQIT FOAs, while the other two grantees received more recent grants through ASQ FOAs. Since the reporting deadline for this report, the ASQ grantees have begun reporting, and active THQIT grantees have indicated their willingness to provide information as needed and requested.

AHRQ-sponsored health IT grantees' self-reported status regarding spending for calendar year 2008 were (see Figure 6):

- 16 percent (20/124) were significantly under spent, more than 20 percent
- 30 percent (37/124) were somewhat under spent, approximately 5-20 percent
- 48 percent (60/124) were spending roughly on target
- 0 percent (0/124) were significantly overspent, more than 20 percent
- 6 percent (7/124) did not report

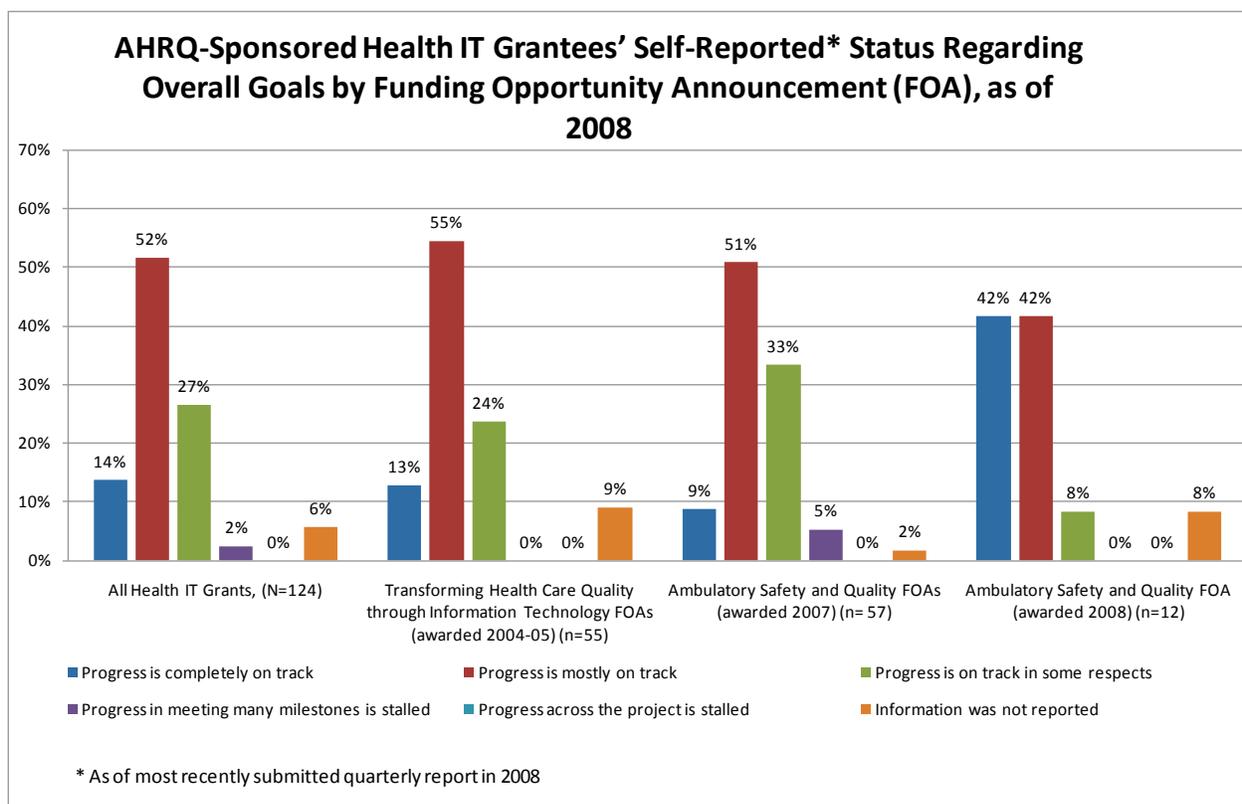
More than one-half of grantees report under spending of budgeted AHRQ funds as of the most recent 2008 quarterly report. More than 59 percent (41/69) of ASQ grantees reported having under spent their allotted budget. These 41 grantees were relatively new, with 29

grantees having an average duration of 15 months and another group of 12 grants having an average duration of 3 months at the time of reporting. Several of the grantees explained in their 2008 summary that under spending of the budget was often a result of delays in implementation of the project early on. The same seven PIs did not report for either project milestones or spending categories.

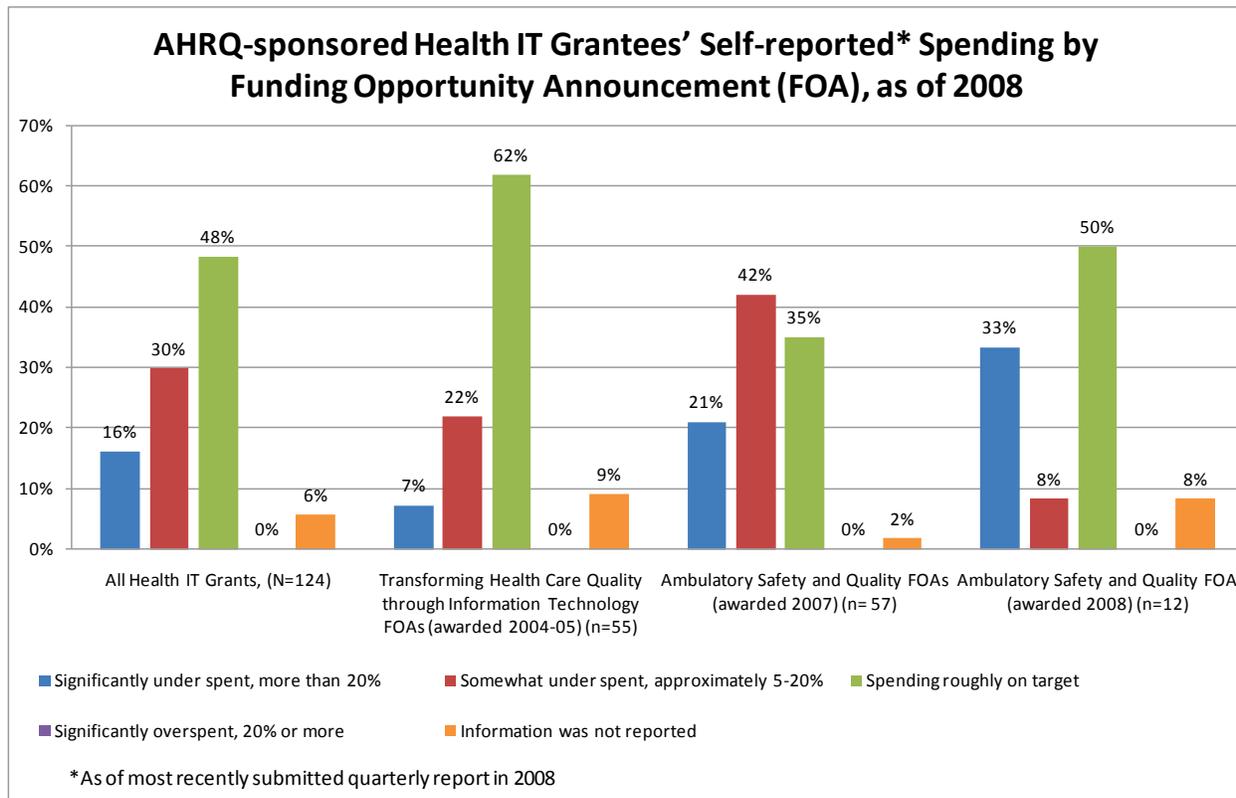
It is of note that reporting of these spending levels through ARRS is, in part, voluntary. Grantees are required to report on budgeting and spending patterns in the requisite PHS Form 2590 in order to receive approval for continuation of funding for each multi-year grant, such as these grants.

AHRQ is monitoring the progress in meeting milestones and spending patterns of grantees both within and across funding mechanisms in order to understand factors that influence overall project process and spending.

**Figure 5: AHRQ-Sponsored Health IT Grantees' Self-Reported\* Status Regarding Overall Goals by Funding Opportunity Announcement as of 2008**



**Figure 6: AHRQ-Sponsored Health IT Grantees' Self-Reported\* Spending by Funding Opportunity Announcement as of 2008**



#### iv. Principal Investigators

Grants and cooperative agreements are actually awarded to an institution and not to the PI. Yet, the PI is the individual designated by the recipient grantee organization as responsible for the scientific, technical, and programmatic aspects of the grant and for day-to-day management of the project. Among the 124 health IT grants active in 2008, there were 116 distinct PIs. Six of these PIs had two AHRQ-sponsored health IT grants active in 2008, and one PI has received successive AHRQ health IT grant awards over time, in 2004, 2007, and 2008, through different FOAs.

AHRQ gathered information about PI grantee award histories based on the information recorded in the IMPAC II database. This grantee award database is maintained by the National Institutes of Health and is used by Agencies within the Department of Health and Human Services including AHRQ, the Health Resources and Services Administration (HRSA), and the National Institute for Occupational Safety and Health. Among the 116 unique PIs who had an active health IT-sponsored grant in 2008, 18 (16 percent) had previously received a career award (K-award) or training grant (T-32) to enhance their research abilities. Among these 18 PIs, 10 had received a K-award and 8 had received a T-32 training grant. None of the 116 PIs appears to have received a dissertation grant (R-36). Three of the K-awards and three of the T-32 grants received had been sponsored by AHRQ. The other K-awards and training grants were sponsored

by Institutes from NIH (e.g., National Cancer Institute, National Institute of Mental Health, and National Center for Research Resources) or HRSA.

The THQIT FOAs (HS-04-010, HS-04-011, HS-04-012, HS-05-013) were specifically designed to target the involvement of community health centers, rural hospitals, and other health care settings and community representatives who are concerned with health IT implementation that, by design, may not have a history of conducting traditional health services research and evaluation. As such, we anticipated that there would be some THQIT PIs who themselves would not have prior grantee experience but who would gather an appropriately trained and experienced interdisciplinary research team.

The ASQ FOAs (HS-07-007, HS-07-006, HS-07-002, HS-08-002) also specified particular health care setting requirements. However, they did not target applicant institutions that may have been less likely to have grantee experience, as was expected for some applicants and awardees of the THQIT grants.

**Table 4: The Distribution of First-Time Grant Principal Investigators by Funding Opportunity Announcement<sup>15</sup>**

<b>Transforming Healthcare Quality Through Health IT (THQIT) FOAs:</b>	
44% (7/16)	RFA-HS-05-013 Limited Competition for AHRQ THQIT Implementation
78% (15/19)	RFA-HS-04-011 THQIT Implementation
35% (7/20)	RFA-HS-05-012 Demonstrating the Value of Health Information Technology [THQIT]
<b>Ambulatory Safety and Quality (ASQ) FOAs:</b>	
44% (7/16)	RFA-HS-07-007 ASQ Enabling Patient-Centered Care through Health IT
25% (6/24)	RFA-HS-07-006 ASQ Improving Quality through Clinician Use of Health IT
24% (4/17)	RFA-HS-07-002 ASQ Enabling Quality Measure through Health IT
0% (0/12)	RFA-HS-08-002 ASQ Improving Management of Individuals with Complex Healthcare Needs through Health IT

It is not surprising that the rates of first-time grantees were high for the THQIT Value PIs (HS-05-012) and the initial THQIT Implementation PIs (HS-04-011) at 35 percent and 78 percent, respectively. At first glance, one may wonder why the number of first-time PIs for the Limited Competition THQIT Implementation grants (HS-05-013) was as high as 44 percent since that RFA was restricted to recipients of one-year THQIT Planning Grants (HS-04-010). Yet, since grants are awarded to the institution and not the PI, it is not illogical that seven of the 16 PIs for the Limited Competition THQIT Implementation grants were first-time PIs. Moreover, the first-time PIs for the Limited Competition THQIT Implementation grants (HS-05-

<sup>15</sup> The Department of Health and Human Services (DHHS) IMPAC II database tracks research funding for several grant programs among various DHHS, including AHRQ, the 27 institutes at the National Institutes of Health, Health Resource Services Administration, National Institute for Occupational Safety and Health, etc.

013) had played an important role in the conduct of their predecessor THQIT Planning Grant (HS-04-010).

The percentage of first-time grantees across the ASQ FOAs varied quite a bit. Of note is the fact that each of the 12 PIs for grants to the Improving Management of Individuals with Complex Healthcare Needs through Health IT (HS-08-002) had previous experience serving as a PI. Five of these PIs had at least one predecessor grant to enhance their research abilities; however, none of these predecessor grants were funded by AHRQ.

## **v. Pursuing Completion of Specific Aims of Grants**

Thirty-eight of the 124 health IT-sponsored grants that were active in 2008 ended in 2008. Each of these 38 grants had been issued through one of the THQIT RFAs. Through the process of developing the grantee-specific summaries of these 38 grants, we began to see a few patterns emerging:

- Ninety-five percent (36/38) of these grants received no-cost extensions, generally for 1 year.
- Twelve of the PIs for those 36 grants indicated, on their own initiative, that after receiving a no-cost extension and at the end of the AHRQ-sponsored project period, there were ongoing or upcoming efforts to pursue the completion of at least one of the specific aims of the project using other funding resources. These 12 completed projects were associated with the following FOAs:
  - 50 percent (2/4) of the Limited Competition AHRQ THQIT Implementation grants (HS-05-013).
  - 28 percent (5/18) of the Initial THQIT Implementation grants (HS-04-011).
  - 31 percent (5/16) of the Demonstrating the Value of Health Information Technology (THQIT) grants (HS-05-012).

The implications to the PI and the portfolio at large are quite different, depending on which of the following scenarios is implied by the use of the term “ongoing” pursuit of specific aims of a concluded grant:

- Are there common problems that have inhibited the meeting of certain milestones across these grantees? If so, AHRQ could provide technical assistance to groups of grantees on how to handle such issues.
- Perhaps some grantees propose overly ambitious research projects. If this is a problem, is there a way that the Health IT Portfolio can modulate the process for allocating grants so that the expectations from both recipients and the awarding institution are more realistic?
- Another possible interpretation of ongoing or upcoming efforts among these concluded grants is that the PI is indicating that the health IT system initially implemented and evaluated through the grant is now being used in a sustained fashion through other funding. In this case, the perseverance should be viewed as a sign of success.

The Health IT Portfolio will continue to investigate the duration of and extent to which no-cost extensions are used among health IT grantees and the necessity, frequency, duration, and magnitude of supplemental support for grantees whose AHRQ grant funding has ended before all the objectives (specific aims) of the project have been met.

## C. Contracts

The Health IT Portfolio had 26 active contracts in 2008 with cumulative AHRQ lifetime support of \$70 million. Twenty-five of these contracts are for robust individual projects to address a defined, pre-determined need. Each of those contracts was assigned one of three Health IT Portfolio strategic goals and one of three AHRQ business goals. Their cumulative AHRQ lifetime budget equals \$47.6 million. Yet the large, multi-purpose, 5-year contract begun in 2004 to support AHRQ's NRC is involved in so many disparate activities that all three Health IT Portfolio strategic goals and all three health IT business goals are ascribed to it.

Initial project duration is specified in each contract. Some contracts have a provision to support additional option years, to be executed at AHRQ's discretion. The start dates and duration of the 25 project-specific contracts active in 2008 are quite varied:

- Five 5-year contracts for State and Regional Demonstration (SRD) Projects for HIE began in 2004 and are scheduled to conclude in 2009.
- One 5-year contract for SRD Projects for HIE began in 2005 and is scheduled to conclude in 2010.
- Of the 10 contracts begun in 2007, one concluded in 2008, and nine are scheduled to end in 2009.
- Of the nine contracts begun in 2008, one concluded in 2008, three are scheduled to conclude in 2009, and five are scheduled to conclude in 2010.

As illustrated in Table 5, more contracts (n=13) and contract funding (\$33.1 million) is associated with the Health IT Portfolio strategic goal of PCC or HIE than the other two strategic goal categories combined (n=12 and \$14.5 million). Together, the six SRDs for HIE have an AHRQ lifetime budget of \$30 million; each of the SRDs has the strategic goal of PCC or HIE.

There were 10 contracts with a Health IT Portfolio strategic aim of Improved Decisionmaking. Both of the 2-year, \$5 million-contract projects for CDS had an AHRQ business goal of Knowledge Creation.

Health IT Portfolio support for Medication Management is lower than other categories. The portfolio did provide \$1.5 million in support for a CMS-led IAA addressing medication management issues.

Excluding the larger contracts for SRD and CDS, AHRQ lifetime funding ranged from \$250,000 to \$1 million for the remaining 17 contracts.

**Table 5: Counts and Lifetime AHRQ Funding for Health IT Contracts<sup>16</sup> as of 2008, by Health IT Portfolio Strategic Goal and AHRQ Business Goal**

	Medication Management		Patient-Centered Care or Health Information Exchange		Improved Decisionmaking		Total	
	n (%)	AHRQ Funding* (%)	n (%)	AHRQ Funding* (%)	n (%)	AHRQ Funding* (%)	N (%)	Total AHRQ Funding* (%)
Implementation and Use	1	\$1.0	8	\$31.5	4	\$1.5	13 (52%)	\$34.0 (71%)
Knowledge Creation	1	\$0.4	2	\$0.9	2	\$10	5 (20%)	\$11.2 (24%)
Synthesis and Dissemination	0	\$0.0	3	\$0.8	4	\$1.5	7 (28%)	\$2.3 (5%)
<b>Total<sup>17</sup></b>	<b>2 (8%)</b>	<b>\$1.4 (3%)</b>	<b>13 (52%)</b>	<b>\$33.1 (70%)</b>	<b>10 (40%)</b>	<b>\$13.1 (28%)</b>	<b>25 (100%)</b>	<b>\$47.6 (100%)</b>

\*In millions of dollars

<sup>16</sup> Does not include the \$22 million dollar contract to the NRC, which supports all three strategic and business goals.

<sup>17</sup> Totals may differ due to rounding.

AHRQ's NRC was begun in 2004 to provide direct support to AHRQ-funded health IT grants and some contracts and to provide an open-access, easy-to-use platform for disseminating findings from those research projects. Under the direction of AHRQ, the NRC is a critical and substantive component of the Health IT Portfolio. The NRC is the primary "public face" and dissemination workhorse of the Health IT Portfolio through its well-received and resource-rich Web site, [www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov), which went live in 2005. From 2004 through September 2009, the NRC has been primarily supported through a large multi-year contract with the National Opinion Research Center (NORC) at the University of Chicago. NORC serves as the prime contractor in partnership with other institutes, including the Regenstrief Institute, the Vanderbilt Center for Better Health, the Center for IT Leadership (CITL), and John Snow Incorporated. The NRC plays a pivotal role in supporting AHRQ's management of the Health IT Portfolio in various capacities including: quarterly telephone meetings with grantees; provision of technical assistance to grantees; generation and dissemination of synthesized reference documents, such as lessons learned and decisionmaker briefs; conducting a series of National Web conferences; organizing and posting numerous resources on the NRC Web site, etc. (For more information, see [NORC's CY2008 contract-specific summary](#).)

## V. Dissemination

A hallmark of AHRQ's Health IT Portfolio is its commitment to prompt and easy-to-use dissemination of information generated through its program, related partners, and other Federal programs. In order to fully characterize the breadth of synthesis and dissemination activities of the Health IT Portfolio, one has to include: presentations and outreach activities pursued by members of the Health IT Portfolio, the many activities led by staff of AHRQ's OCKT, and the numerous NRC-sponsored activities and Web-based postings.

There are four complementary, yet interrelated means for AHRQ-led dissemination of health IT information:

- Presentation by members of the Health IT Portfolio
- AHRQ's Office of Communications and Knowledge Transfer
- The NRC Web site
- AHRQ's Annual Meeting Conference

### A. Presentations by Members of the Health IT Portfolio

Numerous presentations were made to various health IT stakeholder groups and venues, including: Healthcare Information and Management Systems Society (HIMSS); American Medical Informatics Association Conferences; and cosponsored meetings with other Federal agencies including CMS, NIH, the Department of Health and Human Services Office of the National Coordinator for Health IT (ONC), and HRSA.

## B. AHRQ's Office for Communication and Knowledge Transfer (OCKT)

Staff in AHRQ's OCKT play a critical role in the synthesis and dissemination of findings from the Agency's health IT research. In addition to preparing and disseminating content-specific multi-media newscasts and press releases, OCKT staff engage in periodic systematic updates of various points-of-contact lists to ensure successful dissemination of materials as they are generated. For example, in calendar year 2008 (CY 2008), OCKT launched a new health IT e-mail list using a sophisticated e-mail subscription system. By the end of CY 2008, nearly 14,000 subscribers joined the health IT e-mail list.

### To Sign Up to Receive AHRQ Health IT News and Information:

1. Go to AHRQ's homepage: [www.ahrq.gov](http://www.ahrq.gov).
2. Select "E-mail Updates," located next to the red envelope on the upper right hand corner.
3. Enter your e-mail address.
4. Select "Health IT" under the "Quality & Patient Safety" heading.

Highlights from OCKT's media and marketing outreach efforts during CY 2008 are listed below:

- **Press releases:** OCKT issued five press releases on health IT research findings, tools, and other resources to various media outlets. Topics included AHRQ's study on how using electronic prescribing systems that allow doctors to select lower-cost or generic medications can lead to drug cost savings; how the implementation and evaluation of four computer-based decision-support tools can help clinicians and patients better use genetic tests to evaluate and treat breast cancer; and AHRQ's \$5 million project on the development, adoption, implementation, and evaluation of best practices using CDS. Press releases are available through the press room option on the NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)).
- **Marketing outreach:** OCKT conducted marketing outreach to key associations, Federal entities, advocacy groups, policy groups, and other stakeholders to promote relevant findings to the health IT industry. As a result, OCKT issued 15 brief e-mail announcements on important health IT findings and activities to these key audiences.
- **Media interviews and coverage:** OCKT conducted nearly 20 media interviews. There was strong media coverage by mainstream and trade publications including:
  - *iHealthBeat*
  - *Modern Healthcare's Health IT Strategist*
  - *Wall Street Journal's Market Watch*
  - *Healthcare IT News*
  - *Medical News Today*
  - *Earthtimes*
  - *Biloxi Sun Herald*
  - *Health Data Management*
  - *Newswise*
  - *Yahoo!News*

- *Health Day*
- *Government Health IT*
- *PC Magazine*
- *Baltimore Business Journal*
- FierceHealthIT.com
- StreetInsider.com
- FindLaw.com

- **Manuscripts:** OCKT prepared approximately 30 health IT-oriented manuscripts in various formats, including Emerging Lessons and Health IT Implementation Stories, which are available on the NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)) under AHRQ-funded projects.
- **Journal commentaries:** Health IT Portfolio Director, P. Jon White, M.D., and AHRQ Director, Carolyn M. Clancy, M.D., co-authored a commentary, titled “Community-Based Physicians Test Safety, Workflow Benefits of E-Prescribing,” for the January/February issue of *Patient Safety and Quality Healthcare* (source: <http://www.psqh.com/janfeb08/ahrq.html>).
- **Meeting exhibits:** OCKT participated in 12 national conferences and meetings that were relevant to the health IT community and promoted AHRQ’s products and resources from its Health IT Portfolio to participants at each event.
- **E-Newsletters and Research Activities:** About 46 articles and summaries on AHRQ’s health IT programmatic and research activities were featured in three Agency electronic newsletters: AHRQ’s weekly *Electronic Newsletter*, AHRQ’s monthly *Patient Safety and Health Information Technology E-Newsletter*, and AHRQ’s monthly *Research Activities*.
- **Podcasts.** AHRQ’s Healthcare411 (<http://www.healthcare411.org/>) is a news series that features audio podcasts on consumer-oriented, timely topics on health care quality, safety, efficiency, and health IT. Weekly, 60-second radiocasts now air on almost 300 radio stations nationwide, and a 10-minute newscast produced by AHRQ on a bi-weekly basis is shared with more than 500 professional organizations. OCKT issued seven newscasts that are relevant to the health IT community. Links to the newscasts, which include topics such as care transitions, EHRs, and telemedicine, are below:
  - [Health IT – Using Technology to Improve Transitional Care](#)
  - [Implementing an Electronic Health Record System](#)
  - [A New Web Site Helps Consumers Navigate the Health Care System](#)
  - [Comparing Hospitals to Get Quality Care](#)
  - [Research News: AHRQ Unveils a New Forum for Exchanging Innovative Health Care Ideas](#)
  - [Telemedicine Project Links Rural Care Clinicians with their Counterparts in the City](#)
  - [Health Literacy Limited For Many Americans](#)

This report briefly highlights the impact that results from AHRQ’s continued efforts to market and disseminate findings from its Health IT Portfolio.

## C. National Resource Center for Health IT Web Site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov))

### i. NRC Web Site Content

The NRC Web site ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)) is a sentinel vehicle for the dissemination of findings across projects in AHRQ's health IT program. It is equally a platform to support outreach and conveyance of information from AHRQ and to share expertise across the multidisplinary fields that are engaged in critical aspects of health IT implementation and use in order to improve the quality and safety of health care.

Most notably, the NRC Web site is a contemporary gateway and historical repository of AHRQ's Health IT Portfolio. It is a comprehensive repository for myriad resources including AHRQ-sponsored reports and press releases, multimedia information telecasts and podcasts, funding opportunities, educational meetings—such as the periodic National Web Teleconferences—and summaries and insights of recipients of AHRQ-sponsored funding. The vast majority of material posted on the NRC Web site was generated by Health IT Portfolio-sponsored grantees or contractors. As of 2008, through the NRC Web site, information was continuously updated and organized by categories of information types, which include but are not limited to:

- **Events:** Series of both past and upcoming events related to health IT are listed with links to resources, such as meeting agendas and presentations. The list includes activities sponsored by AHRQ, such as the well-attended Web-based National Web Teleconferences featuring interactive presentations by noted experts in a particular field of health IT, and other important health IT activities such as those sponsored by the ONC. The list of upcoming events is proactively assembled and includes important professional meetings up to 1 year in advance. Special events such as the AHRQ Annual Meeting were featured with an eye-catching button on the NRC homepage.
- **AHRQ-Funded Projects:** Through this tool, one can identify groups of health IT-funded projects by health care setting, type of health IT technology, PI, State of organization conducting the research, and community type.
- **Health IT Tools:** AHRQ and its community of contractors and grantees have developed tools to help health care organizations plan for, implement, and evaluate health IT. These tools describe and recommend strategies for addressing some of the common challenges organizations encounter when working with health IT systems. The tools are freely available, but proper citation should be used when referenced on the Web or in print.
- **Knowledge Library:** The Knowledge Library contains both evidenced-based and theoretical content gathered by health IT experts. The content is organized into two categories: Core Collection and Partner Contributions. The Core Collection contains items found by AHRQ NRC experts to be of exceptional quality and central to the health IT discipline. Partner Contributions include content provided by professional societies and nonprofit organizations experienced in health IT.
- **Funding Opportunities:** This Web site lists all of AHRQ's open FOAs for health IT and provides links to other Federal grant programs such as NIH, the Department of Defense, the National Science Foundation, HRSA, and the White House Official Grant Catalog, as

well as foundation funding Web sites for the Robert Wood Johnson Foundation, California Healthcare Foundation, and the Commonwealth Fund.

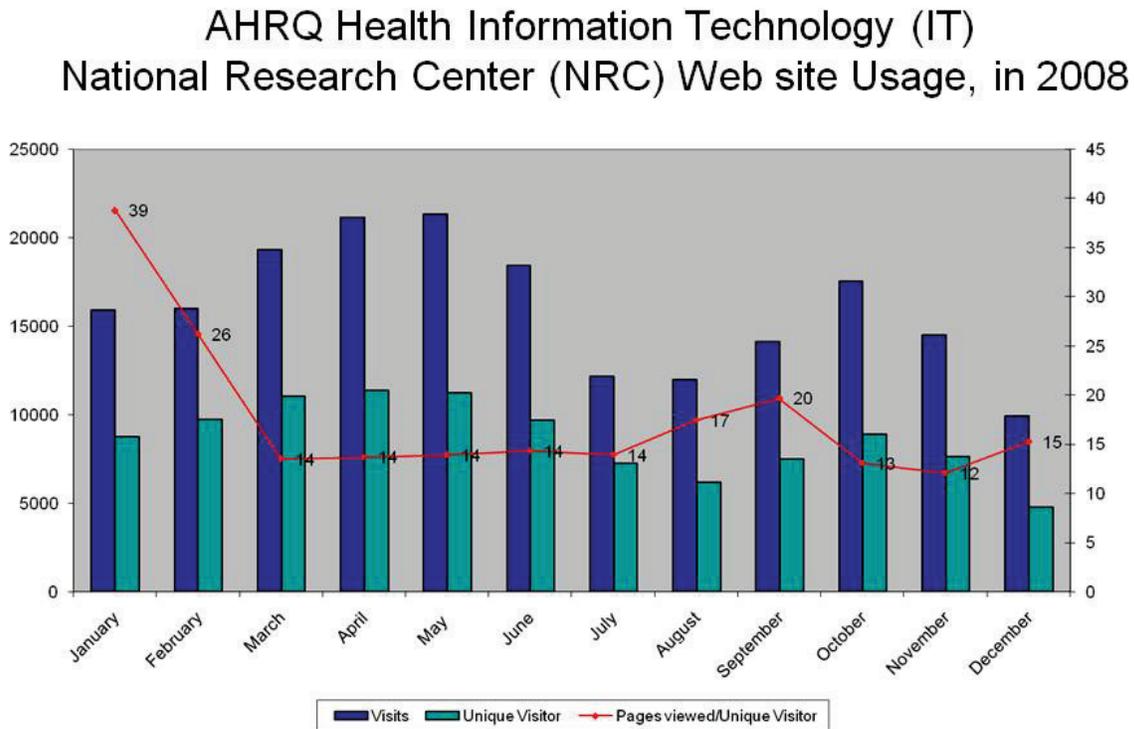
## ii. Key Performance Indicators

In 2008, the NRC increased its monitoring of NRC Web site usage. The NRC monitored key performance indicators of visits to and information sought from the NRC Web site, including unique visitors, visits, and pages viewed per unique visitor by month. The NRC uses the AWStats Web usage reporting tool. It defines a unique visitor to be someone who has made at least one hit on one page of the host's Web site during a month. If the user makes several visits during a month, it is counted only once. Most of these hits are tracked using the Internet protocol (IP) of devices participating in a computer network. However, many users surf the Web using proxy servers (e.g., AOL, Comcast), and these proxies use banks of servers to hit the same page to speed surfing. AWStats has a method for resolving proxy usage and avoids over-reporting of unique visitors.

Figure 7 shows the monthly values for number of visits, unique visitors, and average page views per unique visitor. The monthly key performance indicators for visits to the NRC Web site were:

- Mean number of visitors per month in 2008 was 16,034. The lowest number of visitors was in December (9,913), and the highest number of visitors was in May (21,351).
- Mean number of unique visitors per month was 8,671. The lowest number of unique visitors was in December (4,764), and the highest number of visitors was in April (11,361).
- Mean average number of page views per unique visitors was 17.7. The lowest number of mean number of page views per unique visitor was in November (12.1), and the highest number of page views per unique visitor was in January (38.8).

**Figure 7: AHRQ Health IT National Resource Center Web Site Usage, in 2008**



Health IT NRC Website: <http://healthit.ahrq.gov>

It is not surprising that the lowest values for two of the key NRC Web usage indicators were in December 2008—mean number of visitors per month and mean number of unique visitors per month—given the fact that in 2008 there were no new AHRQ-sponsored health IT initiatives announced and the predilection for people to take vacations in December due to school closings and religious holidays. However, there are no definitive answers regarding relative increases observed among key usage indicators over time.

In January 2008, the NRC actively advertised the release of a Health IT Survey Compendium Tool in the NRC’s Knowledge Library. Originally, the tool contained 48 surveys; subsequently during 2008, 11 additional surveys were added. The initial response to this resource was strong with more than 1,800 hits on the Health IT Survey Compendium Tool site in January. The number of hits dropped slightly in February and continued to fluctuate generally between 1,350 and 1,750 until July 2008. From July 2008 onward, despite the end of the marketing efforts, interest remained strong with more than 900 hits monthly. Although not verifiable, the spike in average number of pages viewed per unique visitor observed in January and February 2008 may be a result of the strong level of interest in the content of the Health IT Survey Compendium.

The key usage indicators were trending upward in September, which coincided with the Agency's publication of three new health IT-focused FOAs (HS-08-268, HS-08-269, HS-08-270) and the beginning of the school year. There was also a slight upward trend in number of pages viewed per unique visitor in December 2008, which coincided with the release of materials and registration for an upcoming Technical Assistance Presentation (that would be attended by more than 650 participants) to discuss the content and objectives of the three new health IT-directed FOAs.

In 2008, the NRC Web site did prompt some users to evaluate the utility of the NRC Web site through a Web-based customer service evaluation. To date, the number of visitors who have completed the customer-service evaluation form has been so low that it is difficult to interpret the findings. The frequency with which users were prompted to provide customer feedback was limited to avoid irritating regular visitors to the NRC Web site. However, in 2009, AHRQ is considering modifications to this customer-service feedback mechanism by not repeatedly targeting customers for the same type of feedback. Also in 2009, AHRQ is planning to evaluate more carefully which of the resources on the NRC Web site receive the most hits and are downloaded most often.

### **iii. AHRQ Annual Conference, 2008**

The 2008 AHRQ Annual Conference, "*Promoting Quality...Partnering for Change*," was held September 7-10, 2008, at the Bethesda North Marriott Hotel in Bethesda, Maryland. This was AHRQ's second annual agency-wide conference. Across the 4-day meeting, there were 100 interactive in-person sessions, scores of posters, and numerous manned support booths at the mAHRQet Place Café. The free 4-day meeting was well attended by 1,405 registered participants. Eight hundred and fifty people attended the AHRQ Director Dr. Carolyn M. Clancy's keynote plenary session on September 8, 2008.

The conference program was organized around the six AHRQ portfolios for 2008:

- Comparative Effectiveness
- Health Information Technology (IT)
- Innovations/Emerging Issues
- Patient Safety
- Prevention and Care Management
- Value

Approximately one-fifth of the sessions (n=17) were dedicated to discourse and dissemination about Health IT Portfolio-funded projects. AHRQ's recognition of the importance of health IT grantees' participation in this meeting was emphasized by the fact that funding was provided through their grants for the required participation of the PI and one other key personnel.

1. **Sessions on Health IT.** The 17 health IT sessions addressed a variety of health IT topics (see Table 6). Approximately four dozen Health IT Portfolio-sponsored projects were represented. All of the public sessions were well attended with 30 to 76 confirmed attendees. Nine of the public session had more than 50 attendees. Five of the most highly attended health IT sessions (more than 70 attendees per session) included sessions from the three health IT strategic

research areas (Medication Management, PCC or HIE, Improved Decisionmaking). The PowerPoint presentations for these 17 health IT sessions and other portfolios presentations from this meeting can be found at <http://www.ahrq.gov/about/annualmtg08/>.

**Table 6: Health IT Portfolio-Sponsored Sessions at AHRQ’s Annual Meeting, September 2008**

Sessions on Health IT	Attendees
<b>Monday, September 8, 2008</b>	
Considerations for Health Information Exchange (HIE) Implementation	33
Medicaid and Health IT	44
ePrescribing: Enabling Change and Measuring Impact	46
Clinical Decision Support Tools for Ambulatory Settings	52
Improving Quality of Care for Vulnerable Populations Through Health IT	55
Using Health IT to Improve Medication Management	66
Clinical Decision Support to Improve Quality	72
Enabling Quality Measurement Through Health IT	76
<b>Tuesday, September 9, 2008</b>	
Improving Patient-Clinician Communication Through Consumer Health IT	30
Considerations in Design of Health IT for In-Home Use	31
Stakeholder Involvement in HIE	34
Innovative Telehealth Applications to Support High Quality Care From a Distance	38
Measuring the Quality of Health Across Populations	44
Design of Patient-Centered Care (PCC) Health IT	61
Enabling Transitions in Care Through Health IT	72
Electronic Healthcare Record (EHR) Implementation and Adoption	72
Enabling Chronic Disease Care Through Health IT	75
<i>NOTE: Persons indicating interest in attending the meeting were polled regarding interest in attending individual public sessions. Closed sessions were not polled.</i>	

**2. Health IT Grantee Meetings.** It was AHRQ’s intent and grantees’ request that AHRQ facilitate grantees meeting one another in order to make connections and share information amongst themselves both at the meeting and afterward. As such, there was one

session for the 16 PCC grantees (HS-07-007), and another session for the 24 IQHIT grantees (HS-07-007) and 17 EQM grantees (HS-07-002) in combination. The NRC staff served as networking facilitators and unobtrusive notetakers. Given the intended informal, free-flowing atmosphere of the breakout groups and the larger number of conversations compared to the number of NRC health IT scribes who recorded them, the scribes' written account reflects a nonscientific sampling of the issues raised both within and across the PCC, IQHIT, and EQM initiatives.

Grantees indicated the desire to have similar forums via technical assistance teleconferences and national Web conferences to discuss their projects with fellow grantees. This feedback was incorporated into plans for technical assistance venues.

**3. mAHRQet Place Café.** The health IT booth at the mAHRQet Place Café was staffed by health IT staff from the NRC, who provided 2 full days of demonstrations on how to use and search the NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)); answered questions; and distributed 150 Health IT Portfolio folders containing 12 AHRQ publications, which provided overview and summary materials for various health IT-sponsored programs (see Table 7).

**Table 7: Contents of the Health IT Folder of Information Distributed at the 2008 AHRQ Annual Meeting**

Publication Title	Publication Number/Link
Health IT Brochure	<a href="#">(08-M064)</a>
AHRQ NRC Web card	<a href="#">(06-M024)</a>
AHRQ NRC One-Pager	(06-M023) <sup>18</sup>
Health IT Decisionmaker Briefs on:	
Computerized Provider Order Entry	<a href="#">(08-0093)</a>
Bar Coded Medication Administration	<a href="#">(08-0085)</a>
Chronic Disease Management	<a href="#">(08-0084)</a>
Telehealth	<a href="#">(08-0045)</a>
Patient safety/Health IT E-newsletter Card	<a href="#">(08-M059)</a>
Health IT Overview Program Brief	<a href="#">(07-P006)</a>
Ambulatory Safety and Quality Program Brief	<a href="#">(07-P014)</a>
e-Prescribing Program Brief	<a href="#">(08-PFS015)</a>
Health IT: State and Regional Demo (SRD) Projects	<a href="#">(07-P005)</a>

<sup>18</sup> This publication is no longer available on the Web site.

## VI. Conclusion

In 2008, the Health IT Portfolio provided funding to numerous organizations and individuals through various mechanisms: organizations in 39 States and the District of Columbia had active Health IT-sponsored projects, and there were 116 unique grant PIs among the 124 grants active. At the close of its fifth year, 2008, the Health IT Portfolio entered a phase of supporting projects that evaluate factors associated with successful implementation and utilization of health IT in order to improve the quality, safety, effectiveness, and efficiency of health care.

There were beginnings as well as endings in 2008. Thirteen grants and nine contracts were begun. Thirty-eight grants and two contracts, including one begun in 2008, ended. Three new grant PAs and a Special Emphasis Notice (NOT-HS-08-014) were issued to support research that examines how health IT can be used to improve health care quality in a progressively more complex fashion and to support career development, respectively. These PAs are open through November 2011. Each provides several opportunities for applicants to submit different types of grant proposals regarding the use of health IT to improve health care outcomes through small research grants (HS-08-268 [R-03]), exploratory and developmental grants (HS-08-269 [R-21]), research and demonstration grants (HS-008-270 [R18]), and career development (K-awards) and dissertation grants (R-36). With the release of these new Health IT Portfolio-sponsored Program Announcements in 2008, AHRQ expects continued and expanded work across the Health IT strategic goals and the AHRQ business goals for years to come.

The Health IT Portfolio grants active in 2008 were funded through two now-closed grant initiatives: 1) Transforming Healthcare Quality Through Information Technology (THQIT), which focused on use of health IT in rural hospitals and community health centers, and 2) Ambulatory Safety and Quality (ASQ) initiative which focused on health IT use impacting outcomes in ambulatory care settings, emergency departments, and transitions in care.

Fifty-five of the 118 grants that had been funded through the THQIT initiative were still active in 2008. Of those 55 active THQIT grants, 38 ended in 2008, leaving 17 of the THQIT grants (1 HS-04-011, 4 HS-004-012, and 12 HS-05-013) to continue their respective no-cost extension periods and conclude in fall 2009. In 2009, through an NRC Task Order award, the Health IT Portfolio will synthesize and evaluate the THQIT initiative in terms of the barriers, facilitators, and incentives for the timely completion of those grants, and the extent to which various types of health IT systems implemented through these grants have been sustained or modified, as well as other factors. The in-depth grant-specific summaries for the 55 THQIT grants active in 2008 will be an important resource to inform the conduct of that synthesis and dissemination contract.

Through its THQIT initiative, AHRQ proactively focused on health IT implementation among rural hospitals and community-based health care settings, many of which had little or no prior experience in preparing for and implementing health IT systems. During the first few years of these grants (2005-2006), through the NRC, grantees were provided myriad opportunities for one-on-one and group technical assistance on various topics including: governance; getting started and grant writing; research design and evaluation; Health IT procurement, connectivity,

privacy, security, and standards; and synthesizing, disseminating, and publishing findings. Both first-time and experienced grantees engaged in these activities and displayed a commitment toward honing new skills and building integrated communities that support health IT implementation and use.

The summaries for several THQIT grantees revealed clear and sustained dividends of AHRQ's commitment to nurture these communities and research topics in terms of the awardees' perseverance to engage communities despite travails in technology, divergent opinions, governance challenges, changing administrations within institutions, privacy and security, and other challenges. Of note were the 12 THQIT PIs who demonstrated passion and perseverance and report that they have continued to build on their research project after the completion of their grants, garnering additional resources to pursue sustainable use of health IT in their organizations. Seven of those PIs were first-time PIs.

The majority of the Health IT Portfolio's active grants in 2008 (56 percent; 69/124) were funded through one of the four RFAs of the ASQ initiative. As of the end of 2008, 57 of the 69 ASQ grants entered their second year and began to report challenges and triumphs as discussed in their individual project summaries:

- Each of the 17 Enabling Quality Measurement Through Health IT (HS-07-002) grants had concluded the first 12-15 months of their scheduled 2-year project funding periods.
- Each of the 16 grants funded through Enabling Patient-Centered Care Through Health IT (HS-07-007) had concluded their first 15 months of their scheduled 3-year project funding periods.
- Each of the 24 Improving Quality Through Clinician Use of Health IT (HS-07-006) had concluded their first 15 months of their scheduled 3-year project funding periods.
- Each of the 12 Improving Management of Individuals with Complex Healthcare Needs Through Health IT grants had concluded the first 3 months of their 3-year project funding periods.

Among the Health IT Portfolio contracts active in 2008, nine contracts across three program areas accounted for 90 percent of the Health IT Portfolio's contract funding:

- Five-year contract to support the National Research Center (NRC) for Health IT, 2004-2009. Their AHRQ lifetime funding is \$22.4 million.
- Six 5-year contracts to support a State and Regional Demonstration Project for Health Information Exchange, beginning in 2004 and 2005. Their AHRQ lifetime funding is \$30 million.
- Two CDS Services contracts begun in 2008 currently have AHRQ lifetime funding of \$10 million with additional option years.

The remaining 17 contracts had AHRQ lifetime funding ranging from \$250,000 to \$1 million and typically had 2-year project periods. Individually and collectively, these projects serve to generate and disseminate much-needed insight. Moving forward in 2009, the Health IT Portfolio will pursue various new contracts to address knowledge gaps. For example, in 2009, the Health IT Portfolio will conduct three comprehensive and systematic reviews of the scientific literature to address each of the Health IT Portfolio's strategic goals.

In 2008, across the Health IT Portfolio, projects with PCC or HIE as a strategic goal dominated at 46 percent (69/149), followed by Improved Decisionmaking at 32 percent (47/149) and Medication Management at 22 percent (33/149). Fifty-eight percent (86/149) of Health IT Portfolio projects had an AHRQ business goal of Implementation and Use, followed by Knowledge Creation at 29 percent (43/149), and Synthesis and Dissemination at 13 percent (20/149). However, this one-dimensional system of characterizing projects, especially in terms of Synthesis and Dissemination, can be misleading if taken out of context. In order to characterize the breadth of synthesis and dissemination activities supported through the Health IT Portfolio one needs to consider the \$22.3 million-dollar 5-year NRC contract, which addresses all three Health IT Portfolio strategic goals and AHRQ business goals, and the synthesis and dissemination efforts led by OCKT.

On average, there were 8,671 unique visitors each month to the NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)). The series of National Web Teleconferences administered by the NRC are an example of extremely well-attended (several hundred participants per event) dissemination activities conducted by the NRC. AHRQ's OCKT was actively engaged in synthesis and dissemination of Health IT Portfolio including press releases; media interviews; and drafting and dissemination of manuscripts, including Emerging Lessons, and Health IT Implementation Stories.

Early in 2009, AHRQ's Health IT Portfolio set forth its plan to aggregate extant information in order for NRC staff, with the assistance of AHRQ staff, to develop robust and comprehensive project-specific summaries. This project has provided the Health IT Portfolio with a better understanding of the potential power of concise, but informative, project reporting that provides contextual explanations of triumphs and travails of health IT implementation and use. For example, grantees are asked to self-identify the extent to which project milestones and spending are on track on a quarterly basis using categorical values. Forty-eight percent of grantees (60/124) reported spending roughly on target. Sixteen percent (20/124) were significantly under spent by more than 20 percent, and 30 percent (37/124) were somewhat under spent by approximately 5-20 percent. Forty-one percent (41/69) of the grants reporting under spending were relatively new grants, having completed only 15 months of a 3-year project period or only 3 months of a 3-year project period. Several of these grantees explained in their 2008 summary that under spending was the result of delays in implementation of the project early on. AHRQ will continue to explore these project summaries in order to identify technical assistance guidance. Through this feedback loop of informed guidance to grantees, benefits of reporting may be better realized as compared to the inconvenience of reporting.

With the assistance of contractors and grantees, the NRC has generated 150 candid and pragmatic Health IT resources. AHRQ intends for the summaries to be informative references for implementers of health IT, prospective research applicants, and others interested in the challenges and successes of health IT implementation and use in terms of research and practical application. We encourage would-be grantees to carefully peruse project-specific summaries in their fields of interest to learn more about characteristics of successful research projects and adaptability of PIs to adjust and persevere through real world challenges and setbacks encountered in health IT implementation, use, and evaluation.

The project summaries are available on the NRC Web site ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)) and within the appropriate chapters of this document (see Section VII Grant-Specific Summaries and Section VIII Contract-Specific Summaries). Leveraging the lessons learned from this inaugural project, AHRQ hopes to provide 2009 updates of all continuing and new projects sponsored by the Health IT Portfolio in 2010.

There are large and diversified groups of stakeholders committed to successful health IT implementation in order to achieve measurable and sustained improvement in the quality and safety of health care. AHRQ encourages you to explore the NRC Web site and sign up for the AHRQ Health IT Portfolio Listserve to receive updates on research findings and funding opportunities (see instructions in Section V. b. OCKT). AHRQ looks forward to enhanced and expanded participation by many in AHRQ's Health IT Portfolio activities during this defining moment in the evolution of health IT.

## VII. Grant-Specific Summaries

This section contains project tables and project-specific summaries for the 124 AHRQ-funded grants active in calendar year 2008.

Grant-specific summaries are organized by one of three Health IT Portfolio strategic goals, which are as follows:

1. **Medication Management:** To develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.
2. **Patient-Centered Care (PCC) or Health Information Exchange (HIE):** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.
3. **Improved Decisionmaking:** To develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Within each strategic goal section, summaries are organized by AHRQ business goal, which include: Implementation and Use, Knowledge Creation, and Synthesis and Dissemination. Grants that were complete as of December 2008 are listed first, followed by those grants that continue into calendar year 2009. Grants within these categories are organized by PI's last name, first name. A Project Table at the beginning of each strategic goal section summarizes the grants included in that portion of the report, providing information on the Project Title, Principal Investigator, and Funding Opportunity Announcement, as well as listing whether the grant was completed in 2008. A page number for each summary and hyperlink to that page within the document is also provided.

Each project-specific summary uses headers to display basic project information, including the Project Title, Principal Investigator, Organization, Grant Number, Mechanism, Project Period, and AHRQ Funding Amount. The header also indicates whether the summary represents the project's status as of December 2008 or as of the conclusion of the grant. The text of the summary contains information on the Health IT Portfolio strategic and AHRQ business goals addressed by the project, as well as a project summary. Additional headers are used to frame other elements of the project summary including: Specific Aims and the status of progress in achieving those aims, 2008 Activities, Preliminary Impact and Findings, and Selected Outputs. In addition, each grantee's project-specific summary includes information on their most recent self-reported status from the ARRS system, which provides a snapshot of the grant's progress toward project milestones and the status of their spending for CY 2008.

To find project-specific summaries on AHRQ's National Resource Center for Health IT Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)), select "AHRQ-Funded Projects" or the United States map, then follow the instructions and make selections on the AHRQ-Funded Projects page.

**Table 8: Grant-Specific Summaries (Medication Management)****HEALTH IT PORTFOLIO STRATEGIC GOAL:**

Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies (Medication Management).

<b>AHRQ BUSINESS GOAL: IMPLEMENTATION AND USE</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Funding Opportunity Announcement</b>	<b>Summary</b>
Yes	Brown, C Andrew, MD, MPH	Detecting Med (Medication) Errors in Rural Hospitals Using Technology	<a href="#">HS04-011</a>	<a href="#">Page 45</a>
Yes	Davison, Rod	Tulare District Hospital Rural Health Electronic Medical Record Consortium	<a href="#">HS04-011</a>	<a href="#">Page 48</a>
Yes	Gurwitz, Jerry, MD	Health Information Technology in the Nursing Home	<a href="#">HS04-012</a>	<a href="#">Page 51</a>
Yes	Jose, James, MD	Comprehensive Information Technology (IT) Solution for Quality and Patient Safety	<a href="#">HS04-011</a>	<a href="#">Page 54</a>
No	Carrow, Grant, PhD	Enabling Electronic Prescribing and Enhanced Management of Controlled Medications	<a href="#">HS07-006</a>	<a href="#">Page 57</a>
No	Gardner, William, PhD	Pharmaceutical Safety Tracking (PhaST): Managing Medications for Patient Safety	<a href="#">HS07-006</a>	<a href="#">Page 61</a>
No	Gorman, Paul, MD	RxSafe: Shared Medication Management and Decision Support for Rural Clinicians	<a href="#">HS07-006</a>	<a href="#">Page 63</a>
No	Gurwitz, Jerry, MD	Improving Post-Hospital Medication Management of Older Adults with Health Information Technology	<a href="#">HS07-006</a>	<a href="#">Page 65</a>
No	Kaushal, Rainu, MD	Electronic Prescribing and Electronic Transmission of Discharge Medication Lists	<a href="#">HS07-006</a>	<a href="#">Page 67</a>
No	Lapane, Kate, PhD	Optimizing Medication History Value in Clinical Encounters with Elderly Patients	<a href="#">HS07-006</a>	<a href="#">Page 69</a>
No	Lobach, David, MD, PhD, MS	Improving Quality through Decision Support for Evidence-Based Pharmacotherapy	<a href="#">HS07-006</a>	<a href="#">Page 72</a>
No	Nebeker, Jonathan, MD	Veterans Administration (VA) Integrated Medication Manager	<a href="#">HS07-006</a>	<a href="#">Page 75</a>
No	Ornstein, Steven, MD	Medication Safety in Primary Care Practice - Translating Research into Practice	<a href="#">HS07-006</a>	<a href="#">Page 77</a>
No	Trivedi, Madhukar, MD	Using Information Technology to Provide Measurement Based Care for Chronic Illness	<a href="#">HS07-006</a>	<a href="#">Page 79</a>

<b>AHRQ BUSINESS GOAL: KNOWLEDGE CREATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Funding Opportunity Announcement</b>	<b>Summary</b>
Yes	Arora, Sanjeev, MD	Project ECHO: Extension for Community Healthcare Outcomes	<a href="#">HS04-011</a>	<a href="#">Page 82</a>
Yes	Bates, David W, MD MSc	Statewide Implementation of Electronic Health Records	<a href="#">HS04-011</a>	<a href="#">Page 85</a>
Yes	Ferranti, Jeffrey, MD, MS	Automated Adverse Drug Event Detection and Intervention	<a href="#">HS04-011</a>	<a href="#">Page 87</a>
Yes	Gandhi, Tejal K, MD, MPH	Improving Safety and Quality with Outpatient Order Entry	<a href="#">HS04-012</a>	<a href="#">Page 90</a>
Yes	Gazelle, G Scott, MD, MPH, PhD	Value of Imaging-Related Information Technology	<a href="#">HS04-012</a>	<a href="#">Page 93</a>
Yes	Hayden, Avis, PhD	Improving Healthcare Quality via Information Technology	<a href="#">HS04-011</a>	<a href="#">Page 95</a>
Yes	Koss, Richard, MA	Toward An Optimal Patient Safety Information System	<a href="#">HS04-012</a>	<a href="#">Page 98</a>
Yes	Reiling, John G, MHA, MBA, PhD	Improving Patient Safety/Quality with Health Information Technology Implementation	<a href="#">HS04-011</a>	<a href="#">Page 101</a>
Yes	Schadow, Gunther, MD, PhD	Value of New Drug Labeling Knowledge for e-Prescribing	<a href="#">HS04-012</a>	<a href="#">Page 104</a>
Yes	Thomas, Eric J, MD, MPH	Measuring the Value of Remote Intensive Care Unit (ICU) Monitoring	<a href="#">HS04-012</a>	<a href="#">Page 107</a>
Yes	Ward, Marcia M, PhD	Health Information Technology Value in Rural Hospitals	<a href="#">HS04-012</a>	<a href="#">Page 110</a>
No	Carayon, Pascale, PhD	Computer-Based Provider Order Entry (CPOE) Implementation in Intensive Care Units (ICUs)	<a href="#">HS04-012</a>	<a href="#">Page 113</a>
<b>AHRQ BUSINESS GOAL: SYNTHESIS AND DISSEMINATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Funding Opportunity Announcement</b>	<b>Summary</b>
Yes	Gorman, Paul, MD	Using Information Technology (IT) to Improve Medication Safety for Rural Elders	<a href="#">HS04-011</a>	<a href="#">Page 116</a>
No	Fischer, Michael, MD	Impact of Office-based e-Prescribing on Prescribing Processes and Outcomes	<a href="#">HS07-006</a>	<a href="#">Page 119</a>
No	Johnson, Kevin, MD, MS	Safety Through Enhanced E-PreScribing Tools (STEPStools): Developing Web Services for Safe Pediatric Dosing	<a href="#">HS07-006</a>	<a href="#">Page 122</a>
No	Schwarz, Eleanor, MD	Harnessing Health Information Technology to Prevent Medication-Induced Birth Defects	<a href="#">HS07-006</a>	<a href="#">Page 125</a>
No	Singh, Gurdev, PhD, MSc	A Systems Engineering Approach: Improving Medication Safety	<a href="#">HS07-006</a>	<a href="#">Page 128</a>

<b>Project Title:</b>	Detecting Med (Medication) Errors in Rural Hospitals Using Technology
<b>Principal Investigator:</b>	Brown, C. Andrew, M.D., M.P.H.
<b>Organization:</b>	University of Mississippi Medical Center
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015400
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,222,089
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** In 2004, the Patient Safety Center at the University of Mississippi Medical Center was awarded this grant to set up a rural hospital medication error reporting network. Eight rural hospitals, including five in the Mississippi Delta and three in east central Mississippi, were recruited to participate in the project. Six of the eight were critical access care hospitals, having fewer than 25 beds. The largest hospital had 69 licensed beds; the smallest had 8 beds. In year one, an analysis focusing on technology capacity, physical space, personnel, and current medical error reporting practices was conducted. After collecting data, an educational and implementation strategy was developed. The customized educational courses that were created included continuing education (CE) and continuing medical education (CME) credits focusing on the importance of reporting medication errors and use of a Web-based medical error reporting system. Of the 210 direct care providers, 198 attended educational seminars and received CE or CME credit. In year two, an interoperable frame relay network using fractional T1 lines—bundles of normal phone lines functioning as a single data channel—and computer hardware and software was installed in each of the eight rural hospitals. The network became fully functional on January 1, 2006. Data were collected from this date until August 31, 2008; in total, 805 errors were documented.

### Specific Aims

- Introduce voluntary, anonymous, electronic medical error and adverse drug event (ADE) reporting in eight small, rural hospitals (fewer than 100 beds) in Mississippi. **(Achieved)**
- Identify barriers to implementation of health IT, including educational, cultural, technological, and intangible issues, such as reticence and resistance. **(Achieved)**
- Ascertain the epidemiology and root cause of medical errors and ADEs in small, rural hospitals. **(Achieved)**
- Formulate educational and continuous quality improvement (CQI) strategies that are specific to small, rural hospitals in partnership with participating hospitals. **(Achieved)**
- Develop, demonstrate, and evaluate strategies in partnership with the participating institutions for reducing errors and, ultimately, improving patient safety throughout Mississippi, and by extension, in other rural areas, based on the data gathered. **(Achieved)**
- Disseminate the research results and the quality improvement strategies developed in partnership with participating institutions throughout the health care industry. **(Ongoing\*)**

*\* This aim was not completed prior to scheduled conclusion of the grant, August 2008, yet, as other sources of funding have been secured, it is still targeted for completion.*

**2008 Activities:** The grantee continued to offer technical support for the error-reporting system throughout the project; data collection, ongoing since 2006, closed on August 31, 2008. Data analysis and interpretation are ongoing.

**Preliminary Impact and Findings:** To date, academic efforts have been focused on barriers encountered while implementing an electronic reporting system in a very rural, impoverished area of the United States. Some data analyses and interpretation of findings have begun. Three barriers to the adoption of new technology have been identified that may be specific to rural areas: personnel, physical space, and Internet access. For rural providers, the previously recognized barrier of cost is closely tied to personnel time—time is money. It is essential to assure hospital administrators that the reporting system is easy to learn, easy to use, and saves time in reporting medication errors, and that quality assurance reports will be provided, thus lessening time demand and responsibilities for the quality assurance director. Initially, the Internet was planned to be the sole means through which our medication error reporting system could be accessed. However, since not all direct care providers in the rural network had access to the Internet, T1 lines and the ClearCube technology were used to provide access to the medication error reporting system. It was learned that in Mississippi, rural hospitals are enthusiastic about participating in technology projects. Both administrators and staff are more knowledgeable about the benefits and governmental initiatives to create an interoperable information infrastructure than was initially assumed. Prior to starting this project, a leading private health care agency in the State commented that we would “be lucky to find eight hospitals to participate and, even if we did find eight, they would not use our system.” In fact, 35 hospitals volunteered to participate in the study. It was learned that, although implementation of technology may be different in rural settings, technology can make measurable improvements in patient safety. As in urban areas, the overall impact of the adoption and implementation of new technology in reporting medication errors has the potential to improve patient safety and patient care in rural areas.

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### **Selected Outputs**

Rudman W, Burke-Bebee S, Hart-Hester S, et al. Patient safety and patient care among small rural physician offices: the impact of electronic medical record adoption on medical error reduction, patient care, and cost reduction. *J Am Med Inform Assoc* (Submitted).

Miller-Davis P, Brown CA, Rudman W, et al. “Blunt end/sharp end” perceptions of patient safety culture: a practical approach to developing performance improvement initiatives. *Acad Med* (Submitted).

Rudman W, Hart-Hester S, Brown CA, et al. Factors Affecting the Adoption of EHR: The Use of Bayesian Models in Assessing EHR Adoption. National Rural Health Association 14<sup>th</sup> Annual Rural Minority and Multicultural Health Conference; December 2008; Albuquerque, NM.

Rudman W, Hart-Hester S, Brown CA, et al. Mississippi HIT Initiatives. National Oral Health Conference; April 2008; Miami, FL.

Rudman W, Hart-Hester S, Brown CA, et al. Research Reviews and Secondary Analysis. In: Watzlaf V and Layman E, eds. *Research in Health Information Management*; April 2008.

Rudman W, Hart-Hester S, Brown CA, et al. HIT/HIE/EMR Trends and Updates. Healthcare Financial Management Association Summer Meetings; August 2007; Philadelphia, PA.

Rudman W, Burke-Bebee S, Hart-Hester S, et al. Patient Safety and Patient Care among Small Rural Physician Offices: The Impact of Electronic Medical Record Adoption on Medical Error Reduction, Patient Care, and Cost Reduction. AHRQ Annual Conference; September 2008; Bethesda, MD.

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**Grantee’s Most Recent Self-Reported Status:** Findings are being prepared for publication.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Tulare District Hospital Rural Health Electronic Medical Record Consortium
<b>Principal Investigator:</b>	Davison, Rod
<b>Organization:</b>	Tulare Local Healthcare District
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015096
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,500,000
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** At the time the grant was awarded, Tulare District Hospital (TDH), operated by the Tulare Local Healthcare District, was a 112-bed acute care hospital, employing approximately 500 staff members. Annually, the hospital cared for 27,600 emergency room visits, 59,000 outpatient visits, and 2,300 outpatient surgical procedures. Of the hospital’s patients, 66 percent are on Medicaid or Medicare, and 12 percent are uninsured. The service area of the hospital is a primary care Health Profession Shortage Area (HPSA) and serves a medically underserved population (MUP). TDH is the only hospital in Tulare and the surrounding rural areas. Prior to commencement of the project, Tulare District Hospital had established an extensive technology infrastructure, consisting of a gigabit backbone network (3Com Core and Switches); a new AS/400 supporting the information technology (IT) applications already in place; six IBM X-series servers that drove all the personnel files, the Intranet, e-mail, and various software applications; Novel and UNIX servers for clinical systems for the pharmacy and the lab; and additional servers for a remote radiology system and the new cardiac catheterization lab. Hospital leadership recognized that resistance to change was a potential obstacle to the successful implementation of the electronic medical record at the hospital. Another obstacle faced by TDH was the training of staff members in the use of the IT system. Surveys of staff were conducted in June 2005, summer and fall 2007, and summer 2008; the initial survey provided an assessment of staff attitudes toward computer technology and its role in health care. Subsequent surveys focused on staff assessment of specific IT modules with the intention of surveying staff several months after the introduction of each module. The staff survey in summer 2007 assessed the current charting methods and staff’s expectations for the planned Patient Care Documentation module. In fall 2007, the staff were asked about their experiences with the electronic medication administration record (eMAR) module. Finally, in summer 2008 staff were asked about their experience with the recently installed Patient Care Documentation module. Quantitative data and methods were used to understand the impact of the IT system on medication errors, patient safety, and hospital finances.

### Specific Aims

- Successfully deploy a fully integrated EMR system using proven health IT practices to reduce medical error and improve overall patient safety at TDH. **(Achieved)**
- Provide private physicians and local clinic physicians the opportunity to use computerized provider order entry (CPOE) to reduce medication errors. **(Achieved, though participation in the system was low)**

- Provide private physicians and clinics in the hospital's service area the opportunity to access patient information remotely via a fully integrated EMR. **(Ongoing\*)**
- Evaluate and analyze data resulting from health IT implementation at TDH in order to assess the extent health IT contributes to measurable and sustainable improvements in patient safety and quality of care in rural hospitals. **(Achieved)**

*\* This aim was not completed prior to scheduled conclusion of the grant (September 2008) yet, as other sources of funding have been secured, it is still targeted for completion.*

**2008 Activities:** All major system components had been launched by the end of 2007. In 2008, data collection was finished, staff surveys were completed, and results were analyzed.

**Preliminary Impact and Findings:** Tulare District Hospital had a number of successes with the ambitious IT project. Many IT systems were implemented in a short period of time and on a limited budget. Larger hospitals have invested much more money only to abandon the investment. The difficulties faced by TDH during the grant arose for four reasons. First, the implementation plan may have been too aggressive for the time period of the grant. Second, the implementation team did not have consistent clinical leadership or staff input. Third, the executive leadership of the hospital completely changed, and the hospital faced one year of interim leadership during the grant. Finally, the vendor did not have fully functional products in the timeline promised. While health IT has promised to improve the quality of patient care, research supporting this potential is limited. At TDH, there is no evidence that the IT system, as implemented thus far, has had any benefit to patients. In fact, there is some indication that the disruption caused by the Patient Care Documentation system, combined with the near-simultaneous firing of the Chief Nursing Officer, may have temporarily led to more patient care errors. As TDH moves forward, it is important for leaders to develop strategies to ensure a smooth transition to an electronic medical record. One key strategy will be to increase nurse staffing during the implementation period, so that patient care activities are not deferred while staff deal with the demands of learning the new system. The experience of this first grant provides guidance specific to TDH about how to move forward over the next several years.

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### **Selected Outputs**

Spetz J, Keane D. Evaluating success: strategies and challenges for understanding IT implementations in a rural hospital. *J Healthc Inf Manag*, 2009 Winter;23(1):62-7.

eMAR Survey. Keane D, Spetz J. Unique survey developed for this study. 2007. San Francisco, CA: University of California, San Francisco.

Patient Care Documentation Follow-Up Survey. Keane D, Spetz J. Unique survey developed for this study. 2008. San Francisco, CA: University of California, San Francisco.

Patient Care Documentation Training Survey. Keane D, Spetz J. Unique survey developed for this study. 2007. San Francisco, CA: University of California, San Francisco.

Survey of Staff Readiness to Adopt Health IT. Keane D, Spetz J. Unique survey developed for this study. 2005. San Francisco, CA: University of California, San Francisco.

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**Grantee's Most Recent Self-Reported Status:** The grant has been completed. Most major system components remain in place, although their level of use varies. TDH is interested in continuing to develop and use EHRs in the future. Some project aims were infeasible due to technology constraints. The EHR

project did not demonstrably improve medical errors or hospital finances, but it has received positive feedback, and the improvements in care may manifest once the system is more familiar.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Health Information Technology in the Nursing Home
<b>Principal Investigator:</b>	Gurwitz, Jerry H., M.D.
<b>Organization:</b>	University of Massachusetts Medical School – Worcester
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015430
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,458,965
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** The project provided a framework and foundation to assess the economic implications of health information technology (IT) in the nursing home environment. The dearth of evidence about the value of IT in the care of nursing home residents and uncertainties about return on investment continue to delay the adoption of this technology for use in the nursing home setting. The overarching aim of this project was to begin to fill this gap in knowledge with solid evidence using rigorous study designs to assess the value of computerized provider order entry (CPOE) with clinical decision support in the nursing home setting. The setting for this study was an academically-affiliated long-term care facility in Canada with an electronic medical record system including integrated CPOE. The facility's CPOE software was fully linked to information in the electronic medical record and was capable of being programmed to present alerts in real-time during medication orders. Ten community-based physicians provided care to long-stay residents. These physicians usually ordered medications personally through the CPOE system. The clinical decision support system (CDSS) for adjusting dose and frequency of medication orders for long-term residents with renal insufficiency was developed by a team of physicians, pharmacists, and informatics professionals. Sixty-two drugs were selected for inclusion based on published guidelines and lists from hospital-based dosing alert systems; those chosen included oral drugs commonly prescribed in the long-term care setting that are primarily eliminated by the kidney and have known nephrotoxic effects or for which drug efficacy may be modified due to renal insufficiency. As this CDSS was developed and implemented, a study estimating the time and costs involved was performed. Because the alerts were added to an existing CPOE system within an electronic medical record that included laboratory test results and nursing notes, no additional hardware or software were required. Costs for developing and implementing the system resulted entirely from personnel time. Analysis of the costs and benefits relating to implementation of CPOE with clinical decision support in the long-term care setting indicated that the costs of implementing and maintaining these systems will be incurred by multiple stakeholders, but that the costs incurred by each may not be aligned with the benefits.

### Specific Aims

- Assess the effectiveness of computer-based clinical decision support in the nursing home setting for improving the quality of medication ordering. **(Achieved)**
- Determine costs directly related to the development and installation of computer-based clinical decision support and its impact in the nursing home setting on drug, laboratory, and personnel costs. **(Achieved)**

- Assess the impact of computer-based clinical decision support in the nursing home setting on provider productivity with reference to physicians, pharmacy staff, and nurses. **(Achieved)**
- Assess the nursing home culture and organizational structure with respect to readiness to incorporate computerized provider order-entry with computer-based clinical decision support. **(Achieved)**

**2008 Activities:** Conclusions were synthesized from the data. Results were prepared for publication and disseminated.

**Preliminary Impact and Findings:** A CDSS in the long-term care setting can lead to improved medication safety, but implementation costs are substantial and only modest cost savings can be expected. During the 12 months of the trial, more than 800 residents were present on the participating units. In total, there were 107,856 resident-days in the intervention units and 106,111 days in the control units. The rates of alerts were nearly equal in the intervention and control units. Physicians prescribing medications for residents in the intervention units received 274 alerts for a rate of 2.5 per 1,000 resident days. In the control units, 257 alerts were generated during physician medication orders and output to the audit trail for a rate of 2.4 per 1,000 resident days. The proportions of final drug orders for which doses were appropriate were similar between the intervention and control units (relative risk 0.95, 95 percent confidence interval [CI] 0.83, 1.1). For each of the remaining alert categories, a significantly higher proportion of drug orders was appropriate in the intervention units. The relative risks for appropriate drug orders were 2.4 for the alert category recommending maximum frequency (CI 1.4, 4.4), 2.6 for the category recommending that a drug be avoided (CI 1.4, 5.0), and 1.8 for alerts about missing serum creatinine (CI 1.1, 3.4). Across all categories of alerts, drug orders were appropriate significantly more often—relative risk 1.2 (CI 1.0, 1.4). By tracking personnel time and expenditures, the cost of developing the clinical decision support system was estimated at \$48,668.57. Alternatively, if the CDSS product compatible with CPOE was previously developed and truly “plug and play,” there could be reductions in programming and informatics management time; this scenario further reduces costs to \$23,694.51. Drug costs saved over a 12-month period, however, were estimated at only \$2,137. Successful adoption of health IT depends on physician, nurse practitioner, and nurse receptivity to using these systems. Thus, incentives, either non-monetary or monetary, may need to be in place to ensure this use.

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### Selected Outputs

Subramanian S, Hoover S, Field TS, et al. Cost savings from implementation of computerized clinical decision support for medication dosing for long-term care residents with renal insufficiency. (In preparation.)

Field TS, Rochon P, Lee M, et al. Computerized clinical decision support during medication ordering for long-term care residents with renal insufficiency. *J Am Med Inform Assoc* 2009 April 23. (Epub ahead of print.)

Thomson MS, Gruneir A, Lee M, et al. Nursing time devoted to medication administration in long-term care: Clinical, safety, and resource implications. *J Am Geriatr Soc* 2009 Feb;57(2):266-72.

Field TS, Rochon P, Lee M, et al. Costs associated with developing and implementing a computerized clinical decision support system for medication dosing for patients with renal insufficiency in the long-term care setting. *J Am Med Inform Assoc* 2008;15:466-72.

Wolfstadt JI, Gurwitz J, Field TS, et al. The effect of computerized physician order entry with clinical decision support on the rates of adverse drug events: a systematic review. *J Gen Intern Med* 2008;23:451-8.

Subramanian S, Hoover S, Gilman B, et al. Computerized physician order entry with clinical decision support in long-term care facilities: costs and benefits to stakeholders. *J Am Geriatr Soc* 2007;55:1451-7.

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**Grantee's Most Recent Self-Reported Status:** All aims were completed satisfactorily.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Comprehensive Information Technology (IT) Solution for Quality and Patient Safety
<b>Principal Investigator:</b>	Jose, James, M.D.
<b>Organization:</b>	Children's Healthcare of Atlanta, Inc.
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015236
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,495,572
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** Children's Healthcare of Atlanta partnered with Epic, an electronic medical record (EMR) technology vendor, and with Georgia Tech and Emory University, which together provided the research and evaluation expertise needed to fully document and evaluate the health information technology (IT) implementation as well as derive generalizable recommendations. The settings of this completed study were Children's Healthcare of Atlanta's (Children's) two inpatient facilities: one academic (Egleston), the other community-based (Scottish Rite). Children's has developed a vision for implementing health IT to improve all aspects of its operations. The hospital has embarked on a multiyear process to grow a culture of safety to support safe, consistent, quality care and services.

In particular, for this specific project, Children's started the implementation of a series of EMR components to improve patient safety and quality as well as increase efficiency of all operations. The wave of implementation focused on the pharmacy aspects of Children's as well as clinical documentation. Children are more susceptible to serious medication errors than adults due to weight-based dosing, off-label drug usage and preparation, limited ability to withstand a dosing error, and a limited ability to communicate with health care professionals when an error might occur or has occurred. Information technology such as computerized physician order entry (CPOE) and decision support are powerful tools to reduce medication errors. Designing and implementing a CPOE system in pediatrics is much more complicated than in adult medicine. The system must be able to frequently update the patient's weight because most of the medications are weight-dependent. Also, normal laboratory value ranges vary considerably as the child matures, requiring customized checks. However, due to the complicated nature of pediatric medication administration, CPOE would bring greater magnitude of benefits in pediatrics than in adult medicine to prevent potential errors.

The stages of implementation in this project were: Inpatient Pharmacy System (Jan 2005), Electronic Medication Administration Record and Clerk Order Entry (Nov 2005), Nursing & Ancillary Documentation (May 2007), Physician Documentation (Aug 2007), and CPOE (June 2008). The phased implementation approach allows for the introduction and mastery of each EMR component separately, and for the separate analysis and reporting of each component and its contribution to improving patient safety and quality of care. It changes the culture of the organization gradually. It whittles away at the medication error and other quality problems through improved tools, systems, practices and culture.

## Specific Aims

- Improve pediatric patient safety by reducing medication errors. **(Achieved)**
- Improve the hospital's culture of safety by changing staff attitudes and perceptions, particularly related to the role of health IT. **(Achieved)**
- Improve pediatric quality of care by evaluating and changing workflows. **(Achieved)**

**2008 Activities:** The CPOE module came online in 2008, completing the suite of capabilities targeted by this project. Final survey data were collected regarding attitudes toward health IT and the hospital's culture of safety. Analyses were performed, and production of dissemination vehicles continued, including several publications.

**Preliminary Impact and Findings:** A total of 959 patients were randomized and evaluated for possible adverse drug events (ADEs) and medication errors using the trigger tool. Note that ADEs include expected side effects associated with a prescribed drug, for example, nausea. Approximately 160 patient charts were examined for each time period: 40 patients from each general care unit and intensive care unit (ICU) at both campuses were reviewed. During the implementation of the EMR, Children's initiated other projects in addition to EMR to reduce ADEs and medication errors. During August 2005, smart pump technology for syringes was implemented to prevent medication errors at the bedside by catching any miskeys and/or pump programming errors. Also, in summer 2006, the pharmacy completed a Six Sigma project targeting a reduction in medication errors in preparation and dispensing medications. The phased EMR implementation and these other initiatives have contributed to the changes in medication error rates and ADEs observed in this study. Overall error rates, including low-severity errors, dropped to almost zero by late 2007. ADE rates, since they include known, expected medication side effects, were more variable across the study period. Redesigning workflows to incorporate the new systems was a critical component to ensuring that the EMR had the desired effects on quality, safety, and efficiency and on user acceptance.

The transition from paper to an EMR is difficult, and it is important to address both the technology and workflow changes needed for a successful transition. For Children's, the transition from paper documentation to Epic, the EMR system, began with clinicians. The clinicians involved in the transition included the core clinical informatics (CI) team as well as representatives for each user group (e.g., clinical role, specialty, etc.) who worked with the CI team to design workflows for their area. The CI team is a diverse group with experience as nurses, respiratory therapists, pharmacists, and a clinical nutritionist. Design groups met approximately every 2 weeks during the design phase to review the latest Epic build and provide feedback. The design groups and EMR champions also received training on change management. This enabled them to help prepare other staff to move from paper to electronic documentation. Overall, 73 percent of clinical and pharmacy managers surveyed rated the success of their hospital's implementation as "very good" or "good," and the lessons learned can help future adopters of similar technology. Training and education were considered some of the most significant facilitators to the adoption of this technology. The training instructors were highly regarded and respected by their peers. Along with the formal training sessions, the availability of pharmacy "super users" was identified by a majority of study participants as a key implementation strategy. Children's put significant effort into ensuring that clinicians were engaged at all stages of the EMR implementation and that change management needs were addressed. Despite these efforts, clinician ratings of the system's impact on individual work (efficiency, effectiveness) and quality of care were moderate and changed very little over the course of the implementation. This indicates the current generation of EMRs has room for improvement, both in the design of the technology and the methods used to ensure successful implementation and adoption of these systems. If the promise of EMR systems is to be achieved, greater emphasis has to be placed on the human element.

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**Selected Outputs**

Culler S, Jose J, Kohler S, et al. Implementing a pharmacy system: facilitators & barriers. *J Med Sys* 2009;33:80-91.

Edwards PJ, Moloney K, Jacko JA, et al. Evaluating usability of a commercial electronic health record: a case study. *Int J Human-Computer Studies* 2008 Oct;66(10):718-28.

Edwards PJ, Scott T, Richardson P, et al. Using staff perceptions on patient safety as a tool for improving safety culture in a pediatric hospital system. *J Pt Safety* 2008;4(2):113-8.

Edwards PJ, Huang D, Metcalfe LN, et al. Maximizing your investment in EHR: utilizing EHRs to inform continuous quality improvement. *J Healthc Inf Manag* 2007;22(1):32-7.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Project has been completed. All EHR functionalities have been rolled out successfully, and super-user clinicians are cultivating the hospital's culture of safety. Feedback processes have been established that have already begun to improve the quality and usability of the EMR system and its modules, and these processes will lead to further improvement.

**Milestones:** Grantee did not provide self-assessment in 2008.

**Budget:** Grantee did not provide self-assessment in 2008.

<b>Project Title:</b>	Enabling Electronic Prescribing and Enhanced Management of Controlled Medications
<b>Principal Investigator:</b>	Carrow, Grant, Ph.D.
<b>Organization:</b>	Massachusetts State Department of Public Health
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017157
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$1,199,794
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The immediate goal of this project is to foster the safe and productive adoption of electronic prescribing (e-prescribing) nationwide through the design, implementation, evaluation, and dissemination of model security standards for consideration by the U.S. Drug Enforcement Administration (DEA) as the agency develops regulations and policy governing e-prescribing of federally controlled substances. The project team is partnering with health information technology (health IT) solutions providers, such as DrFirst, Inc., and eRX Network, LLC, to design, implement, and field test a system for e-prescribing controlled substances in a contained ambulatory care environment. Concurrently, the project will develop and test the interfacing of the e-prescribing system data with Massachusetts Prescription Monitoring Program data to monitor for nonmedical use and abuse of federally controlled medications, while supporting enhanced patient-clinician communication, medication access, and safety of patients with chronic medical conditions.

This research and demonstration project will examine the adoption and diffusion of e-prescribing, a key component of health IT, and electronic health records (EHRs) to improve medication management by ambulatory care clinicians at the point-of-care. The project will also contribute to the discussions about considered expansion of e-prescribing to cover federally controlled substances (e.g., narcotics, stimulants, sedatives), particularly for patients with chronic medical conditions who are frequently treated with federally controlled substances, and the potential for e-prescribing of federally controlled substances to be associated with reduced risks of prescription fraud and other drug diversion.

### Specific Aims

- Develop, implement, and verify a system of safe and secure electronic transmission of prescriptions for federally controlled substances in an ambulatory care setting. **(Ongoing)**
- Develop and test the interfacing of the e-prescribing system described in the first aim with the Massachusetts Prescription Monitoring Program to monitor for prescription fraud and nonmedical use and abuse of controlled medications, while supporting enhanced patient-clinician communication, medication access, and safety of patients with chronic medical conditions. **(Ongoing)**
- Conduct systems process and outcomes evaluations of improvements to patient care, risk reductions, patient and clinician benefits, patient safety, and information privacy and confidentiality expected to ensue from the implementation of the first two aims. **(Ongoing)**

- Develop and implement a plan for dissemination of findings for all aims listed above. **(Ongoing)**

**2008 Activities:** A memorandum of agreement (MOA) between the U.S. Drug Enforcement Administration and the Massachusetts Department of Public Health (MDPH) was finalized and signed by the agencies on September 18, 2008. The MOA provides the regulatory framework and security requirements for electronic prescribing of controlled substances (EPCS) for the purposes of the project.

The leadership team for the project, including key persons and service providers, was fully assembled by early 2008. However, MDPH was informed in June 2008 that Surescripts, the e-prescribing network service provider for the project, would no longer be able to participate in the project. MDPH subsequently identified eRx Network, LLC, a Texas-based information technology company, as an alternative network service provider. In the last quarter of 2008, eRx Network formally joined the project. eRx Network identified three pharmacy IT system vendors, in addition to those in their own network, representing 10 pharmacies, that are capable of receiving e-prescriptions from eRx Network, and initiated discussions to identify the technical considerations required to achieve successful transmission for EPCS.

In June 2008, Berkshire Health Systems, the project test site, hosted an information dissemination meeting in Pittsfield, MA, for more than 90 invited providers and pharmacies from Berkshire County. The leadership team presented the project and fielded questions from the group. Feedback from participant evaluations suggested that the project was well received and that both providers and pharmacists are looking forward to participating.

The evaluation team finalized the scope and specific items of the prescriber survey and in December 2008, the survey was administered to a wide range of prescribers representing medical specialties, surgery, pediatrics, and obstetrics-gynecology at organized meetings. By December 31, 2008, 100 surveys were completed and returned to the liaison, representing approximately an 80 percent return rate for those distributed. In addition, the evaluation team made a number of visits to Berkshire County to conduct interviews with several pharmacies to discuss participation in the project, gather “process” information from the operational managers, identify any implementation issues, and address any lingering concerns that might impede participation.

The project has experienced delays in regards to the Department of Health and Human Services (DHHS) and DEA reaching a final agreement over the conditions of participation spelled out in the September 18, 2008, MOA between MDPH and DEA.

The leadership team discussed the composition of the project advisory group and developed a list of 32 individuals/organizations that may be approached concerning participation. A meeting would be planned to coincide with full implementation of EPCS. MDPH has been exploring the feasibility of conducting a symposium on e-prescribing in the Boston area after the implementation phase begins. The intent would be to bring together representatives from e-prescribing projects in the state and region to discuss their projects and findings.

**Preliminary Impact and Findings:** The project team has confirmed a number of potential regulatory barriers to EPCS that may be of interest to policymakers. Preliminary analyses of some States' laws indicate that there are prohibitions to EPCS, particularly for prescriptions for Schedule II pharmaceuticals, in at least some States. These States may need to change statutes and/or regulations to fully permit EPCS. Since changing statutes and regulations takes considerable time, there may be delays in full implementation of EPCS even after a final rule is promulgated by DEA. In presentations, the PI and colleagues have suggested some strategies States may employ to expedite implementation of new EPCS regulations.

An additional finding is that many States place responsibility for security and validity of prescriptions on prescribers and pharmacies, both of which are regulated/licensed at State and Federal levels. Transaction

system providers (e.g., e-prescribing software, transmission networks and switches, and pharmacy software) are not separately regulated/licensed. These additional responsibilities may be barriers to adoption of EPCS by prescribers and/or pharmacies. Another finding is that electronic prescriptions for controlled substances are currently rejected automatically by Massachusetts Medicaid (MassHealth). There will need to be changes to reimbursement mechanisms to allow for acceptance of controlled substance e-prescriptions by Medicaid and possibly other third-party payers.

The above preliminary findings were presented at several conferences, including the AHRQ Annual Conference in September 2008 and the Annual Conference of the National Association of State Controlled Substances Authorities (NASCSA) in October 2008. As a result of the NASCSA presentation, the NASCSA Executive Committee published the presentation on the organization's Web site and a notice in the organization's newsletter to disseminate the findings.

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### **Selected Outputs**

MDPH contributed to conferences and meetings at which the project was a subject of presentations and discussion. The conferences, meetings, and presenters were as follows:

Massachusetts Health Council, Pharmacy Committee, Boston, MA, March 26, 2008, Grant Carrow, Ph.D. (PI).

Massachusetts Health Data Consortium: eRx Forum, Burlington, MA, April 10, 2008, Grant Carrow, Ph.D. (PI).

Joint Meeting of the Executive Directors of the Massachusetts Boards of Medicine, Pharmacy, Dentistry, Nursing, and Physician Assistants, Boston, MA, May 20, 2008, Grant Carrow, Ph.D. (PI) and Stephen J. Kelleher, Jr., F.A.C.H.E. (PM).

Massachusetts College of Pharmacy and Health Sciences, E-Prescribing Conference, Framingham, MA, October 7, 2008, Grant Carrow, Ph.D. (PI).

National Association of State Controlled Substances Authorities (NASCSA) Annual Conference, Jacksonville, FL, October 23, 2008, Grant Carrow, Ph.D. (PI) and Peter Kaufman, M.D.

2008 AHRQ Annual Conference Session – e-Prescribing: Enabling Change and Measuring Impact. Presentation: Enabling Electronic Prescribing and Enhanced Management of Controlled Substances ([PowerPoint® File](#), 510 KB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting about 30 to 65 percent of its milestones; there is a plan for achieving some milestones, but not others. A revised protocol will enable achievement of all aims of the project and nearly all milestones except for the originally planned numbers of participating practitioners and e-prescriptions. Progress on the first aim, and to a lesser degree on other aims, was limited in the reporting period by the restriction from expenditure of all Year 2 funds pending an agreement between DHHS and the DEA. Nevertheless, groundwork in several areas continued using Year 1 funds. The project is significantly under spent, by more than 20 percent of its budget. Under spending is a function of delays in meeting the originally planned timetable as a result of unanticipated complexities in executing the project, including negotiating the DEA MOA as well as the withdrawal from the project of the original e-prescribing network provider. Moreover, AHRQ has restricted all Year 2 funds pending a final agreement between DHHS and DEA regarding the conditions of participation defined in the MOA between MDPH and DEA of September 18, 2008. Once Year 2 funds are released, the project will follow the original timetable, albeit with a shifted timeframe, as well as resume planned spending.

**Milestones:** Progress in meeting many milestones is stalled.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Pharmaceutical Safety Tracking (PhaST): Managing Medications for Patient Safety
<b>Principal Investigator:</b>	Gardner, William, Ph.D.
<b>Organization:</b>	Children's Research Institute
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017258
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,156,142
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. Pharmaceutical Safety Tracking (PhaST) is a health information system that assists clinicians' management of medications in ambulatory settings. PhaST seeks to protect outpatients taking drugs that have recognized side effect risks even when those drugs are correctly prescribed. PhaST is an automated system for monitoring of medication adherence, side effects, and patient symptoms. PhaST uses research-based assessment procedures administered using interactive voice response (IVR) telephony. When a patient reports a problem with a medication on an IVR call, PhaST alerts a psychiatric social worker trained to triage the problem, to counsel the patient or family, and, when necessary, to contact the patient's prescribing clinician or the hospital emergency services. The goal of PhaST is not to replace clinician visits with telephone calls, but rather to improve safety monitoring and remediate access problems by augmenting channels already available for families to contact clinicians. PhaST is integrated with the mental health system's electronic medical record (EMR) and computerized physician order-entry (CPOE) system, enabling clinicians to have near real-time information on the patient's experience with the medication.

The target medication for this project is the pediatric use of antidepressants. To compare PhaST and usual care, the project is conducting a randomized trial in a large urban specialty mental health system serving a primarily Medicaid population. The project seeks to enroll 800 youths receiving new prescriptions for anti-depressants and is assessing the patients for adverse events during home visits at baseline and 1, 2, and 3 months. The project will compare chart-documented adverse events against adverse events as determined by an examiner blind to the patient's randomization and predicts higher agreement between chart-documented adverse events and examiner-determined adverse events in the PhaST condition. The project is also comparing PhaST and usual care on measures of patient and provider satisfaction, patient outcomes, and measures of the quality of medication management such as rates of patient medication non-adherence.

### Specific Aims

- Determine if PhaST is superior to usual care on measures of system process. **(Ongoing)**
- Determine if PhaST is superior to usual care on measures of patient and provider outcomes. **(Ongoing)**

**2008 Activities:** The project is off to a great start in regards to data collection but needs to increase the rate of recruitment and is therefore expanding recruitment efforts to include the Nationwide Children's Hospital Adolescent Medicine clinic. Rather than conducting an additional pilot study, the project has been incrementally testing the new version of the software as it is rolled out. Teleform documents have been created to record all study data, along with structured query language (SQL) server database tables to receive these data. A policy manual for PhaST triage psychiatric social workers has been created and is online in the form of a wiki. While the manual is complete, it is being continuously updated based on experience with the system. The Institutional Review Board (IRB) would not permit the use of Medication Event Monitoring System (MEMS) caps to collect medication adherence data, as an alternative, self-reports of medication adherence are being used.

**Preliminary Impact and Findings:** There are no findings to report at this time.

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### **Selected Outputs**

The PhaST project. American Academy of Pediatrics Second National Ambulatory Primary Care Patient Safety and Health Information Technology Conference; 2008 October 1-3; Washington, DC.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is mostly on track and meeting 80 to 99 percent of its milestones; the project is generally on time. Recruiting has been slower than anticipated, in part because changes in recruitment procedures required by the IRB. The project is somewhat under spent, approximately 5 to 20 percent. There is a revised plan to use members of the Nationwide Children's Hospital Psychiatric Emergency Services team as PhaST triage staff. These staff members will work on an on-call basis; however this reduces the grant expenses.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	RxSafe: Shared Medication Management and Decision Support for Rural Clinicians
<b>Principal Investigator:</b>	Gorman, Paul, M.D.
<b>Organization:</b>	Oregon Health & Science University
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017102
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,200,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. This project will provide important results about how to integrate decision support into clinical practices to improve the quality and safety of medication management for persons with chronic illnesses. This project investigates the feasibility and impact of novel approaches to clinician decision support in multidisciplinary ambulatory care, emphasizing high-risk transitions of care. The project has developed technology to support shared medication management for persons with chronic conditions. This health information technology will be used to facilitate clinician decisionmaking and improve outcomes for patients and providers in the management of chronic conditions.

The project aims to show improvements in medication management by 1) providing the means to effectively share medication information, 2) sharing the benefit of corrections or improvements to the regimen made by any team member but visible to all the others, and 3) providing clinicians using the system with access to evidence-based information at the time and place it is needed.

This project is a continuation of a successful collaboration between community-based nurses and physicians providing ambulatory services in an Oregon coastal community, a multidisciplinary team of university-based investigators with expertise in medicine, nursing, medical informatics, and computer science; and the Oregon Rural Practice-based Research Network (ORPRN), which provides the infrastructure, coordination, and support. Clinical settings for the project are independent clinic practices in two coastal communities, local home health services, and transitions in care into and out of the single community hospital and its emergency room. The patient focus is on community-dwelling persons with chronic conditions on multiple medications. The choice of these specific innovations is informed by experience with development and early deployment of RxSafe, a system that consolidates medication lists of patients in long-term care to integrate information for providers involved in prescribing, dispensing, administering, or monitoring medications.

### Specific Aims

- Enhance clinician cognitive performance in medication management tasks by exploiting the underlying semantics of medication lists to improve the organization and presentation of medication list information. **(Ongoing)**

- Implement medication list management tools that are integrated into clinician-specific and task-specific workflows to support medication reconciliation at high-risk transitions, as well as in ongoing ambulatory care. **(Ongoing)**
- Increase the effectiveness of medication management activities of clinicians in multiple roles by improving their coordination and communication using shared medication management tools. **(Upcoming)**
- Employ evolving standards and architectures to link external, machine-actionable, evidence-based clinical information in context-appropriate and user-appropriate ways to support shared medication management by clinicians practicing in ambulatory settings. **(Upcoming)**

**2008 Activities:** In aim one, to provide meaningful presentation, the project team investigated the differing categories used by different clinicians such as pharmacists, nurses, and physicians, and then examined the impact of medication list order on the task performance and cognitive performance of physicians in a medication reconciliation task. For aims two and three, observations of clinicians performing medication management tasks were conducted and will be used to create task models that form the basis for technology interventions. For aim four, to employ evolving standards and architectures to link information, the FDA-structured product labels were examined as a source of Web-based decision support and build mock-ups of Web services that would employ this and other resources.

**Preliminary Impact and Findings:** The project team found that nurses, pharmacists, and physicians used different categorization schemes when thinking about medications. The project found that physicians, in a pilot study, form sophisticated initial mental models of the patient when performing a simple medication reconciliation task, and that these models reinforce cognitive performance. In addition, it was found that pharmacists and nurses performing medication management tasks identify and correct discrepancies in the medication regimens of their patients, but this work is more complex than “medication reconciliation” as commonly defined and performed, and is embedded in other tasks relating to the total care of the patient. Finally, no publicly available standard for classifying medications is in use, and this is a major barrier to effective multidisciplinary distributed decision support.

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### **Selected Outputs**

None Available

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**Grantee’s Most Recent Self-Reported Quarterly Status:** As of the cut-off for this report, the grantee had yet to report via the quarterly reporting system, AHRQ’s Research Reporting System (ARRS) 2008. However, through other reporting mechanisms a summary of the grant’s general status as of the end of 2008 is provided. Due to delays, the project has a revised plan, which includes postponing much of the planned clinician involvement. The milestones were revised based on the revised project plan. First-year expenses were significantly under budget while the senior software architect was on sabbatical. There is a plan in place to ramp up activities and bring in an additional research assistant to achieve our goals. The project requested to carryover funds from Year 1 to Years 2 and 3 due to unanticipated changes in key personnel, which led to substantially reduced expenditures and required adjustments to the project plan.

**Milestones:** Grantee did not provide self-assessment.

**Budget:** Grantee did not provide self-assessment.

<b>Project Title:</b>	Improving Post-Hospital Medication Management of Older Adults with Health Information Technology
<b>Principal Investigator:</b>	Gurwitz, Jerry, M.D.
<b>Organization:</b>	University of Massachusetts Medical School at Worcester
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017203
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,199,952
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The project proposed to develop and evaluate the value of an enhanced health information technology (health IT)-based medication reconciliation system interfaced with the ambulatory electronic medical record (EMR) to improve the quality and safety of medication management, focusing particularly on the transition from the inpatient to the ambulatory setting for older adults with multiple co-morbid conditions who are prescribed high-risk medications. The project interfaces with the EpicCare Ambulatory EMR Spring 2007 IU3, which is certified by the Certification Commission for Healthcare Information Technology (CCHIT). The project employs a randomized controlled trial design to test a health IT-based transitional care intervention with enhanced medication reconciliation and therapeutic monitoring alerts to improve the quality and safety of patient monitoring and medication management. This research allows for the examination of an integrated health IT intervention on the quality of follow-up, outpatient clinician workflow, occurrence of adverse drug events (ADEs), and health care utilization to gain insights into the effective use of clinical alerts and coordinated delivery of actionable information to outpatient clinicians in the management of ambulatory elderly patients subsequent to hospital discharge.

The project's health IT intervention begins with medication reconciliation at the time of hospital discharge.

The intervention addresses the special challenges in complex information management and coordination of data sharing across multiple settings that hamper clinician workflow in the post-hospitalization setting. Specifically, the intervention automates key steps in the transition of care from the hospital to home, including: 1) expediting and facilitating discharge follow-up appointment scheduling (including monitoring for no-shows), 2) sharing of enhanced medication reconciliation lists that highlight key therapeutic changes, and 3) generating patient-specific therapeutic monitoring recommendations for high-risk medications in the post-hospitalization period. This project is a randomized controlled trial of a health IT-based transitional care intervention. Randomization of the health IT discharge communication will occur at the level of the hospital discharge.

## Specific Aims

- Evaluate the impact of automated scheduling alerts on the rate of follow-up to an outpatient provider within 14 days of hospital discharge. **(Ongoing)**
- Evaluate the impact of automated monitoring alerts on the prevalence of appropriate monitoring for selected high-risk medications at 30 days from the time of hospital discharge. **(Ongoing)**
- Evaluate the impact of a health IT-based transitional care intervention on the incidence of ADEs within 45 days of hospital discharge. **(Ongoing)**
- Evaluate the impact of a health IT-based transitional care intervention on the rate of hospital readmissions and emergency department visits within 30 days of discharge. **(Ongoing)**
- Assess whether a health IT-based transitional care intervention is more effective in subgroups of patients (by level of co-morbidity, number of medications, and use of specific high-risk medications). **(Upcoming)**
- Determine costs directly related to the development and installation of the health IT-based transitional care intervention. **(Upcoming)**

**2008 Activities:** The process of reviewing and organizing data from existing therapeutic monitoring standards has continued in 2008. Consultant pharmacists were contracted and continue to review the data and assist with development of expert review and obtaining consensus. The expert drug review has been implemented and completed a modified Delphi process to achieve consensus. The project has held two clinical review sessions with members of the study team, as well as members external to the study team within the clinical organization, to solicit buy-in for the monitoring guidelines.

**Preliminary Impact and Findings:** The project does not have any findings at this time.

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## Selected Outputs

Project staff met with national leaders at the health maintenance organizations (HMO) Research Network Annual Meeting in April 2008 to discuss plans for the validation process of the therapeutic monitoring guidelines/standards. The development of the therapeutic monitoring guidelines/standards is in progress. The first round of expert drug review has been implemented.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is mostly on track with 80 to 99 percent of its milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Electronic Prescribing and Electronic Transmission of Discharge Medication Lists
<b>Principal Investigator:</b>	Kaushal, Rainu, M.D.
<b>Organization:</b>	Joan and Sanford I. Weill Medical College of Cornell University
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017029
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$1,187,674
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. This project consists of three studies designed to measure the impact of health information technology (health IT) on patient safety in the ambulatory setting. The first study is a multi-center before-and-after study measuring the effects on medication errors of transitioning from one electronic prescribing (e-prescribing) system to another, in this case from a home-grown to a vendor-based system. The second study is a qualitative study of physicians, which uses one-on-one-interviews and direct observation to understand variations in human-computer interactions with the new e-prescribing system and how user patterns or system features may influence medication errors. The third study is a randomized, controlled trial evaluating the effect of electronically transmitting discharge medication lists from the hospital to the ambulatory setting. The third study will consider the following outcomes: 1) medication discrepancies at the first ambulatory visit following discharge and 2) adverse drug events (ADEs) 30-days post-discharge.

These studies will yield important information on the effectiveness of two electronic interventions to decrease medication errors in the ambulatory setting. If effective, these interventions could be implemented and sustained in many other centers. The studies also have implications for institutions or practices that are transitioning from one electronic health record (EHR) to another. This project has the potential to reveal critical insights into why certain health IT interventions work (or do not) and how future interventions should be designed to align themselves better with physicians' workflow. If rates of errors vary greatly between commercial systems, there are potential policy implications for more stringent certification criteria of e-prescribing to ensure medication safety.

### Specific Aims

- Measure the effects of transitioning from one e-prescribing system to another in the ambulatory setting on medication errors. **(Ongoing)**
- Measure the effects of transitioning from one e-prescribing system to another in the ambulatory setting on human-computer interactions. **(Ongoing)**
- Evaluate the impact of electronic transmission of medication lists at discharge from the hospital to the ambulatory setting on medication discrepancies at the first ambulatory visit following discharge. **(Ongoing)**
- Evaluate the impact of electronic transmission of medication lists at discharge from the hospital to the ambulatory setting on ADEs 30 days post-discharge. **(Ongoing)**

**2008 Activities:** For Study One, project investigators have nearly completed review of baseline prescription data and data 3 months after the implementation of the new e-prescribing system at one study site. The project team anticipates beginning prescription review at the second study site in the next quarter.

Two novel surveys have also been created to be administered to providers and key informants. These surveys are designed to measure associations between providers, office practices, e-prescribing systems, patients, and implementation strategies that may be influencing error rates. For Study Two, the project has developed a semi-structured interview guide and field observation guide for qualitative data collection and has begun data collection and analysis at one study site. These were developed in collaboration with Dr. Joan Ash, a nationally recognized expert in behavioral issues related to implementing clinical information systems. For Study Three, the project team anticipates that the electronic transmission of medication lists from the inpatient to the outpatient setting will be implemented next quarter. The project team is in the process of developing a patient survey tool to detect medication errors and adverse drug events.

**Preliminary Impact and Findings:** Not yet applicable.

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### **Selected Outputs**

None available.

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**Most Recent Self-Reported Quarterly Status:** The project has been delayed in carrying out Studies One and Two because both study sites delayed implementation of the new e-prescribing systems. The project's research nurse is only part-time, so there are additional funds left on this budget line. However, under spending is not expected to affect the progress or quality of the grant. The under spent amount from the research nurse will be used for additional biostatistician support from the junior biostatistician.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Optimizing Medication History Value in Clinical Encounters with Elderly Patients
<b>Principal Investigator:</b>	Lapane, Kate, Ph.D.
<b>Organization:</b>	Virginia Commonwealth University (VCU)
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017150
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$1,199,989
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. Stemming from previous research, this project hypothesized two ways to optimize improvements in the quality of medication management during clinician office visits: clinicians need additional professional development to better use medication history information during the clinical encounter, and additional clinical informatics functionality must be used in conjunction with detailed medication history via electronic prescribing (e-prescribing) to help guide and structure the clinician’s approach to medication management in ambulatory settings. The intervention will: 1) aid in the evaluation and prioritization of medication management issues (e.g. polypharmacy, non-adherence issues, potentially inappropriate medications) at the point of prescribing; 2) facilitate the incorporation of information regarding medication issues into the clinical encounter; 3) foster clinician-geriatric patient/caregiver communication regarding potential medication management issues; 4) promote the optimal integration of medication-history data at the point of prescribing; 5) assist clinicians in evaluating and monitoring complex medication regimens to assist in identifying, resolving, and preventing medication-related problems; and 6) facilitate informed, shared decisionmaking and monitoring for medication-related problems.

The project is unique in that it aims to test information technology leveraging the flow of community pharmacy-based medication history at the point of prescribing coupled with professional development to enhance patient-provider communication specifically to improve medication management among elderly persons seeking care in ambulatory care settings. To test this intervention, the project conducts a large-scale randomized trial, recruiting 18 physician practices that use e-prescribing and DrFirst e-prescribing application and network to transmit prescriptions to pharmacies. One-third will receive the innovative modality for delivery of the standard of care by leveraging medication history information (triggering), one-third will receive the triggering and a curriculum to teach clinicians how to optimize communication skills with elderly persons and their caregivers in the presence of health information technology in the clinical encounter (training), and one-third will receive the existing modality for delivery of standard of care. The evaluation of the project relies on extensive process tracking, existing data sources of medication history, and primary data collection of provider information.

## Specific Aims

- Develop geriatric-specific algorithms to identify potential issues with medication management (e.g. polypharmacy, potentially inappropriate medication use, duplicative therapy, non-adherence) using community pharmacy-generated medication history. **(Ongoing)**
- Develop structured, problem-oriented frameworks for organizing medication history information during visits (triggering) for common issues identified by the algorithms developed in Aim 1. **(Ongoing)**
- Develop and pretest modules to teach clinicians how to improve geriatric patient-provider communication relating to medication management with the use of technology (training). **(Ongoing)**
- Test the impact of these interventions on clinician behavior using a randomized controlled trial with three arms: 1) no intervention, 2) delivery of triggering intervention, and 3) delivery of triggering and training interventions. **(Ongoing)**
- Develop "tool-kit" resources that include developed intervention products for use by non-physician providers in other ambulatory settings (e.g. pharmacists in community pharmacy settings). **(Ongoing)**

**2008 Activities:** The triggers to be incorporated in the project have been developed along with recommended alternatives for many drugs listed on the Beers list, adherence triggers, underuse triggers, and overuse triggers. With input from DrFirst, staff have ruled out the implementation of the underuse triggers owing to questions regarding the validity of the data. In the upcoming months, staff will evaluate the newly emerging Surescripts data to see if this approach will be more viable in the future. Project staff conducted an analysis of National Health and Nutrition Examination Survey (NHANES) to understand population-based estimates of medication issues in elderly populations. This analysis was followed by confirmation of themes in the literature. The project is working with partners in Canada who have developed a coding system (MEDICODE) to capture the interaction between physicians and patients related to medications.

The development of the physician training content is ongoing, and the content leaders have audiotaped their modules. The modules need to be converted and integrated into the training presentations. Once completed, the next step is for each module with audio recording to be posted to the Web site for use in the intervention aspect of the study. Currently, an application for continuing medical education (CME) credit is underway. The staff is applying for evidence-based CME for some of the modules, as it was indicated in a focus group that this would provide extra incentive for participation. It is anticipated that the CMEs will in place by the first quarter of 2009.

The patient survey used for data collection has undergone cognitive interviews and pre-pilot testing for timing, clarity, etc., and the content of the physician surveys is currently being revamped. Both surveys need to undergo Institutional Review Board (IRB) approval before they will be available for use.

**Preliminary Impact and Findings:** There are no findings to report to date.

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## Selected Outputs

AHRQ 2008 Annual Conference presentation: Findings from Focus Groups of Geriatric Patients Regarding Medication Issues ([PowerPoint® File](#), 515 KB; [Web Version](#))

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is under spent owing to Dr. Lapane's transition to VCU from Brown and the resulting lag time in the transfer of paperwork and budgets.

**Milestones:** Progress is mostly on track.

**Budget:** Significantly under spent, more than 20 percent.

**Project Title:** Improving Quality through Decision Support for Evidence-Based Pharmacotherapy  
**Principal Investigator:** Lobach, David, M.D., Ph.D., M.S.  
**Organization:** Duke University  
**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)  
**Grant Number:** R18 HS 017072  
**Project Period:** 09/07 – 08/10  
**AHRQ Funding Amount:** \$1,198,429  
**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. This project seeks to develop a decision support system for medication management to promote increased adherence to evidence-based pharmacotherapeutic guidelines both through traditional clinic-based models of care and through new care models including population health management and cross-disciplinary teams. The system is based on an emerging standard for decision support and uses routinely available claims and scheduling data in order to serve as a replicable model for broader use of decision support for medication management. The decision support system used in this project, known as the System for Evidence-Based Advice through Simultaneous Transaction with an Intelligent Agent across a Network (SEBASTIAN), is the basis for an international Health Level 7 (HL7) standard for Clinical Decision Support (CDS) using a service-oriented architecture. Increased availability and use of decision support tools for medication management can be expected to reduce medication errors, improve health care quality at an acceptable cost, and augment disease management for patients and populations.

This project builds upon a regional Health Information Exchange (HIE) network created to connect providers serving 43,000 Medicaid beneficiaries across traditional institutional boundaries from both rural and urban settings in a six-county region in the Northern Piedmont of North Carolina. This network includes 28 private primary care clinics, 3 federally qualified health centers, 4 rural health clinics, 3 urgent care facilities, 11 government agencies, 5 hospitals, and 2 cross-disciplinary care management teams. Rules for evidence-based pharmacotherapy for priority areas identified by the Institute of Medicine (IOM) will be encoded in a standards-based decision support tool that has been in use within the HIE network for 3 years to promote population health management. These rules will be designed to function using routinely available claims and scheduling data in order to make the proposed approach more generalized, portable, and scalable. This approach will support both traditional clinic-based models of care and new care models, including population health management and the use of cross-disciplinary teams. The primary study hypothesis is that adherence to evidence-based pharmacotherapy will be highest among patients who receive medication management information sent both to their clinic-based practitioners and to their care managers. The expected effect on safety/quality from this project will be improved adherence to evidence-based pharmacotherapy guidelines. This project will undertake a randomized clinical trial within an HIE network known as Community-Oriented Approach to Coordinated Healthcare (COACH) to evaluate the impact of the medication management interventions. To enhance the data in the HIE, new data importation programs are being developed for practices using different health

information technology (IT) vendor-based practice management applications for patient scheduling and encounter billing activities. Vendors include IDX, Health Pro, Mysis Tiger V, NueMed, and Healthmatics. Daily importation of scheduling and encounter data is in place for 11 of 14 clinical sites. The remaining three clinics are in test mode.

### Specific Aims

- Expand the functionality of an existing decision support system in use within a regional HIE network for Medicaid beneficiaries to incorporate evidence-based (EB) pharmacotherapy and to promote medication adherence. **(Ongoing)**
- Implement and evaluate the impact of two complementary interventions for medication management on adherence to EB pharmacotherapy among Medicaid beneficiaries in ambulatory care settings through a three-arm randomized controlled trial. **(Ongoing)**
- Compare resource utilization and assess the economic attractiveness (cost-savings or cost effectiveness) of the interventions to promote medication adherence and EB pharmacotherapy. **(Ongoing)**
- Disseminate information regarding the development and impact of the interventions through Web teleconferences, professional meetings, educational lectures, and peer reviewed journals. **(Ongoing)**

**2008 Activities:** Project staff are continuing the process of developing and encoding evidence-based pharmacy rules to make them machine process-able. System architecture meetings have defined the necessary system enhancements to support the point-of-care (POC) report. The preliminary and final reviews of the first data bank (FDB) drug classifications have been completed to ensure that the FDB classifications appropriately associate the medications of interest. Software to generate the POC medication and adherence reports has been developed, and the workflow and process analysis interviews with each of the 14 clinical sites to ensure effective delivery and utilization of the POC report have been initiated. Currently, the project team is working with the 14 clinical sites to obtain registration and scheduling data on a daily basis. However, as most sites have different application software, these data importation efforts have required more time and effort than expected.

**Preliminary Impact and Findings:** There are no findings to report to date.

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### Selected Outputs

Co-presented an AHRQ Webinar, October 2008: Use of Clinical Decision Support and the Impact of Clinical Decision Support on Workflow; presentation: Use of Clinical Decision Support in Clinical Practice. [Adobe PDF File](#), 2.72MB. Accessed May 2009.

Presented at the annual AMIA conference, November 2008: Development and Evaluation of an Improved Methodology for Assessing Adherence to Evidence-Based Drug Therapy Guidelines Using Claims Data.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Progress is on track in some respects but not others. About 65 to 80 percent of the project milestones are being met, but there is a viable plan for achieving the others; the project is staying close to schedule with some slippage. This slippage is in part the result of delays from partner primary care clinics and their IT vendors that have slowed efforts to import schedule data needed for this intervention. It is also due in part to the complexity in developing and implementing the decision support rules needed to generate evidence-based pharmacotherapy recommendations. The development of the POC medication reports has been delayed because the complexity of the task is greater than initially projected and because of unplanned extended absences of important study staff members. Furthermore, the hiring of a new software engineer to develop the highly complex SEBASTIAN CDS component for this project required an extended training period. Project staff

are currently estimating a three-month shift in the time line for the deployment of the intervention. Hiring delays and extended medical leave for important staff members account for much of the under spending in the personnel and professional services category. Local travel expenses were lower than anticipated as clinic workflow assessment visits were delayed due to the project coordinator's illness. In addition, the rate of spending has slowed down with the slowdown in system development. Other expenses related to project implementation initially targeted for CY2008 will be incurred during CY2009-2010. It is anticipated that future expenses will track with the revised deployment timeline.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Veterans Administration (VA) Integrated Medication Manager
<b>Principal Investigator:</b>	Nebeker, Jonathan, M.D.
<b>Organization:</b>	Western Institute for Biomedical Research
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017186
<b>Project Period:</b>	09/07 – 03/10
<b>AHRQ Funding Amount:</b>	\$594,582
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. This project features the development and evaluation of a new health information technology (health IT) application called the Integrated Medication Manager (IMM). This application was developed using well-established theories of cognition, notably Hollnagel’s Contextual Control Theory, and is designed to facilitate improved decisionmaking by helping clinicians to consider more relevant data, and to better plan patient care. One of the major features of this system is the explicit linking of patient problems, therapies, and goals. This project will compare the new IMM to the current version of the Veterans Administration’s (VA) Computerized Patient Record System. This project focuses on generating new knowledge about medication management. The VA Office of Information and Technology is the primary organizer. The study occurs in three phases over 2½ years. During the first year, mixed methods were used to elucidate the technology’s socio-cognitive mechanisms of action. The preliminary findings of this phase were shared with the development team, who refined the software based on the findings. There is some modest overlap in the first-year studies and those begun subsequently. During the second year, the project will continue to analyze data from the first year and implement the software in a cluster-randomized trial. During the final 6 months, the clinical data will be analyzed.

In addition to the immediate aims that will be attained during the life of this grant, the project team plans to apply for funding for the following future aims: evaluate the impact of the IMM on team interactions and communication; evaluate the effect of the IMM on adverse drug events; implement and evaluate the effect of integrating patient-entered clinical information and goals through myHealthVet, the VA patient Web portal; implement and evaluate rich, condition-specific decision support for hypertension and other conditions; evaluate the IMM as a tool for continuous medication reconciliation; and evaluate the cost, cost effectiveness, and cost benefit of the IMM and related systems.

### Specific Aims

- Identify cognitive components of providers’ therapeutic decisionmaking in the field. **(Upcoming)**
- Refine and evaluate the IMM using simulation studies. **(Upcoming)**
- Implement and evaluate the IMM in a cluster-randomized trial. **(Ongoing)**

**2008 Activities:** The process of working with standards committees in the VA to apply knowledge representations such as National Drug File Reference Terminology, which links drug ingredients to indications and adverse effects, was completed, along with the construction of compact representations for use in testing. Identification of cognitive components of providers' therapeutic decisionmaking in the field was completed and pilot data was collected. The computerized data collection tools were finalized and are in use. Institutional review board (IRB) approval was previously obtained for the first two aims listed above for some sites; however, the remaining two sites for the first aim are within the VA Puget Sound Health Care System, where a moratorium was placed on all research currently being conducted or pending approval. Thus, IRB approval will be pending until they lift restrictions and grant approval for the study. The project hopes to receive approval in year two quarter two, but has no definite timeline for when approval will be granted. Data collection at one of the five sites has been collected with the target of collecting data from two additional sites by quarter two of year two still on track.

**Preliminary Impact and Findings:** The project has no findings to report at this time.

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### **Selected Outputs**

AHRQ 2008 Annual Conference presentation: Human Factors in Prescription Medication Management ([PowerPoint® File](#), 1.2 MB; [Web Version](#)).

AHRQ 2008 Annual Conference presentation: Information Integration to Support Medication Management ([PowerPoint® File](#), 2.1 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is mostly on track with 80 to 99 percent of its milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Medication Safety in Primary Care Practice—Translating Research into Practice
<b>Principal Investigator:</b>	Ornstein, Steven, M.D.
<b>Organization:</b>	Medical University of South Carolina
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017037
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$1,183,549
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The Practice Partner Research Network (PPRNet), a practice-based research network among primary health care providers practicing in 38 States who use a common electronic medical record (EMR), has developed a quality improvement model for successfully translating research into primary care practice termed the Practice Partner Research Network—Translating Research into Practice (PPRNet-TRIP). The purpose of this project is to conduct a demonstration project among 20 PPRNet practices. The project will develop a set of medication safety measures relevant for primary care, incorporate these measures in practice performance reports sent quarterly to participating practices, and assess the impact of PPRNet-TRIP on the incidence of these errors. The project is 3 years in duration. During the first 9 months, a preliminary set of medication safety indicators developed by the research team were refined, using a consensus development process among the participating practices. Programs were developed to add these medication safety measures to the quarterly PPRNet practice reports.

A 2-year intervention is underway, including the development and dissemination of performance reports, network meetings, and practice site visits, to help practices systematize their use of the medication safety clinical decision support features in their electronic medical record (EMR) system, McKesson Practice Partner (Version 9, Seattle, WA). These features include warnings for drug allergies, drug-drug and drug-disease interactions, incorrect dosages, and drug ineffectiveness; and prompts for therapeutic monitoring to prevent adverse drug events. After 2 years, the impact of the intervention on the incidence of medication errors will be assessed. A mixed-method process evaluation will also be conducted to assess the project. The findings will then be disseminated to other PPRNet practices and more broadly through presentations and publications. The final performance report will be prepared in the tenth month of year three of the project, and these data will serve as the final point for assessment of the project's effectiveness. Analyses and manuscript preparation will be done during the final 3 months of the project, and a wrap-up network meeting will be held to disseminate study results.

### Specific Aims

- Develop a set of PPRNet medication safety indicators based on literature, refined to reflect cumulative expertise of members. **(Achieved)**

- Incorporate PPRNet medication safety indicators in quarterly practice reports distributed to 20 participating practices. **(Ongoing)**
- Assess the impact of the PPRNet-TRIP quality improvement (QI) model on medication safety indicators in participating practices. **(Ongoing)**

**2008 Activities:** The project continues to assess the impact of the PPRNet-TRIP QI model on medication safety indicators and conducted the first practice site visit in September 2008; all site visits will be completed by March 2009. The development of the set of PPRNet medication safety indicators is complete, and indicators have been incorporated in quarterly practice reports but will continue to make minor modifications as the project progresses.

**Preliminary Impact and Findings:** The initial key finding was the relatively high baseline performance on the variety of medication safety indicators included in the reports. The second key finding was the enthusiasm for the project demonstrated by participants at the September 5, 2008, network meeting and the broad set of improvement approaches they developed. Site visits were completed at 13 practices. Project staff noticed that practices were generally enthusiastic about the study. All made improvement plans, largely centered around developing better systems for assuring the completeness of medication lists, using reports to identify patients needing specific follow-up and using EMR medication safety tools more systematically.

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### **Selected Outputs**

The project presented on the measure set and baseline performance at the North American Primary Care Research Group Meeting in San Juan, Puerto Rico, in November 2008.

Measure Outcomes and Medication Safety Reports.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 100 percent of its milestones; and is on time on all tasks.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Using Information Technology to Provide Measurement Based Care for Chronic Illness
<b>Principal Investigator:</b>	Trivedi, Madhukar, M.D.
<b>Organization:</b>	University of Texas SW Medical Center – Dallas
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017189
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,196,703
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. This project tests the implementation of measurement-based care (MBC) in an ambulatory care setting with an integrated clinical decision support system (CDSS) and an electronic health record (EHR). The project focuses on the use of MBC to improve the quality of care for patients with major depressive disorder (MDD). The EHR-CDSS program facilitates MBC and will improve medication management for patients with this chronic disorder by using information technology (IT) to ensure that clinicians are monitoring three critical response domains (i.e., symptom severity, side-effect burden, and treatment adherence) using standardized measures. The proposed IT system will also provide decision support during each medication treatment phase as well as help prevent medication errors.

This project is a collaboration between the University of Texas Southwestern Medical Center (UT Southwestern) and the Centerstone Community Mental Health Center, Inc. (Centerstone). Centerstone is a behavioral health services provider that provides treatment throughout the State of Tennessee. The first year of the project has been primarily devoted to: 1) customization of the CDSS to take into account the specific needs of Centerstone, and 2) integration of CDSS into the Centerstone’s EHR CenterNet, internally developed and maintained, and has a custom version number, as development is ongoing. The objective in the second and third years of the project will be to test the effectiveness of this new EHR-CDSS to increase the use of MBC principles in medication management by participating clinicians treating patients with MDD.

In order to fully evaluate effectiveness of the EHR-CDSS, two research studies are proposed. The first study is a comprehensive, system-wide evaluation that will include all clinicians using the EHR-CDSS and all of their patients with depression that require a treatment change (either switching medication or dose increase). The second study is an in-depth evaluation of the impact of the EHR-CDSS on a limited sample of physicians and their patients, directly assessing the use of MBC using a pre-post test design.

### Specific Aims

- Integrate a CDSS, facilitating MBC, with physician needs and the EHR at Centerstone.  
**(Ongoing)**
- Evaluate EHR-CDSS’s successful promotion of MBC in improving medication management.  
**(Ongoing)**

**2008 Activities:** In order to design and execute a plan for successful integration of the Computerized Decision Support System for Depression (CDSS-D) into the Centerstone EHR, an IT Project Team was created consisting of IT personnel from each agency (Centerstone and UT Southwestern) involved in the project, and with expertise in the architecture of each software application. In addition to technical staff, the IT Project Team also includes members of the project management team (PMT) from each organization. The IT team meets every 2 weeks. In addition, the PMT group has been meeting bi-weekly to discuss plans and progress for the EHR-CDSS integration.

In initial discussions, it was agreed that the best approach to accomplishing integration would be a two-phased approach. The first phase would build an interface or bridge between the EHR and the CDSS-D that would provide an avenue for the bi-directional exchange of data between the two systems. The second phase would be a complete integration or melding of the two applications into one that would combine all of the functionality of each into one new software application. Phase one is now underway. IT personnel at UT Southwestern and Centerstone have shared pertinent technical information about each software system, including: type of database used by each system, a Web demonstration of each system, and types of files used by each system's user interface (e.g. file extensions and ActiveX Controls). In addition, each IT team provided access to a demo server for their respective software to the other IT team. This was done in preparation for the programmers to determine at what points to exchange data between systems. This information will be used to develop code instructing the sending and receiving of patient data to and from each system. The IT personnel at UT Southwestern and Centerstone also discussed the networking architecture being used to connect end user PCs to the EHR's server and database.

In calendar year 2008, the following steps occurred:

- Each IT team developed an interface layout with definitions of each relevant field of their respective databases.
- The Electronic Measurement-based Care Guiding Evidence in Depression (e-MERGE) IT project team built a software bridge to facilitate a real time, bi-directional exchange of data between the EHR and the CDSS-D.
- The e-MERGE IT project team identified a hardware configuration to accommodate the addition to the Centerstone network of a server to host the CDSS-D application, which exchanged patient data between the EHR and the CDSS.
- Centerstone purchased and configured a server to host the CDSS-D.

In addition, a series of focus groups were conducted with a varied group of personnel, including physician providers, nurse providers, non-provider nurses, regional directors, clinic managers, and case managers. The focus groups yielded the following needs assessment results.

During the fourth quarter of the project, the team successfully met enrollment goals, enrolling 25 patients for Study 2, Phase 1. After enrollment, the team began collecting patient evaluations for Study 2, Phase 1 patients. Also during this quarter, the patient satisfaction questionnaire was revised and completed.

In the fifth quarter, the project team completed continuing reviews for both UT Southwestern and Centerstone Behavioral Health Institutional Review Boards, which were subsequently approved. Study 1 data were pulled for the pre-implementation condition from Centerstone's EHR during this period as well, and Study 2, Phase 1 patient evaluations were completed. Randomization of clinics and physicians for Study 2 also occurred during this quarter. Lastly, steps for provider training were initiated and scheduled for January 2009 in a two-phase process: Phase I included Drs. Trivedi and Kurian travelling to Nashville, TN, and presenting on: 1) measurement-based care for the treatment of depression, and 2) algorithmic

treatment of depression. Phase 2 was set to include Ronny Pipes following up with a hands-on EHR-CDSS training for both physicians and nurses, using the updated/integrated CDSS-D software.

In addition, the following IT integration steps were completed during the fifth quarter:

- CompTMAP was successfully installed on the new Centerstone CompTMAP server.
- Microsoft Sequel Server Database was set up on Centerstone CompTMAP server.
- Active X Control was installed and set up on Centerstone CompTMAP server.
- Microsoft Terminal Services was installed and set up on Centerstone CompTMAP server.
- Programmers completed building database tables for bi-directional transfer of data between EHR and CDSS.

**Preliminary Impact and Findings:** A needs assessment questionnaire was sent to 294 employees in the Centerstone Behavioral Healthcare System, of which 209 questionnaires (73 percent) were returned (three employees left Centerstone before the return date). The primary concern expressed in the survey responses received relates to the issue of perceived increased time burden in terms of both the length of the treatment visit and the number of treatments visits. It is expected that providing MBC will at first require more time, but once the system is established, the increased visit time is primarily time the patient needs for self-reports (based on physician reports from the Sequenced Treatment Alternatives to Relieve Depression [STAR\*D] study). In terms of the frequency of treatment visit data, the Texas Medication Algorithm Project study compared algorithm-based care (ALGO) with treatment as usual (TAU) and found that while patients in the ALGO arm of the trial initially were seen at a higher frequency, the total number of visits over a year were similar in both arms of the trial, with outcomes for depression significantly better in those in the ALGO group.

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### Selected Outputs

A detailed description of eMERGE study activities was included in a newsletter that is sent out to all Centerstone Behavioral Health clinics and staff.

eMERGE Focus Group Summaries.

eMERGE Clinic End-User Needs Assessment report.

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**Most Recent Self-Reported Quarterly Status:** During the final quarter of calendar year 2008, the Information Resources departments at both agencies underwent transitions in organizational structure and personnel, which led to slight delays in the project period. However, understanding the complex nature of integrating software (CDSS-D) within an EHR, the project team designed the study timeline to provide ample time to complete the major technological tasks. As such, the following items required additional time/effort during this project period: full integration of the CDSS server into the existing network, and fully complete and functional software interface. From a fiscal standpoint, the project team has underutilized the funds that were allocated to allow for modifications of the current software program. It is anticipated that, through the implementation period, additional changes to enhance the software's functionality will be identified. Multiple users can best identify these specific changes with extensive use. To this end, the team expects to use all funds that were originally allocated for this purpose, as well as gain insight into modifications that could not be identified without full integration and implementation.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Project ECHO: Extension for Community Healthcare Outcomes
<b>Principal Investigator:</b>	Arora, Sanjeev, M.D.
<b>Organization:</b>	University of New Mexico at Albuquerque
<b>Mechanism:</b>	RFA: HS04-011: Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015135
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,455,258
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** Project ECHO (Extension for Community Healthcare Outcomes) involves a partnership of academic medicine, public health offices, corrections departments, and community clinics dedicated to providing best practices and protocol-driven specialty healthcare in rural and underserved areas. This specific research project focused on using health information technology to provide improved treatment of hepatitis C virus (HCV). Project ECHO's weekly scheduled telemedicine clinics, which are hosted by UNM HSC specialists in the areas of HCV, use telemedicine pathways and Internet-based access to provide community healthcare practitioners with the opportunity to present cases, which are discussed among the network participants to jointly reach treatment decisions. This particular form of case-based learning, called "learning loops," allow community providers to learn from the experience of co-managing patients with specialists and their peer providers around the State. In these case-based learning clinics, partners rapidly gained deep domain expertise in HCV as they collaborated with university specialists in hepatology, infectious disease, psychiatry, and substance abuse in co-managing their patients. Expansion of this telehealth model to other chronic, complex diseases is underway.

### Specific Aims

- Co-manage ECHO HCV patients by partnering urban specialists with community physicians. **(Achieved)**
- Develop and expand access to treatment for HCV and eventually other complex diseases (diabetes, asthma, etc.) by building treatment capacity in New Mexico among rural medical providers. **(Achieved)**
- Create a model for treatment of complex, chronic diseases in rural and/or underserved populations in New Mexico. **(Achieved)**
- Provide extensive professional healthcare no-cost education through use of telemedicine technologies. **(Achieved)**
- Develop Patient and Provider Outcomes Program. **(Achieved)**
- Expand telehealth access/infrastructure. **(Achieved)**

**2008 Activities:** In 2008, the grantee continued to offer teleconference clinics for HCV (during the first 8 months of 2008, 5,993 patient consultations were provided), while expanding to offer clinics for rheumatology, integrated addiction/psychiatry, child psychiatry, psychodynamic psychotherapy, gestational diabetes/high-risk pregnancy, cardiovascular risk reduction, pediatric obesity, asthma/pulmonary disease, HIV, occupational medicine, medical ethics, and chronic pain.

**Preliminary Impact and Findings:** Provider outcome data demonstrated increased provider knowledge, self-efficacy in treating HCV patients, decreased professional isolation, and enhanced professional satisfaction. Preliminary patient outcome data analysis confirms co-managed HCV treatment by rural providers is as safe and effective as treatment delivered in an academic medical center HCV clinic.

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### **Selected Outputs**

Berkley EM, Leslie K, Arora S, et al. Chronic hepatitis C in pregnancy. *Obstet Gynecol* 2008 Aug; 112(2: Pt 1):304-10.

Geppert CM, Arora, S. Widening the door: the evolution of hepatitis C treatment in patients with psychiatric disorders. *J Hepatol* 2007 Oct; 46(4):957-9.

Gish RG, Arora S, Rajender RK, et al. Virological response and safety outcomes in therapy-naive patients treated for chronic hepatitis C with taribavirin or ribavirin in combination with pegylated interferon alfa-2a: a randomized, phase 2 study. *Hepatology* 2007 Jul; 47(1):51-9.

Arora S, Thornton K, Jenkusy S, et al. Project ECHO: linking university specialists with rural and prison-based clinicians to improve care for people with chronic hepatitis C in New Mexico. *Public Health Rep*, 2007; 122(S2):74-7.

Arora S, Geppert C, Kalishman S, et al. Academic health center management of chronic diseases through knowledge networks: Project ECHO. *Acad Med* 2007 Feb; 82 (2):54-60.

Arora S, O'Brien C, Zeuzem S, et al. Treatment of chronic hepatitis C patients with persistently normal alanine aminotransferase levels with the combination of peginterferon alpha-2a (40 kDa) plus ribavirin: impact on health-related quality of life. *J Gastroenterol Hepatol* 2006 Feb; 21(2):406-12.

Geppert CM, Arora S. Ethical issues in the treatment of hepatitis C. *Clin Gastroenterol Hepatol* 2005 Oct; 3(10):937-44.

Sulkowski M, Wright T, Rossi S, et al. Peginterferon alfa-2a does not alter the pharmacokinetics of methadone in patients with chronic hepatitis C undergoing methadone maintenance therapy. *Clin Pharmacol Ther* 2005 Mar; 77 (3):214-4.

iHealth Electronic Clinical Management Tool: Real-time remote entry and access to patient-specific information is needed for co-management and during consultative clinics. An outside vendor, Infosys Technologies, Inc., completed a new Web-based clinical management database, iHealth (trademark application pending), in May 2008. This allowed all partners to access information even from remote sites, with HIPAA-compliant controlled access to protect confidentiality. Clinical personnel from ECHO Partner Sites continued to receive iHealth instruction. This database will ultimately be utilized by all ECHO Partner Sites that treat HCV patients.

AHRQ 2008 Annual Conference presentation: ECHO Project ([PowerPoint® File](#), 2.6 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** This project has been completed. Project ECHO will continue to offer clinics and services to rural New Mexico physicians. The project's success has spurred further interest as well as funding from additional sources, and its methodology will be expanded to other diseases while utilizing the same infrastructure developed with this grant.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Statewide Implementation of Electronic Health Records
<b>Principal Investigator:</b>	Bates, David, M.D., M.Sc.
<b>Organization:</b>	Brigham and Women's Hospital
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015397
<b>Project Period:</b>	09/04 - 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,497,154
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** In 2005, the Massachusetts e-Health Collaborative (MAeHC) completed a proposal process for selection of three Massachusetts communities as pilots for full statewide electronic health record (EHR) implementation. The State of Massachusetts has over 6 million residents who are cared for by approximately 20,000 physicians in about 6,000 practices; the three selected communities represent over 150 ambulatory practices with more than 400 clinicians. Prior to this project, the MAeHC had implemented full EHRs in all of these practices and created an operational clinical data exchange platform in two of the three communities. This study comprehensively evaluated the intervention and measured trends in health IT adoption across Massachusetts. Multiple statewide surveys of office staff and physicians addressed barriers to adoption and use of EHRs. A quasi-experimental pre-post study evaluated the effect of EHR implementation on medication errors. A randomized controlled trial assessed the effects of academic detailing on the uptake of new EHR systems. Merging survey results with claims data enabled the evaluation of the relationship between EHRs and quality of care. An additional analysis examined the relationship between EHRs and malpractice claims.

### Specific Aims

- Evaluate the effectiveness of an intervention designed to increase the rate and extent of adoption of electronic health records in physicians' offices throughout Massachusetts. **(Achieved)**
- Determine the effect of EHR use on medication error rates, and, second, determine the effects of EHR use on quality of care in primary care office practices. **(Achieved)**
- Develop, pre-test, and administer a survey to Massachusetts licensed physicians before and after implementation of a multi-stakeholder collaborative intervention. **(Achieved)**
- Measure the degree and correlates of physician receptivity to (readiness to adopt) EHRs. **(Achieved)**
- Assess the effects of the statewide program on physician receptivity to and use of EHRs. **(Achieved)**
- Measure potential facilitators of EHR adoption by physicians. **(Achieved)**
- Measure the effectiveness of academic detailing in fostering successful implementation and usage of EHRs among physicians adopting such systems. **(Achieved)**

**2008 Activities:** Data from the surveys used to evaluate EHR use was received and analyzed over the course of 2008. Articles were readied for publication.

**Preliminary Impact and Findings:** The most significant barriers to EHR adoption were financial, which was most apparent in small practices. While a majority of physicians had adopted EHRs by 2005, only a small fraction regularly used key functions, including clinical decision support. EHR adoption was associated with lower rates of malpractice settlements. The relationship between EHRs and quality of care is complex and depends not only on EHR adoption, but also on usage of key EHR features.

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### **Selected Outputs**

Rudin RS, Simon SR, Volk LA, et al. Understanding the stakeholders of health information exchange: experiences from Massachusetts. *Am J Public Health* 2009 May; 99(5):950-5.

Jha AK, Bates DW, Jenter C, et al. Electronic health records: use, barriers and satisfaction among physicians who care for black and Hispanic patients. *J Eval Clin Pract* 2009 Feb; 15(1):158-63.

Goroll AH, Simon SR, Tripathi M, et al. Community-wide implementation of health information technology: the Massachusetts eHealth Collaborative Experience. *J Am Med Inform Assoc* 2009; 16:132-9.

Virapongse A, Bates DW, Shi P, et al. Electronic health records and malpractice claims in office practice. *Arch Intern Med* 2008; 168(21):2362-7.

Simon SR, Kaushal R, Jenter CA, et al. Readiness for electronic health records: comparison of characteristics of practices in a collaborative with the remainder of Massachusetts. *Inform Prim Care* 2008; 16(2):129-37.

Simon SR, McCarthy ML, Kaushal R, et al. Electronic health records: which practices have them, and how are clinicians using them? *J Eval Clin Pract* 2008; 14(1):43-7.

Simon SR, Kaushal R, Cleary PD, et al. Correlates of electronic health record adoption in office practices: a statewide survey. *J Am Med Inform Assoc* 2007; 14(1):110-17.

Simon SR, Kaushal R, Cleary PD, et al. Physicians and electronic health records: a statewide survey. *Arch Intern Med* 2007; 167(5):507-12.

Jenter CA, Simon SR, Volk LA, et al. Evaluation of a statewide implementation of electronic health records. In Kuhn KA, Warren JR, Leong T-Y, editors. *Medinfo 2007: Building Sustainable Health Systems. Proceedings of the 12th World Congress on Health (Medical) Informatics; 2007. Amsterdam: IOS Press; 2007. p. 2575-9.*

AHRQ 2008 Annual Conference presentation: Electronic Health Record Adoption and Implementation: A Report from the Massachusetts eHealth Collaborative ([PowerPoint® File](#), 626 KB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** This project has been completed. Currently, survey data regarding EHR usage is still being analyzed.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Automated Adverse Drug Event Detection and Intervention
<b>Principal Investigator:</b>	Ferranti, Jeffrey, M.D., M.S.
<b>Organization:</b>	Duke University
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 014882
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,455,091
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** The primary purpose of the Automated Adverse Drug Event Detection and Intervention project was to reliably measure and reduce the incidence of adverse drug events (ADEs) suffered by hospitalized patients using a computerized system for ADE detection, reporting, and intervention. The initiative embodied collaboration between information technology (IT) resources, patient safety and clinical leadership, and the departments of pharmacy at three partnering hospitals. The study took place at a large, tertiary care-based health system, which included an academic medical center and two community-based hospitals. The surveillance system leveraged technology and information systems already in place at each of the three entities, and included three unique vendor-based systems, a centralized health system clinical data repository, and a mainframe-based rules engine. The rules engine process was scheduled to run in batch once daily, at which time it received transactional patient, laboratory, and pharmacy data from the hospital information systems. Within the rules engine, specific rule logic was programmed to screen for “trigger” data that alone, or in combination, suggested the occurrence of an ADE. When the logic of a specific rule was met, alerts were triggered and compiled into a daily electronic report for evaluation by pharmacists trained in ADE investigation. In addition to permitting immediate intervention and mitigation of ADEs, the automated surveillance system also permitted the establishment of baseline statistics on the incidence and nature of ADEs at each of the three partnering hospitals. This will permit evaluation of the effectiveness of alert-generated interventions, as well as the effectiveness of other interventions currently in implementation to improve medication safety.

### Specific Aims

- Establish a baseline rate of the incidence of ADEs in hospitalized patients of the three-hospital system. **(Achieved)**
- Study the implementation and operational utility of an automated surveillance system for detection and mitigation of ADEs. **(Achieved)**
- Reduce the incidence of ADEs through process- or technology-based interventions. **(Ongoing\*)**

\* This aim was not completed prior to scheduled conclusion of the grant (August 2008) yet, as other sources of funding have been secured, it is still targeted for completion.

**2008 Activities:** Data collection activities from the automated ADE system concluded on September 20, 2008. The scope of drug interventions was narrowed to include only the top three high-risk drug categories: anticoagulants, hypoglycemics, and narcotics/benzodiazepines. This reduced the research

funded pharmacist full-time employee allocation. Medication safety and quality leaders across the organization applied these data to quality improvement efforts.

**Preliminary Impact and Findings:** As part of this study, a comparison of two fully operational ADE detection methods was completed—computerized surveillance and voluntary reporting. This analysis underscored the synergistic nature of these two approaches. While surveillance provides quantitative data to estimate the true rate of ADEs, voluntary reporting contributes qualitative evidence to inspire future trigger development and to identify potential areas of emerging risk. In order to improve the safety profile of the health system, it is essential that safety leaders have prompt and accurate access to aggregate safety reports generated from the ADE surveillance system. This grant supported the integration of the ADE surveillance data into the enterprise data warehouse. Pediatric patients are at exceptionally high risk for medication-related adverse events. Therefore, analyses of data were used from a 1-year period to compare the detection rates of two ADE discovery strategies, voluntary reporting and computerized surveillance, in pediatric inpatients at a large academic medical center. The primary drugs that generated ADEs in this specialized patient population were assessed, and recommendations were made as to which may identify the most opportunities for intervention and reduce patient harm. It was concluded that computerized ADE surveillance underperformed compared to detection rates seen in adult systems, suggesting that tailored rule sets are necessary to accommodate the unique needs of high-risk pediatric patients. ADE detection methodologies appear to be synergistic and complementary. When used in combination with each other, multiple detection methods may provide additional clarity on the scope of medication safety issues. The surveillance system from this study focused on quantitative measurement of a succinct set of events which cause patient harm, whereas the established voluntary reporting system captured a broader range of events and provided more qualitative data for reducing medication use process errors. Any hospital medication safety program should consider using multiple ADE detection methods, if resources permit.

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### Selected Outputs

Eckstrand J, Cozart H, Horvath M, Ferranti J. Implementation of pediatric-specific triggers: modification of a computerized adverse drug event surveillance system. *Qual Saf Health Care*. In draft.

Long A, Cozart H, Horvath M, et al. Patient safety in perioperative care: computerized detection of opioid related adverse drug events in an academic medical center. *Am J Health-Syst Pharm*. In draft.

Horvath MM, Cozart H, Ferranti J, et al. Sharing adverse drug event data using business intelligence technology. *J Patient Saf* 2009;5(1):35.

Ferranti J, Horvath MM, Cozart H, et al. Re-evaluating the safety profile of pediatrics: a comparison of computerized adverse drug event surveillance and voluntary reporting in the pediatric environment. *Pediatrics* 2008;121(5):e1201-7.

Ferranti J, Horvath MM, Cozart H, et al. A multifaceted approach to safety: the synergistic detection of adverse drug events in adult inpatients. *J Patient Saf* 2008;4:184-90.

Kilbridge PM, Alexander L, Ahmad A. Implementation of a system for computerized adverse drug event surveillance and intervention at an academic medical center. *JCOM* 2006;13:94-100.

Kilbridge PM, Campbell UC, Cozart HB, et al. Automated surveillance for adverse drug events at a community hospital and an academic medical center. *J Am Med Inform Assoc* 2006;13(4):372-7.

Cozart H. Using Informatics and Basic Research to Improve Medication Safety. ASHP 2008 Midyear Clinical Meeting and Exhibition; December 2008; Orlando, FL.

Horvath M, Cozart H, Ferranti J. Sharing Adverse Drug Event Surveillance Results Using Business Intelligence Technology. 2008 AMIA Spring Congress; May 2008; Phoenix, AZ.

Cozart H, Horvath M, Ferranti J. Developing an Innovative Patient Safety System to Improve Healthcare Quality: Operational Integration of Computerized Adverse Event Surveillance. 2008 AMIA Spring Congress; May 2008; Phoenix, AZ.

Wu J. Using Information Technology to Detect Ambulatory Adverse Events Related to Anti-diabetic Drug Therapy. SERC presentation; April 2008.

Vila T. Impact of the Institute for Healthcare Improvement Global Trigger Tool Compared to Current Adverse Event Monitoring Systems at a Large Teaching Hospital. SERC presentation; April 2008.

Available at: Duke University. Computerized Patient Safety Project Web site. <http://cpsi.dhts.duke.edu/>. Accessed May 21, 2009.

Long A, Cozart H, Eckstrand J, et al. Implementation of Anticoagulant-Focused “Just-in-Time” Alerts in an Academic Medical Center. AHRQ 2008 Annual Conference; September 2008; Bethesda, MD.

Ferranti J. Bridging the Gap: Empowering Caregivers with Real Time Access to Aggregate Patient Safety Data. AHRQ 2007 Annual Conference; September 2007; Bethesda, MD.

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**Grantee’s Most Recent Self-Reported Status:** This grant has been completed. The next stage of this project will be to monitor the overall progress of the scorecard measure, as well as continue to educate safety leaders on the operational utility of the data collected by the surveillance system. Additional work will also continue to define and deploy “just-in-time” surveillance systems, which focus solely on monitoring for unsafe patient conditions across the medication use continuum. All milestones have been achieved and/or retired. The lessons learned in developing and implementing this system should be instructive in future efforts to improve ADE response.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Improving Safety and Quality with Outpatient Order Entry
<b>Principal Investigator:</b>	Gandhi, Tejal K., M.D., M.P.H.
<b>Organization:</b>	Brigham and Women's Hospital
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015226
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,499,401
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** The United States health care system continues to face enormous quality, safety, and cost challenges, many of which occur in the ambulatory setting. Quality gaps that are particularly relevant in this setting include a high incidence of adverse drug events and lack of compliance to established guidelines for preventive care, chronic disease management, and test result follow-up. Two forms of health information technology (health IT), clinical decision support systems (CDSS) and ambulatory computerized physician order entry (ACPOE), have been touted as powerful and sustainable interventions to address these quality concerns. Prior work suggests that CDSS work best when they are speedy and well-integrated into clinicians' workflow. Therefore, tight integration of CDSS with ACPOE is a promising strategy for improving quality and efficiency in the ambulatory setting. When ACPOE is linked with advanced CDSS, clinicians can be prompted at various points during their workflow about the desirable course of action and simultaneously be given the opportunity to execute the action (by ordering it) with minimal effort. It is hypothesized that the value of ACPOE integrated with advanced CDSS lies not only in improved medication safety and guideline compliance, but also in improved efficiencies for the individual provider and the health care system. Further, the overall value added by these systems is hypothesized to outweigh their costs. Study physicians worked with the Information Systems staff to develop the clinical content and to convert this content into interpretable clinical decision support rules within the ACPOE system. During the initial study phase, four outpatient primary care clinics, affiliated with Partners HealthCare System and utilizing the electronic health record (EHR) for at least 24 months, implemented ACPOE. The implementation phase took between 8 to 12 weeks. The ACPOE system has undergone nine software releases to add functionality and improve its user experience. As of August 2008, seven practices are using the system. Over 145,000 orders have been generated across approximately 109,000 encounters. Implementation of an EHR-integrated with ACPOE and CDSS also occurred at three health centers affiliated with another institution, Atrius Health. EHR implementation occurred in phases, taking several months to reach full functionality.

### Specific Aims

- Evaluate physicians' use of the EMR system in chronic disease management, preventive care, and medication monitoring in a controlled trial for Actionable Reminders, Advanced Results Manager, and Order Tracking modules. **(Ongoing\*)**
- Perform quantitative analyses of the impact of ACPOE system on clinicians' time utilization and frequency of unnecessary redundant testing. **(Ongoing\*)**

- Perform qualitative analyses of users' satisfaction with system, including both pre-post surveys and longitudinal studies. **(Achieved)**
- Apply cost-benefit analysis to ACPOE implementation. **(Upcoming\*)**

*\* Several aims of the grant were not completed prior to 8/31/08, but, as other sources of funding have been secured, these aims are still targeted for completion.*

**2008 Activities:** The Actionable Reminder Intervention was completed on March 31, 2008. Analysis will be completed by January 2009, and an abstract will be submitted for presentation at the Society for General Internal Medicine Annual Meeting in May 2009. The functional and technical specifications for the Advanced Results Manager module of the ACPOE system were completed in early 2008. However, due to a major enterprise architecture initiative, development was on hold until November 2008. Coding was estimated at 6-8 weeks, and the functionality will go live with the next major EHR release in spring 2009.

**Preliminary Impact and Findings:** Before ACPOE implementation, 15 clinicians were observed, treating 193 patients. Fifteen clinicians were observed after ACPOE implementation, treating 137 patients. Twelve clinicians were observed both before and after implementation. The data suggest that the ACPOE implementation did not significantly impact the duration of time spent in clinic and time spent face-to-face with patients. Compared to pre-ACPOE, the distribution of time spent in major activities also did not significantly change after ACPOE. Further analysis is under way to examine the impact on specific clinician clinic activities that occur between patient visits. The response rate for the baseline survey was 55 percent (144/261). The survey revealed that 52 percent of primary care physicians (PCPs) did not have a system for tracking test results, 62 percent did not have a system to detect a missed ordered test, and 32 percent of PCPs were not satisfied with how they managed test results. ACPOE addresses common physician concerns, such as test tracking and notification of missed tests. However, physicians were concerned about the impact of ACPOE on workflow and the value of its features, and these concerns will need to be addressed to ensure acceptance. Results for the longitudinal study indicate that over the course of a year, the proportion of clinicians agreeing that the EHR improved quality of care increased ( $p < 0.001$ ). The proportion of clinicians who agreed that the EHR reduced medication-related errors ( $p = 0.03$ ) and improved follow-up of test results ( $p < 0.001$ ) also increased. An increasing proportion of respondents agreed that communication among clinicians improved ( $p < 0.001$ ), and a decreasing proportion reported a worsening in the quality of patient-physician interactions ( $p = 0.001$ ). While clinicians may perceive some initial problems with a new EHR, they become significantly more receptive to it within 1e year of implementation. The research team is currently performing an analysis to determine the baseline rates of redundant testing and the potential cost savings that could be achieved if redundant testing decision support rules were incorporated into order entry. While this decision support was not implemented during the grant, it is anticipated that the findings will inform the institution and others whether to use such decision support. There is some variation in the perceived impact on efficiency.

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### **Selected Outputs**

El-Kareh R, Gandhi TK, Poon EG, et al. Trends in primary care clinician perceptions of a new electronic health record. *J Gen Intern Med.* 2009 Apr; 24(4):464-8.

El-Kareh R, Gandhi TK, Poon EP, et al. Trends in clinician perceptions of a new electronic health record. 2008 SGIM 31st Annual Meeting.

El-Kareh R, Gandhi TK, Poon EP, et al. Trends in clinician perceptions of a new electronic health record. AMIA Annual Symposium 2008.

Ungar JP, Gandhi TK, Poon EG, et al. Impact of ambulatory computerized physician order entry on clinicians' time. AMIA Annual Symposium 2008.

Gandhi TK, Poon EG, Sequist TD, et al. Primary care clinician attitudes towards ambulatory computerized physician order entry. AMIA Annual Symposium 2005.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This grant is completed. Implementation for several of the planned modules, including some CDSS, was delayed beyond the ending period of the grant. Research, knowledge transformation, and coding efforts were largely completed, and based on data from implementation of ACPOE.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Value of Imaging-Related Information Technology (VIRIT)
<b>Principal Investigator:</b>	Gazelle, G. Scott, M.D., M.P.H., Ph.D.
<b>Organization:</b>	Massachusetts General Hospital
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 014891
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,471,989
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** Medical Imaging Informatics (MII) is responsible for a substantial portion of the total health care budget allocated to health information technology (health IT). MII systems—usually comprising a combination of digital imaging systems, picture archiving and communication systems (PACS), radiology information systems, and voice recognition transcription technology—are now available from a number of commercial vendors. The commercial availability of MII systems makes IT in radiology somewhat unique compared with IT in most other sectors of health care. Nevertheless, a minority of radiology departments in U.S. hospitals have deployed comprehensive MII systems. MII systems have the potential to improve health care quality in at least four of the six focus areas described by the Institute of Medicine in its 2001 report *Crossing the Quality Chasm*; these include safety, effectiveness, efficiency, and timeliness. Deployment of a comprehensive MII system at Massachusetts General Hospital (MGH) began in 1995. The potential for cost savings was a deciding factor in the decision to proceed, and preliminary analysis suggested there was a substantial return on investment for these technologies. Widescale MII deployment at New York University (NYU) Medical Center began just prior to the start of data collection. This research project evaluated MII deployment at MGH and NYU. The opportunity to study MII deployment at two large academic medical centers that went through the process almost a decade apart presented a unique opportunity to better understand the value of MII and to isolate the effects of MII from other secular trends in health care. Our analysis identified the financial implications of deploying MII systems, including the costs and savings attributable to their use. We also determined the effect of MII on health care quality and safety by examining outcomes such as process times, provider and capital utilization efficiency, throughput, and other metrics.

### Specific Aims

- Determine the financial impact, including initial cost, savings, and rate of return, of the deployment of a comprehensive MII system in two large academic radiology departments. **(Achieved)**
- Determine the impact of MII on health care quality, focusing on dimensions of quality, including process times, duplicate studies, and efficiency of provider utilization as defined by the Institute of Medicine. **(Achieved)**

**2008 Activities:** Data collection was completed prior to 2008. In 2008, focus was shifted to generalizing project results to make a financial and clinical practice model describing MII deployment, and then to projecting possible effects of implementing MII technology in other settings.

**Preliminary Impact and Findings:** The payback period for the MII system deployed by Academic Medical Center (AMC) 1 in 1995 was 48.8 months, and the Internal Rate of Return in the year of payback was 56 percent. While the savings on film realized by AMC1's deployment of the MII system positively contributed to the financial return, the payback period of the initial capital investment was not realized until the fifth year of operations (64.5 months), yielding an 18 percent internal rate of return. Alternatively, the net profitability of the MII volume, considered alone, yielded a 16 percent internal rate of return in just the fourth year of operations (54.2 months). The linear regression models of each of the four measures of productivity demonstrated a significant ( $p < 0.0001$ ) relationship to the modeled extent of penetration of PACS at AMC1. No other terms were significant. None of the models for the mean times, nor the fraction of AMC2 exams reported within three days, demonstrated any significant relationship to the implementation of PACS at AMC2 or PACS at AMC1. Results demonstrate a strong business case for the use of MII systems in radiology departments and hospitals, and show that the implementation and use of these systems is associated with measurable quality and efficiency improvements. These results should encourage institutions that have yet to implement these systems to do so, sooner rather than later.

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### **Selected Outputs**

Impact of Health Information Technology on Radiologist Productivity (submitted to Radiology).

Impact of Health Information Technology on Timeliness of Radiology Reporting (submitted to Radiology).

Making the Business Case for Radiology Medical Imaging Informatics (submitted to JAMIA)

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### **Grantee's Most Recent Self-Reported Quarterly Status:**

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Improving Healthcare Quality via Information Technology
<b>Principal Investigator:</b>	Hayden, Avis, Ph.D.
<b>Organization:</b>	Southwest Vermont Health Care Corporation
<b>Mechanism:</b>	RFA: HS04-011: Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015270
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,486,304
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** The purpose of this completed project was to reduce medical errors and adverse events at the Southwestern Vermont Medical Center (SVMC) through several information technology (IT) innovations, including the expansion of electronic health records (EHRs) at the hospital, the introduction of EHR practice management software to the community, the introduction of bedside medication verification and electronic medication administration records (eMARs), the use of recorded nurse-to-nurse shift reports, the implementation of computerized physician order entry (CPOE), and the implementation of Midas+ clinical decision support (CDS) software. In addition, SVMC undertook a major initiative to improve organizational culture around patient safety. Leadership made a conscious effort to shift organizational culture from one that discouraged disclosure and blamed individuals for medical errors to one that promotes disclosure, seeks out root causes, and implements systemic improvements in clinical practice to improve patient safety. The original scope of this project was to implement EHR technologies throughout SVHC’s several organizations and in privately-owned medical practices in the community. During the first year of implementation, however, it became clear that the job of moving forward with EHR was a much larger and more complex task than had been originally anticipated. Therefore, the scope of the project was tightened, focusing Year 2 only on the introduction of EHRs and related technologies at the hospital. By Year 4, some issues with the implementation of EHRs in area private practices had been resolved, and again began to move forward, while implementation of EHRs at the hospital continued. For 6 months prior to the implementation of eMARs, during the 5-month implementation window, and for 5 months after full implementation, the head of Pharmacy examined all the medication-related events submitted through SVMC’s internal reporting system (based on self-report), and identified actual errors in transcription, administration, and near misses for the four types of medication errors (ordering, transcription, dispensing, and administration).

### Specific Aims

- Assess the development of a “culture of safety” through educational programs, administrative efforts, and the implementation of health IT. **(Achieved)**
- Develop a new protocol for nursing shift reports and assess its impact on completeness of reporting; implement voice recording technology to supplement the report and assess its effects. **(Achieved)**
- Implement bedside medication verification and electronic medication administration records and assess their value in reducing errors. **(Achieved)**

**2008 Activities:** By 2008, EHR and nursing shift report care technologies had largely been implemented in the hospital setting. Implementation processes at local private practices had begun. Data collection and analysis were completed.

**Preliminary Impact and Findings:** Surveys administered over the term of the grant, in 2005, 2007, and 2008 suggest that staff notions of patient safety have indeed evolved in particular ways that mirror the efforts of administration to promote improved communication, standardization of clinical practice, the use of IT, and the promotion of a “culture of safety” throughout the organization. Among both nurses and physicians in 2005, patient safety was largely understood as a matter of having the right professionals delivering the right kinds of care to patients. By 2008, while the prior understanding continued, it was joined by an increased focus on systems of communication, the importance of access to information, and a more frequently articulated sense that a “culture of safety” was important to the organization. To say that these factors became more prominent in discussions of patient safety over the study period, however, is not to say that their rising prominence indicates a uniformly positive impact of these factors on staff’s perceptions of patient safety at SVMC. It appears that, while staff have recognized that the introduction of health IT is making concrete, positive contributions to promote patient safety, staff have also recognized that personal interaction with patients can be a vital element in achieving that goal. Furthermore, staff acknowledged that health IT may become more pervasive and that careful consideration is needed regarding how health IT is designed and implemented in terms of their practice of medicine and interaction with patients. The efforts of management around patient safety are correlated with both a deepening appreciation of the importance to safety of good communication and a belief that communication systems have improved and, for at least some staff, are correlated with an improved openness to the reporting and analysis of adverse events. However, the fact that communication is now more reliant on IT, staff believe, has had the potential for both positive and negative impacts on patient safety. One of the key promises made by our eMAR vendor was that the software would alert a nurse about a potential error before s/he actually administered the wrong drug. It turned out that, in fact, the software issued so many warnings that the nurses adapted by ignoring many of them. This set up a risky situation that no one had anticipated. While the focus of our work was on implementation of EHR components at the hospital, the need to link the hospital to other entities significantly slowed progress. SVMC encountered potential technology links with state EHR initiatives, private practice EHR systems, and the EHR systems of entities within the SVHC organizational umbrella, all of which slowed the ability of SHMC to move forward with new technology.

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### **Selected Outputs**

Lanoue E, Still CJ. Special Report: closing the medication loop. *Health Data Management Magazine* 2008 Dec;16(12):34.

Lanoue E, Still CJ. Patient identification: producing a better bar coded wristband. *Patient Safety and Quality Health Care Magazine* 2008;5(3):12.

Still, CJ. Using video to enhance training. *Meditech Magazine* September 2007.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** This grant has been completed. Implementation of EHRs is continuing at the private practice level. Health IT at SVMC is being positioned for sustainability and for continuation of the culture of patient safety. All project aims have been completed subject to the scope developed during the first year of the grant.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Toward an Optimal Patient Safety Information System
<b>Principal Investigator:</b>	Koss, Richard, M.A.
<b>Organization:</b>	The Joint Commission
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015164
<b>Project Period:</b>	09/04 – 03/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,498,434
<b>Summary Status as of:</b>	March 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** This study was designed to understand the “landscape” of hospital incident reporting systems and to examine the use of health information technology to improve reporting, data analysis, and learning from errors in health care. To date, no systematic estimates exist of the characteristics of reporting systems operated by U.S. hospitals or of how these systems are being used. More research is needed to substantiate the value of improved patient safety reporting at both the organizational and individual practitioner levels. Surveys were administered to U.S. hospitals to determine the current state of incident reporting systems and their perceived value. During the first phase of the study, the Adverse Event Reporting Survey (AERS) was administered to a representative sample of 2,050 U.S. hospitals to gather information about hospital incident reporting systems in use. For the second phase of the study, a stratified subsample of 489 hospitals was selected from AERS respondents to complete a questionnaire about their perceptions of their incident reporting system. The Patient Safety Event Taxonomy (PSET) was used to link disparate patient safety data from a sample of hospitals to assess the value of using a common framework to analyze and produce standardized reports of patient safety data. During the last phase of the study, a nonrandom subsample of 20 hospitals was selected to provide the Joint Commission with 30 de-identified incident reports per month for 12 months (April 2007–March 2008). The PSET and hospital incident report data were used to develop a hospital incident reporting ontology (HIRO) to enable adverse event data analysis.

### Specific Aims

- Assess the level of adoption of patient safety reporting systems in U.S. hospitals. **(Achieved)**
- Assess the perceived value of patient safety reporting systems. **(Achieved)**
- Delineate the advantages and disadvantages of information technology applications in adverse event reporting and prevention. **(Achieved)**
- Determine the perceived utility of using a standardized PSET for classifying and organizing adverse event data from many disparate hospital incident reporting systems. **(Achieved)**
- Develop and test a patient safety ontology for adverse events that would facilitate data mining, knowledge sharing and learning from adverse events. **(Achieved)**

**2008 Activities:** Data collection for the final phase of the study concluded in March 2008. Altogether, nearly 7,000 adverse events were classified with the PSET and used for ontology development, though it should be noted that these adverse events came from a small purposive sample and not a representative sample of hospitals. These reports were classified using the PSET, and data were analyzed concurrent to data collection efforts.

**Preliminary Impact and Findings:** A large percentage of hospitals in this study reported having centralized adverse event reporting systems, but the nature of these systems varied greatly across hospitals. The majority of hospitals use basic office software (e.g., Microsoft® Word or Excel) with a combination of paper/electronic systems. For-profit and larger hospitals are more likely to have sophisticated electronic systems. The information collected by reporting systems differs significantly across large, medium, and small hospitals and across for-profit, nonprofit/nongovernment, and government hospitals. The results show that across most hospitals, the majority of adverse events are reported by nursing staff and the fewest adverse events are reported by physicians. Findings of low participation in adverse event reporting by physicians have been found in numerous other studies in the United States and in other countries. The ways in which hospitals learn about adverse events can impact the way in which events are addressed. There are significant differences in whether action was taken as a result of learning about adverse events through occurrence reports, rounds, telephone calls, or by attending meetings. While nearly all hospitals indicate that they produce summary reports of adverse events, the use of these reports varies widely among hospitals.

Respondents to the second phase of the study reported that for most staff groups, training on their incident reporting system is mandatory. Two open-ended questions in the Value Questionnaire asked respondents what additional information or changes would help improve patient safety in their hospitals. Five overarching themes emerged from respondent comments to these questions: (1) improvements/changes to adverse event reporting processes and systems, (2) improved patient safety culture, (3) external data sharing, (4) access to robust internal data/information, and (5) access to additional resources. Suggested improvements or changes to adverse event reporting processes and systems focused on simplifying the reporting process, instituting anonymous reporting, and shifting to electronic reporting systems in an effort to enhance data integration and linkage to other platforms, including patient records, for more comprehensive analyses.

In the final phase, risk managers were asked how many occurrence reports were entered into their occurrence reporting system for 2006. The number of occurrence reports ranged widely from 344 to 7,263. Overall, participants felt that the HIRO provided an efficient method of managing information over time and that there were many benefits to this application. However, participants felt that the major drawback of the HIRO was that it contained too much information for the end-user. The ability to conduct large-scale data mining of adverse events has been identified as a primary goal within patient safety circles, both domestically and internationally. The development of the HIRO may be the first step toward addressing this goal.

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## Selected Outputs

Adverse Event Reporting Survey – assessed use of incident reporting systems.

Value Questionnaire – assessed perceptions of value of incident reporting.

Value Questionnaire II – gathered feedback on incorporation of PSET classification into incident reporting.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** This project is complete. Development of PSET framework has not resulted in a finished product, but it may provide some direction for future patient safety activities. All principal aims of the project are completed. Although the HIRO classification system was not widely adopted, adverse event data is not uniformly collected, making data comparison among hospitals and at a national level virtually impossible. Without a standardized set of terms and common formats, large-scale comparison of data, data mining, and identification of patient safety issues on a local, regional, and national level is impossible.

**Milestones:** Grantee did not provide quarterly milestone self-assessment in 2008.

**Budget:** Grantee did not provide quarterly budget self-assessment in 2008.

<b>Project Title:</b>	Improving Patient Safety/Quality with Health Information Technology Implementation
<b>Principal Investigator:</b>	Reiling, John G., M.H.A., M.B.A., Ph.D.
<b>Organization:</b>	St. Joseph's Community Hospital
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015284
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,500,000
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** St. Joseph's Community Hospital of West Bend, Wisconsin, began building a new 80-bed hospital around the date this grant was awarded, with a design focusing on patient safety. St. Joseph's has identified health information technology (IT) as a necessary component of safety-driven design. This project is intended to support the implementation of an Epic-integrated system between the hospital, West Bend Clinics, and The Kathy Hospice. St. Joseph's believes that a culture of patient safety involves not only developing values and practices but also continually striving for improvement; collaboration with the National Learning Lab helped to define this culture and reassess previous standard procedures in light of this goal. Health IT enhances the ability to collect and analyze reporting data when adverse events do occur. Automated surveillance of data can detect triggers that identify adverse events that may not have been detected through chart review or reported voluntarily. The Epic system is an integrated inpatient clinical package of software developed by Epic Systems Corporation, providing electronic support to both direct and indirect patient care. The Epic system includes electronic documentation for nurses and physicians, clinical pathways and protocols, efficient patient management tools for the emergency department, electronic medical records (EMRs), automated pharmacy communication and workflow assistance, electronic medication administration records (eMAR), computerized provider order entry (CPOE), bar-coding, and centralized scheduling. Implementation began at our existing small community hospital and continued at the new replacement hospital. It also connected the Epic system to multi-location clinics (West Bend Clinic) and a residential hospice facility (the Kathy Hospice). St. Joseph's identified medication errors, near misses, and preventable adverse drug events (ADEs) as the adverse events that would be most significantly reduced by the implementation of Epic. As a result, this study was focused on these types of errors.

### Specific Aims

- Implement Epic, diffused across a community and service area-wide system of St. Joseph's Community Hospital of West Bend. **(Achieved)**
- Document latent conditions, and discuss the roles Epic and safe design principles have in meeting them, either directly or indirectly. **(Achieved)**
- Identify the prevalence of adverse events, specifically medication errors, near misses, and preventable adverse drug events, before and after Epic was implemented. **(Achieved)**
- Measure the length of stay, patient satisfaction, and cost in the current system, and then after Epic was implemented and the new hospital was built. **(Achieved)**

- Develop a generalized implementation plan that can be used by other small community hospitals. **(Achieved)**

**2008 Activities:** Data collection from the new facility concluded in 2008. Analyses are ongoing, with dissemination efforts to follow. Some elements of the system, including CPOE, were not implemented during the term of the grant, but, due to ongoing support from the hospital, were scheduled for implementation later in the year or in 2009.

**Preliminary Impact and Findings:** The project analyzed qualitative and quantitative data in order to develop a complete picture of patient safety, comparing conditions prior to Epic system implementation to those with the system in the newly-built hospital. Methods employed included workflow observation; surveys of providers and patients; interviews, focus groups, and data from hospital charts; in-house incident reporting systems; and the Epic system. Prior to the implementation of Epic and the opening of the new hospital, around 12,000 near misses and medication errors were reported in a 12-month period. This was a period of heightened awareness and screening due to St. Joseph's participation in the Institute of Health Improvement (IHI) Impact Project. The number of acute admissions during that same period was about 4,000, so there were approximately 3 near misses and/or errors per patient. Due to the small number of cases available for the medication error observation study, the results lack the sensitivity to statistically demonstrate effects. The analysis of latent condition data demonstrated improvement in all but one condition—fatigue. The adverse events of falls and infections declined since 2002. Any adverse events that were zero before the opening of the new hospital stayed at zero throughout the study period. The number of transfusion related events stayed flat over the entire study period, averaging 0.3 percent; most of these were considered non-preventable. Within the samples we took, medication errors and adverse drug events (ADEs) declined since 2002; ADEs declined dramatically during the study period, particularly in the Surgical unit and Emergency Department. During the study period, length of stay declined from 5.25 days to 4.43 days for Medicare patients, and from 4.14 days to 3.64 days for acute patients. Expenses per adjusted admission increased from \$5,268 to \$7,808 over the study period. Adjusting for inflation, interest, depreciation, and corporate overhead/management fee, expenses decreased from \$5,540.23 to \$5,533.95. Compared to pre-test data, there is a higher expectation by St. Joseph's patients to be involved with their care. Patients are more comfortable asking questions about their care and about important processes of caregivers, such as medications and hand washing. Generally, there is an improving trend in processes such as discharge planning, hand washing, and medication management as it relates to patient involvement. External factors such as better informed consumers or insurance company policies may also be influencing this improvement. The improvements have yet to yield a statistically significant improvement in the quality of care, but the trend is positive. It is important to note that, although the changes in many latent conditions may be attributable to Epic implementation or the design of the new hospital, this reduction cannot be traced to any specific cause. The interplay between safety culture, management focus, process change, facility design, and the implementation of Epic may all contribute to the decline in adverse events.

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### **Selected Outputs**

Reiling JG. Safety by design: safe design of healthcare facilities. *Quality and Safety in Health Care* 2006 Dec;15:134-40.

Reiling JG, Knutzen BL, Wallen TK, et al. Enhancing the traditional hospital design process: a focus on patient safety. *Joint Commission Journal on Quality & Safety* 2004 March;30(3):115-24.

Reiling JG, Hughes RG, Murphy M. Patient safety and quality: an evidence-based handbook for nurses. The impact of facility design on patient safety. Rockville, MD: Agency for Healthcare Research and Quality. Publication No. 08-0043; 2008.

Reiling JG. Safe by design—patient safety in hospitals: a serious issue. Dansk Selskab for Kvalitet–Denmark Newsletter 2007 Oct;15(3).

Reiling JG. Safe by design: designing safety in health care facilities, processes, and culture. Oakbrook Terrace, Ill: Joint Commission Resources; 2007.

Reiling JG, Chernos S. Human factors in hospital safety design. In: Carayon P, editor. Handbook of Human Factors and Ergonomics in Health Care and Patient Safety. New Jersey: Lawrence Erlbaum Associates; 2007. p. 275-86.

Reiling JG. Safety culture and organizational issues: creating a culture of patient safety through innovative hospital design. In: Advances in Patient Safety: From Research to Implementation. AHRQ Publication Nos. 050021 (1-4); 2005 Feb;2:425-39.

Carlson School of Management: Designing a safe hospital. Publication 1 Series. Minneapolis: University of Minnesota; 2002.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** At the conclusion of the project, all milestones were met and spending was on target.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

**Project Title:** Value of New Drug Labeling Knowledge for e-Prescribing  
**Principal Investigator:** Schadow, Gunther, M.D., Ph.D.  
**Organization:** Regenstrief Institute  
**Mechanism:** RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)  
**Grant Number:** R01 HS 015377  
**Project Period:** 09/04 – 08/08, Including No-Cost Extension  
**AHRQ Funding Amount:** \$1,356,108  
**Summary Status as of:** August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** The objectives of this project were to: 1) create new knowledge and evidence regarding the benefits of uniform standards for health information for the dissemination of computer-actionable knowledge that can improve patient safety and quality of care, and 2) to develop and implement health information technology (IT) in diverse health care settings. The Food and Drug Administration (FDA) has been working for several years on a new format to disseminate prescribing information—the “package insert”—with improved usability for providers. The next release of the electronic Structured Product Label (SPL) is intended to include computer-interpretable prescribing information in an HL7-standard data structure. This project assessed the value that the upcoming FDA-mandated electronic drug labeling standard will bring to existing and emerging computerized provider order entry (CPOE) systems and e-prescribing tools on the Regenstrief Medical Gopher CPOE system and on a newly-developed, complete HL7 standards-based, open-source prescribing tool.

All published SPL labels were loaded into our standards-based data and knowledge systems. Algorithms were developed to extract the vendor-independent clinical drug descriptions from the vendor and product-centric labels; while SPL labels still cover only 23 percent of RxNorm clinical drugs, they were found to describe 77 percent of actual community pharmacy dispensing records. This foundation was supplemented by the Regenstrief Gopher knowledge base, exported into an XML format and into a relational database for mapping to standard terminologies.

SPL knowledge was evaluated using a large set of drug-intolerance, ordering, and dispensing records covering more than 50,000 patients over 30 years. Here it was found that the more systematic nature of the public knowledge sources improved the sensitivity of the system to detect adverse situations such as drug-allergy conflicts and possible drug-drug-interaction events by a factor of between two and four. The medication order entry application, which was created based on these standards, includes an allergy list, a problem list, and a list of both historical and current medications. It promotes tracking indications with drug orders by allowing drag-and-drop relation between problems and prescriptions being written.

As planned, the system operates solely from standard public knowledge sources without any manual maintenance of order catalogs or decision support knowledge, so it suggests that one of the very costly steps of deploying EHR applications, the local creation of data dictionaries, may indeed be overcome using available format and content standards.

## Specific Aims

- Investigate how SPL can help in knowledge management of existing CPOE systems such as the Regenstrief Medical Gopher system. **(Achieved)**
- Develop a standards-based e-prescribing system which would use SPL, the underlying HL7 standards and terminologies as a foundation. **(Achieved)**

**2008 Activities:** Focus group end-user testing events were undertaken, and they found that some of the project's further-reaching goals, particularly the linking of medications to managed problem lists, were of lesser interest to prospective adopters. On the other hand, it was found that some significant basic administrative data management functions were necessary to make the system more practical for everyday use. Fragmentation of the environments in which this system was to be deployed made its actual deployment challenging. For example, one site had a proprietary electronic medical record system in which doctors would maintain allergies and problems; the e-prescribing function would have been required to either interface with a non-interoperable system or force the user to enter the same data twice. In both of the test adopter sites, competing implementations of other software were occurring prior to when this project's application was ready. Thus, the initial plan to deploy the system remotely on stand-alone server computers was not completed.

**Preliminary Impact and Findings:** The standards-based data and knowledge tools have been made publicly available and were significantly improved through this project. This work has shown that standard data formats and terminology are both valuable for integrating health care data and knowledge for clinical decision support with minimal manual efforts, and that the role of terminology is specifically for the purpose of mapping and providing detailed knowledge content. The software piloted a certain "late binding" approach to terminology, whereby terminology is a useful tool for data linkage, but is not a precondition for storing, querying, and operating with the data. This is shown best by the ability to use the SPL labels and their descriptions of drugs directly for medication data entry without requiring any "clinical drug" terminology: the user simply types the names of ingredients or brands into a simple entry box and auto-completion ensures that orders are for items that are available on the market. Thus various drug databases could easily be used at different times, including Multum, SPL, and RxNorm, simply by loading this knowledge content into the system. Overall this project found that the specific need for application terminology management was minimal using the standards-based approach. It was found that mapping local terminology to standard terminology and SPL was possible, and that such mappings could provide value to improve legacy application dictionaries. For example, the project demonstrated how RxNorm, NDFRT, and SNOMED-CT can be used to make inferences about the Problem List of a single patient record using the Medications List. While the sensitivity was much less than desirable, the specificity was reasonable, particularly in the context of term frequency. Furthermore, challenges and opportunities for these standards and their utility as a knowledge base for clinical decision support have been identified. The Regenstrief Institute, which hosted this grant, is currently undertaking a CPOE system redesign project, revising an existing in-house CPOE system. Because of the progress made during this grant, particularly in developing a standards-based approach to CPOE system architecture, this project will play an integral role in the development of a new Regenstrief system. It is hoped that the new system will receive wide distribution and provide value to the broader community.

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## Selected Outputs

Schadow G. Structured product labeling improves detection of drug-intolerance issues. *J Am Med Inform Assoc* 2009;16:211-219.

Burton MM, Schadow G, Simonaitis L. Medication and indication linkage: a practical therapy for the problem list? *AMIA Annu Symp Proc* November 2008; 6:86-90.

Schadow G. Structured product labeling improves detection of drug-intolerance issues. AMIA Annu Symp Proc November 2008; 6:646.

Dolin RH, Giannone G, Schadow G. Enabling joint commission medication reconciliation objectives with the HL7 / ASTM Continuity of Care Document standard. AMIA Annu Symp Proc October 2007; 186-90.

Mantena S, Schadow G. Evaluation of the VA/KP problem list subset of SNOMED as a clinical terminology for electronic prescription clinical decision support. AMIA Annu Symp Proc October 2007; 498-502.

Schadow G. Assessing the impact of HL7/FDA Structured Product Label (SPL) content for medication knowledge management. AMIA Annu Symp Proc October 2007; 646-50.

Available at: Regenstrief Institute, Inc. HL7 Java SIG. Implementation of HL7 v3 (RIM based application architecture). <http://aurora.regenstrief.org/javasig>. Accessed May 2009.

Available at: Regenstrief Institute, Inc. Biomedical Workbench Framework and Order Entry Application. <http://aurora.regenstrief.org/mw>. Accessed May 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project has been completed. Although implementation did not take place in as many sites as had been hoped due to conflicts with other ongoing technology projects, development and knowledge transfer offered significant insight into how to streamline CPOE software for maximum utility using open-source information.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

**Project Title:** Measuring the Value of Remote Intensive Care Unit (ICU) Monitoring  
**Principal Investigator:** Thomas, Eric J., M.D., M.P.H.  
**Organization:** University of Texas Health Science Center at Houston  
**Mechanism:** RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)  
**Grant Number:** R01 HS 015234  
**Project Period:** 09/04 – 09/08, Including No-Cost Extension  
**AHRQ Funding Amount:** \$873,108  
**Summary Status as of:** September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** Patients in adult intensive care units (ICUs) require close monitoring, frequent invasive procedures, multiple medications, complicated decisionmaking processes, and multidisciplinary care. This complex care coupled with inadequate nurse-patient ratios, provider fatigue, on-the-job training, and poor communication can result in substantial morbidity, mortality, and costs. A powerful influence on the quality of ICU care is the presence of critical care physicians (intensivists) in the unit. Telemedicine, a common form of health information technology (IT), has been used to provide remote intensivist monitoring for ICUs. Remote ICUs connected via telemedicine technology (tele-ICUs) allow intensivists to simultaneously monitor more patients than possible by standard onsite care, and to extend intensivist care to patients in ICUs where intensivists would otherwise be unavailable, such as rural and small community hospitals. Furthermore, tele-ICUs may have decision support software to help identify subtle trends like rising creatinine and falling oxygen saturation that need to be addressed to prevent complications. The tele-ICU also makes intensivists more available to nurses.

A preliminary study was conducted over a 4-week period between November and December 2005, to determine how changes to the user interface in a tele-ICU could be improved. An ICU remote monitoring facility affiliated with a large health care system located in the Gulf Coast region was selected. The facility had been using the proprietary eICU<sup>®</sup> technology developed by VISICU, Inc., for 21 months and remotely monitored 9 ICUs with a total of 132 beds in 5 of the health care system's hospitals at the time of the study. An electronic data collection tool was specially constructed for the study. The data collection tool was implemented as a Microsoft Access Form application and installed on a tablet PC. The information collected included time-stamped tasks and activities, information resources (i.e., artifacts), participants, and any additional information manually entered by the observer. The survey of attitudes about safety and teamwork was given to the three ICUs that implemented the system at or around the beginning of the project—several others had either adopted the system earlier or had no plans to do so during the term of the grant. The results were compared with a baseline established by safety surveys administered annually to the whole network of hospitals. Quantitative data were captured, as well, highlighting the effect of tele-ICU on patient outcomes, including length of stay, conditions developed while admitted, and mortality rates (controlled for differences in severity of the initial diagnosis), as well as on hospital costs.

## Specific Aims

- Use human factors engineering techniques to determine how changes to the user interface of the tele-ICU may increase the value of the technology. **(Achieved)**
- Measure changes in health care provider attitudes about teamwork and safety climate after implementation of the tele-ICU. **(Achieved)**
- Measure the effect of a tele-ICU on mortality, complications, and length of stay in ICUs in a tertiary care teaching hospital, and in seven community (including two “small”) hospitals using a before-and-after study design. **(Achieved)**
- Measure the cost-effectiveness of the tele-ICU. **(Achieved)**

**2008 Activities:** Analyses of the data concluded in 2008, and papers were prepared for publication.

**Preliminary Impact and Findings:** The preliminary study of tele-ICU workflows was valuable in familiarizing researchers with the function of the remote monitoring unit. It did not lead to changes made to the interface. The teamwork and safety surveys demonstrated improvements at the  $p < 0.1$  level, which recommends this model for larger-scale trial implementations. The initial sample for patient outcomes consisted of 4,167 subjects. Elimination of cases with missing data yielded a final sample of 4,142 subjects, of whom 2,034 were pre-tele-ICU and 2,108 post-tele-ICU. The crude ICU mortality rates were 12.0 percent pre- and 9.9 percent post-tele-ICU ( $p = .03$ ). The dominant variable was severity of initial diagnosis, as measured by the Simplified Acute Physiologic Score (SAPS) II standards for intensive care, which assigns a value ranging from 0 to 150 to each patient, with higher numbers indicating more serious diagnoses. Patients with SAPS II  $> 50$  (17 percent of the sample) had approximately 20-50 percent reduction in risk of hospital mortality depending upon the precise SAPS II score. These improvements in mortality did not hold for patients with SAPS II  $< 50$ . Of the 4,142 patients, the 3,789 patients who survived to ICU transfer were analyzed for ICU length of stay (LOS). The crude mean hospital LOS for survivors in the pre-tele-ICU group was 9.8 days versus 10.7 days for the post-tele-ICU group ( $p = .006$ ). The tele-ICU effect ( $p = .19$ ) was moderated by linear and quadratic SAPS components ( $p = 3.8 \times 10^{-6}$ ) such that only surviving patients with SAPS  $> 70$  had shorter hospital LOS in the post-tele-ICU intervention. Secular trends toward declining mortality among ICU patients could have accounted for the reductions observed here. However, the fact that the observed mortality reduction occurred only among the patients most likely to benefit from this intervention (the most severely ill patients), and the large magnitude of the reduction, argues against the secular trend hypothesis and supports the hypothesis that the tele-ICU intervention caused the reduction in mortality. The sickest patients are those most likely to have unexpected changes in their medical condition that require rapid intervention (arrhythmia, hypotension, sepsis, hypoxia). The tele-ICU can provide this rapid response due to the constant monitoring (including computerized alerts for changes in key physiologic parameters) and availability of nurse and physician intensivists. Even among the sickest patients, this research needs replication, and there is a need to compare use of tele-ICU technology with less expensive, but also powerful, quality improvement interventions.

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## Selected Outputs

Chu-Weininger M, Wueste L, Lucke J, et al. The impact of a tele-ICU on provider attitudes about teamwork and safety climate. Under review by Quality and Safety in Healthcare.

Thomas EJ, Lucke JF, Wueste L, et al. Telemedicine for remote monitoring of intensive care patients: impact on mortality, complications, and length of stay in six intensive care units. Under review.

Tang Z, Weavind L, Mazabob J, et al. Workflow in intensive care unit remote monitoring: a time-and-motion study. *Critical Care Medicine* 2007;35:2057–63.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is completed.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Health Information Technology Value in Rural Hospitals
<b>Principal Investigator:</b>	Ward, Marcia M., Ph.D.
<b>Organization:</b>	University of Iowa
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015009
<b>Project Period:</b>	09/04 – 08/08, Including No-cost Extension
<b>AHRQ Funding Amount:</b>	\$1,304,478
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** Today, hospital-based health information technology (IT) encompasses a wide range of quality and patient safety applications including: electronic medical records, personal health records, e-mail communication, clinical alerts and reminders, computerized physician order entry, computerized decision support systems, hand-held computers, electronic information resources technology, electronic monitoring systems, and telehealth consultative and diagnostic services. However, very few rural hospitals have developed or implemented these health IT capacities because of factors including expense, limited in-house IT expertise and staffing, and the fact that many health IT applications benefit from economies of scale that are unavailable to them. Currently, there are significant gaps in our knowledge about the value of health IT in general, but they are especially pronounced in rural applications. There has been little systematic study of whether existing health IT technologies, or investment in the commonly implemented health IT projects, readily lend themselves to quality enhancement in rural hospitals. For a rural hospital with limited resources, there needs to be a better understanding of the fit between actual quality and safety problems and the health IT solutions under consideration. Rural hospitals could benefit substantially from assistance and tools to aid in their health IT decisionmaking. This grant was designed to address these knowledge gaps, using an in-depth study of Iowa’s 89 rural hospitals with a particular focus on its 80 Critical Access Hospitals (CAHs). A major component of this research was focused on identifying and prioritizing the quality-of-care and patient safety issues facing rural hospitals; this part of the project used surveys, interviews with key personnel, and quantitative analysis. Related to this was the aim of identifying challenges and barriers facing rural hospitals embarking on health IT projects, using research methods including expert panels, case studies, and a literature review. Assessment work also included investigations of the correspondence between various types of health IT technologies and improvements in patient safety, as well as the cost-effectiveness of health IT for rural providers. The information gathered through the project’s research efforts was then synthesized into toolkits for rural providers in Iowa.

### Specific Aims

- Characterize patient safety and health care quality issues in rural hospitals. **(Achieved)**
- Characterize the health IT capacity and barriers of rural hospitals. **(Achieved)**
- Identify which health IT capacities are most strongly related to patient safety and health care quality issues in rural hospitals. **(Achieved)**
- Identify the cost of health IT in rural hospitals. **(Achieved)**
- Develop toolkits to help rural hospitals make informed health IT investments. **(Achieved)**

**2008 Activities:** With data collection complete, the primary 2008 activities were analysis and dissemination of knowledge products.

**Preliminary Impact and Findings:** The Iowa Hospital Association and the Iowa Department of Public Health–Iowa Medicare Rural Hospital Flexibility Program (FLEX) created a workgroup, the Iowa CAH Data Workgroup, of representatives from CAHs to focus on identifying “rurally relevant” patient safety and quality issues. The “rurally relevant” patient safety and quality issues that the Iowa CAH Data Workgroup identified as having the highest priority for Iowa CAHs were: medication errors, falls, appropriate assessment and treatment of chest pain presenting in the emergency department, and births for those hospitals that have obstetric services. They established a Web-based reporting tool for all CAHs to report on these five topics on a quarterly basis for benchmarking within Iowa’s CAHs. The Iowa CAHs have been participating in this voluntary reporting and benchmarking effort since 2005. Quantitative analysis showed that the only AHRQ Patient Safety Indicators (PSI) for which Iowa was substantially worse than the national benchmark involved maternal trauma during vaginal deliveries. An in-depth analysis of these procedures determined that a number of factors were involved, including maternal risk factors (e.g., higher prevalence of teenage mothers), baby risk factors (e.g., higher prevalence of large babies), and procedure risk factors. This compounding of risk factors occurred more often in rural hospitals and appeared to be related to emergency deliveries in rural hospitals that were not staffed to handle unplanned cesarean deliveries. Analysis of PSIs in rural hospitals before and after conversion to CAH status indicated improvement in indicator rates for prevalent complications coincident with enhanced financial performance. The team also found that the raw in-hospital mortality rate for acute myocardial infarction (AMI) in Iowa rural hospitals (14 percent) was twice the rate of Iowa urban hospitals (6.4 percent). However, AMI patients admitted to rural hospitals were a decade older and sicker than those admitted to urban hospitals, in part because many AMI patients in rural hospitals are transferred to urban hospitals, and this sub-population of transfers is younger and healthier than those who remain at rural facilities. An instrumental variable approach to control for this trend caused the difference in in-hospital mortality rates to disappear. In a published review of existing literature, the project concluded that to expedite the spread of health IT in rural America, Federal and State governments, along with private payers, who are important beneficiaries of health IT, must make difficult decisions as to who pays for the investment in this technology. They must also drive standards, simplify approaches for reductions in risk, and create a workable operational plan. Toolkits developed included an algorithm to optimize AMI patient referrals, a health IT cost calculator, and online toolkit offering information on health IT implementation and best practices.

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### **Selected Outputs**

Li P, Schneider J, Ward MM. Effects of critical access hospital conversion on the financial performance of rural hospitals. Inquiry (in press).

Li P, Ward MM, Schneider JE. Factors associated with Iowa rural hospitals' decision to convert to critical access hospitals status. J Rural Health 2009 Winter; 25(1):70-6.

Bahensky JA, Jaana, M, Ward MM. Healthcare IT in rural America: EMR adoption status in meeting the national agenda. Rural Health 2008;24(2):101-5.

Bahensky J, Moreau B, Frieden R, et al. Critical Access Hospital informatics. How two rural Iowa hospitals overcame challenges to achieve IT excellence. Journal of Healthcare Information Management 2008;22(2):6-22.

Chi C, Street N, Ward MM. Building a hospital-referral expert system with a prediction and optimization-based decision support system algorithm. Journal of Biomedical Informatics 2008;41:371-86.

Clabaugh G, Ward MM. Cost of illness studies in the United States: A systematic review of methodologies used for direct cost. *Value in Health* 2008;11(1):13-21.

Li P, Bahensky J, Jaana M, et al. Role of multihospital system membership in electronic medical record adoption. *Health Care Management Review* 2008;33(2):1-9.

James PA, Li P, Ward MM. Comparing mortality rates in rural and urban hospitals for patients with myocardial infarction: Rethinking measures of quality of care. *Annals of Family Medicine* 2007;5(2):105-11.

Li P, Ward MM, Schneider JE. The effect of critical access hospital conversion on patient safety. *Health Services Research* 2007;42:2089-108.

Roberts LL, Ely J, Ward MM. Patient safety in Iowa: An analysis of maternal birth-related trauma rates. *American Journal of Medical Quality* 2007;22(5):334-43.

Wakefield DS, Ward MM, Wakefield BJ. A 10-rights framework for patient care quality and safety. *American Journal of Medical Quality* 2007;22:103-11.

Jaana M, Ward MM, Pare G, et al. Antecedents of clinical information technology sophistication in hospitals. *Health Care Management Review* 2006;31(4):289-99.

Ward MM, Evans TC, Spies AJ, et al. National Quality Forum 30 Safe Practices: Priority and progress in Iowa hospitals. *American Journal of Medical Quality* 2006;21(2):101-8.

Ward MM, Jaana M, Bahensky JA, et al. Clinical information systems availability and use in urban and rural hospitals. *Journal of Medical Systems* 2006;30:429-38.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This project is complete. All aims have been met and outputs have been developed to help rural providers assess their health IT needs and possibilities.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

**Project Title:** Computer-Based Provider Order Entry (CPOE) Implementation in Intensive Care Units (ICUs)

**Principal Investigator:** Carayon, Pascale, Ph.D.

**Organization:** University of Wisconsin–Madison

**Mechanism:** RFA: HS-04-012: Demonstrating the Value of Health Information Technology (THQIT)

**Grant Number:** R01 HS 015274

**Project Period:** 09/04 – 08/09, Including No-Cost Extension

**AHRQ Funding Amount:** \$1,455,066

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** The Computer-Based Provider Order Entry (CPOE) Implementation in Intensive Care Units (ICUs) Project is an ongoing collaborative endeavor between the researchers at the Center for Quality and Productivity Improvement (CQPI) at the University of Wisconsin–Madison and Geisinger Medical Center in Danville, Pennsylvania. This project is focused on the evaluation of the implementation of Smart Intravenous (IV) pumps and their integration with a bar code medication administration system within the ICU. This project will specifically focus on the use of a prospective approach using human factor techniques to smooth the implementation process. Although Smart IV pump technology in combination with a bar code medication administration system has the potential to decrease IV medication errors significantly, the implementation of new technology systems frequently results in failures and unforeseen errors. This project uses a human factors approach in the implementation process in order to reduce these potential negative consequences. The human factors approach with prospective error analysis will be used to evaluate the technology and technology change process, specifically using failure mode and effects analysis, work system analysis, and technology change surveys to improve implementation. Direct observations, surveys, and longitudinal assessment of the Smart IV pump event log data and error reports will provide rich data on Smart IV pump programming errors and provider job and work-life characteristics affected by the change process. This study will provide hospitals without medication administration technology opportunities to assess and change human, medication, and organizational factors related to pump programming errors. Valuable information will be gained and shared about the technology change process associated with Smart IV pump implementation and integration with a bar code medication administration system to allow other hospitals to safely and effectively implement these technologies and avert new errors.

### Specific Aims

- Conduct preliminary job task analysis of nurses and physicians. **(Achieved)**
- Conduct preliminary prospective risk analysis. **(Achieved)**
- Implement timeline revision with partner organization. **(Achieved)**
- Collect data on quality of care and financial measures to determine the impact of CPOE on quality of care in ICUs and the financial value of CPOE implementation. **(Ongoing)**
- Collect and analyze employee questionnaire data to determine the impact of CPOE on end users. **(Ongoing)**
- Collect medication safety data to determine the impact of CPOE on safety in ICUs. **(Ongoing)**

- Develop and implement a publication plan to inform other hospitals about how to safely and effectively implement these technologies and avert new errors. **(Ongoing)**

**2008 Activities:** In 2008, post-implementation data collection for job task analysis for nurses and physicians was completed. Data on quality of care and financial measures were also collected. From January 2008–May 2008, employee questionnaires were completed and collected as part of the 3-month post-implementation end user review. Most of the 12-month post-implementation data were collected in October 2008, and all data for nurses were entered and cleaned. Data collection from residents for the 12-month post-implementation employee questionnaire continued through the end of 2008. For the medical safety data collection, the Medical Safety database was designed and used to collect post-implementation data. That data collection process is nearly complete, and the data verification and cleaning process has started. The publication plan was also evaluated and updated, and drafts have been written for several portions of that plan.

**Preliminary Impact and Findings:** For the job task analysis portion of the project, preliminary data analyses show interesting differences in time use across units. Also, residents, attending physicians, and physician assistants show rather different patterns of time use. Preliminary analysis of the employee questionnaire data for nurses shows that concerns about patient safety and quality of care went up after implementation but, at 1 year post-implementation, it either returned to the previous level or improved.

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### Selected Outputs

Hoonakker, et al. Communication in the ICU and the Relation with Quality of Care and Patient Safety from a Nurse Perspective. *Human Factors in Organizational Design and Management* 2008; 9.

Alvarado, et al. Macroeconomic Challenges in Implementation of Health Information Technology. *Proceedings of the Human Factors and Ergonomics Society 52nd Annual Meeting*; New York, September 22-26, 2008.

Paris, et al. Safety of the Antibiotic Medication Use Process in the Intensive Care Unit. *Proceedings of the Human Factors and Ergonomics Society 52nd Annual Meeting*; New York, September 22-26, 2008.

Li Q, Douglas S, Hundt AS, et al. A heuristic evaluation of a computerized provider order entry (CPOE) technology. In: *Proceedings of the IEA2006 Congress*; Pikaar RN, Koningsveld EAP, Settels PJM, editors. Elsevier; 2006.

**Employee Questionnaire Survey:** The Employee Questionnaire Survey was developed to examine CPOE/EHR implementation; the systems' usability; and the effects of implementation on communication, coordination, the quality of working life, patient, safety and quality of care. In designing the survey, researchers combined reliable and valid questions previously used to study technology implementation and the work of inpatient providers. This survey is a useful tool for researchers studying CPOE across the U.S.

**Medication Safety Database:** This Microsoft Access database was designed by the Medication Safety Research Team as a way for nurse data collectors to easily enter safety and quality of care data. It is an innovative tool that would be useful for any researcher gathering data on medication errors or adverse drug events because it captures the complexity of these events, their causes, and the related harm.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 80 to 99 percent of its milestones and is generally on time. Delays are due in part to the fact that the project was moved to Geisinger Medical Center 18 months into the project. Delays have also been caused by problems with the technology implementation at the research site. A no-cost extension has helped to remedy these issues.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Using Information Technology (IT) to Improve Medication Safety for Rural Elders
<b>Principal Investigator:</b>	Gorman, Paul, M.D.
<b>Organization:</b>	North Lincoln Hospital
<b>Mechanism:</b>	HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 014928
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,496,748
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

**Summary:** People with multiple chronic conditions typically receive care from many physicians, nurses, pharmacists, and other clinicians practicing in diverse settings such as primary care clinics, specialty clinics, hospitals, nursing homes, home health agencies, and various pharmacies. Each of these clinicians or organizations generally maintains a medication list, in many cases electronic, designed to support a specialized role such as prescribing, dispensing, administering, or monitoring medications. These medication systems also are designed to support related business practices of the organizations, such as inventory, quality control, and the like. However, the medication management work practices of these historically independent organizations are rarely integrated, and their medication information systems are not designed to interact or exchange information electronically. Traditionally, this medication information moves, as one clinician put it, “by foot, phone, or fax.” As a result, the medication lists that these organizations maintain do not match, and discrepancies between these lists are a threat to patient safety and the quality of care.

The clinical setting for the project was long-term care of elders with multiple chronic conditions in assisted living and skilled nursing facilities in a rural community on the Oregon coast. This project was essentially an attempt to build a mini-regional health information organization (RHIO) focused on medication management. The project involved developing a novel technology, RxSafe, which brings together the medication information contained in the diverse and isolated information systems of multiple independent organizations (clinics, hospital, pharmacies). This enables authorized clinician users to obtain a more complete picture of each patient’s medications and to use this information for clinical tasks.

Formative evaluation of the prototype application was conducted in fall 2005 using qualitative methods approximately 1 year after initial deployment. In general terms, the intended outcome was to provide a medication management tool that clinical users would adopt into work practices and that would be sustainable on the basis of the preferences of clinical users and commitment from the local organization. Though this AHRQ-funded technology implementation project concluded as of September 2008, the technology remains in local use, and refinement of the system continues. Further development of the technology is underway as part of a subsequent project, with plans to make selected functionality available as Web-based application services that can be used to support medication management technologies under development by others.

## Specific Aims

- Create and maintain an organizational structure that would permit secure sharing of patient data across disparate institutions. **(Achieved)**
- Design and implement a technical architecture that could enable clinicians to view medication list information from multiple sites at the same time. **(Achieved)**
- Create a useful and usable prototype application integrated into clinical workflow that could take advantage of this shared medication list system. **(Achieved)**
- Conduct a formative evaluation of the impact of this system on clinical users. **(Achieved)**

**2008 Activities:** The project achieved each of its aims during 2008, including:

- 1) Maintaining the organizational structure for the project through: a) ongoing meetings with the local Chronic Care Committee, which served as a Community Advisory Board to the project; b) regular contact between project staff and clinician users; c) responding to change in ownership of the main pharmacy collaborator to the project, requiring reestablishment of the agreements necessary to share patient medication information.
- 2) Continuing development of the technical architecture that connects participating medication information systems, including: a) continuing work on parsing medication information in text output from some participating organizations; b) revising the integration of hospital discharge medication information in concert with revised hospital discharge work process; c) expansion of the patient coverage to include a broader population of patients cared for by providers in participating clinics.
- 3) Expansion of the usability and usefulness of the prototype application through: a) installation of the prototype, at the request of nursing staff and management, in additional nursing units such as day surgery; b) modification of the report format to match changing requirements determined by changes in hospital medication reconciliation procedures; and c) providing ongoing technical support to maintain system stability and respond to user concerns.
- 4) Formative evaluation was conducted in the form of interviews with nurses, physicians, management, and support personnel to identify perceived benefits, limitations, and impacts of the system. Analysis of these data was performed. Final reporting of these findings is underway at the time of this report.

**Preliminary Impact and Findings:** The RxSafe project was essentially an attempt to build a mini-regional health information organization (RHIO) focused on medication management. As such, like so many projects that attempt to create a health information exchange, the RxSafe project had both successes and failures. We failed to successfully engage the entire group of organizations that would need to participate in order to achieve our vision of a shared medication management system. We also failed to achieve the complete technical integration of this medication information into existing information systems that had been part of our original vision. On the other hand we were successful at: 1) engaging active community involvement, 2) forming a core group of participating organizations that actively contributed both data and expertise to the project, 3) successfully implementing a prototype application which clinical users found useful and usable in common clinical tasks, and 4) conducting formative evaluation of the impact of the system. The RxSafe project demonstrated the feasibility and usefulness to clinicians of a shared medication management technology. The project also identified two formidable barriers to progress: 1) the absence of universally adhered to technical standards for exchange of health data (*technical interoperability*) and 2) the absence of a health care policy and regulatory environment that ensures true portability of each patient's health information (*organizational interoperability*).

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### **Selected Outputs**

Available at: Oregon Health and Science University. Welcome to RxSafe.  
<http://www.ohsu.edu/RxSafe/index.html>. Accessed May 11, 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project concluded in September 2008, having met major milestones established in a revised project plan formulated midway through year 2 of the project.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Impact of Office-Based E-Prescribing on Prescribing Processes and Outcomes
<b>Principal Investigator:</b>	Fischer, Michael, M.D.
<b>Organization:</b>	Brigham and Women's Hospital
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017151
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,199,007
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The primary aim of this study is to evaluate the implementation of an electronic prescribing (e-prescribing) system in ambulatory settings. ZixCorp's PocketScript system is currently used in a large number of practices in Massachusetts, New Jersey, Pennsylvania, New York, North Carolina, California, and Louisiana, providing a large study population with diverse practice types (e.g., pediatric, adult primary care, family practice, and specialty offices), locations (e.g., urban, suburban, and rural), and sizes (from single-physician practices to groups of over 20 providers). This study will evaluate the full spectrum of e-prescribing. The project has an active partnership with the makers of the office-based e-prescribing system and with multiple insurance companies and public programs who will provide claims data.

The project includes three phases. The first phase uses data from the e-prescribing system to evaluate physician responses to decision support interventions and alerts. For the second phase, the project brings together experts on information technology (IT) and experienced survey researchers to develop a qualitative study demonstrating the impact of e-prescribing on prescribing processes and outpatient workflow, including a large-scale survey to develop a detailed understanding of how e-prescribing can be integrated into medical practice. The third phase of the project will draw on decades of experience studying large medical databases to evaluate prescribing decisions and clinical outcomes when e-prescribing is initiated. The project will link the e-prescriptions issued to patients with the pharmacy claims for those patients and will generate a comprehensive dataset to evaluate the true clinical impact of e-prescribing.

Although the public interest in e-prescribing is growing, including recent proposals to provide e-prescribing systems to all physicians, the data on how e-prescribing systems are used and what impact they actually have on prescribing processes and outcomes are still quite limited. The findings of this research will provide important lessons for clinicians, researchers, insurers, policymakers, patients, and all those with an interest in improving the use of prescription drugs.

### Specific Aims

- Measure physician use of two safety-related e-prescribing functions: safety alerts and dispensed drug history. **(Ongoing)**

- Measure the effect of e-prescribing on processes of prescribing for physicians to assess characteristics of successful and productive adoption. **(Ongoing)**
- Extend and expand ongoing research to assess whether the adoption of e-prescribing is associated with improved clinical outcomes for patients. **(Upcoming)**

**2008 Activities:** Project staff have completed development of the physician survey based on information that was gathered from the focus groups and interviews. A collaboration has been developed with Surescripts and the Center for Improving Medication Management that has allowed the researchers to greatly expand both the sample size and geographic scope for the survey. The cognitive testing, field-testing, and survey activities were planned so that all results could be collected before summer 2009, at which point the investigators planned to begin compiling and analyzing results data.

All data use agreements have been completed and executed. System use data (Aim 1) have recently been transferred to the research team to be cleaned and uploaded. ZixCorp and the companies started assembling the main datasets to link patient identifiers, which will then be encrypted before sending the data to the project staff. ZixCorp and the companies also started working on linking the patient identifiers for this dataset to the identifiers that are in the data from an earlier study in the same setting (those data run through 3/31/2005). This is extending the timeframe planned for the process of preparing the dataset. This dataset offers the possibility of following early adopters of e-prescribing through several years of time and drawing conclusions regarding the longer-term impacts of e-prescribing.

Final Institutional Review Board (IRB) approval for the in-office visits has been obtained. Project staff at the Center for Health Information and Decision Systems (CHIDS) at the University of Maryland have been organizing in-office visits. Phone interviews have been conducted; results will be incorporated into the survey questions. Project staff have conducted four focus groups: two with doctors and two with nurses/office managers, exploring a variety of topics that were used in developing the survey. A manuscript analyzing the focus group findings has been through one round of review by all of the investigators and is now being prepared for submission.

**Preliminary Impact and Findings:** Focus group participants identified a range of issues associated with the current use of e-prescribing in their practices, including benefits derived/perceived, challenges encountered in using the technology, as well as workflow issues caused by the technology. Positive responses toward e-prescribing focused on its efficiency, the reduction in medical errors, patient satisfaction, and ease of use. Negative responses to e-prescribing focused on technological problems, medical errors, trust of technology, the learning curve for using the software, and surveillance and liability issues.

There were different reactions and changes to the e-prescription workflow based on which functions were completed by physicians versus office staff. Physicians entered prescriptions while seeing patients or immediately thereafter, whereas the office staff usually handled the refills. By splitting the tasks, significant efficiency was gained in the workflow process. It was also noted that in some instances the office staff “signed-on” as the physician in order to handle the prescriptions.

In regards to e-prescription evolution/adoption, the focus groups found that the attitude of the doctors played a major role in the perceived usefulness of the technology. Some practices that have adopted the technology have found that they cannot live without it now. On the other hand, several users do not yet have complete knowledge of the functionality of the application (e.g., what do the colors on the screen for various drugs represent).

It appears that, in some cases, either there is a disregard for policies regarding who can prescribe/approve medications or people simply do not know. It seemed that several doctors ‘delegated’ approval tasks to medical assistants with at least some knowledge that it was not proper protocol. One unintended

consequence that may be brought to light by e-prescribing is the legality of the prescribing process. However, it is unknown how often the paper-based prescribing process/policy was being abused. In general, there is naïveté, misinterpretation, and a complete unknowingness surrounding certain policies related to health IT adoption and use. For example, in mid-2008 some commented that e-prescribing would be mandated for Medicare patients by December 2008, while others said it was mandated, and still others had no knowledge of the ‘policy’. The consensus was that e-prescribing was a good thing and that it would be a tremendous hassle to go back to the ‘old way.’

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### **Selected Outputs**

AHRQ 2008 Annual Conference presentation: E-prescribing in Community-Based Practices: Successes and Barriers ([PowerPoint® File](#), 540 KB; [Web Version](#)).

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The slippage that the project has had is due to administrative issues. There was a short time between the Notice of Grant Award and the start date and delays in setting up administrative accounts, hence funds were not allocated right away. Similarly, the project was unable to begin formally negotiating the data use agreements until it was clear that the grant would be awarded. Now that the accounts are properly set up and the various contracts and data use agreements are moving forward, the project will be able to spend the funds on the planned activities.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Safety Through Enhanced e-PreScribing Tools (STEPStools): Developing Web Services for Safe Pediatric Dosing
<b>Principal Investigator:</b>	Johnson, Kevin, M.D., M.S.
<b>Organization:</b>	Vanderbilt University
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017216
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,157,753
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The broad goal of this project, called STEPStools (Safety Through Enhanced e-PreScribing Tools) is to assess the impact of a generally available knowledgebase for pediatric medication management on the quality and safety of prescribing in this age group. STEPStools will construct, pilot test, and evaluate generally available tools that provide medication-specific knowledge about rounding and extemporaneous formulations necessary in small children. This project will also evaluate the effectiveness of using a service-oriented architecture to distribute knowledge, which is an emerging approach to knowledge management and dissemination.

If successful, this project will demonstrate two things. First, the project will contribute knowledge in a computable form to the e-prescribing community. The project is committed to releasing this database as a toolkit, ideally through the National Library of Medicine and RxNorm, but also initially as a dataset available publicly through AHRQ, and as a peer-reviewed publication in the pediatrics literature. Second, the project will inform the vendor community and general public about the utility of Web services as a tool for knowledge dissemination, as proposed in the clinical decision support roadmap, among others. These approaches to dissemination of the knowledge developed will contribute to improved e-prescribing in pediatrics. In addition, the American Academy of Pediatrics (AAP) is committed to adding to this knowledgebase, enabling this knowledge to be available to e-prescribing developers for many years.

### Specific Aims

- Convene a panel of AAP and American Medical Informatics Association (AMIA) experts to construct a knowledgebase of actionable data to guide e-prescribing systems in the appropriate rounding of calculated doses and selection of extemporaneous medication formulations. **(Ongoing)**
- Use established service-oriented architecture models to construct Web services and a Web-based client to allow the knowledgebase. **(Ongoing)**
- Evaluate the usability and content validity of these Web services, using a series of pediatric prescribing use cases, site visits to pilot users, and through an examination of the error rate of prescriptions generated with and without the use of these Web services. **(Upcoming)**

**2008 Activities:** With the help of partners at CVS Caremark, project staff have created an initial version of the data for medication compounding. This database is ready to be populated based on published evidence of Food and Drug Administration (FDA) reports. The plan is to have a completed draft knowledgebase available in July 2009 for review. In addition, construction of use cases has begun to outline how community pharmacists might use this knowledgebase. These use cases will be evaluated by members of the National Association of Chain Drug Stores and the Pediatric Pharmacist Advisory Group over the summer 2009 months.

Development of a schema has started for the knowledgebase, consisting of commonly prescribed medications and the dose rounding that is tolerable at each age. The initial approach is being modified by interviews with pharmacy experts. A data acquisition protocol has been constructed, recognizing various sources of knowledge with differing evidentiary quality: FDA; commonly used textbooks, such as the Pediatric Dosage Handbook; peer-reviewed literature; and expert opinion.

After discussing this project with the AAP, the project is collaborating with them to recruit a high-volume practitioner to participate on the STEPStools Working and Advisory Group. This practitioner will help provide expert opinion or a dissenting voice that will trigger additional research or expert consultation with specific drugs.

The project approach has also been modified to recognize the interdependence between accepted medication-specific weight-based dosing formulae (which are often based on indication) and the therapeutic window for each medication. The knowledgebase will now include dosing formulae for common indications, although the project will most likely not provide these formulae as recommendations; rather, it will use these formulae to reconcile specific use cases, such as a dose submitted to STEPStools that is too low for common use, though possibly appropriate for a specific indication (i.e., antibiotic prophylaxis). In this setting, were the dose being prescribed for common uses, it would be appropriate for STEPStools to return the minimum dose rather than the calculated dose. Therefore, the project may have to return multiple doses based on indication for cases such as this.

**Preliminary Impact and Findings:** The project continues to build the knowledgebase of pediatric compounds and rounding knowledge. Project staff have realized the importance of using a knowledge formalism to help describe the rounding process, and are in communication with one of the contractors for the AHRQ Clinical Decision Support Demonstrations to help with this strategy.

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### Selected Outputs

Drs. Weinberg and Johnson hosted a meeting of e-prescribing vendors at a recent American Academy of Pediatrics meeting.

A newsletter article for the American Academy of Pediatrics Newsletter, which has been released.

Available at: Vanderbilt University Medical Center. STEPStools. <http://www.pedstep.org/>. Accessed May 2009.

Constructed a knowledgebase of medications that are commonly compounded (available with password).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is on track in terms of constructing the Web services and will soon have completed the knowledgebase development. A publication about the Web services was submitted to AMIA, as was a poster about the knowledgebase development efforts. The project anticipates completing both components by the end of summer 2009.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Harnessing Health Information Technology to Prevent Medication-Induced Birth Defects
<b>Principal Investigator:</b>	Schwarz, Eleanor, M.D.
<b>Organization:</b>	University Of Pittsburgh at Pittsburgh
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017093
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,199,370
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. This project conducts a series of focus groups with clinicians and patients seen in academic and community-based practices to better understand what information about the risk of medication-induced birth defects would be most useful to primary care clinicians and their patients. Data from these discussions are used to refine the two distinct health information technology (IT) application interventions: 1) a multi-faceted decision support, and 2) the network tablet computer's electronic collection of machine-actionable information about women's risk of pregnancy. The impact of each of these interventions is being evaluated using a factorial design, randomized, controlled trial. In the first trial, multi-faceted decision support (intervention) is being compared to streamlined clinical alerts (control). The second trial evaluates whether collecting machine-actionable information about women's risk of pregnancy using a networked tablet computer (intervention) is superior to the way clinicians usually collect this information (control). Over the course of a year, data were abstracted from the electronic medical record (EMR) when study clinicians prescribed teratogenic medications, conducted phone interviews with women prescribed medications by participating clinicians, and surveyed participating clinicians about their satisfaction with the decision support they receive. These data are being used to confirm the hypotheses that clinicians in the intervention groups will: 1) prescribe fewer teratogenic medications, 2) be more likely to prescribe contraception when a teratogenic medication is prescribed, 3) have more patients report satisfaction with the counseling they received, and 4) report more satisfaction with the decision support they received. This evaluation will provide much-needed information on how health IT can best be harnessed to prevent medication-induced birth defects nationwide. The health IT intervention shown to be most effective will be disseminated within the University of Pittsburgh Medical Center (UPMC), which provides 3 million outpatient visits each year.

All of the practice sites have used the EpicCare (Summer 2007) EMR system that has been developed by UPMC through collaboration with the Epic Systems Corporation since 1999. EpicCare, a Certification Commission for Healthcare Information Technology (CCHIT) certified product, supports a patient medication list that is reviewed with each patient encounter. All visit documentation is either typed directly into EpicCare or is dictated, transcribed, and then authenticated online. Results of laboratory testing, imaging studies, and most other tests done in UPMC hospitals are fed directly into the EpicCare system. Transcriptions of most emergency department, inpatient admission, and inpatient discharge notes are automatically filed in EpicCare. UPMC's electronic Medical Archival Record System (MARS) stores additional clinical information from inpatient settings (including all laboratory, imaging, and other test

results, as well as all consult and progress notes dictated about hospitalized patients) with comprehensive outpatient data. MARS also provides additional opportunities for quality and outcomes assessment.

### Specific Aims

- Develop and implement two decision support systems designed to alert ambulatory clinicians to the risk of medication-induced birth defects. **(Achieved)**
- Evaluate the effect of two decision support systems designed to alert ambulatory clinicians to the risk of medication-induced birth defects. **(Ongoing)**

**2008 Activities:** The project conducted 12 focus groups as of September 2008 (and April 2009). The aim of these focus groups was to: 1) obtain the perspective of women of reproductive age on how they would like their primary care clinicians to provide information about medication-induced birth defects, and 2) understand clinician perspectives on what type of decision support would be most useful. Two abstracts describing this work were accepted for oral presentation at the Organization of Teratologic Information Specialists Annual Meeting in June 2008. A third abstract, titled “Primary care providers’ perspectives on the challenges of contraceptive counseling,” was presented as a poster at the Association of Reproductive Health Professionals and Society of Family Planning 2008 Annual Meeting, held September 19, 2008, in Washington, DC. A manuscript describing some of this work is forthcoming in the journal *Birth Defects Research*, Part A. Project staff continue to develop manuscripts that describe this work in more detail.

Programming of the FAST tablet-PC system to enable assessment of pregnancy intentions and use of contraception has been completed and is “live.” Consent to be randomized was obtained from all clinicians at the community-based practice and most faculty at the university clinic; however, two clinicians who consented subsequently left the clinic practice, leaving 29 faculty participants and the majority of clinical trainees. The 69 consenting clinicians were then randomly assigned to one of four groups.

The decision support system has gone live and “pre-intervention” surveys have been completed by 78 percent of participating clinicians. Dr. Schwarz and Dr. Koren finalized a list of which medications should trigger decision support alerts and provided this list to the individuals responsible for programming the decision support algorithms. Decision support has been programmed in to the system and has gone live at both the General Internal Medicine Faculty practice as well as all three Partners in Health clinics.

The project has begun recruiting patients at four primary care clinics to participate in this project. To date, 2289 women have consented (an average of 18 women recruited per day), 1130 have completed surveys, and an additional 243 will hopefully complete surveys via the Internet or by telephone in the next month. Project staff anticipate beginning to analyze the data in the coming months.

**Preliminary Impact and Findings:** Themes that emerged from focus groups with women of reproductive age include: 1) A desire to receive information about medication side effects from physicians at the time of prescription; 2) a feeling that pregnancy-related risks (related to medication use or poor maternal health) should be routinely discussed; 3) that women depend on their physicians for information about pregnancy risks because they feel other sources may not be reliable; 4) that women can rarely alert their physicians to the possibility of pregnancy because most do not plan their pregnancies; and 5) that if a clinician thinks a woman should not get pregnant while using a medication, the clinician needs to help the woman avoid pregnancy by providing an effective form of birth control.

Barriers that women identified as preventing them from obtaining desired information about medication risks include: a lack of privacy at the pharmacy, embarrassment at raising the possibility of an unplanned pregnancy, lack of trust in a clinician, and language barriers.

The major themes that emerged from focus groups with primary care clinicians include: 1) desire for accurate information about teratogenic risk that is available in “real time”; 2) difficulty identifying concise sources of teratogenic information on the Internet; 3) concern that hard-copy references may not be up to date; 4) desire for references that provide clinically relevant information about teratogenic risks (such as absolute risks instead of relative risks); 5) belief that decision support with computerized order entry would help them alert women to the possibility of teratogenic risk; 6) concern that few medications have been adequately studied during pregnancy; 7) worry that information about teratogenic risks may lead some women to decide not to use needed medications; 8) concern that raising the possibility of unintended pregnancy may offend some women; 9) perception that few women present requesting preconception counseling; and 10) perception that limited clinical time requires prioritizing acute issues and issues that can be billed for (clinicians cannot currently bill for providing preconception counseling).

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### **Selected Outputs**

Two abstracts accepted at the Organization of Teratology Information Specialists 21<sup>st</sup> Annual Meeting, Monterey, CA; June 28 – July 1, 2008.

Abstract presented at the Society of Family Planning Annual Meeting, Reproductive Health 2008, Washington, DC; September 17 – 20, 2008.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The project is mostly on track with 80 to 99 percent of its milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	A Systems Engineering Approach: Improving Medication Safety
<b>Principal Investigator:</b>	Singh, Gurdev, Ph.D., Ms.C.
<b>Organization:</b>	State University of New York at Buffalo
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory and Safety Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017020
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,200,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. This project implements an information technology (IT)-based Crew Resource Management (CRM) tool in a primary care setting. The selected IT system that is being adapted (with CRM elements embedded) for this study is the A Collaboration of Resources Network (ACORN) system developed by the Dendress Corporation for facilitating quality improvement teams in hospital settings. The modified system, ACORNOffice, was completed and alpha-tested within the first 6 months of the project. This project was formulated in consultation with Upstate New York Practice Based Research Network (UNYNET) clinicians who are already using electronic medical records (EMRs) and are interested in identifying affordable approaches that are useful and generalizable to their practices. The project is an experimental design (single-blind randomized block cluster) of a site-level intervention. Outcome assessment will be focused on medication safety among geriatric patients and on office staff use/application of the IT-based CRM tool. Participatory research methods will be used to assess provider- and staff-identified barriers to implementation. The overall purpose of this study is to conduct and publish the results of an IT demonstration project using a human factors approach to geriatric medication safety so as to provide pilot data for larger confirmatory studies and perhaps to develop and market test the IT-CRM software via Small Business Innovation Research (SBIR) mechanisms for eventual national release.

### Specific Aims

- Examine the impact of an IT-based CRM intervention on reducing selected adverse drug events (ADEs) among geriatric patients in primary care settings by evaluating changes in: 1) number of preventable ADEs that occur, 2) severity of those ADEs, and 3) stage of the medication use process in which they occur (i.e., diagnosis, prescribing, transcribing, dispensing, administration, and monitoring). **(Ongoing)**
- Examine the impact of an IT-based CRM intervention on improving monitoring for geriatric patients on persistent medications in primary care settings by evaluating changes in monitoring rates for subjects (age 65 and older) on: 1) angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs), 2) digoxin, 3) diuretics, and 4) statins. **(Ongoing)**
- Evaluate office staff use and application of the IT-based CRM Tool for improving geriatric medication safety in primary care settings by examining use of the IT tool by office staff and changes in safety attitude constructs (safety climate, teamwork climate, stress recognition, working conditions, and perceptions of management and job satisfaction). **(Ongoing)**

**2008 Activities:** All eight eligible study sites from among UNYNET sites with EMRs have been recruited and have been randomized to either intervention or control groups using concealed allocation (i.e., the person recruiting practices is blinded to the allocation). Project staff have conducted baseline chart review screening for ADEs (using an ADE trigger tool) as well as Healthcare Effectiveness Data and Information Set (HEDIS) lab monitoring measures at six out of eight sites. The ascertainment training in the EMR extraction protocol has also been completed during this year.

All four intervention sites have completed their prioritization of perceived patient safety hazards in offices and have developed a common vision of the problems. Examples of problems prioritized include poor patient education regarding high-risk medications; high no-show rate; poor medication tracking; and poor teamwork/coordination among staff, especially related to processing of refill requests. These sites are implementing practice changes focusing on the prioritized problems. Examples include: incorporation of patient education brochures for high-risk medications; inclusion of diagnosis on prescriptions; patient reminders regarding follow-up; patient-carried medication lists; changes in the way that refill requests are handled; and formation of teams to address ongoing communication problems.

In addition, all four intervention sites have successfully completed the following:

- Installation of ACORNOffice.
- Onsite training and introduction to staff.
- Team assessment of safety culture and medication safety in the office using Ambulatory Safety Attitude Questionnaire (SAQ) and Safety Enhancement and Monitoring Instrument that is Patient centered (SEMI-P).

Graphic displays of the results from an analysis of SAQ and SEMI-P have been added to enhance understanding and create common vision in the teams. To enable the use of the Delphi technique, facilities have been created for receiving anonymous voting for priorities, and graphic display of consensus results of priorities of hazards is provided. The facility allows revision of priorities by individual respondents and invites anonymous comments accessible to the whole team to facilitate synergy. In addition, numerous quick reference sheets have been prepared. Examples are: “ACORNOffice Instructions” (including how to set up a new practice), “Getting Started” (including how to log in and how to change passwords), “Tips for Completing Online Surveys,” “Voting for Medication Safety” (including how to vote for your top three choices and make comments anonymously), “Updating Progress on Initiative/s Work Steps,” and “Entering Data for Indicators.”

**Preliminary Impact and Findings:** The project does not have any findings to date.

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## **Selected Outputs**

FAQs for SAQ and SEMI-P

Instructions with animation and voice-over for SAQ and SEMI-P completion

Tool for online:

- Delphi technique for prioritization of safety problems based on SEMI-P results
- Visual presentation of SEMI-P results
- Visual presentation of SAQ results
- Anonymous completion of SEMI-P survey via anonymous password
- Completion of SAQ via anonymous password

Web-based trigger tool for screening and review

Written procedures for use of trigger tool for data capture

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is mostly on track with 80 to 99 percent of its milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

**Table 9: Grant-Specific Summaries (PCC HIE)**

**HEALTH IT PORTFOLIO STRATEGIC GOAL:**

Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care (PCC), the coordination of care across transitions in care settings, and the use of electronic exchange of health information (HIE) to improve quality of care (PCC HIE).

<b>AHRQ BUSINESS GOAL: IMPLEMENTATION AND USE</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Funding Opportunity Announcement</b>	<b>Summary</b>
Yes	Huck, Jacqueline, RN, MPH	A Rural Healthcare Information Technology Cooperative to Promote Clinical Improvement	<a href="#">HS04-012</a>	<a href="#">Page 135</a>
Yes	Jones, Mark H, MS, MBA	Implementation of a Health Improvement Collaboration in Cherokee County, Oklahoma	<a href="#">HS05-013</a>	<a href="#">Page 138</a>
Yes	Mathews, Craig Alonzo	Service Integration	<a href="#">HS05-013</a>	<a href="#">Page 141</a>
Yes	Samore, Matthew H, MD	Rural Trial of Clinic Order Entry with Decision Support	<a href="#">HS04-012</a>	<a href="#">Page 144</a>
No	Adams, William, MD	Conversational Information Technology (IT) for Better, Safer Pediatric Primary Care	<a href="#">HS07-007</a>	<a href="#">Page 148</a>
No	Baker, Wende M, Med	Chronic Mental Health: Improving Outcomes through Ambulatory Care Coordination	<a href="#">HS08-002</a>	<a href="#">Page 150</a>
No	Bergner, Gregory W, MD, FAAFP	El Dorado County Safety Net Technology Project / Access El Dorado (ACCEL)	<a href="#">HS05-013</a>	<a href="#">Page 152</a>
No	Bove, Alfred, MD	Using a Telemedicine System to Promote Patient Care Among Underserved Individuals	<a href="#">HS07-007</a>	<a href="#">Page 154</a>
No	Burns, Edith, MD	Enhancing self-management of T2DM with an Automated Reminder and Feedback System	<a href="#">HS07-007</a>	<a href="#">Page 156</a>
No	Chrischilles, Elizabeth, PhD	Personal Health Records and Elder Medication Use Quality	<a href="#">HS07-007</a>	<a href="#">Page 159</a>
No	Chueh, Henry, MD	Ambulatory Care Compact to Organize Risk and Decisionmaking (ACCORD)	<a href="#">HS07-007</a>	<a href="#">Page 161</a>
No	Ciemins, Elizabeth, PhD	Evaluation of Effectiveness of an Health Information Technology-based Care Transition Information Transfer System	<a href="#">HS08-002</a>	<a href="#">Page 163</a>
No	Druss, Benjamin, MD, MPH	An Electronic Personal Health Record for Mental Health Consumers	<a href="#">HS08-002</a>	<a href="#">Page 165</a>

No	Feldman, Penny, PhD	Improving Medication Management Practices and Care Transitions through Technology	<a href="#">HS08-002</a>	<a href="#">Page 167</a>
No	Field, Terry, DSc	Using Health Information Technology to Improve Transitions of Complex Elderly Patients from Skilled Nursing Facilities (SNF) to Home	<a href="#">HS08-002</a>	<a href="#">Page 169</a>
No	Forrest, Christopher, MD	Improving Otitis Media Care with Electronic Health Record (EHR)-based Clinical Decision Support and Feedback	<a href="#">HS07-006</a>	<a href="#">Page 171</a>
No	Friedman, Robert, MD	A Longitudinal Telephone and Multiple Disease Management System to Improve Ambulatory Care	<a href="#">HS08-002</a>	<a href="#">Page 173</a>
No	Garber, Lawrence D, MD	Secure Architecture For Exchanging Health Information (SAFEHealth)	<a href="#">HS04-011</a>	<a href="#">Page 175</a>
No	Hahn, Elizabeth, MA	Implementing a low-literacy, multimedia Information Technology (IT) system to enhance patient-centered cancer care	<a href="#">HS07-007</a>	<a href="#">Page 177</a>
No	Jack, Brian, MD	Virtual Patient Advocate to Reduce Ambulatory Adverse Drug Events	<a href="#">HS07-007</a>	<a href="#">Page 179</a>
No	Kahn, James, MD	Randomized Controlled Trial Embedded in an Electronic Health Record	<a href="#">HS08-002</a>	<a href="#">Page 182</a>
No	Krist, Alexander, MD	An Interactive Preventive Health Record (IPHR) to Promote Patient-Centered Care	<a href="#">HS07-007</a>	<a href="#">Page 183</a>
No	Lapane, Kate, PhD	Tailored DVD to Improve Medication Management for Low Literate Elderly Patients	<a href="#">HS07-007</a>	<a href="#">Page 186</a>
No	Lewis, Thomas L, MD	Metro DC Health Information Exchange (MeDHIX)	<a href="#">HS05-013</a>	<a href="#">Page 189</a>
No	Lobach, David, MD, PhD, MS	Improving Care Transitions for Complex Patients through Decision Support	<a href="#">HS08-002</a>	<a href="#">Page 193</a>
No	Mehr, David, MD, MS	Using Health Information Technology to Improve Ambulatory Chronic Disease Care	<a href="#">HS07-006</a>	<a href="#">Page 195</a>
No	Mertens, Ann, PhD	Improving Pediatric Cancer Survivorship Care Through SurvivorLink	<a href="#">HS08-002</a>	<a href="#">Page 198</a>
No	Mold, James, MD	Impact of a Wellness Portal on the Delivery of Patient-Centered Prospective Care	<a href="#">HS07-007</a>	<a href="#">Page 200</a>
No	Nashan, Georges	The Chronic Care Technology Project	<a href="#">HS05-013</a>	<a href="#">Page 202</a>
No	Richards, Francis M, CASC	Regional Approach for Transforming Healthcare Quality through Information Technology (THQIT) in Rural Settings	<a href="#">HS05-013</a>	<a href="#">Page 204</a>
No	Ritchie, Christine, MD, MSPH	E-Coaching: Interactive Voice Response (IVR)-Enhanced Care Transition Support for Complex Patients	<a href="#">HS08-002</a>	<a href="#">Page 207</a>
No	Samore, Matthew, MD	Patient-Centered Informatics System to Enhance Health Care in Rural Communities	<a href="#">HS07-007</a>	<a href="#">Page 209</a>

No	Schillinger, Dean, MD	Harnessing Health Information Technology for Self-Management Support and Medication Activation in a Medicaid Health Plan	<a href="#">HS07-007</a>	<a href="#">Page 212</a>
No	Sequist, Thomas, MD, MPH	Can Risk Score Alerts Improve Office Care for Chest Pain?	<a href="#">HS07-006</a>	<a href="#">Page 215</a>
No	Shank, Nancy C, MBA	Health Information Exchange: A Frontier Model	<a href="#">HS05-013</a>	<a href="#">Page 218</a>
No	Singh, Hardeep, MD, MPH	Using Electronic Data to Improve Care of Patients with Known or Suspected Cancer	<a href="#">HS08-002</a>	<a href="#">Page 220</a>
No	Sodomka, Patricia, MHA, FACHE	Using An Electronic Personal Health Record To Empower Patient With Hypertension	<a href="#">HS07-007</a>	<a href="#">Page 222</a>
No	Stepnowsky, Carl, PhD	Enabling Sleep Apnea Patient-Centered Care Via an Internet Intervention	<a href="#">HS07-007</a>	<a href="#">Page 225</a>
No	Tang, Paul, MD	Patient-Centered Online Disease Management Using a Personal Health Record System	<a href="#">HS07-007</a>	<a href="#">Page 228</a>
No	Veline, James, MS, MA	Electronic Prescribing and Decision Support to Improve Rural Primary Care Quality	<a href="#">HS07-006</a>	<a href="#">Page 231</a>
No	Wolf, Michael, PhD	Using Information Technology for Patient-Centered Communication and Decisionmaking about Medications	<a href="#">HS07-007</a>	<a href="#">Page 234</a>

### AHRQ BUSINESS GOAL: KNOWLEDGE CREATION

Completed in 2008	Principal Investigator	Project Title	Funding Opportunity Announcement	Summary
Yes	Blair, A John, MD	Taconic Health Information Network and Community (THINC)	<a href="#">HS04-011</a>	<a href="#">Page 236</a>
Yes	Lobach, David F, MD, PhD, MS	Showing Health Information Value in a Community Network	<a href="#">HS04-012</a>	<a href="#">Page 238</a>
Yes	McConnochie, Kenneth M, MD, MPH	Valuation of Primary Care-Integrated Telehealth	<a href="#">HS04-012</a>	<a href="#">Page 241</a>
Yes	Sims, Thomas R, MS	Improving Rural Healthcare: Implementing Innovative Integration Solutions	<a href="#">HS05-013</a>	<a href="#">Page 244</a>
No	Deluca, Michael, MBA, MS	Ambulatory Electronic Medical Record and Shared Access	<a href="#">HS05-013</a>	<a href="#">Page 247</a>
No	Lozzio, Carmen B, MD, FACMG	Improving Quality Care for Children with Special Needs	<a href="#">HS05-013</a>	<a href="#">Page 249</a>
No	Middleton, Blackford, MD, MPH, MSc	Evaluating Smart Forms and Quality Dashboards in an Electronic Health Record (EHR)	<a href="#">HS04-012</a>	<a href="#">Page 251</a>
No	Overhage, Joseph Marcus, MD	Value of Health Information Exchange in Ambulatory Care	<a href="#">HS04-012</a>	<a href="#">Page 255</a>

No	Rachal, Valerie, RN, PhD	Creating Online Newborn Intensive Care Unit (NICU) Networks to Educate, Consult & Team	<a href="#">HS05-013</a>	<a href="#">Page 257</a>
<b>AHRQ BUSINESS GOAL: SYNTHESIS AND DISSEMINATION</b>				
Completed in 2008	Principal Investigator	Project Title	Funding Opportunity Announcement	Summary
No	Simon, Steven, MD, MPH	Improving Laboratory Monitoring in Community Practices: A Randomized Trial	<a href="#">HS07-006</a>	<a href="#">Page 259</a>
Yes	Goldberg, Lee Richard, MD, MPH	Home Heart Failure (HF) Care: Comparing Patient-Driven Technology Models	<a href="#">HS04-012</a>	<a href="#">Page 262</a>
Yes	Gunter, Margaret J, PhD	New Mexico Health Information Collaborative (NMHIC)	<a href="#">HS04-011</a>	<a href="#">Page 264</a>
No	Connelly, Donald Patrick, MD, PhD	A Community-shared Clinical Abstract to Improve Care	<a href="#">HS05-013</a>	<a href="#">Page 266</a>
No	Guisse, Jeanne-Marie M, MD	Improving Safety and Quality with Integrated Technology	<a href="#">HS04-012</a>	<a href="#">Page 268</a>

<b>Project Title:</b>	A Rural Healthcare Information Technology Cooperative to Promote Clinical Improvement
<b>Principal Investigator:</b>	Huck, Jacqueline, R.N., M.P.H.
<b>Organization:</b>	Rural Healthcare Quality Network (RHQN)
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015188
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,498,916
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This completed study was intended to foster awareness and use of clinical practice guidelines for acute myocardial infarction (AMI) and community acquired pneumonia (CAP) in rural hospitals in Washington State. It adapted AMI and CAP guidelines to make them more relevant to rural practice, examined clinicians' attitudes and practices regarding best practice guidelines and information technology (IT) for quality improvement in small rural hospitals, and evaluated the use and impact of an Internet-based IT intervention designed to improve adherence to guidelines. Data were gathered from nurses and physicians at the participating hospitals through in-person interviews and Web and mail surveys. The interviews and questionnaires included items about leadership support for quality improvement, hospital environment, attitudes toward best practice guidelines, use of the computer to perform professional tasks, and computer literacy. Most staff felt that best practice guidelines improve the quality of care. Guidelines were perceived as improving response time; serving as reminders, especially in instructing temporary staff or for treating conditions rarely seen in rural hospitals; and delivering evidence-based care. Nurses, in particular, perceived potential increased autonomy through the use of clinical practice guidelines that would include standing orders and protocols for actions that they could perform without previous physician approval. Each participating hospital was invited to send staff to a quality improvement workshop hosted by the Rural Healthcare Quality Network (RHQN). These workshops were interactive and presented in a "train-the-trainer" format. Once the Rural Health Information Technology Consortium (RHITC) Web site had been completed, each participating hospital received training via videoconference on how to access the site, complete data entry, initiate online discussion, retrieve evidence-based articles, complete self-education tests, and obtain free Continuing Medical Education (CME) and nursing education credits. They were also trained in retrieving their data reports, which were completed by the subgrantee, the American Institutes for Research (AIR).

### Specific Aims

- Design a Web site that would serve as an intervention to improve adherence to best practice guidelines. **(Achieved)**
- Develop a survey to measure practitioner attitudes regarding best practices. **(Achieved)**
- Implement educational programming to improve knowledge of and adherence to best practices for AMI and CAP. **(Achieved)**

- Evaluate the process and outcomes of the intervention on the knowledge, attitudes, and behavior of nurses, physicians, and hospital administrators working at critical access hospitals in Washington. **(Achieved)**

**2008 Activities:** All hospitals began Quality Improvement plans. Data were collected from all sites and analyzed. It appeared that, while a number of hospitals participating in this study were not fully engaged or were not able to implement quality improvement initiatives in their institutions for a variety of reasons, there were several hospitals that were committed to overcoming the barriers they faced. These hospitals proceeded with pursuing quality improvement and demonstrating excellence in the care they provide to their patients.

**Preliminary Impact and Findings:** Of the four components of the intervention Web site—library resources, training resources, staff-to-staff communications, and the repository of quality measures data on guidelines adherence—hospital staff were mainly interested in the data repository. After intervention, there were substantial, statistically significant ( $p < 0.05$ ) improvements in several selected quality measures. These results were based on comparing pre-intervention performance to post-intervention performance for overall AMI and CAP opportunity scores as well as individual guidelines. The amount of improvement varied by region within the State of Washington (east vs. west), but both regions saw substantial improvements. Improvement was measured using ‘opportunity’ scores—that is, the number of instances where the guidelines were met, divided by the total number of opportunities to apply the guidelines. The Overall AMI opportunity score increased by 16 percentage points (52 percent to 68 percent) among eastern hospitals, and 5 percentage points (55 percent to 60 percent) among western hospitals. Both regions experienced significant improvements in the rate at which they met several individual AMI guidelines, including giving aspirin and beta blockers at arrival, and the eastern hospitals improved the rate at which they gave an EKG within 10 minutes and the frequency of collecting cardiac enzymes.

The overall CAP opportunity score increased by 25 percentage points (from 67 percent to 92 percent) among eastern hospitals, and 9 percentage points (from 79 percent to 88 percent) in the western hospitals. By the post-intervention period, both regions were meeting the oxygenation assessment guideline for 100 percent of patients. Across both regions combined, these hospitals significantly improved the percentage of eligible patients receiving smoking cessation counseling (from 25 percent to 77 percent) and the percentage of eligible patients receiving influenza vaccinations (from 1 percent to 22 percent); and the eastern hospitals significantly increased the percentage of eligible patients receiving Pneumococcal vaccinations (from 1 percent to 20 percent).

Process changes such as creating or modifying standing orders sets and treatment protocols occurred in most of the participating hospitals and are expected to have a greater impact on improving quality in the future. Thus, with attention and persistence, many of the identified barriers can be overcome in critical access hospitals with limited resources. Due to a number of delays, dedicated efforts by hospitals to improve performance on the selected quality measures did not truly start until the final 9 to 12 months of the grant.

Barriers remain for the widespread use of IT and the implementation of clinical practice guidelines in small rural hospitals in Washington State. These barriers are related to attitudes toward and experience with guidelines and the use of computers in clinical care. Although improving, there remains a significant opportunity for further improvement. It is recommended that only those hospitals that are willing to commit the energy and resources needed to participate in national or statewide research projects be included in research projects with a quality improvement component.

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**Selected Outputs**

Tool: Clinician Survey regarding attitudes toward best practices for AMI and CAP, as well as the role of computers in the workplace.

Measures: Adapted measures for AMI and CAP best practice guidelines suitable for small rural hospitals.

Web portal (Sharepoint) for QI focused on AMI and CAP.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This project has been completed. Although intervention did not lead to implementation of best practice guidelines to the desired extent, some cultural and procedural changes were made.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Implementation of Health Improvement Collaboration in Cherokee County, Oklahoma
<b>Principal Investigator:</b>	Jones, Mark, M.S., M.B.A.
<b>Organization:</b>	Tahlequah City Hospital
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016131
<b>Project Period:</b>	09/05 – 09/08
<b>AHRQ Funding Amount:</b>	\$1,499,200
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

Summary: The purpose of this study was to implement three related projects using health information technology (IT). The first was to evaluate the possibilities for construction of a widely diverse and inclusive organization to build multiple patient data exchanges for use by providers across Oklahoma. The second evaluated whether a model for prioritizing cost-effective preventive care to shift population health status could be theoretically added to the network. The third examined whether a Web-based system could be built to help the population identify health providers in their area. Consensus models were built using expert groups and consultants to develop all three projects. Clinicians worked collaboratively to develop parameters for the data set that would provide the basic information needed by providers to treat a new patient, as well as any limitations on available data or legal boundaries regarding types of information that can be exchanged in Oklahoma. The project also cultivated resources related to laws and privacy policies including the development of Health Insurance Portability and Accountability Act (HIPAA)-compliant privacy practices, including patient notification, Web portal design, staff education, and patient materials development. The State Health Security and Privacy Taskforce project was helpful in this arena. In addition, the principal author of HIPAA came to Tahlequah in 2005 and met with members to help them understand and become comfortable with HIPAA within the context of patient data exchange. Documents addressing patient privacy issues have been made available through the Web site. An initial patient survey asked participants about the degree of difficulty they had locating providers. The results were surprising: over 60 percent stated they had difficulty finding appropriate services. A Web-based service to find health providers was developed on a statewide basis, supported by 24-hour telephone service. The data set included 18 provider types and was categorized by payment source, location, and business hours.

### Specific Aims

- Assess the viability of constructing patient data exchanges in Oklahoma serving a variety of providers and practice types. **(Achieved)**
- Develop a framework for a cost-effective preventive care module to be added to the records in the exchange. **(Achieved)**
- Create and implement a Web-based directory of providers to help patients locate providers in their area. **(Achieved)**

**2008 Activities:** The health data exchange network, named the Secure Medical Records Transfer Network (SMRTNET), went live in multiple locations. The network is a sustainable way for smaller practices and groups to receive technical assistance with their plans for health information exchange (HIE). The provider directory Web site also went live in 2008.

**Preliminary Impact and Findings:** By September 2008, SMRTNET had established two operational data exchanges including over one million patients located in 20 of the 77 counties in Oklahoma. Obligations already on the books for the network will have the data system growing to over two million patients, almost 30 million medical records, and approximately 30 percent of the prescriptions filled in Oklahoma by the end of 2008. The clinical taskforce identified demographics, allergies and reactions, diagnoses, procedures, laboratory tests, medications, immunizations, and data needed for up to five prevention services as the basic data set. Services to be offered initially include a community health record and e-prescribing. The SMRTNET Member Agreement is now in service with 17 different entities. The evolution of SMRTNET from a self-contained regional data exchange into a multi-faceted statewide planning and oversight body to help plan, finance, and operate many interoperable data exchanges took place over a long period of time. SMRTNET is intended to be a hub for smaller proprietary networks, as a provider of legal assistance with HIPAA compliance as well as State law, and as a support service that assists in the development of HIEs, especially where funds are limited as most exchanges require \$1.5 million to develop a complete implementation plan. SMRTNET can work with potential members to develop a complete implementation plan at no charge or a very small percentage of the usual amount needed. Using the SMRTNET approach, HIE networks can be developed in a more natural way, from the bottom up, rather than the top down. Using one broadly-managed government-incorporated health authority to build multiple data exchanges quickly and inexpensively on a smaller scale may provide a model that can work in many areas of the country.

An expert taskforce identified five preventive care activities that could be integrated into the system while remaining cost-effective: 1) blood pressure medication, 2) cholesterol-lowering medication, 3) prophylactic aspirin, 4) reduction in drinking by physician encouragement, and 5) smoking reduction through medical office referral. However, because of concerns about the efficacy of emplacing these care activities in a health data exchange system—where, due to interoperability concerns, data actually sent is not robust—the working group decided not to pursue these additions at this time.

The provider directory project has led to a publicly-available product, including over 10,000 providers listed by type, location, payment sources, and special hours. The goal of this system is to provide a public and objective link to locating health care providers. A potentially important finding is that the number of active physicians in Oklahoma appears to be significantly less than publicly estimated. Physicians with addresses listed in the State medical registry outside the State were eliminated; this surprisingly amounted to 40 percent of those registered. This project can be considered a success in that the system works well, provides the necessary provider information, and even gives driving directions and the amount of time it would take to drive to the provider's office. Further, geocoding all the health sites in the State has proved very useful for health planning and the establishment of provider offices. Overall, the project helped develop significant resources that can be leveraged in the future to improve quality of care throughout Oklahoma. The SMRTNET program is sustainable, funded by its partner organizations, and the provider Web site has aggregated information in an accessible and useful way.

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### **Selected Outputs**

Available at: Cherokee County Health Services Council. Secure Medical Records Transfer Network Web site. <http://www.smrtnet.org>. Accessed May 2009.

Available at: Cherokee County Health Services Council. OKHealthfinder. <http://www.okhealthfinder.com>. Accessed May 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Although the provider directory Web site has not received large amounts of traffic from patients, it has significant value, and the project is in negotiations with State government and provider entities to incorporate it into their Web sites. The conclusions reached about the value of various chronic care reminders will likely be useful for future planning for systems with this type of functionality, anticipated to occur as the development of electronic health records continues to spread. SMRTNET is a sustainable program and a valuable resource for clinicians interested in beginning electronic health data exchange, particularly those based in Oklahoma.

The interoperable data sharing system is operational in two data sharing networks. These networks include over 18 large data contributors, have separate management boards, and are fully sharing data with one another. Several other networks are under active discussion, and the number of records and patients grows daily as new data are sent into the system. The data sharing agreement which allows providers, hospitals, community health centers, public health organizations, universities, Native American tribes, and mental health clinicians to share data has been reviewed and accepted by over 20 different attorneys from these provider groups. The agreement has also been vetted at the Federal level as part of a template for Federal data sharing in the Indian Health Service. The network is financially self-sustaining without grant or government assistance.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Service Integration
<b>Principal Investigator:</b>	Mathews, Craig A.
<b>Organization:</b>	Franklin Foundation Hospital
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality Through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016151
<b>Project Period:</b>	09/05 – 09/08
<b>AHRQ Funding Amount:</b>	\$1,500,000
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The Bayou Teche Community Health Network (ByNet) partnered with Franklin Foundation Hospital, a Critical Access Hospital, in this project to establish an integrated clinical and human services health information exchange (HIE) for public and private health service providers of residents of St. Mary and surrounding parishes in the State of Louisiana. Safety net providers serving this target area committed in-kind administrative time and information technology (IT) staff to complete an intensive 3-year implementation process. Observations of committee meetings, review of reports, survey of project partners, and interviews with key stakeholders all indicate a significant level of community support for the Service Integration effort. Further, participants indicated that the planning process was effective and believe that the project has the potential to create an effective system across safety net providers for sharing some forms of clinical information. ByNet has developed an HIE allowing caregivers within its immediate collaborative network a summarized view of a patient’s recent health history. Although the system is not yet live, other sources of funding have been secured. The initial phase of the implementation will allow authorized caregivers an online view of a patient’s demographic details and recent encounters, including the dates and locations with narrative diagnoses and procedures. This patient information will be printable as a PDF and can easily be attached to a paper chart to support a care episode. As additional patient care occurs in the ByNet community, the patient’s demographics and encounters will be updated to reflect this new information. System launch date is outside the scope of this AHRQ grant, but is still proceeding, as other sources of funding have been secured. Initially, the system will have major functions intact, with more features planned for the future.

**Specific Aims**

- Develop a robust governance structure for ByNet. **(Achieved)**
- Link existing electronic information systems from a variety of partner organizations, including clinics, laboratories, and the state office of public health, to a common data repository. **(Ongoing\*)**
- Create a Master Patient Index and system program needed to export and import data from project partner systems. **(Achieved)**
- Go live with LH II sharing of relevant clinical and administrative data across ByNet sites. **(Upcoming\*)**
- Continue to support individual ByNet partners in moving to electronic records, and interface new information sources to the repository as they come on line. **(Upcoming\*)**
- Make enhancements that could include CPOE, referral tracking, links to eligibility screening and network-wide scheduling. **(Upcoming\*)**

- Build and implement the automatic “required disease reporting” component. **(Upcoming\*)**

\* Several aims of the grant were not completed prior to 09/08, but, as other sources of funding have been secured, these aims are still targeted for completion.

**2008 Activities:** Users were trained for the system, and a go-live date was set. Patient consent and information security documents were prepared.

**Preliminary Impact and Findings:** To date, four partners have officially signed a Memorandum of Understanding (MOU) and have been actively engaged in the data-sharing process. Two additional partner sites are in position to sign the MOUs, namely the Louisiana State University’s Charity System, which encompasses the Leonard J. Chabert and University Medical Centers. The exigencies associated with Hurricanes Katrina and Rita previously, and with Hurricanes Gustav and Ike more recently, caused a significant delay in getting the legal department of the LSUHSC to finalize the agreement. The delay is not considered to be problematic as the technical and leadership components of those organizations continue to work constructively with the project. The ByNet organization has submitted two grant applications to continue implementation work and hopefully make the HIE self-sustaining. The first is the Project Outreach application, which has been submitted to the Louisiana State Access Initiative. The purpose of the proposed project is to expand ByNet’s existing efforts to increase access to prescription drugs for under- and uninsured residents of the St. Mary, Iberia, Vermilion, and Terrebonne Parish region. This task will be met through partnerships with various entities and providers, which will allow patients enhanced access to a broader variety of prescription assistance opportunities. Additionally, ByNet will expand its services to target the younger, nontraditional working class, and low-income under- and uninsured population not directly targeted in the past. ByNet is requesting a sum total of \$50,000 in State of Louisiana funding for the purpose of implementing the proposed project. The second, funded application is to the Department of Health and Human Service’s Health Resources and Services Administration (HRSA) as part of the *Rural Health Care Services Outreach Grant Program*. The funding amount is for \$375,000 and for the period of May 1, 2006, through April 30, 2009.

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### **Selected Outputs**

ByNet Memorandum of Understanding; Governance Document; ByNet Governance Committee/Board of Directors (including Franklin Foundation Hospital).

ByNet HIE Governance Committee Operating Guidelines; Governance Document; ByNet Governance Committee/Board of Directors (Including Franklin Foundation Hospital).

ByNet Business Associate HIPAA Agreement; Governance Document; ByNet Governance Committee/Board of Directors (Including Franklin Foundation Hospital).

ByNet OpenHRE Patient Finder Training Manual, Version 1.0; Governance Document; ByNet Governance Committee/Board of Directors (Including Franklin Foundation Hospital).

ByNet Patient Consent Form; Governance Document; ByNet Governance Committee/Board of Directors (Including Franklin Foundation Hospital).

ByNet OpenHRE Architecture Design Document; Governance Document; ByNet Governance Committee/Board of Directors (Including Franklin Foundation Hospital).

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The THQIT grant from AHRQ has been completed, but the project continues. Implementation of an HIE has required more time than initially expected, in part due to natural disasters and other adverse events outside of the project’s control, but system implementation is continuing with funding from other sources.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

**Project Title:** Rural Trial of Clinic Order Entry with Decision Support  
**Principal Investigator:** Samore, Matthew, M.D.  
**Organization:** University of Utah  
**Mechanism:** RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)  
**Grant Number:** R01 HS 015413  
**Project Period:** 09/04 – 08/08, Including No-Cost Extension  
**AHRQ Funding Amount:** \$1,499,650  
**Summary Status as of:** August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Samore’s team implemented the computerized clinic order entry (CCOE) tool, a Web-based program for generating and executing ambulatory orders. The tool was evaluated in a cluster randomized trial in rural primary care clinics. Their technology partner was CaduRx. The evaluated tool is proprietary. It currently adheres to 338 of 479 Certification Commission for Health Information Technology (CCHIT) evaluation criteria. This grant is in the reporting and dissemination stage. Final analyses are being performed. The acronym used for this study was INFORM (Intelligent Network for Registries and Order Management).

This study was conducted in rural primary care clinics throughout Utah, Idaho, and Wyoming. Clinics that were staffed by at least two primary care providers and did not already use an electronic health record were considered eligible for participation. A total of 16 clinics completed the 3-year study; 9 were randomly assigned begin use of the CCOE tool between May and August 2005, and 7 were assigned to begin use of the tool between May and August 2006. Most of the study clinics had no previous experience with health information technology (IT), and some had no previous in-clinic Internet service. None had previous existing electronic health records (EHR) or CCOE. One challenge that many study clinics experienced was limited access to reliable high-speed Internet services, which was a precursor to implementing the health IT intervention into their clinics. The study team assisted the clinics in identifying possible options for obtaining the services to address this barrier. Another barrier the study clinics faced was unfamiliarity with the Internet and Web-based communication, such as e-mail. The study team spent time with study providers who needed assistance learning these methods.

This grant addressed the strategic goal of medication management. The primary order entry features of the CCOE tool included a prescription writer and laboratory and x-ray order entry modules. It was designed for use on any type of Web-enabled computer, including handheld computers, tablet, laptop, and desktop computers. Features of the prescription writer included on-the-fly drug-to-drug interaction prompts; automatic allergy and drug intolerance checking; ICD-9 coding for lab and x-ray orders, including sensitivity to Medicare coding rules; capacity to drill-down to the Multum™ database for detailed prescribing recommendations; the ability to print orders, fax them directly to pharmacy, lab, or x-ray department; and direct electronic transmission to participating pharmacies. The prescription writer generated a refill queue to facilitate hand-off from nursing staff to the primary care provider.

*Drug-drug interaction checker:* The drug-drug interaction checker displayed information about potential drug-drug interactions above the electronic prescription pad. Drug names color coded red indicated a

major drug-drug interaction, purple indicated a moderate reaction, and green indicated the drug is not known to have a moderate or severe interaction with any of the patient's active medications; minor reactions were not targeted. When an order was attempted with a medication identified as having a major drug interaction, the alert presents in a separate window, and the prescriber was forced to hit continue before the electronic prescription pad appears. Moderate alerts were passive in that the prescriber was allowed to proceed directly to the electronic order view without the extra step required for major alerts.

*Decision support tool for antimicrobial prescribing:* The respiratory infection algorithm was an individual patient, point-of-care-based clinical decision support tool designed to help clinicians manage patients with acute respiratory infections. The branching logic used in the decision support tool was similar to the algorithm implemented in an earlier study in rural communities. At the start of the algorithm, the provider selected one of four options: "upper respiratory tract infection," "lower respiratory tract infection," "other infection," or "not for an infection." If either of the first two options was selected, additional checkboxes were revealed to solicit sufficient clinical information to generate a management recommendation. Information previously entered about the patient such as age, allergies, and weight was integrated into the algorithm.

The program had several different entry points: 1) automated trigger when an antibiotic is chosen during the electronic prescription writing process, 2) initiation by clinical staff (e.g. documenting patient's chief complaint), and 3) user-directed algorithm button on the patient home page. The algorithm was intended to be easy to use and time-neutral.

*Vaccine reminder:* The vaccine reminder was an automated notification to inform the provider when influenza vaccination was indicated on the basis of time of year and patient criteria. CDC recommendations for influenza vaccination were translated into computer logic, driven by the available electronic data about the patient. Chronic diseases such as diabetes mellitus were inferred from the patient's active medication list or from ICD-9 codes linked to laboratory test orders. When the reminder popped up or was selected, the provider had the option of declining or canceling or ordering the vaccine for the patient. The reason for not vaccinating, such as allergy or already received, was solicited when the vaccine was declined. Choosing to give the vaccine included an option to print an immunization consent form to be placed in the chart. The vaccine administration date was stored in the patient's electronic record.

The CCOE tool was subjected to a formative evaluation, which included: 1) ongoing tracking of system performance, system usage, and reports of problems; 2) provider survey to examine constructs such as self-efficacy, perceived usefulness, usability, and subjective norms; 3) physician productivity with respect to clinical volume; 4) periodic interactions with providers and clinical staff; and 5) end-of-study focus groups to support a qualitative analysis of user experiences.

The team evaluated the effect of the CCOE tool on clinic processes, focusing on medication management workflow. First, clinic observations were used to construct graphical charts to depict tasks, decisions, and personnel involved in the processing of prescription refills within each clinic. These flow charts were used to qualitatively assess the impact of implementation of the CCOE tool. Second, structured observations were made before and after implementation of the CCOE tool to estimate the average time to process a prescription refill request. Third, Web log files were used to estimate the efficiency of electronic prescription writing for new prescriptions and refills. Rows of data in the Web log files corresponded to specific time-stamped page views that were created during each user session with the CCOE tool. The number of steps and amount of time needed to generate a prescription was compared for prescriptions written entirely by the provider versus prescriptions that entailed clinical staff involvement.

The impact of the CCOE on quality of clinical practice was examined using three endpoints: 1) rate of potential drug-drug interactions, 2) proportion of clinic visits for upper respiratory infection resulting in

the prescribing of an antimicrobial agent, and 3) proportion of adults patients with an indication for influenza vaccine who had documented receipt of influenza vaccine.

### Specific Aims

- Recruit rural primary care practices for participation in a cluster-randomized trial of a computerized clinic order entry (CCOE) tool. **(Achieved)**
- Quantify the impact of the CCOE tool on clinical practice, patient safety, provider productivity, and office efficiency. **(Ongoing - final analyses in progress\*)**
- Assess the effect of the CCOE tool on costs. **(Ongoing - final analyses in progress\*)**

*\* Some aims of the grant were not completed prior to conclusion of the AHRQ funding period, yet work continues and these aims are targeted for timely completion.*

**2008 Activities:** Paper chart review was the primary means by which we assessed the effect of the CCOE tool on clinical practice. Chart review was necessary because electronic data about medications and other practices were not available from these clinics prior to implementation of the CCOE tool.

Three clinical practice domains were studied, linked to the tool's decision support features: medication safety (potential drug-drug interactions), preventive care (adult vaccination), and acute respiratory infection management.

The team developed a chart extraction tool in Microsoft Access using structured data input forms. Documented office visits, medication histories, and immunizations during the interval May 2004 to August 2007 were recorded. Reviewers followed an explicit chart review protocol. Medication histories encompassed drug names and dates as listed in the progress notes, with or without an associated office visit. Documented instances of administration of influenza and pneumococcal vaccines within the clinic or outside the clinic were recorded. Office visits were classified as acute upper respiratory tract infection if acute respiratory symptoms were present or if the provider diagnosed an acute upper respiratory infection.

Some locations were harder than others to schedule for the 2 days required to complete the necessary chart review. This means that these activities took place over several months

**Preliminary Impact and Findings:** Implementation of the CCOE tool led to redesign of clinical processes for prescribing medications. Front office staff became more engaged in the prescription process. The efficiency of communication tasks increased because steps to relay information on paper notes were eliminated. Refill requests were often managed in a batch mode. Provider time spent to write refills was saved. Final analyses of the impact of the CCOE tool on potential drug-drug interactions and antimicrobial prescribing practices are in progress.

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### Selected Outputs

The respiratory infection algorithms are publicly available for use.

Statistical procedures for performing Web log file analysis will be published as supplemental materials.

The CCOE tool is commercially available for clinicians to use on a subscription basis. It is fully integrated with an electronic health record, personal health record, and electronic communication system.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** This project is complete, having met all its milestones. Further data analyses are ongoing beyond the scope of the grant, and manuscripts are being prepared for publication.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Conversational Information Technology (IT) for Better, Safer Pediatric Primary Care
<b>Principal Investigator:</b>	Adams, William, M.D.
<b>Organization:</b>	Boston Medical Center
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017248
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,159,609
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project, approximately mid-way through its scheduled duration, seeks to develop and evaluate an automated telephony system as part of prevention services delivered in a pediatric practice. The system gathers personal health data and counsels parents before scheduled visits, integrates the data with the physician's electronic health record (EHR), and offers personalized follow-up assessment and counseling after visits. The internally developed interactive voice response (IVR) telephony system interfaces with the providers' EHR (GE Centricity Physician Office). The telephony system, called the Personal Health Partner (PHP), uses fully automated, interactive conversations (including synthetic speech and speech recognition) to gather health data and counsel parents before scheduled pediatric primary care visits. Parent-entered data is shared with the child's primary care clinician via the EHR, where data is reviewed and clinician decision support is provided. The system is being evaluated via a three-armed, randomized, controlled trial (PHP only, PHP assessment with counseling, or usual care groups) to determine the marginal effect of the PHP intervention on comprehensive preventive and medication management assessments during PCP visits; preventive and medication management counseling; healthier parental behaviors; and increased parental activation.

### Specific Aims

- Develop an automated telephony system that uses fully automated conversations to perform pre-visit pediatric primary care assessments, offer parental counseling (including appropriate medication use), and support clinician decisionmaking by incorporating the PHP child assessments into their EHR at the point-of-care. **(Ongoing)**
- Conduct a randomized clinical trial to determine whether: 1) PHP assessment alone (no counseling) with EHR data exchange leads to higher quality preventive care and medication management; and 2) whether the addition of PHP counseling to PHP child assessments (before and after visits) is associated with increased quality and healthier parental behaviors. **(Upcoming)**

**2008 Activities:** The team has successfully accomplished Phase I of the project, which was the building of content with experts while concurrently building the IT infrastructure. The project team designed and developed a prototype system and final system to store and manage the PHP system. To accomplish this, Dr. Adams and his team gathered instruments, developed the content, and programmed all pre- and post-visit human and IVR call scripts, programming modules for routine health care maintenance, obesity, smoking, tuberculosis risk, depression, development, and medication safety assessments; developed the

parent activation measures, converting the language to be appropriate for speaking with parents of child patients; and planned, recruited for, and conducted two focus groups to gather feedback on the assessment questions, counseling content, and recruitment materials. In addition, the team developed a library of all children's medications. The system will be able to pull the medication names from the EHR, map them to medications from the library, and ask the parent if the child is currently on those medications. The system is being tested, and the team is putting their final touches on the data exchange process between the patient's EHR and the telephony system. Once the data are collected from the telephony system, parsed into module specific components, and input into the provider's EHR, the providers will be able to click on the data the patient has provided and decide whether to accept the information; if they do, the data will pre-populate the visit documentation. The team is currently building the forms and establishing the workflow for this data exchange process; finalizing the application that will manage potential and actual study participants; and building the application to extract appointment data, demographics, and medicines on medication lists from the EHR system to be input into the IVR system.

**Preliminary Impact and Findings:** No impacts or findings have yet been reported.

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### **Selected Outputs**

AHRQ 2008 Annual Conference presentation: Conversational IT for Better, Safer, Pediatric Care ([PowerPoint® File](#), 1 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 80-99 percent of its milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Chronic Mental Health: Improving Outcomes through Ambulatory Care Coordination
<b>Principal Investigator:</b>	Baker, Wende, M.Ed.
<b>Organization:</b>	Southeast Nebraska Behavioral Health Information Network, Inc.
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017838
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,199,871
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Mrs. Baker and her team launched their project in late September 2008. This project will demonstrate how health information exchange (HIE) between rural and urban providers in the behavioral health field can improve ambulatory patient care coordination and safety across treatment settings. Specifically, the project will examine provider barriers to technology acceptance in the behavioral health setting, behavioral health care technology acceptance and adoption, and the effects of HIE on clinical outcomes. A committee will select the hardware and software vendors during the first phase of the project, as the team designs the HIE. In the second phase of the project, the team will develop the HIE infrastructure and equip provider offices with new or updated technology and provide training to participating providers. In phase 3, the team will pilot the HIE in three provider facilities.

### Specific Aims

- Identify provider barriers to technology acceptance. **(Ongoing)**
- Implement an HIE among three major behavioral health provider facilities. **(Upcoming)**
- Collect data on how timely access to accurate information relates to quality of care. **(Upcoming)**

**2008 Activities:** The project team focused on instituting the organizational framework for completing the design phase of the behavioral health HIE during the first phase of work. Organizational developments included hiring a full-time director for the project and drafting a Request for Proposal for a technology consultant who will develop the system specifications and perform other tasks to develop the system.

**Preliminary Impact and Findings:** There are no findings at this time because they are still developing the intervention.

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### Selected Outputs

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project team is meeting 100 percent of milestones and is on time for all tasks.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	El Dorado County Safety Net Technology Project/Access El Dorado (ACCEL)
<b>Principal Investigator:</b>	Bergner, Gregory W., M.D., F.A.A.F.P.
<b>Organization:</b>	Marshall Medical
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality Through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016129
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,491,985
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The goal of this nearly completed project is to create a functional and sustainable health information exchange (HIE) connecting over a dozen facilities throughout El Dorado County. These include both private and public providers, and represent a diversity of practices, including a community health center and a tribally run clinic. This partnership is working to reach all patients, especially the underserved populations in this rural, northern California county. Through a confidential and secure HIE network, health care providers, with the appropriate patient permissions, will be able to access patient information no matter where the patient is treated in El Dorado County, whether the provider has an electronic health record (EHR) system or not. Aggregated, timely health data will be available to enhance public health surveillance, reporting, program management, and clinical/medical research. The project will enable El Dorado County to link to the California HIE when that exchange becomes functional.

### Specific Aims

- Develop the governance structure and privacy protections needed to operate an HIE. **(Achieved)**
- Implement Care Pathways—stepped workflows, coordinated through a county-wide shared software application, developed to help un/under-insured residents locate resources and services to receive needed care for themselves and their families. **(Achieved)**
- Implement the Enterprise Master Patient Index (EMPI) for the county. **(Achieved)**
- Work with a vendor to develop and implement an HIE. **(Ongoing)**

**2008 Activities:** The Care Pathways technology was implemented in sync with the countywide privacy practices, policies, and procedures. The EMPI phase of the project went live successfully in 2008 with a pilot program. The groundwork has been laid for the HIE software implementation. Sustainability concerns continue to be considered and addressed.

**Preliminary Impact and Findings:** The ‘Medical Home’ Care Pathway has had a positive impact (decline) in non-urgent pediatric patient use of the emergency department. Reduced time per community health workers’ client case has occurred following implementation of Care Pathways. The Securing Health Coverage pathway has served over 3,000 clients, helping 96 percent find health coverage for their children. Further analyses of the data from Care Pathways are ongoing. Several valuable lessons have been learned in the course of health information technology implementation. The Privacy and Security Workgroup performed a thorough examination of privacy issues and legal rights, and as a consequence,

the ACCEL program has a patient permission structure countywide that takes into account privacy concerns while still encouraging participation in the HIE system.

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### **Selected Outputs**

Request for Proposal for HIE software vendors, detailing requirements and system specifications as developed by the Clinical Advisory Workgroup.

2007 HIE Business Case.

AHRQ 2008 Annual Conference presentation; September 2008; Bethesda, MD: ACCEL: Access El Dorado; Health Care Access That Works. Simpler. Better. ([PowerPoint® File](#), 1.3 MB; [PDF File](#), 230 KB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is mostly on track in its progress.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Using a Telemedicine System to Promote Patient Care Among Underserved Individuals
<b>Principal Investigator:</b>	Bove, Alfred, M.D.
<b>Organization:</b>	Temple University Clinical Research Center
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health IT (PCC)
<b>Grant Number:</b>	R18 HS 017202
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,198,371
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The goal of the project is to develop a patient-centered tool for managing hypertension within a primary care practice. The project, approximately mid-way through its progress, builds upon a pre-existing, internally developed telemedicine system that patients access via the Web that provides patient education on hypertension and serves as a tool for self-management, shared decisionmaking and treatment planning. A cellular telephone interactive system was added to the Internet-based system to accommodate subjects who do not have Internet access. The team has also enhanced their system by incorporating hypertension treatment guideline education modules; self-reporting modules on items such as blood pressure, weight, exercise activity, diet, and smoking activity; and automated reminders and feedback. The project team is observing patients' responses to care measures aimed at lowering their blood pressure to normal as defined by standards of the Joint National Committee (JNC-VII). The education module incorporated into the system requires a response by the patient before they are able to proceed to enter their data. Patients complete one of seven lessons per login, after which they will receive a one-line reminder of the guidelines. The automatic report created from the database will be sent to both the primary care physician and the patient once a month. The report will describe in both text and graphics the patient's blood pressure over that month, the medications the patient was on, whether the patient is at his/her goal blood pressure, and recommend a physician visit to those that are not within goal. The primary endpoint of the randomized, controlled trial will be the proportion of subjects who achieve goal blood pressure. Secondary endpoints will include rate of self-monitoring, steps per day, weight, cardiovascular disease knowledge, number of patients at medication guidelines, and satisfaction with the practice.

### Specific Aims

- Enhance the current telemedicine system by incorporating guideline-based algorithms for hypertension treatment and by automated reminders and feedback for both patients and health care providers. **(Achieved)**
- Determine the percentage of patients at guidelines for anti-hypertensive medication therapy. **(Ongoing)**
- Empower inner city African American patients through telemedicine to take a more active role in their own health care through self-monitoring, education, reinforcement and feedback. **(Ongoing)**
- Measure telemedicine utilization. **(Ongoing)**

- Examine the impact of the telemedicine system on medical knowledge, self-efficacy, and the quality of doctor-patient interaction as compared to controls. **(Ongoing)**
- Compare blood pressure outcomes between control and telemedicine groups after 6 months of telemedicine risk management. **(Ongoing)**

**2008 Activities:** The team has designed, built, and tested their additions to the pre-existing telemedicine system to tailor it for hypertension patients, developing screens for patient input on blood pressure, weight, pulse, steps taken, and smoking habits, as well as the education modules that provide lessons and reminders of JNC-VII guidelines. Addition of an automated cellular telephone communication component of the system has also been completed. The project team has also completed development of a quality measure tool to measure the quality of the primary care physician-patient interaction. Active recruiting is in progress via the primary care practices, as well as local health fairs, churches, and through the local news media. The project team is developing automated reports on blood pressure, health education, and quality of care by summarizing information from the telemedicine system's database that will be sent to both primary care physician and patient once a month.

**Preliminary Impact and Findings:** At this point, the study does not have adequate numbers of subjects to draw any conclusions on outcome of the telemedicine intervention. However, the project has recruited approximately 30 percent of its sample goal. According to the current baseline data, the demographics of the sample are typical of the patient population and indicate the need for improved cardiovascular risk management. The data to date indicate that the patients are aware of their health status, satisfied with their physicians, and on anti-hypertensive medication.

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### **Selected Outputs**

Web tool used for patient interaction.

Web reporting form that will be sent to physicians and patients.

Information page used by the research team that enables the study coordinator to view patient responses and respond as needed.

AHRQ 2008 Annual Conference presentation: Internet-based Telemedicine for Cardiovascular Disease Management ([PowerPoint® File](#), 1.4 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 80-99 percent of its milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Enhancing Self-Management of Type 2 Diabetes (T2DM) With an Automated Reminder and Feedback System
<b>Principal Investigator:</b>	Burns, Edith, M.D.
<b>Organization:</b>	Medical College of Wisconsin Affiliated Hospitals
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017276
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,166,243
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project, approximately mid-way through its progress, is testing whether an automated self-management monitor (ASMM) that reminds patients at home to perform self-monitoring of blood glucose (SMBG) and take their medications, and also provides patient education on how lifestyle choices affect blood sugar, has an effect on diabetics' glycemic control and self-management behaviors. The ASMM developed by the project team is composed of a simple personal computer–glucometer interface unit and specialized software that receives data downloaded through the glucometer interface; interprets the measures; matches them with individualized profiles for glycemic monitoring and control; and provides appropriate, individualized audio feedback.

In order to demonstrate the effectiveness of the intervention, the project team is recruiting adults from community health centers and the Veteran's Health Administration (VHA) to participate in a randomized, controlled trial. Participants must have poorly controlled diabetes, defined as those with hemoglobin A1c (HbA1c) levels greater than 8 percent. Once participants are recruited, the project team contacts the provider to request the patient's glucose checking schedule and glycemic targets. Once enrolled, a research team member visits the participants' homes to collect their baseline data and provide the Precision Xtra glucometer and supplies necessary to perform SMBG. At a second home visit 3 months later, the researcher provides all participants with a standard set of educational materials and administers survey tools, determines any self-reported change in medication regimen, and downloads glucometer data. For the intervention participants, the researcher installs the ASMM with the pre-programmed information, trains the participants to use the system, and reviews the reminders the system provides. Additional home visits will be conducted by the research team 9 months and 15 months after enrollment. The primary outcome for evaluation of effectiveness is change in HbA1c, with secondary outcomes including self-management behaviors such as SMBG frequency, nutritional content, physical activity, medication adherence, and patient use of diabetes education options.

### Specific Aims

- Demonstrate that use of the ASMM improves glycemic control in inadequately controlled persons with T2DM. **(Ongoing)**
- Demonstrate that this effect is sustained over longer term follow-up. **(Ongoing)**
- Identify self-management practices that improve in persons using the ASMM. **(Ongoing)**

**2008 Activities:** The project team has hired, trained, and certified research staff on protection of human subjects, data and cyber security, and safety; good clinical practices; obtaining informed consent; and obtaining fingerstick blood samples. To refine and finalize the intervention, the project team developed a preliminary feedback algorithm for automated reminder system pilot testing with community-based nurses, educators, and diabetic volunteers, and revised the algorithm based on their feedback; reviewed and tested different scenarios to optimize feedback from the system; wrote feedback scripts; recorded audio wave clips of those scripts; and successfully transferred those scripts into the intervention software package. The project team pilot-tested the system at a volunteer's home, with whom they met several times to obtain feedback, and revised the educational material based on her feedback.

The team designed, tested, and finalized a computerized data collection system, adding a color perception test and measurement of social support to the instrument. The team has identified potential participants from a variety of arenas. Their recruitment efforts have been delayed due to an unexpected number of potential participants not meeting inclusion criteria when measured during the first home visit. The team has begun mining data from primary care clinics and targeting those that meet the criteria, while continuing to meet with local agencies to facilitate their recruitment efforts.

**Preliminary Impact and Findings:** No impacts or findings have yet been reported.

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### **Selected Outputs**

Burns E. Use of a computerized reminder and feedback system to improve self-management of type 2 diabetes and improve resilience in older adults. Gerontological Society of America (GSA) Annual Conference; November 2008; Hyattsville, MD.

Carpiaux A, Burns E. Enhancing self-management of type 2 diabetes with an automated feedback and reminder system: relationship between cognitive status, depression, and glycemic control. Medical Student Research Day, Medical College of Wisconsin; September 2008; Milwaukee, WI.

Spittgerber M, Burns E. Enhancing self-management of type 2 diabetes with an automated feedback and reminder system: relationship between glycemic control and neuropathic injury. Medical Student Research Day, Medical College of Wisconsin; September 2008; Milwaukee, WI.

Barber L. Improving Self-Management of type 2 diabetes. Annual Research Opportunity for Academic Development in Science (ROADS) presentation, Medical College of Wisconsin; August 2008; Milwaukee, WI.

AHRQ 2008 Annual Conference presentation: Enhancing Self-Management of T2DM with In-Home Technology ([PowerPoint® File](#), 1.8 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** About 65-80 percent of the project's milestones are being met, but there is a viable plan for achieving the others. Due to issues with the VA Institutional Review Board (who have a requirement of two staff members at each baseline visit) and an unexpected proportion of potential participants not meeting the inclusion criteria when rechecked at the baseline visit (40 percent of veterans and almost 30 percent of community-based individuals), recruitment has proceeded more slowly and taken double the labor than had been originally anticipated. The team hopes to complete enrollment by the end of March 2009 in order to complete the project within the original timeline. The team has calculated that they can continue enrollment through the end of April 2009 and still complete the study protocol by the end of the grant in August 2010. At the current rate, they estimate that they will be able to enroll approximately 75 percent of the total proposed participants. This will provide enough power to analyze the primary outcome of HbA1c but not the secondary outcomes.

A request for an administrative supplement to hire additional personnel has been submitted to AHRQ. If granted, the team will hire additional research staff and, therefore, be able to increase the number of baseline visits and complete all follow-up visits by the end of the project. They anticipate the need for a 4 to 6 month no-cost extension in order to complete the data analysis.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

**Project Title:** Personal Health Records and Elder Medication Use Quality  
**Principal Investigator:** Chrischilles, Elizabeth, Ph.D.  
**Organization:** University of Iowa  
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)  
**Grant Number:** R18 HS 017034  
**Project Period:** 09/07 – 08/10  
**AHRQ Funding Amount:** \$1,199,999  
**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The project, approximately mid-way through its progress, is evaluating the ability of a personal health record (PHR) to support elderly patients' medication adherence, medication use quality, and medication management behaviors. The team is testing the hypothesis that successfully maintaining a PHR provides reinforcement to build self-efficacy for medication therapy management (MTM), that the act of keeping a PHR up-to-date increases patient knowledge about medications, and that information gained through using the PHR allows patients to shift the balance of their beliefs about medication from concern toward necessity.

Phase I of the project consists of a series of patient, caregiver, and provider focus groups to identify current patient and physician medication management practices, barriers to usage of PHRs, and physician office workflow issues. Through a careful evaluation of the feedback received during these sessions, the project team identified patients' and providers' wants and needs with respect to the varied functionalities of these products and will develop a formal measure of the patients' role in maintaining their health. The project team also conducted an environmental scan of commercially available PHR products to identify currently existing core PHR functions available to elderly patients. From the information collected, the project team selected the best commercially available PHR, based on the products that met the criteria of the identified core functions as well as on usability as evaluated by experts on older adult computer interactions.

Phases II and III are hands-on, interactive trials of patients' interaction with the product identified in Phase I, the MiVIA PHR licensed to Community Health Resource & Development Center (CHRDC). The team will test the existing PHR by measuring elderly patients' interaction with the technology and their resulting self-activation with respect to medication management. Based on feedback received during Phase I, the project team is working with the PHR developers to incorporate patient and provider suggestions into the product to maximize its usability and value to the end users. Phase II is a randomized, controlled trial comparing older adults' usage of the PHR across six practices within a practice-based research network (PBRN). The team will compare those using the PHR with those receiving usual care across outcomes such as patient-reported MTM behaviors, patient beliefs about their medications, medication adherence, patient-physician communication, as well as other technology utilization measures. Core activities to be analyzed as behavior-based measures of patient participation include: keeping an active medication list; recording the purpose and treatment goal of each medication; keeping track of symptoms and goal achievement; reporting side effects to providers; asking questions about new medications; looking up information about medications; and refilling medications on time.

Phase III is a usability study of the PHR via a human-computer interaction (HCI) laboratory assessment of elderly adults to identify the challenges patients face when using the PHR and the support needed to facilitate usage.

### **Specific Aims**

- Develop, through patient and provider focus groups, measures of patient medication therapy management behaviors and patient self-efficacy for medication therapy management. **(Ongoing)**
- Compare, in a trial in a primary care PBRN, the 6- and 12-month patient-reported medication therapy management behaviors, medication adherence, patient- and physician-centric medication quality indicators, patient self-efficacy for medication therapy management, and patient beliefs about medication, among those randomized to a current, representative PHR system vs. those randomized to usual care. **(Upcoming)**
- Investigate the usability of this PHR system in a human-computer interaction laboratory compared with alternative prototypes developed through participatory design with older adults of varying ability levels, and associate PHR performance with measures of cognitive, motor, and perceptual ability. **(Ongoing)**

**2008 Activities:** The project team developed protocols for, recruited for, and conducted focus groups with older adults, caregivers, and family physician/office staff on PHR usage, medication management activities, and physician office workflow issues. The team has conducted a thorough qualitative analysis of the focus group transcripts, using thematic coding to identify perceptions of the patient's role in medication management and the obstacles to filling that role through use of a PHR. The team established criteria for and conducted an environmental scan of existing PHRs, evaluating products with respect to criteria abstracted from the focus groups, as well as determinations of compatibility in terms of cost, data management and transfer, available functionalities, and usability. After this analysis, the team decided to use the MiVia PHR for the trial. They are in the process of implementing changes to the product's functionality and user-interface, including branding the product as the "Iowa PHR." In addition, the project team has finalized the HCI design; completed development of protocols, instrumentation, and recruitment materials; and obtained approval to begin HCI testing. The HCI will incorporate a preliminary assessment of the PHR and add an age-based comparison (18-25 vs. 65+) to better anticipate potential issues and barriers to PHR use among older adults.

**Preliminary Impact and Findings:** No impacts or findings have yet been reported.

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### **Selected Outputs**

AHRQ 2008 Annual Conference presentation: Personal Health Records for Medication Use: Views from Elders and Their Physicians ([PowerPoint® File](#), 1.8 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is somewhat under spent, approximately five to twenty percent. Based on focus group results, the project team has delayed activities related to the randomized controlled trial for several months. A considerable proportion of the project's estimated costs are related to trial activities.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Ambulatory Care Compact to Organize Risk and Decisionmaking (ACCORD)
<b>Principal Investigator:</b>	Chueh, Henry, M.D.
<b>Organization:</b>	Massachusetts General Hospital
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017190
<b>Project Period:</b>	9/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$923,783
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project’s objectives are to design, develop, implement, and evaluate a comprehensive, practical, and innovative model of care delivery to support the process of shared decisionmaking. The system, entitled Ambulatory Care Compact to Organize Risk and Decisionmaking (ACCORD), will allow patients to collaborate with their clinicians to establish, monitor, and track shared clinical care plans. The ACCORD system will interface with the Massachusetts General Primary Care Practice-Based Research Network’s pre-existing, internally-developed Computer Stored Ambulatory Record (CoSTAR) Electronic Health Record (EHR) system.

The project team is developing the ACCORD system to aid providers and patients in managing the follow-up activities determined during primary care visits. The team selected the following domains to maintain through the ACCORD system: preventive health screenings, abnormal findings follow-up, and medication monitoring. The ACCORD system will enable patient-specific care plan development to diminish miscommunication between providers and patients by presenting care plans as explicit compacts, and by providing explanatory information about the risks of not adhering to the plans. The project team is working to ensure that both patient and provider are comfortable proposing the compacts.

The project activities were organized into three steps. Step One is to design, build, and test the system in order to develop a method of compact authoring and tracking that is useful and usable by both groups. Step Two is to test the tool to determine if providers and patients are both comfortable creating explicit agreements and if the tool is effective for those agreements. Step Three is to conduct one or more randomized, controlled trials (RCTs) in a primary care practice, as well as an institution-wide cohort in another primary care practice to examine system adoption and process measures. The RCTs will examine differences in outcomes such as preventive screening test completion, chronic disease management, patient engagement, patient knowledge, patient-provider communication, patient and clinician satisfaction, and various system utilization metrics.

### Specific Aims

- Design a model for patient-centered primary care that facilitates patient-clinician partnerships and shared decisionmaking that results in documented follow-up care plans that can be tracked reliably to reduce the risk of lost follow up in busy primary care networks. **(Achieved)**

- Develop a health information technology architecture and software (ACCORD) to support the patient-centered care delivery model designed in Specific Aim 1. **(Ongoing)**
- Implement and evaluate ACCORD in an RCT within the Massachusetts General Primary Care Practice-Based Research Network. **(Upcoming)**

**2008 Activities:** The project has designed and built the prototype ACCORD system. This was accomplished through defining the ACCORD template library index, including: preventive health, medication monitoring, abnormal result follow-up, lifestyle, complex but routine conversations, and chronic disease management; developing representative use cases for different types of potential ACCORDS; establishing operational rules for creating ACCORDS; and design and development of the authoring tool. The team conducted seven focus groups of patients, providers, and a group of both patients and providers. The analysis of the feedback from these focus groups brought about valuable information on factors important in health decisionmaking to both patients and providers, as well as patient and provider perspectives concerning ACCORD workflow, access to resources, and concerns about/obstacles to ACCORD use. Based on feedback from the focus groups, the team further modified the system to develop a functional pilot of the ACCORD template for release to a group of internists. In addition, the team has developed their recruitment protocols and adjusted their evaluation methodology in order to collect valuable information on not only the clinical outcome and satisfaction measures, but also system integration and process measures to allow for dissemination.

The project is conducting another round of focus groups to simulate the patient and provider interaction through observing simulated visits between the pairs. The team is working to determine the best method to display the information through the patient and provider interfaces, developing how ACCORDs will be tracked over time, and enhancing understanding of how people will interact with the system. This will be accomplished through partial integration of the ACCORD system into the EHR currently in use in the clinic; a usability study of the ACCORD proposal tool with physician and patient participants; and design and initial development of the clinical event monitoring and notification modules.

**Preliminary Impact and Findings:** No impacts or findings have yet been reported.

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### **Selected Outputs**

AHRQ 2008 Annual Conference presentation: Designing for ACCORD with Patients ([PowerPoint® File](#), 3 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 80-99 percent of its milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Evaluation of Effectiveness of a Health Information Technology-Based Care Transition Information Transfer System
<b>Principal Investigator:</b>	Ciemins, Elizabeth, Ph.D.
<b>Organization:</b>	Billings Clinic Foundation
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017864
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,155,371
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Ciemins and her team launched their project in late September 2008. This new project proposes to improve the coordination of care for patients with two or more chronic conditions who are discharged from an acute hospital stay back to rural primary care clinics or other care sites. The grantees will develop, implement, and evaluate a Care Transition Information Transfer (CTIT) system that the rural clinics can access—a modification of the current Billings Clinic system. Four of the clinics will access CTIT through the Billings Clinic health information technology network, as they are electronic health record (EHR)-integrated systems, and four will access the Billings Clinic Health Information Technology (Health IT) network through a Web-based portal or through the receipt of e-fax, e-mail, or phone call. The system will provide patients and their primary care providers with discharge information, particularly focused on medication management, but also including information such as follow-up visits, laboratory testing, operative reports, and so on. They will conduct a prospective study to evaluate whether the intervention improved patient clinical outcomes, system efficiency and process outcomes, and patient and rural provider satisfaction with the hospital discharge process. The Billings Clinic uses the Cerner EHR system. The CTIT system will be integrated into the Cerner EHR system; the Access database is solely for research purposes to evaluate outcomes among study participants.

### Specific Aims

- Develop a health IT-based care transition information transfer (CTIT) system. **(Ongoing)**
- Evaluate the effects of the CTIT system on timely communication of patient information. **(Upcoming)**
- Evaluate the effects of the CTIT system on clinical and systems-level outcomes. **(Upcoming)**
- Evaluate the effect of the CTIT system on system efficiency. **(Upcoming)**
- Evaluate the effect of the CTIT system on satisfaction with care transitions among rural primary care providers. **(Upcoming)**
- Evaluate the effect of the CTIT system on patient satisfaction with care transitions. **(Upcoming)**

**2008 Activities:** Dr. Ciemins and her team have begun developing the Access database. They have also developed the chart review collection instrument. The team has begun to administer the patient telephone surveys to collect baseline outcomes data, having developed the data abstraction tool to identify possible

candidates. They have presented information about the intervention to a number of clinicians, including internal medicine physician groups, cardiologists, and hospitalists—physicians specializing in non-surgical care of hospital inpatients. They collected baseline data on patient satisfaction and have begun collecting baseline data on provider satisfaction with hospital discharge. The team visited seven of the eight participating rural clinics in order to collect information about the clinical context, staff satisfaction with hospital discharge, and generally to generate interest in the intervention. In addition, they have also established several committees, including the Information Technology Task Force Committee, the Discharge Process Task Force, and the Project Steering Committee. More important than the development of the Access database (which is only for evaluation of outcomes) is the initiation of the process of developing the information transfer system that will be integrated into the current Cerner EHR system.

**Preliminary Impact and Findings:** Although there are no key outcome findings, because they are still developing the intervention, Dr. Ciemins’ team identified a preliminary finding based on their assessment of workflow processes. They determined that there is currently no standard hospital discharge process, so the team will have to develop a standard procedure before they can automate the discharge procedure. The discharge process is on the hospital end, not at the participating clinics, although the team is attempting to improve the communication process with the participating clinics when their patients are discharged.

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### **Selected Outputs**

Telephone Survey tool and accompanying script: the telephone survey tool is related to specific outcome measures. The tool is not being completed by rural clinics, but by rural patients and does not supplement data on contextual factors. Instead, it will directly measure outcomes.

Fact Sheet: developed to describe the project to participating organizations.

Chart Review tool: used to collect medication-related and health care utilization data on patients.

Series of Satisfaction Surveys, including a telephone and Web-based survey for patients and a Web-based survey for providers.

Presentation to present the project to key stakeholders, including participating rural clinics, participating hospitals, and clinical staff.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The project is completely on track, meeting 100 percent of its milestones.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	An Electronic Personal Health Record for Mental Health Consumers
<b>Principal Investigator:</b>	Druss, Benjamin, M.D., M.P.H.
<b>Organization:</b>	Emory University
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017829
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,199,379
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Druss and his team launched their project in late September 2008. The project proposes to adapt an existing personal health record (PHR) to better meet the needs of a population that typically receives health care in the public sector. Specifically, they will modify a PHR in order to better knit together the typically fragmented care that patients with severe mental illness in the public sector health system receive. Overall, the focus of their work is to improve the quality and coordination of care among patients with serious mental illness and, while there are good PHR systems for use in the general population, this grant will allow the team to test whether they can modify a PHR to meet the needs and improve care among severely mentally ill patients using the public health system for care. They are having the developer modify the Shared Care Plan, a PHR developed by a consortium of provider organizations in Whatcom County, Washington. The software code for the PHR is available at no charge to any community or organization.

### Specific Aims

- Develop a mental health personal health record (MH-PHR). **(Ongoing)**
- Implement a randomized trial of the MH-PHR. **(Upcoming)**
- Disseminate results. **(Upcoming)**

**2008 Activities:** Dr. Druss hired all personnel for the study, including the nurse case specialist, project director, and research interviewer. He and his staff traveled to Seattle to be trained in the Shared Care Plan product, and the project manager is in close contact with the programmers of the Shared Care Plan to discuss modifications and electronic enhancements. The Shared Care Plan staff has expressed great interest in this modification to their product, as it presents quite a departure from typical use. Dr. Druss and his team completed the patient and provider focus groups and have incorporated their suggestions into the design of the MH-PHR. The patient and provider focus groups have highlighted different issues for the developers: the patients are excited about the opportunity to have a little more control over their care, while the providers are concerned about the trustworthiness of the information.

**Preliminary Impact and Findings:** There are no findings at this time because they are still developing the intervention.

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**Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Status:** Project spending is somewhat under spent by 5-20 percent due to delays with project adaptation during the first quarter of the project. The project expects to be on track with spending in the future.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Improving Medication Management Practices and Care Transitions through Technology
<b>Principal Investigator:</b>	Feldman, Penny, Ph.D.
<b>Organization:</b>	Visiting Nurse Service of New York (VNSNY)
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017837
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,199,998
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Feldman and her team launched their project in late September 2008. The goal of this randomized, controlled study is to design and test a medication management strategy that harnesses the power of information technology (IT) to facilitate high quality care transitions through improved clinician practice and enhanced patient engagement. The two interventions to be tested include: 1) a “basic” intervention that uses an algorithm to alert the home health nurse, at the point of service, to a patient at risk of a potentially serious medication problem and provides the clinician with decision support, including high risk medication management recommendations that are integrated into the clinician’s visit documentation system and the electronic patient health record; and (2) an “augmented” intervention that includes all the IT elements of the basic intervention targeted to the home health nurse plus materials designed for and directly delivered to patients at home via Internet or mail. These interventions will be compared to each other and to a usual care group. The electronic health record (EHR) is a self-developed system that incorporates the First DataBank drug records. This project is an extension of their existing health IT system and uses many of the features that the home health nurses regularly use.

### Specific Aims

- Examine the relative effects of the basic and augmented interventions on workflow and medication management practices of home health care nurses. **(Ongoing)**
- Examine the relative effects of the basic and augmented interventions on the outcomes and service use of patients in the respective intervention groups. **(Ongoing)**
- Estimate the costs associated with each of the interventions and subsequent care, and compare these costs across interventions and relative to usual care. **(Upcoming)**

**2008 Activities:** Dr. Feldman recruited or retained the project management and analytic staffing for this project. The team is in the process of finalizing the content for the computerized medication risk algorithm. They are holding meetings with the Visiting Nurse Service of New York (VNSNY) Information Systems (IS) and Systems Application Implementation (SAI) groups in order to secure allocations of IS and SAI programming time in 2009. They secured Institutional Review Board (IRB) approval at the primary VNSNY site and the co-investigator site at the Medical College of Wisconsin. In order to obtain agency intake and assessment data for their sample population, they submitted a Waiver of

Authorization and received approval from the Institutional Review Board (IRB)/Health Insurance Privacy and Accountability Act (HIPAA) privacy board.

**Preliminary Impact and Findings:** There are no findings at this time because they are still developing the intervention.

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### **Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is mostly on track, but the project team is concerned that, because of the general fiscal environment, the IT departments may have to reduce staff, which may delay some implementation steps. The project team is working on alternative strategies in the event of staffing reductions.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Using Health Information Technology to Improve Transitions of Complex Elderly Patients from Skilled Nursing Facilities (SNF) to Home
<b>Principal Investigator:</b>	Field, Terry, D.Sc.
<b>Organization:</b>	University of Massachusetts Medical School – Worcester
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017817
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,188,157
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care

**Business Goal:** Implementation and Use

**Summary:** Dr. Field and her team launched their project in late September 2008. This new project will develop and evaluate an electronic medical record (EMR)-based medication reconciliation system for medication monitoring and follow-up of elderly patients discharged from a skilled nursing facility (SNF) to ambulatory settings, including communication of key health information and alerts to the outpatient primary care physicians. The EMR will be custom developed based on the Epic system Spring 2007 IU3, which is used in the Fallon Clinic. Dr. Field and her team will measure a range of outcomes to determine if the intervention facilitates high quality transitions. Using a randomized, three-arm, controlled trial, outcomes will include the rate of follow-up office visits, the rate of appropriate monitoring for high-risk medications, and the incidence of adverse drug events. Finally, they will analyze the costs of developing and implementing the intervention.

### Specific Aims

- Evaluate the intervention. **(Upcoming)**
- Implement the intervention. **(Upcoming)**
- Train geriatricians and geriatric nurse practitioners. **(Upcoming)**
- Establish electronic transmission of information to the Visiting Nurse Association of Central Massachusetts. **(Upcoming)**
- Program the alerts and EMR components. **(Upcoming)**
- Ensure clear connection to the EMR at participating SNFs. **(Upcoming)**
- Prepare blueprints to direct programmers. **(Ongoing)**
- Develop therapeutic monitoring guidelines. **(Achieved)**

**2008 Activities:** The team has begun preparing data resources and developing an analytical approach to conduct the evaluation of the transitional care intervention on the process and outcome measures outlined in the proposal. In addition, they have completed the development of a time-tracking system to support the analysis of the costs of developing the intervention. They have selected the SNFs to include in the trial and identified issues to resolve to ensure geriatricians have easy access to EMRs at each site. They have begun preparing the blueprints to direct the programmers, in cooperation with local Epic programmers. Finally, they developed the therapeutic monitoring guidelines in conjunction with faculty from the Massachusetts College of Pharmacy and colleagues from the Health Maintenance Organization

(HMO) Research Network. To do this, they used a modified Delphi process and engaged local physicians, pharmacists, and leaders of the multispecialty group practice to ensure buy-in.

**Preliminary Impact and Findings:** There are no findings at this time, because they are still developing the intervention.

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### **Selected Outputs**

Complete Therapeutic Monitoring Guidelines: used to evaluate the monitoring of high-risk medications as the intervention is launched.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project team is meeting 100 percent of milestones and is on time for all tasks.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Improving Otitis Media Care with Electronic Health Record (EHR)-Based Clinical Decision Support and Feedback
<b>Principal Investigator:</b>	Forrest, Christopher, M.D.
<b>Organization:</b>	Children's Hospital of Philadelphia
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory and Safety Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017042
<b>Project Period:</b>	09/07 – 02/10
<b>AHRQ Funding Amount:</b>	\$877,011
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. This project addresses the quality problems of physicians' overuse of antibiotics as the treatment for otitis media (OM), and physicians' lack of awareness of national guidelines that recommend more judicious use of these medicines. The intervention uses the Children's Hospital of Philadelphia's (CHOP's) electronic health record (EHR) to integrate care across time and to supply physicians with the knowledge they need for treating a patient at the point of care. The full intervention comprises: 1) a method for linking all services a patient received from any physician into clinically logical clusters called episodes-of-care, 2) clinical decision support (CDS) for medications and referrals to specialists that are based on the best available scientific evidence, 3) feedback on past performance of OM care provided to physicians, and 4) physician training on how to use the tools. The study randomly allocates 28 primary care practices into usual care, full intervention, and full intervention without feedback.

The goal of the project is to develop, test, and disseminate an OM health information technology (health IT) intervention designed to improve quality and reduce resources associated with OM care.

The project is being conducted in the CHOP Pediatric Research Consortium (PeRC), which includes all primary care practices in the CHOP network and utilizes the Epic ambulatory electronic medical record system, EpicCare 2007, a Certification Commission for Healthcare Information Technology (CCHIT)-certified ambulatory EHR tool that affords immediate, secure electronic access to clinical information and communication at the point of care. Given that OM is a common disorder in children, the widespread adoption of the results from this project has the potential for affecting lives of millions of children.

### Specific Aims

- Develop and pilot test the OM health IT intervention. **(Ongoing)**
- Examine the overall effect of the health IT intervention and the independent contribution of physician feedback on quality (primary outcomes). **(Ongoing)**
- Assess the effects of the intervention on the secondary outcomes of resource use and clinician adoption of the technology. Upon project completion, the study team will work with members of their advisory board, including the American Board of Pediatrics, National Committee for Quality Assurance (NCQA), and the Child Health Corporation of America to disseminate the work nationally to child health professionals. **(Upcoming)**

**2008 Activities:** Translation of the consensus OM guidelines to a Web-based, interactive algorithm has been completed, capitalizing on successful experiences with other clinical pathways available on the project's Intranet. The investigative team has established a relationship with the hospital's Web team and is creating a Web site on which two separate algorithms will be presented, one for acute OM (AOM) and one for OM with effusion (OME). Each pathway allows the user to "drill-down" to access background information explaining the rationale for each step in the pathway. To increase the utility of this information for patient care and clinician and trainee education, a link to this content is available through the CDS tool.

In addition, the finalized guidelines for the diagnosis and treatment of AOM and OME have been formatted to allow actionable CDS to be programmed; however, the timeline for this has been extended to allow for the refinement of the interface of the instrument using state-of-the-art methodologies. The assembly and analysis of the pre-intervention data from the primary care practice sites has been completed. The CDS tool has been reviewed with Epic physician champions, and feedback has been conveyed to the investigative team. Current and next steps for the investigative team include: 1) incorporating primary care physician champions feedback into CDS tool, 2) identifying the goals of the clinician training, and 3) interviewing key clinicians to complete a workflow analysis. The training and education materials are being developed.

**Preliminary Impact and Findings:** The project does not have preliminary impacts or findings at this time.

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### **Selected Outputs**

A mock-up of the CDS tool was created and has been distributed to the physician champions for their initial feedback and review.

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**Grantee's Most Recent Self-Reported Quarterly Status:** There has been a slight delay in the implementation of the project due to the expanded decision support system. This project initially envisioned a decision support system that was a bit simpler than what was needed. The development of the more sophisticated system slowed down the initiation of the clinical trial. The project will spend the full budget as the intervention is now turned on.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	A Longitudinal Telephone and Multiple Disease Management System to Improve Ambulatory Care
<b>Principal Investigator:</b>	Friedman, Robert, M.D.
<b>Organization:</b>	Boston Medical Center
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017855
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,199,934
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Friedman and his team launched their project in late September 2008. This project proposes to use electronic methods to collect and monitor health status for patients who have multiple chronic conditions. Using real-time information provided by the patients, it identifies when additional follow-up care with clinicians is needed. This supplements the care they receive from their physicians and other clinicians. The objective of the virtual health care system is to identify clinically significant problems during transitions in care and between ambulatory care visits and to alert appropriate medical staff. The interactive voice response system (IVR), Telephone-Linked-Care for Complex Patients (TLC-C), monitors patients virtually between ambulatory care visits and notifies clinicians about clinical problems they need to address. The TLC-C system is a self-developed system that is connected to a Centricity electronic health record (EHR), although the system is designed to interface with any EHR system. The system gathers information from the patients' EHRs, the patients themselves, clinicians, and other medical staff. The TLC-C system is an expansion of other IVR systems that the Boston Medical Center uses—these other systems were hospital discharge interventions, while this intervention is testing whether this new component of the IVR system can streamline ambulatory care for patients with complex chronic conditions, reduce clinically significant medical complications, improve the control of chronic disease, and decrease preventable hospitalizations and urgent/emergent care visits.

### Specific Aims

- Design, program, and lab test the system. **(Ongoing)**
- Pilot test the system. **(Upcoming)**
- Redesign and reprogram the system, based on the pilot. **(Upcoming)**
- Conduct evaluation study. **(Upcoming)**
- Recruit patients. **(Upcoming)**
- Evaluate project. **(Upcoming)**
- Analyze study data. **(Upcoming)**
- Sustain and disseminate system. **(Upcoming)**
- Write final report and other manuscripts. **(Upcoming)**

**2008 Activities:** The main activity that Dr. Friedman and his team have been working on, to date, is to design the system. Because of the complexity of the intervention, the challenges of the design phase are significant. In addition, they are refining the design of the research study component in order to ensure smooth progress. Dr. Friedman commented that the team he has assembled works extremely well together.

**Preliminary Impact and Findings:** There are no findings at this time because they are still developing the intervention.

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**Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is on track with its progress in some respects but not others.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Secure Architecture for Exchanging Health Information (SAFEHealth)
<b>Principal Investigator:</b>	Garber, Lawrence, M.D.
<b>Organization:</b>	Fallon Clinic, Inc
<b>Mechanism:</b>	RFA: HS04-011: Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015220
<b>Project Period:</b>	09/04 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,499,999
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Secure Architecture For Exchanging Health Information (SAFEHealth) is a project to create a Community Health Information Exchange (cHIE) for the patients, health care providers, payers, and public health agencies in central Massachusetts. The ongoing project is piloted through the Fallon Clinic, Milford Hospital, and the HealthAlliance Hospital, Leominster Campus, Emergency Room and is interfacing with pre-existing electronic medical record (EMR) systems. SAFEHealth is a project between these entities and working policy and procedures ensure compliance with Health Insurance Portability and Accountability Act (HIPAA) Privacy and Security Rules. Using nationally accepted data exchange standards and a federated, decentralized edge proxy-server approach to authentication, data repositories, and master person index (record locator service), SAFEHealth will create a secure, scalable, and sustainable model that can be replicated and interfaced to other cHIEs. The system uses innovative approaches to integrate with the varied workflows of clinicians in a timely manner and is designed to assist in communication among patients, health care providers, and public health monitoring organizations. Unique to SAFEHealth is an infrastructure hybrid approach to consent allowing clinical data to flow for order/result processing based on the privacy notice, as well as push/pull of clinical data based on opt-in consent. The system is also designed to allow for cross-population queries and public health reporting.

Evaluation metrics for the SAFEHealth project consist of the following: 1) provider satisfaction and perceived benefits/inadequacies of SAFEHealth; 2) percent of visits where SAFEHealth-exchanged documents were available and viewed; 3) ER visit length for SAFEHealth participating patients versus matched non-participant cohort; 4) hospital admission rates from ER for SAFEHealth-participating patients versus matched non-participant cohort; 5) ER Cost for Fallon Community Health Plan’s (FCHP) SAFEHealth participating patients versus matched FCHP cohort from prior year, adjusted for inflation; 6) first month post-ER visit cost for FCHP’s SAFEHealth participating patients versus matched FCHP cohort from prior year, adjusted for inflation; 7) first 6-month post-ER visit cost for FCHP’s SAFEHealth participating patients versus matched FCHP cohort from prior year, adjusted for inflation. The long-term goals of SAFEHealth include improving health care quality and safety while reducing health care costs.

### Specific Aims

- Conduct pre-implementation focus groups with patients and physicians. **(Achieved)**
- Develop software algorithms to allow information from three different entities to interface and integrate in the SAFEHealth environment. **(Achieved)**

- Develop working policy and procedures to assure compliance with HIPAA Privacy and Security Rules. **(Achieved)**
- Implement and use SAFEHealth at Milford Hospital and HealthAlliance Hospital, Leominster Campus, Emergency Room. **(Upcoming)**
- Collect data related to specified evaluation metrics. **(Upcoming)**
- Demonstrate a perceived benefit of SAFEHealth. **(Upcoming)**
- Quantify a reduction in healthcare costs. **(Upcoming)**
- Disseminate lessons learned in order to encourage the creation of other cHIEs. **(Upcoming)**

**2008 Activities:** In 2008, servers were purchased and installed behind each institution's firewall. A robust interface/workflow engine, web portal, and database were created to power SAFEHealth and have been proven to work in unit testing. In the months leading up to the Spring 2009 implementation of SAFEHealth, the focus has been on actively completing and testing the interfaces with the EMRs. Focus group results were also analyzed and a paper summarizing the analysis is in progress.

**Preliminary Impact and Findings:** Careful thought and research, including six patient-centric focus groups, led the core team to change the plans for patient consent from an opt-out method of operation to an opt-in method. Findings from the physician focus groups yielded some unexpected findings, such as the fact that secure e-mail was met with some distrust. Not surprisingly, the younger physicians tended to be more comfortable with the technology, while decision support was met with mixed reviews overall. Message overload and liability were two of the key issues of most concern among physicians.

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### **Selected Outputs**

Opportunities and Risks in Clinical Data Sharing. Patient-Centered Computing and eHealth: State of the Field, Harvard Medical School Continuing Medical Education Course; March 2008; Boston.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Due to a delay in implementation resulting from a change in partnering hospitals, much of the work that had been anticipated for completion during Year 4 (the first no-cost extension) will now be completed during Year 5 (the second no-cost extension). As a result, approximately 50 percent of funds budgeted for Year 3 will be carried over to the second no-cost extension (Year 5).

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

**Project Title:** Implementing a Low-Literacy, Multimedia Information Technology (IT) System to Enhance Patient-Centered Cancer Care

**Principal Investigator:** Hahn, Elizabeth, M.A.

**Organization:** Evanston Northwestern Healthcare Research Institute

**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)

**Grant Number:** R18 HS 017300

**Project Period:** 09/07 – 09/10

**AHRQ Funding Amount:** \$1,198,839

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project modifies and tests a low-literacy-friendly talking touchscreen multimedia information and assessment system for patients being treated for breast and colorectal cancer. CancerHelp® Patient Education Software is a widely used interactive touchscreen software program developed by the CancerHelp Institute, which provides patient education on diagnoses, treatment, support, side effects, prevention, and screening. It contains easy access to cancer information from National Cancer Institute (NCI) sources, user statistics, and customizable features. This project, approximately mid-way through its progress, tests the hypothesis that use of the CancerHelp® Talking Touchscreen will affect patient satisfaction with health care, patient-provider communication, cancer-related knowledge, patients' self-efficacy, treatment adherence, and health-related quality of life (HRQL).

To facilitate the system's feasibility and usefulness to low-literacy patients, the team is adapting the system to incorporate less text on all screens; providing patients with the option to choose between text-based and audio presentation of the education materials, communication tools, and assessment questions; adding multi-cultural images; and adding videos for certain modules. Patients are able to print information and generate a visit-specific checklist of their top priorities to discuss with their providers. During regular visits to cancer care centers for treatment, participants will interact with the adapted CancerHelp® Talking Touchscreen, available at any time during clinic hours via a kiosk at the site. At the conclusion of their in-clinic cancer treatments, participants in the intervention arm will also receive a post-treatment cancer survivorship care plan (modeled on templates from the Institute of Medicine) that summarizes the cancer treatments they have received and provides appropriate aftercare recommendations, including detailed contact information for future appointments. Participants' clinicians review the care plan with them and instruct them to provide a copy to their primary care physicians, who will gradually reassume responsibility for patients' health concerns after cancer treatment. This survivorship care planning is designed to minimize the interruptions in care that can occur when patients complete their cancer treatments.

The intervention will be evaluated through a randomized trial of 200 patients with breast or colorectal cancer conducted at 3 ambulatory cancer care centers. Patients in both the intervention group and control group will use the talking touchscreen to complete surveys on knowledge, satisfaction, HRQL, and other study measures up to three times during and once after treatment. Both groups will receive diagnosis- and treatment-specific brochures. However, only patients randomized to the intervention arm will have access to the CancerHelp® Talking Touchscreen patient education software adapted for this intervention.

## Specific Aims

- Test whether a low-literacy-friendly multimedia information and assessment information technology (IT) system used in daily clinical practice improves patient outcomes during treatment in 200 recently diagnosed breast and colorectal cancer patients, based on the primary endpoints: satisfaction with health care communication, knowledge of cancer and treatment, self-efficacy, adherence to recommended treatment, and HRQL. **(Ongoing)**
- Evaluate the relationships between patient characteristics, resources, needs, health behaviors, and health outcomes using the Behavioral Model for Vulnerable Populations. **(Upcoming)**
- Test whether use of the multimedia IT system improves the following patient outcomes regarding the early post-treatment surveillance period (3 months after treatment): adherence to recommended post-treatment surveillance care, and HRQL. **(Upcoming)**

**2008 Activities:** The team has conducted the developmental and logistical procedures to incorporate computer kiosks into the clinical sites. Once the team reviewed and revised their data collection instruments, they submitted the materials to the talking touchscreen informatics team and the evaluation questions to their Expert Advisory Panel to gather input on final software content. Based on analysis of the feedback received, the team programmed the CancerHelp® modules to incorporate suggested modifications and integrated audio components into the Talking Touchscreen, including the development of breast and colorectal cancer modules; video clips of the site physicians and a co-investigator to reinforce provider interest in the discussion topics presented by the system; audio recordings for all text in the questionnaires; and patient-physician communication tools for patients, such as a “Topics for Today” checklist. The team conducted a pre-test of the system with 12 patients across the 3 clinical sites that will participate in the full clinical trial.

**Preliminary Impact and Findings:** Preliminary findings from the pre-test found that participants thought that the "Topics for Today" covered all relevant topics that they might want to discuss with their providers and found the system valuable, useful, and usable.

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## Selected Outputs

Cancer Care Communication (C3): Implementing a Low Literacy, Multimedia Information Technology System to Enhance Patient-Centered Cancer Care. American Academy on Communication in Healthcare (AACH) Research and Teaching Forum, Joint Annual Meeting of the American Association for Cancer Education (AACE), Cancer Patient Education Network (CPEN), and European Association for Cancer Education (EACE); 2008.

Cancer Care Communication (C3): Implementing a Low Literacy, Multimedia Information Technology System to Enhance Patient-Centered Cancer Care. Fall Scientific Research Poster Reception; 2008; NorthShore University Health System Research Institute, IL.

AHRQ 2008 Annual Conference presentation: Cancer Care Communication (C3) ([PowerPoint® File](#), 3.4 MB; [Web Version](#)).

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The project is somewhat under spent, approximately 5-20 percent. The project team is evaluating modifications to the CancerHelp® software, such as delivering module content as videotaped segments and re-programming the software to deliver up-to-date NCI content. The team anticipates that these enhancements will bring them in proportion to their original funding.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

**Project Title:** Virtual Patient Advocate to Reduce Ambulatory Adverse Drug Events  
**Principal Investigator:** Jack, Brian, M.D.  
**Organization:** Boston Medical Center  
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)  
**Grant Number:** R18 HS 017196  
**Project Period:** 09/07 – 08/10  
**AHRQ Funding Amount:** \$1,180,772  
**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The overarching objective of this project is to expand the use of an animated conversational agent to assist patients during the transition from the hospital to the ambulatory setting. In prior studies, the project team has developed a paper-based tool called the After Hospital Care Plan (AHCP) to deliver the Re-Engineered Hospital Discharge (RED), a set of recommended activities to be performed upon a patient's discharge from the hospital. Subsequently, the team developed the Virtual Patient Advocate (VPA), a computerized, animated character that emulates the face-to-face conversational behavior of an empathic provider, to deliver the AHCP tool.

This project, approximately mid-way through its progress period, delivers the VPA intervention to patients, from the point of discharge from the hospital to their first post-hospitalization visit with their primary care physician, through a Web portal. The VPA offers health education, monitoring, and advice on self-care and medication use, and assesses the patient's understanding and adherence. To program the system, the team is modifying the content, logic, layout, and database of the intervention tools (workstation, AHCP, and training manual) to meet the needs of the ambulatory environment; developing links between the VPA system to the hospital's Certified Commission for Health Information Technology (CCHIT) certified GE Centricity electronic medical record (EMR), version 5.6.9\_2, (144)/DB 5.6.9\_2 and ambulatory provider's IT systems; and conducting a series of qualitative evaluations with potential users and clinicians. Once the beta version is sufficiently prepared, the team will pre-test the system with potential users and clinicians, making any modifications pursuant to findings from the pre-test, and will conduct a randomized trial with subjects at high risk of adverse drug events (ADEs).

The participants in the randomized trial will be instructed to: check in with the VPA through their computer following their discharge from the hospital; interact with the VPA through a kiosk in the doctor's office immediately before the first ambulatory visit to produce a report about medication adherence and any unresolved questions or concerns that will be presented to the physician; and again meet with the VPA after the ambulatory visit to be instructed on any changes in the medication regimen that have been made during the office visit. The team will evaluate the intervention by comparing process outcomes (enrollment, adherence and attrition, fidelity, therapeutic alliance, and patient activation) and clinical outcomes (patient and provider satisfaction, patient knowledge of self-care and medications, adverse events, and pharmacist interventions) of those using the VPA with a group of similar participants. Concurrent to these activities, the team is pursuing dissemination of the VPA by introducing the system to other interested health care organizations.

## Specific Aims

- Program the VPA, a computer-based, interactive, animated character, to offer health education and advice to patients with limited health literacy on self-care and medication use through the transition from hospital to ambulatory care. **(Ongoing)**
- Design and implement an Ambulatory Care Plan using the VPA to educate the patient and respond to questions. **(Ongoing)**
- Evaluate the health information technology (health IT) intervention in the ambulatory setting. **(Upcoming)**
- Build a robust dissemination program that by Year 3 will have introduced this system into a health care system that is a member of a national test bed. **(Ongoing)**

**2008 Activities:** The team has and is continuing to write, validate, and program scripts into the VPA program that provide education and social dialogue between the patient and VPA. The core content of the interaction between the patient and VPA is intended to prepare the patient for their first post-discharge ambulatory care visit. The project team has written and programmed the VPA with script content on more than 3,000 medications containing patient education on dosing, how and why to take the medications, warnings, side effects, and an explanation of differences between brand and generic names. The team has also worked to improve the empathetic and social dialogue interaction of the VPA, as well as developed script content on the patient's medical condition, diagnosis, appointments, durable medical equipment, diet and exercise, activation, and what to do if a problem arises. In addition to development of the core content, the team has developed the greeting and closing and has refined pronunciations of medications and diagnoses.

In addition, the project team is developing and modifying the workstation, which allows patient information to be entered and generates the AHCP, to increase its usability, functionalities, and available selections. Modifications have included adding the ability to house more complex medication regimens, fields for patients' responses to VPA questions, a view of the entire AHCP in the workstation, a display of issues arising from the initial interaction between the VPA and patient, and the ability to print issues and responses. The team has begun integration of the workstation with the hospital's EMR that will allow patient information to automatically populate the fields in the workstation, successfully querying data from the hospital's EMR. The project team has also determined that Newport Hospital in Rhode Island will be a dissemination site and has begun adaptation of the workstation and VPA for that facility, as well as communicated with San Francisco General Hospital regarding potential dissemination of the intervention to that facility.

**Preliminary Impact and Findings:** No impacts or findings have yet been reported.

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## Selected Outputs

The Ambulatory Visit Training Manual: Used to train the clinicians in the ambulatory setting.

AHRQ 2008 Annual Conference presentation: Testing the Re-Engineered Discharge ([PowerPoint® File](#), 53 MB; [PDF File](#), 1.4 MB [[PDF Help](#)]; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is significantly under spent, more than 20 percent. This is due to a delay in a subcontract within the project. The project's key personnel anticipate that this will be remediated very soon and spending should be considerably more on target. This has caused no delay in the specific aims of the project or the work completed by the subcontract partner.

**Milestones:** Progress is mostly on track.

**Budget:** Significantly under spent, more than 20 percent.

**Project Title:** Randomized Control Trial Embedded in an Electronic Health Record  
**Principal Investigator:** Kahn, James O., M.D.  
**Organization:** University of California San Francisco (UCSF)  
**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)  
**Grant Number:** R18 HS 017784  
**Project Period:** 09/08 – 08/11  
**AHRQ Funding Amount:** \$1,199,928  
**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Kahn and his team launched their project in late September 2008. This project proposes to develop a secure enhanced personal health record (ePHR), to provide information, Web-based tools, and reminders to promote self-management, increase safer clinical transitions, and improve outcomes among patients with HIV/AIDS in the public health system. They will work with HIV/AIDS patients in the public health setting to inform the development of the ePHR. They will use the Healthcare Evaluation Record Organizer (HERO, myHERO) platform, which is the electronic health record system used by the Positive Health Program, the primary care clinic at UCSF that specializes in care for patients with HIV/AIDS.

#### Specific Aims

- Build the infrastructure and content of the ePHR to provide patient decision support, information retrieval, and communication tools. **(Ongoing)**
- Evaluate patient and provider experiences using the ePHR, including patient access and use of health education materials and patient provider satisfaction with the ePHR. **(Upcoming)**
- Assess outcomes, including quality of patient-provider interactions, changes in patient behaviors, clinical outcomes, safety, and health services utilization. **(Upcoming)**

**2008 Activities:** This grant began in 2008.

**Preliminary Impact and Findings:** There are no findings at this time because they are still developing the intervention.

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#### Selected Outputs

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** As of the cut-off for this report, the grantee had yet to report via the AHRQ-sponsored quarterly reporting system.

**Milestones:** Grantee did not provide self-assessment during 2008.

**Budget:** Grantee did not provide self-assessment during 2008.

<b>Project Title:</b>	An Interactive Preventive Health Record (IPHR) to Promote Patient-Centered Care
<b>Principal Investigator:</b>	Krist, Alexander, M.D.
<b>Organization:</b>	Virginia Commonwealth University
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health IT (PCC)
<b>Grant Number:</b>	R18 HS 017046
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,198,677
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project's objectives are to design, develop, and evaluate whether an interactive preventive health record (IPHR) linked to an electronic medical record (EMR) will increase recommended screening tests, immunizations, and counseling. The IPHR, entitled MyPreventiveCare.com, provides tailored recommendations, links to educational resources and decision aids, and patient and clinician reminders. By linking patients to their clinicians' EMRs and supplementing that information with user responses to questions on demographics, past receipt of preventive services, and other behavioral risk factors, the IPHR will provide shared knowledge and the free flow of information between clinicians and their patients. The IPHR provides the patient with a link to preventive elements of their EMR; a health risk assessment (HRA); an individualized list of recommended preventive services based on risk stratification; patient education resources; and patient reminders: e-mails encouraging healthy behaviors and/or receipt of recommended services, alerting patients when they become eligible for retesting or new services, and encouraging patients to update their profiles. It provides the clinician with a summary of the patient's risk factor information, patient as well as provided information, which can be used to update the EMR.

The study, approximately mid-way through its progress, takes place in eight primary care practices in the Virginia Ambulatory Care Outcomes Research Network (ACORN). All care practices use a common EMR, the Certified Commission for Health Information Technology (CCHIT) – certified Allscripts Touchworks® EMR, version 10.2. A randomly selected sample of 5,500 of the practices' 228,000 patients, stratified by age and gender, has been assigned in a one-to-one ratio to receive a request from their clinicians to use the IPHR or receive "usual" preventive care. Through this randomized, controlled trial, the project team will examine the effects of the IPHR on clinical preventive services, shared decisionmaking, and patient-physician communication through analysis of data in the EMR, utilization data from the IPHR, and patient and provider surveys.

### Specific Aims

- Evaluate whether an invitation from a patient's primary care clinician to use the IPHR results in increased delivery of age- and gender-appropriate clinical preventive services. **(Ongoing)**
- Evaluate whether an invitation from a patient's primary care clinician to use the IPHR results in use of the IPHR. **(Ongoing)**

- Evaluate whether an invitation from a patient's primary care clinician to use the IPHR results in increased shared decisionmaking for preventive services. **(Ongoing)**
- Evaluate whether an invitation from a patient's primary care clinician to use the IPHR results in improved clinician-patient communication about preventive needs. **(Ongoing)**

**2008 Activities:** The team has developed a logic algorithm that uses a patient's preventive health care information to generate a customized list of recommended services from the following checklist of 18 services: breast, cervical, colon, and prostate cancer screening; diet, exercise, smoking cessation, and obesity counseling; blood pressure and cholesterol monitoring; aspirin chemoprophylaxis; abdominal aortic aneurysm, diabetes, osteoporosis, and chlamydia screening; and tetanus, pneumococcal, and influenza vaccinations. The team solicited feedback from AHRQ and the U.S. Preventive Services Task Force (USPSTF), and modified the logic based on their recommendations. The team has designed, built, pilot-tested, operationalized, and validated transfer of data from the EMR to the IPHR. The IPHR converts the EMR data into usable elements for clinical decision support logic. Tailored patient messages for all 391 logic endpoints have been developed, modeled after content within the Office of Disease Prevention and Health Promotion's (ODPHP's) consumer health information Web site, [www.healthfinder.gov](http://www.healthfinder.gov). The messages have been created, extensively reviewed through two rounds of usability testing, and finalized for the 18 services contained within the IPHR.

The usability testing consisted of a series of 26 tasks, including logging in, reviewing information on Web pages, entering health information, reviewing and editing medical record data, and reading about preventive care priorities for existing medical conditions. The database structure, Web interface, CDS logic programming, and all final corrections to personal statements, formatting, layout, and functionality of the IPHR have been completed. The team conducted two rounds of site visits to demonstrate the functionality of the IPHR to physicians and nurses, and has developed the protocols for managing the user patient summaries that will be transferred from the IPHR to the EMR. The team has begun recruitment of patients and has collected baseline data for analysis.

**Preliminary Impact and Findings:** Within 6 weeks of being mailed the invitation, 292 patients (11 percent) had established an account and used the IPHR (updated usage rates will be presented). IPHR-users were more often male (52 percent vs. 49 percent,  $p < 0.001$ ) and older (mean age of 55 vs. 48 years,  $p < 0.001$ ) than non-users. Although 76 percent of users had attended a wellness or chronic care visit within the past year, only 3 percent were up-to-date, with risk factors under control, for all 18 preventive services. Among the IPHR users, 49 percent and 56 percent were due for screening tests and vaccinations, respectively; 91 percent and 55 percent needed counseling for unhealthy behaviors and preventive medications, respectively; and 35 percent had inadequate control of chronic conditions. Alerts to clinicians issued by the IPHR led practices to update 59 percent of patients' records and to contact patients to schedule a wellness visit (80 patients), chronic care visit (49 patients), or an appointment for a specific preventive service (56 patients).

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### Selected Outputs

Available at: My Preventive Care. <http://www.mypreventivecare.net>, <http://www.mypreventivecare.com>, or <http://www.mypreventivecare.org>. Accessed May 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is somewhat under spent, approximately 5-20 percent. This is due to the IPHR going live in 2008 on Nov 15<sup>th</sup> rather than July 1<sup>st</sup>. As a result, some of the Year 1 programming costs were shifted into Year 2. These funds will easily be reconciled within the overall budget of Year 2 and 3.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Tailored DVD to Improve Medication Management for Low Literate Elderly Patients
<b>Principal Investigator:</b>	Lapane, Kate, Ph.D.
<b>Organization:</b>	Virginia Commonwealth University
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017281
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$1,199,014
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project is testing the hypothesis that information gathered from electronic medication history records as well as qualitative and quantitative feedback from elderly patients can be used to develop tailored patient education DVDs and print materials for low-literate audiences to improve shared decisionmaking, patient-clinician communication, and self-management of chronic conditions. Based on the information collected, the team is developing both paper-based and tailored DVD content for low-literate patients that illustrates the principles of medication adherence and provides guidance on medication use so that they can better adhere to complex drug regimens.

The study, approximately mid-way through its progress, is a formative evaluation in which activities are focused on collecting qualitative and quantitative information in the development of tailored, valuable, and reliable content. To achieve this, the project held a series of focus groups with patients, providers, and caregivers; evaluated electronic prescription data from Surescripts and other sources of data such as Medicaid, the National Health and Nutrition Examination Survey (NHANES), and other publicly available databases; and conducted telephone surveys with a cross-section of the population. This mixed-method approach towards collecting information was intended to ensure that a representative variety of data is analyzed in the development of the final product.

After collecting the information from these diverse sources, the project team is developing the DVD and print content based on the input they obtained. Once the materials are sufficiently formalized, there will be another round of qualitative interviews to obtain feedback on the developed materials from the groups intended to be end-users of the product. After confirming the materials with these additional focus groups, the project will pre-test the DVDs and print materials in a live environment. The team will engage four practices in the study and follow 25 patients within each practice, collecting and analyzing information such as demographics, social support, medication profiles, medication management issues, stage of readiness to change, self-efficacy, self-reported adherence, and adherence measures based on electronic medication history, as well as a series of clinical process measures. The intervention will include surveys of both patients and providers, as well as audio taping of the clinical encounter.

### Specific Aims

- Develop algorithms to identify potential medication management issues based on community pharmacy-generated electronic medication history of elderly persons in Census areas with high concentrations of minorities and poor people. **(Achieved)**

- Develop tailored print materials based on electronic medication history to assist geriatric patients in adhering to complex medication regimens. **(Ongoing)**
- Develop tailored instructional videos which focus on improving the geriatric patient's role in patient-provider communication regarding medication issues and adherence to medication regimens. **(Ongoing)**
- Pre-test these interventions with versions in English and Spanish as part of a feasibility study within physician offices likely to service low-literate geriatric patients. **(Upcoming)**

**2008 Activities:** The project team developed protocols, recruited participants, and conducted a series of patient and caregiver focus groups with the intervention's targeted populations. The team has collected and analyzed qualitative information from the focus groups, as well as quantitative data from Surescripts electronic prescription records, Medicaid claims data, and public databases such as NHANES. Preliminary findings from these analyses indicated that patients exhibit both intentional and non-intentional medication adherence, which pre-existing surveys did not capture. Based on this, the team developed questions to differentiate intentional vs. non-intentional adherence issues, as well as activities patients engage in to aid their adherence efforts. The team conducted a survey of approximately 300 elderly persons to confirm the findings from their qualitative focus groups.

Based on the project team's analysis of the focus group feedback, survey results, prescription records, and quantitative data, the team has developed the themes for three of the DVD's tailored segments: patient empowerment; tips for adherence to medication regimens; and tips for talking with your doctor or health care providers. The project team has written scripts, filmed, edited, and developed the DVD content for these three themes in both English and Spanish. The team has preliminarily developed content for two additional DVD segments: diabetes and depression. They are continuing to generate ideas for new DVD segments and are planning another round of focus groups to provide feedback on their preliminary materials.

**Preliminary Impact and Findings:** Analysis of the results from patients and caregivers provided insight on how people interact with and value the information received from their pharmacist.

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### Selected Outputs

Recruitment fliers for patient and caregiver focus groups (English and Spanish).

Consent forms for patients and caregiver focus groups (English and Spanish).

Demographic forms for patient and caregiver focus groups (English and Spanish).

Scripts for patient and caregiver focus groups (English and Spanish).

Codebooks for analysis of patient and caregiver focus groups.

Audio Clips from focus groups to be used as educational tools.

AHRQ 2008 Annual Conference presentation: Use of Mixed-Method Designs To Inform Patient-Centered Tools To Improve Medication Management ([PowerPoint® File](#), 1.4 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project was under spent owing to issues related to transfer of the Principal Investigator from Brown University to Virginia Commonwealth University. They were unable to initiate one of the subcontracts in a timely fashion. They have since worked on implementing the work within Virginia Commonwealth University restrictions and, as such, should be on track.

**Milestones:** Progress is mostly on track.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Metro DC Health Information Exchange (MeDHIX)
<b>Principal Investigator:</b>	Lewis, Thomas L., M. D.
<b>Organization:</b>	Primary Care Coalition of Montgomery County
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016130
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,363,135
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The goal of this project is to develop and implement a health information exchange (HIE) spanning the Washington, DC, metropolitan area. The Metro DC Health Information Exchange (MeDHIX) project plans to implement an HIE that links the electronic health record (EHR) systems of safety net clinics in the region with each other and with mainstream health care providers, forming a regional community of interest focused on the specific and unique needs of the uninsured population and safety net environment. Although progress has been made in increasing adoption of EHR systems at clinics and hospitals, real leveraging of these data-collection systems does not begin until different points of care are able to freely transmit and exchange patient records, lab results, and other health care data. This HIE hopes to connect hospitals and clinics to third-party labs, improving continuity of care and patient safety.

The initial focus of MeDHIX will be in providing emergency department (ED) clinicians with health information, including medication data, from the safety net clinics and providing these safety net clinicians with similar health information from the EDs to increase the knowledge base on which the clinician makes assessments and medication decisions, ultimately improving patient safety and quality of care. Additionally, MeDHIX will focus on reducing duplicative labs and procedures and reducing unnecessary visits to the EDs.

MeDHIX will be implemented in phases. The first phase will leverage existing technology to deploy a significant subset of provider participants to address the issues of cross-jurisdictional, cross-enterprise HIE. The second phase will be paced with the promulgation of standards, protocols, and operating guidelines necessary for smaller-scale Community of Interest HIEs, such as MeDHIX, to interoperate within the evolving Regional Health Information Exchange and National Health Information Network environment. The third phase will further refine the HIE technology as standards evolve and will extend the number of regional participants. From the first phase onward, enhanced data will be available for public health planning, epidemiological surveillance, and targeting of services to the low-income uninsured.

### Specific Aims

- Create a governance structure for an HIE operating across multiple States. **(Ongoing)**
- Develop documents delineating terms and conditions of use. **(Achieved)**
- Facilitate distribution of laboratory test results to clinical sites. **(Achieved)**

- Use MeDHIX infrastructure to support patient-centered care (PCC) quality and reporting initiatives. **(Achieved)**
- Implement a Web-based “eChart” clinical summary to permit ED physicians and specialists to view an abstract of the integrated shared Community HealthLink (CHL) Care EHR. **(Achieved)**
- Connect clinics and hospitals to MeDHIX with full two-way exchange functionality. **(Upcoming)**

**2008 Activities:** A major goal for 2008 was to incorporate aspects of governance, tri-jurisdictional legal requirements, privacy protections, hospital and clinic workflow and use cases, and safety net patient picture ID cards into the eChart design and workflow. An example of the use of the eChart to facilitate access to pertinent clinical information, while documenting appropriate privacy protection and conforming to hospital policy, is the stepwise access to various levels of protected health information within the eChart with easy documentation of compliance as increasingly protected types of information need to be viewed. Governance work was also completed in conjunction with this activity. For the MeDHIX terms and conditions, the project decided to use the less complex Community HealthLink agreement, as the safety net clinics and patients were familiar with the process and had not experienced problems when explaining it to a diverse population.

In the next phase of the project, all five county hospitals and 10 safety net clinics are collaborating to identify patients receiving emergency room (ER) care who could be treated more effectively and at less cost in a primary care clinic. This “ER diversion” project is expected to result in substantial benefits in the form of greater care continuity and lower costs as clinics and hospitals share data more effectively. The MeDHIX technology and eChart are in place, with the first hospital and clinic ready to share data as soon as the final legal documents are approved. Up to five hospitals and 10 safety net clinics will join as the ER diversion project evolves over the next year, 2009. Additional funding for this project extension was provided by the Centers for Medicare and Medicaid Services (CMS) as a direct result of the demonstration of accomplishments in predecessor-specific aims of this AHRQ-funded MeDHIX work in this grant.

Based on knowledge gained from the AHRQ-funded MeDHIX work, the MeDHIX principal investigator (PI) was asked to co-chair one of two groups commissioned to advise the State of Maryland on a comprehensive strategy and architecture for creating and sustaining a single statewide HIE. The two groups will submit final reports in February 2009. The focus of our group, the Montgomery County Health Information Exchange (MCHIE), was on how to effectively incorporate community hospitals and low income, uninsured, culturally, linguistically, and ethnically diverse groups into a statewide HIE.

In addition, the project completed the process of facilitating distribution of laboratory test results to clinical sites. MeDHIX completed the certification process with Quest and is receiving labs for Muslim, Proyecto Salud, Spanish Catholic Center, and Peoples. The project also completed the database modifications required to more efficiently accept Quest Data, migrated the legacy data, transformed some of the data from inconsistent texts to standardization similar to Quest, modified the CHLCare screens to allow more efficient manual data entry and review of lab data, updated the reporting table storing procedures to work with the new database, modified the existing reports, modified relevant forms, and deployed a Web tool to allow the clinics to manage Quest labs that failed to download due to inability to match to the patient.

**Preliminary Impact and Findings:** So far the project has been able to create a technical infrastructure and robust user interface, deploy an ID card process, draft MeDHIX terms and conditions, draft a governance recommendation, and deploy a Quest Lab interface. The team is optimistic, particularly since a receptive environment to engage in active negotiations for an exchange is emerging as of the end of 2008. Previously, many of the health systems have been hesitant to engage in the cost of aligning with one of the multiple HIE initiatives underway in the area. In addition, the HIE initiatives and health systems have been waiting for leadership from both national and State organizations, especially as related

to standards. Although, the original focus of providing patient information to local EDs to support patient safety, quality of care, and health care efficiency initiatives has not evolved as rapidly as planned, opportunities have arisen to leverage the MeDHIX technology to support other processes and programs in parallel with the original plans. Remarkably, the capabilities of the MeDHIX infrastructure are diverse and continue to grow.

The project is beginning to see a transition in the perceived benefits and risks of HIE. Hospitals and physicians have tended to see great benefit in sharing clinical information on safety net patients because they often receive fragmented care in multiple places. For these patients, the benefits in improved care, reduced cost, and reduced risk to the patients from duplicative procedures were evident and potentially substantial. So the cost/benefit assessment was considered quite beneficial by virtually all participants. In contrast, little benefit from HIE was perceived for insured patients, as they typically had a much smaller number of providers and those providers communicated quickly and effectively with one another. For these patients, the perception was that the benefits of HIE to the patient or provider were likely to be small and the risk of inadvertent disclosure of confidential information likely to outweigh any benefit from HIE. There has been some evolution of this thinking toward a perception of more benefits from HIE in more patient subsets, led by ER physicians. One ER physician even observed that access to the eChart that is available for safety net patients had the potential for him to provide higher quality acute intervention care to the safety net clinic patients than he would be able to provide to insured patients.

In a recent parallel HIE initiative, it was recognized that community leaders and health systems promoted an “opt-in” methodology, while public health programs were adamant that the process be “opt-out.” The core issue revolves around having a critical mass of data. There is a perception that patients will be less apt to initiate an opt-in process, which requires an active action on their part, versus the more passive business process where all patients’ data are exchanged through the network unless they actively opt-out, thus creating a robust critical mass of data. Anecdotal feedback indicates that our safety net patient population rarely declines the opportunity to share health information within MeDHIX and Community HealthLink. This suggests that moving to an opt-out process would be acceptable to patients, more efficient administratively, and make more clinical data more easily available for improved direct care and care coordination.

Of the many project challenges, two are especially noteworthy. The first is harmonizing complex and often conflicting laws and regulations governing the sharing of health information among the three jurisdictions. Not only are the differences themselves complex, but different attorneys often interpreted the laws and regulations differently, compounded by changing interpretations as new clinics joined or new attorneys advised an existing clinic. This regularly delayed data exchange activities that were technically ready. Until such legal issues can be resolved locally, at the State level, and nationally, progress in reaching the theoretical benefits of HIE is likely to be slow and costly. In spite of the substantial, laudable, and expensive Federal efforts to date, there is little evidence that there has been significant progress at the local level in expeditious resolution of legal concerns.

The second challenge was the need to develop a system of positive identification for the low income, uninsured clinic patients. By definition, they did not have insurance cards and often lacked a photo identification (ID) card. This placed an added procedural burden and legal risk on hospitals to confirm the patient’s identity and consent to share information from the medical record. While unexpected, this problem eventually led to a positive solution—designing and implementing a method for creating picture ID cards for clinic patients and incorporating the pictures into the EHR. Adding picture ID card capability to the shared EHR resolved legal concerns about identification and consent because hospitals now know the primary care clinic and can access the patient’s history. They also know the patient has been counseled about the benefits and risks of sharing personal health information.

On a positive note, the ability to share information across the safety net clinics has led to a quantum shift in the way these clinics operate: they now work together instead of alone to provide care to patients who often have multiple complex medical problems. Now safety net clinics routinely track key quality measures; Medical Directors meet regularly to develop and share quality measures and look for ways to improve on the quality of care they provide.

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### **Selected Outputs**

The project has prepared an assessment of information-sharing regulations in Maryland, Virginia, and the District of Columbia, as well as developing governance documents and Terms and Conditions for patients.

AHRQ 2008 Annual Conference presentation: Metro DC Health Information Exchange (MeDHIX) Characteristics, Challenges, Lessons Learned ([PowerPoint® File](#), 1 MB; [Web Version](#)). September 2008, Bethesda, MD.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project has faced a number of challenges, including the fact that the IT infrastructure on which MeDHIX was founded became available for deployment in the third quarter of the third and final year (2009) rather than in Year 1 as defined in the original plan. The loss of the MeDHIX infrastructure in the fourth quarter of the first year had severe implications on the project strategy. The positive lesson from this experience is that large hospitals, on whom this HIE was initially dependent, may have their own agendas, with little understanding of the different clinical and organizational perspectives of community hospitals. It also strongly suggests that Regional Health Information Organizations (RHIOs) dominated and operated by one or more large hospitals may not be the most effective or inclusive model. Regardless, many of the project objectives have been achieved.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Improving Care Transitions for Complex Patients through Decision Support
<b>Principal Investigator:</b>	Lobach, David F., M.D., Ph.D., M.S.
<b>Organization:</b>	Duke University
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017795
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,198,254
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Lobach and his team launched their project in late September 2008. This project proposes to improve outcomes, quality, and coordination of care for patients with complex health care needs by facilitating the availability of information following three types of care transitions into ambulatory care: hospital discharge, emergency department discharge, and specialty care evaluations. The project will provide key information to patients, primary care providers, and care managers. It builds upon an existing regional health information exchange (HIE) network, the Community-Oriented Approach to Coordinated Healthcare (COACH), that was created to connect providers serving Medicaid beneficiaries in rural and urban North Carolina. The HIE will facilitate communication between providers who are caring for patients in different settings. In addition, it will use a standards-based clinical decision support (CDS) application that is delivered over the Internet to client systems. This system will support traditional clinic-based models of care as well as models that incorporate population health management and cross-disciplinary teams. The intervention will be tested by randomizing patients with complex health care needs into one of three arms: patients and clinic-based caregivers receive information on care transitions; patients, clinic-based caregivers, and care managers receive this information; and no information is sent (i.e., usual care). The primary outcome measure is the overall rate of emergency department use. In addition, the economic impact of the intervention will be measured relative to usual care.

### Specific Aims

- Enhance the existing HIE network and decision support tool. **(Ongoing)**
- Implement and evaluate the intervention. **(Upcoming)**
- Conduct the economic attractiveness assessment. **(Upcoming)**
- Disseminate the findings. **(Upcoming)**

**2008 Activities:** Dr. Lobach and his team worked at enhancing the existing HIE network, COACH, by beginning to establish relationships with new primary care clinics and hospitals to facilitate importing the scheduling and billing data. In addition, the team is investigating methods and data sources for identifying care transitions in order to code the SEBASTIAN CDS modules. SEBASTIAN is a standards-based Web service for clinical decisionmaking. They have already developed the tools to detect emergency department encounters through a previous AHRQ grant, and will extend these techniques in order to

capture specialty care encounters. However, preliminary investigations into hospital discharge practices have highlighted new challenges. The five hospitals included in the study have different procedures for documenting discharges, and there are even departmental differences in some hospitals. Thus, this task will require the development of sophisticated logic models. In terms of paving the way to implement the intervention, the team has selected a number of conditions to focus on in patient education materials, including hypertension, coronary artery disease, congestive heart failure, stroke, asthma, chronic obstructive pulmonary disease, diabetes, depression, chronic renal disease, end stage renal disease, and sickle cell disease. They are drafting preliminary versions of those materials and preparing drafts of materials for the clinician and patient focus groups. They have prepared patient consent forms, waiver requests, and other Institutional Review Board (IRB) documents. They are researching vendor options to translate Current Procedural Terminology (CPT) and International Classification of Diseases, 9<sup>th</sup> Revision (ICD-9) codes into patient-friendly descriptions of conditions and treatment to include in the letters for patients. Finally, they have established new relationships with care management teams that might benefit from receiving the intervention, including identifying a new group of care managers and health educators who serve patients with sickle cell disease and end-stage renal disease.

**Preliminary Impact and Findings:** There are no findings at this time, because they are still developing the intervention.

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### **Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Project spending is somewhat under spent by 5-20 percent, but the team anticipates utilizing the full budget over the course of the project.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Using Health Information Technology to Improve Ambulatory Chronic Disease Care
<b>Principal Investigator:</b>	Mehr, David, M.D., M.S.
<b>Organization:</b>	University of Missouri–Columbia
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory and Safety Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017035
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,192,603
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. To improve patient care quality and safety outcomes, the Family Medicine and General Internal Medicine practices at the University of Missouri–Columbia (MU) are conducting a phased implementation of selected ambulatory care health information technology (health IT) systems and functions. This research demonstration project proposes a formative (in-process evaluation aimed at improvement) and summative (final overall) evaluation of health IT innovations designed to foster improved chronic disease care in the ambulatory primary care practices at MU. These innovations result directly from a collaboration of MU clinicians from the Department of Family and Community Medicine (FCM) with MU’s medical record vendor, the Cerner Corporation, which is certified by the Certification Commission for Healthcare Information Technology (CCHIT). This health IT implementation uses specific strategies to: 1) improve providers’ access to information, allowing individual providers to compare and improve their clinical performance against standardized performance targets and peers’ performance; and 2) enhance patient-provider connectivity and communication to improve clinical decision-making, patient participation in the care process, and, ultimately, patient care outcomes. Specific strategies include providing physicians with comparative performance reports in one of three formats, and providing patients with access to a Web-based, interactive software system. This includes secure messaging and in-home reconciliation of all medications, to Cerner IQ Health Cycle 8 release (in the process of upgrading to Cycle 11 with an estimated implementation target of the end of May 2009), and using in-home “smart” diagnostic devices that send patient data directly to the care team. The project proposes a multi-method evaluation of health IT innovations designed to enhance the quality of primary care for chronic diseases, including qualitative interviews, surveys, and analysis of outcome data in the evaluation. The planned health IT systems for improving chronic disease care at MU are being implemented differently in various practices and with different associated care systems. This variation in care processes provides an extraordinary opportunity to evaluate factors that influence whether health IT innovations will aid in performance-based quality improvement, assist with care coordination, and facilitate patient self-management.

**Specific Aims**

- Evaluate the change in patient care processes and outcomes following introduction of health IT-generated clinician quality performance reports with comparison across practices and different peer comparisons. **(Ongoing)**

- Evaluate the effectiveness and changes associated with an interactive Web-based patient interface software system (IQ Health), including in-home medication reconciliation. **(Ongoing)**
- Evaluate the use of in-home “smart” diagnostic devices (e.g., blood pressure cuffs, glucometers) connecting patients with their patient care teams. **(Ongoing)**
- Disseminate information regarding the development and impact of the interventions through Web teleconferences, professional meetings, educational lectures, and peer review journals. **(Ongoing)**

**2008 Activities:** While performance reports were delayed, a new functionality, the diabetes summary screen, was introduced in April 2008. This provides summary information—including blood pressure, laboratory data, and medications for an individual patient—which demonstrates whether most quality indicators have been achieved for that patient. A data dump of pertinent clinical data from the electronic record will allow tracking whether this new functionality is associated with altered clinical outcomes and whether it interacts with the performance reports when they become available (early 2009). The usability and impact of the summary screens were evaluated in a mixed methods study using Morae™ software and through a questionnaire disseminated to faculty physicians, resident physicians, and nurse practitioners. The subgroup working on evaluating the impact of smart devices on blood pressure and blood glucose measures met frequently to fine-tune the intervention protocol, data collection process, and instruments. In the upcoming quarter, these documents will be reviewed by the steering committee, followed shortly thereafter by the initiation of the intervention and data collection. The contract with the vendor for needed equipment has been signed. IQ Health has been launched for patient use in three sites, and the project team began gathering information about its use and implementation, as well as undertaking a small exploratory pilot project to gather information about how easily and accurately patients could use the online form for medication reconciliation. Project staff are continuing to interview/meet with the implementation team and collect documents concerning changes in electronic health records to facilitate chronic disease care.

**Preliminary Impact and Findings:** IQ Health Pilot findings were planned for development in the first quarter of 2009. The summary screen was demonstrated to save substantial time in locating needed information for an ambulatory visit with a patient with diabetes.

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### **Selected Outputs**

IQHealth Benchmarking Survey.

Patient Computer Use Survey.

Presented at the Cerner Health Conference in Kansas City, MO.

Presented at the North American Primary Care Research Group (NAPCRG) Annual Meeting, November 2008, in Puerto Rico.

Provider Experience and Perception Survey.

Provider Information Needs and Uses Survey.

Provider Needs and Use Survey: Getting Information out of PowerChart.

Provider Survey for IQ Health.

Summary Screen Interview Protocol.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** Early on, delays in the implementation of health IT features affected the project’s ability to proceed with evaluation efforts according to our initial

timelines. In order to resolve implementation issues and move forward, a group was constituted to guide implementation and learn from it with key stakeholders included. This group has been successful in moving IQHealth, an important facet of the project, into production. With IQHealth available, the project is able to move forward with several other aims. Performance reports remained unavailable, and the data dump to provide baseline data had not been completed by the end of the year. However, completion of both is expected in early 2009. Hopefully, the extra time that was spent on development of the performance reports will result in a better product, released early in the first quarter of 2009, and the project will be able to proceed with evaluation efforts soon after. Similarly, the “smart devices” portion of the study is slightly delayed due to delays in purchasing the devices. Since delays with IQHealth and the smart devices have now been resolved, no further delays in this area are anticipated. Moreover, implementation of the summary screens, not anticipated until 2009 or 2010 at the time of grant submission, enriches the project’s ability to study impacts of health IT on chronic disease care. With the purchase contract completed during December 2008, the project will no longer be significantly under spending its budget.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Improving Pediatric Cancer Survivorship through SurvivorLink
<b>Principal Investigator:</b>	Mertens, Ann C., Ph.D.
<b>Organization:</b>	Emory University
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017831
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,199,198
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Mertens and her team launched their project in late September 2008. This project proposes to develop a personal health record (PHR), *SurvivorLink*, to support pediatric cancer survivor care by improving transitions to primary and specialty care for pediatric cancer survivors and by increasing patient, family, and provider knowledge about survivor issues. *SurvivorLink* will include a cancer treatment summary, individualized risk profile, individualized late effects screening profile, and other clinical information that is needed for high quality survivor care. It will also have educational material to increase awareness of survivorship issues and best practices in survivor care. The study team will use a pre-test/post-test study design to investigate whether *SurvivorLink* affects patient outcomes; the factors that influence *SurvivorLink* use; and how *SurvivorLink* can be improved to serve as an effective tool to support high quality survivor care. HIMformatics, L.L.C., is developing *SurvivorLink*.

### Specific Aims

- Collect data on pediatric cancer survivors in *SurvivorLink*. **(Ongoing)**
- Facilitate the exchange of clinical information at key transitions. **(Upcoming)**
- Provide patients with easy access to individualized educational materials and evidence-based late-effects screening recommendations. **(Ongoing)**
- Provide researchers with longitudinal information on incidence of late effects in pediatric cancer survivors. **(Upcoming)**

**2008 Activities:** The team received Institutional Review Board (IRB) approval for this initiative. They have completed the first round of interviews with physicians throughout Georgia about their experiences providing survivor care and the types of materials they think might help them treating pediatric cancer survivors. In addition, the team has assembled their advisory group, which consists of physicians, non-profit advocacy group members, health outcomes researchers, and others. They have recruited participants for the first of focus groups for patients and parents of survivors. Finally, the project team has been designing the portal, and has created a series of drafts to share with the focus group members and advisory group in order to get specific feedback.

**Preliminary Impact and Findings:** There are no findings at this time because the project team is still developing the intervention.

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**Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Status:** The project is completely on track.

**Milestones:** Project is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Impact of a Wellness Portal on the Delivery of Patient-Centered Prospective Care
<b>Principal Investigator:</b>	Mold, James, M.D.
<b>Organization:</b>	University of Oklahoma Health Sciences Center
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017188
<b>Project Period:</b>	10/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$902,411
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project develops and tests a Web-based, patient-centered Wellness Portal to allow patient access to the Preventive Services Reminder System (PSRS), a pre-existing internally-developed clinical tool for improving the delivery of patient-centered preventive services. Practices within the OKPRN use the PSRS, which contains a patient registry; preventive service reminders according to evidence-based guidelines (United States Preventive Services Task Force [USPSTF], Advisory Committee on Immunization Practices [ACIP], and American Academy of Family Physicians [AAFP]); an electronic chart auditing and patient recall tool for clinical decision support; patient education materials; and a 3-year prospective wellness plan. The project team members have enhanced functionality of the PSRS by allowing patient access via the Wellness Portal, which patients can access through either their home computers or doctor’s office kiosks. Through the Wellness Portal, patients can securely input personal information on their health behaviors and wellness status to personalize their wellness plan through the risk assessment algorithm; securely message their provider and schedule visits; transfer their wellness record to other providers using the CCR interface; and review educational materials.

The project, approximately mid-way through its progress, is providing access to the Wellness Portal to patients or guardians of patients either less than 6 years of age or greater than 50 years of age in four clinician practices within a primary care practice-based research network in Oklahoma. Four matched clinician practices serve as controls. The 3-year study consists of three phases: development, evaluation, and dissemination. The team is conducting a 9-month pre-post randomized, controlled trial (RCT) to test the hypothesis that usage of the Wellness Portal will affect delivery of appropriate services at the right time; patient experience with patient-centeredness of care; patient activation; and delivery of preventive services, while controlling for variables such as utilization, demographics, and health status.

### Specific Aims

- Develop, field test, and refine an Internet-based patient Wellness Portal linked to PSRS to facilitate patient-centered, preventive care in primary care practices. **(Achieved)**
- Determine the impact of the Wellness Portal on the process of patient-centered preventive care by examining the behavior and experiences of both patients and providers and the degree to which recommended services are individualized. **(Ongoing)**
- Develop model Wellness Portal practices and disseminate the Wellness Portal technology and knowledge derived from Aims 1 and 2 findings. **(Upcoming)**

**2008 Activities:** The project team designed, developed, and pilot tested the Wellness Portal. The team assembled an advisory committee of clinicians, office staff, patients, and national health information technology experts. The committee’s participants represented a wide range of diverse patient groups, and met several times to discuss consecutive versions of the portal Web interface. This iterative process allowed the project team to incorporate an array of expert and end-user perspectives while developing the tool. Once sufficiently vetted, the team tested the Wellness Portal in two OKPRN practices. The team collected patient and provider satisfaction data via surveys and personal feedback to improve and refine the Wellness Portal and its integration into the comprehensive care delivery process. The project team completed the field trial of the Wellness Portal and recruitment methodology, analyzed the results, and made adjustments based on the feedback they received.

In preparation for the RCT, the project team has finalized the content and structure of the Wellness Portal, developed the patient surveys and recruitment documents for the RCT, selected sites for the RCT, briefed the recruitment sites, assigned practice facilitators to each site for patient enrollment and/or Wellness Portal implementation, and assembled and tested the Wellness Portal Kiosk. The project team has begun the RCT, recruiting patients that fit their inclusion criteria through direct contact during the patients’ regular clinic visits.

**Preliminary Impact and Findings:** The team has completed the analyses of the field trial of the Wellness Portal. Results indicate a high degree of patient and provider satisfaction with the tool’s usability, effectiveness and value.

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### **Selected Outputs**

The team has completed development of the beta-test version of the Wellness Portal.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The project is meeting 80-99 percent of their milestones and is generally on time.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	The Chronic Care Technology Project
<b>Principal Investigator:</b>	Nashan, Georges, R.N., M.S., C.P.H.Q.
<b>Organization:</b>	Aroostook Medical Center
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016154
<b>Project Period:</b>	09/05 – 06/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,312,329
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and use

**Summary:** This implementation project is focused on identifying technology solutions that support the implementation of the "Chronic Care Model (CCM)" developed by Dr. Ed Wagner, national program director of Improving Chronic Illness Care. The CCM is a care system framework that is organized around six fundamental areas, each of which has identified functionalities that can be supported by technology innovations. The technology solutions in the implementation phase focuses on two components of the CCM: (1) health practices; and (2) patients and families, specifically addressing facilitation of the transfer of information between providers and between provider and patient. The specific solutions and implementation planning and execution are the product of a regional learning collaborative of health care providers and related stakeholders. The project is intended to assist providers in northern and eastern Maine in implementing new technologies. In this project, instead of using "usual" methods of adopting and implementing technology, health care providers and related stakeholders will plan and implement technology solutions through a collaborative learning process, based on the Institute for Health Care Improvement's (IHI) Breakthrough Series, which has been proven as a successful model to achieve health care change at the practice level.

In this project, the IHI collaborative process is being used to help participants make decisions and reach consensus about the adoption and implementation of technologies in health care systems. The evaluation is measuring the effectiveness of the main elements of the IHI collaborative process: Learning Sessions and Plan-Do-Study-Act (PDSA) change cycles. These two elements are designed to help collaborative participants make decisions and reach consensus about implementing technology. They are also designed to help them form strong and effective teams and to help participating organizations through the implementation process. While some of the survey questions are quantitative (e.g., ratings of Learning Sessions on a numerical scale), the effectiveness of the IHI process will be measured mainly qualitatively. The survey findings are summarized after each learning session to give an evaluation of the IHI process – and participants' impressions of it – at various stages of the process.

It is the project's working hypothesis that the collaborative learning process that has proved so successful in evidence-based practice change can be successfully used in the adoption of technology solutions that improve chronic disease care in rural areas. The Chronic Care Technology Project's focus on improving the care of people with chronic disease will help achieve objectives articulated in Healthy People 2010, but it most directly addresses the goal to "use communication strategically to improve health."

## Specific Aims

- Assess whether the IHI collaborative model is an effective process to adopt and implement technological changes in health care systems (within practices and between practices). **(Ongoing)**
- Assess whether technological changes improve the quality of information transfer by improving its timeliness, accuracy, efficiency, security, usefulness, and cost. **(Ongoing)**
- Assess whether technological changes improve the quality of chronic disease care by improving both standards-based care delivery and patient health status. **(Ongoing)**

**2008 Activities:** Data collection concluded in October 2008. Analyses and evaluation continued through and beyond the end of 2008.

**Preliminary Impact and Findings:** None available.

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## Selected Outputs

None available.

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## Grantee's Most Recent Self-Reported Quarterly Status:

**Milestones:** Grantee did not provide self-assessment in 2008.

**Budget:** Grantee did not provide self-assessment in 2008.

<b>Project Title:</b>	Regional Approach for Transforming Healthcare Quality through Information Technology (THQIT) in Rural Settings
<b>Principal Investigator:</b>	Richards, Francis
<b>Organization:</b>	Weis Center for Research, Geisinger Clinic
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016162
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,499,999
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The Regional Approach for Transforming Healthcare Quality through Information Technology (THQIT) in Rural Settings project addresses the relatively low adoption of health information technology (IT) in rural areas due to factors such as cost, culture, technical expertise, and regulatory concerns. As part of this project, Geisinger Health System has teamed up with two local hospitals to develop the Keystone Health Information Exchange (KeyHIE), a regional HIE that provides caregivers with access to region-wide clinical information, including pre-existing electronic health records (EHRs) and lab results. The implementation of KeyHIE is designed to expand health IT in rural areas, primarily by leveraging health IT investment already made to provide incremental but important functionality that supports wider access to information, communications, and demonstration of the value of health IT. KeyHIE and the other aspects of the regional HIE will be evaluated using the following criteria: 1) number of users accessing the regional exchange system per participating organization, 2) number of patient records accessed through the regional exchange system, and 3) analysis of surveys completed by clinicians to identify system usability concerns and determine whether clinicians are more likely to access regional information for certain patient conditions.

The implementation of a regional HIE will lead to more effective triage in rural emergency departments, better informed clinicians, and better coordination and higher quality of care. This project will also achieve the following main objectives: 1) improve access to existing clinical information by rural health care providers, 2) improve communications between primary care providers and specialists, and 3) lay the foundation for a regional network that supports information sharing among rural hospitals and providers and creates an environment that encourages the adoption of health IT.

### Specific Aims

- Improve transparency and consistency across on-file medical records. **(Achieved)**
- Implement Keystone Health Information Exchange (KeyHIE), the regional HIE that provides caregivers with access to region-wide clinical information. **(Ongoing)**
- Implement Community Lab Interfaces. **(Ongoing)**
- Implement Community Portals. **(Ongoing)**
- Administer surveys and measure use of the information by clinicians. **(Ongoing)**

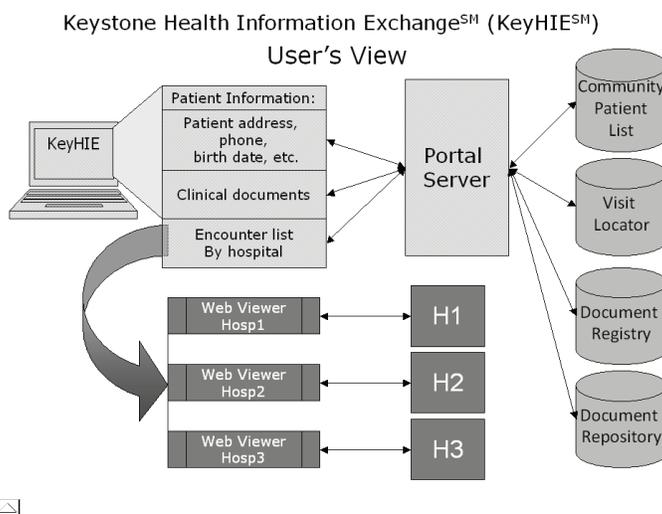
**2008 Activities:** In 2008, the regional HIE was expanded to 10 participating organizations, and the program to clean up duplicate medical records was successfully completed. A Community Lab Interface survey was administered to determine how well the lab interface has met the needs of the clinicians using the system. The Community Portals portion of the project also moved forward despite an initial delay. Assessments of the rate of regional exchange use, the data integrity for the Community Master Patient Index, and the Medical Record Clean Up are also continuing. Participating organizations are also continuing to collect patient authorization forms.

**Technical Model:**

Much of the Exchange’s design was adapted from the Connecting For Health Common Framework, based on a shared master patient index (MPI); a record locator service (RLS); and federated access to clinical information, in which each organization retains control over its data. All organizations contribute to the exchange through their registration interface to a central interface engine that passes the information to the MPI and RLS. The MPI uses a probability-based matching algorithm to decide whether the patient already has a record in the database. If so, it links the new information to the existing record.

A physician queries the RLS to see if information about a particular patient exists at other participating institutions. If so, then the requester may contact the listed institution to request the clinical records, after satisfying the access requirements of that institution.

The RLS lists the facilities where the patient has received care. If the patient has signed an authorization form at one (or more) of the facilities, the RLS will include a one-line summary of the patient’s encounter(s) at that facility, including the service performed, the name of the attending physician, and a reason for the visit. If a facility has not gotten patient authorization, the information will be limited to the date of service and the name of the facility.



If a clinician decides that viewing the information at one or more participating facilities is likely to be useful, they can click on a link to that facility and launch the Web-based EHR viewer for that organization. Access to this facility’s EHR is based on a previous agreement between the clinician and the EHR owner.

Requiring clinicians to log onto many different EHRs using different user IDs and passwords is unacceptably burdensome to clinicians. To streamline this process we implemented a single sign-on tool that allows access to each facility’s EHR without requiring a separate log-in for each EHR. (Of course the clinician must still know how to find information in each different EHR.)

New capabilities allow participating organizations to share important clinical documents with those treating the patient. Discharge and other medical summaries will enable clinicians to quickly understand a patient's medical history. KeyHIE<sup>SM</sup> has developed this document exchange based on the United States Health Information Technology Standards Panel (HITSP) and standards from Integrating the Healthcare Enterprise ([www.ihe.net](http://www.ihe.net)). This document registry and repository is hosted by GE Healthcare HIE Services and currently houses discharge summaries, history and physicals, and radiology reports. The system has been designed for future access by EHR systems, including continuity of care documents (CCDs) as required for EHR interoperability certification by the Certification Commission for Healthcare Information Technology (CCHIT).

**Preliminary Impact and Findings:** Use of the regional exchange by providers increased slightly in the last quarter of 2008, an indication that, despite problems previously cited with use of the system, there are still enough benefits to clinicians to warrant its use. The initial assumption was that emergency departments would have the greatest need to access regional information since little is known about patients when they arrive for treatment. However, the current system is still somewhat fragmented and of limited usefulness to this stakeholder group, and they do not have time to piece together information, even though it can be done more quickly through electronic means. Thus far, numerous reasons why many clinicians choose not to electronically access information from regional data sources have been identified, and the project's approach has been revised to address many of these issues. Preliminary analysis of the Community Lab Interface also estimates that cost-savings involved with the elimination of paper lab results is approximately \$1,854.48 per month in staff time previously spent on scanning paper.

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### Selected Outputs

Younkin J. Ensuring Privacy and Security of Health Information Exchange in Pennsylvania. Developed with the Pennsylvania eHealth Initiative. Publication planned for early 2009.

Sample Universal Authorization Form: This is the form patients are required to sign if they want to permit their health information gathered at a given organization to be shared with other providers involved in their care.

AHRQ 2008 Annual Conference presentation: Lessons Learned: Implementing a Low-Cost Structure Health Information Exchange ([PowerPoint® File](#), 3 MB; [Web Version](#)) Bethesda, MD, September 2008.

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**Grantee's Most Recent Self-Reported Quarterly Status:** There have been delays in the implementation of the regional information exchange at the partner hospitals, due largely to the challenge of developing appropriate inter-institutional and vendor agreements. A 1-year, no-cost extension was requested to complete the document store implementation and evaluation. The achievement of milestones and budget expenditures has been impacted by this delay in the project.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	e-Coaching: Interactive Voice Response (IVR)-Enhanced Care Transition Support for Complex Patients
<b>Principal Investigator:</b>	Ritchie, Christine S., M.D., M.S.P.H.
<b>Organization:</b>	University of Alabama at Birmingham
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017786
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,199,999
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Ritchie and her team launched their project in late September 2008. This project proposes to develop an interactive voice response (IVR)-supported care transition coaching intervention, e-Coach, to support complex medical patients as they transition from hospital to home-based care. The e-Coach, using the TeleSage software product, will support patients with medication self-management assistance, maintenance of a personal health record (PHR), timely follow-up with primary or specialty care, and identifying ‘red flags’ indicating worsening of the patient’s condition. The study will recruit patients with congestive heart failure (CHF) or chronic obstructive pulmonary disease (COPD). The e-Coach system will be self-developed during the initial phase of the project, based on Coleman’s Care Transition Intervention (CTI).

### Specific Aims

- Randomize 720 patients to the e-Coach intervention or to usual care. **(Ongoing)**
- Evaluate the use of the e-Coach system by patient and health care providers. **(Upcoming)**
- Evaluate the effect of e-Coach on patient outcomes, including 90 day re-hospitalizations, successful community tenure at home after discharge from the hospital, and patient self-efficacy based on the Care Transition Measure. **(Upcoming)**
- Quantify the costs associated with the e-Coach intervention. **(Upcoming)**

**2008 Activities:** Dr. Ritchie and her team re-evaluated the conceptual model in their proposal to think about how to operationalize it using the IVR technology. The team chose an IVR software vendor; after considering using the same company that provides their health system’s electronic medical record (EMR), they opted to go with TeleSage in the interest of broader dissemination capabilities and greater flexibility. They then had to determine how to connect the TeleSage content with their EMR platform. In parallel, the team studied 30 patients’ discharge processes in order to identify a rough baseline rate of medication discrepancies in their target populations. They are using an iterative approach in developing and testing the IVR script, including conducting pilot tests on patients who are being discharged with CHF or COPD, in order to ensure that when they “go live,” their e-Coach program will be as refined as possible and will be well-accepted by the patients.

**Preliminary Impact and Findings:** There are few findings at this time, because they are still developing the intervention, although the team identified a high percentage of medication discrepancies in their initial assessment of discharge experiences.

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**Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Project spending is somewhat under spent by 5-20 percent due to delays with project adaptation during the first quarter of the project. The project expects to be on track with spending in the future.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Patient-Centered Informatics System to Enhance Health Care in Rural Communities
<b>Project Investigator:</b>	Samore, Matthew, M.D.
<b>Organization:</b>	University of Utah
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017308
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$1,199,999
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This is a demonstration project to evaluate the effect of integrating the functions of an electronic medical record (EMR) and order entry tool, a personal health record (PHR), and a communication system on patient-centered care in rural communities in the Intermountain West. The group working on this project, which is approximately mid-way through its scheduled duration, is composed of computer software developers, academic researchers, physicians, and public health professionals. This system, called the Unified Health Resource (UHR) to highlight its focus on integration and patient-centric care, provides disease information and decision support tools for patient self-management of acute and chronic diseases, supports the reconciliation of medication lists, and enables exchange of information between clinicians and patients through a series of structured, bi-directional communication channels.

As patients and clinicians need to have ownership and control of their respective records, certain necessary design parameters have been identified, which include programming the UHR so that the EMR and PHR function independently of each other. The UHR software developer, CaduRx, designed an interface that allows each side to view and import changes to reflect the updates made by the other party. However, one side cannot alter the other's records. Patients may view items such as physician notes, diagnoses, and diagnostic test results imported into their PHR. Physicians who are granted access by the patient are able to view and import the patient's information from the PHR into their EMR, which may include new prescriptions, symptoms, or diseases. In addition, there are several types of structured e-visits patients can use to communicate with clinics and clinicians. Patients may request medication refills online, as well as input results of home monitoring tests into their PHR, such as blood sugar levels and blood pressure measurements.

To ensure that navigation through the system is easy and intuitive for both clinicians and patients, different approaches must be taken for the EMR and the PHR to meet the needs of the target users and still allow for a meaningful exchange of information between patient and provider. Through extensive usability testing, the project team has ensured that the vocabulary used in the PHR is understandable to the patients, clinically significant to the providers, linkable to International Classification of Diseases, Clinical Modification (ICD-9-CM) codes, and able to be coded for clinics' record keeping and billing purposes.

To assess the effect of the UHR on patient-centered care, the team will conduct a prospective cohort study among selected adult patients within one of the two rural clinics that use the UHR or two comparable clinics that recently implemented another EMR system. Participants must have one or more of the following chronic illnesses: diabetes mellitus, hypertension, chronic heart disease, or chronic obstructive pulmonary disease. Study cohort participants will complete a baseline and two follow-up surveys consisting of questions from validated surveys as well as internally developed questions. Along with this patient self-reported data, the team will analyze electronic data abstracted from the databases of the UHR, and a manual chart review of the patients' medical records to compare the provider's assessment of a patient's disease management with the patient's report of how well they self-managed. The project team will consider this intervention successful with respect to enhancing patient-centered care if patients report increased access to care and satisfaction with communication; if patient activation as health care consumers is improved; and if self-management behaviors and safe and effective medication practices rise in frequency. In addition to the comparative study, the project team is conducting a formative evaluation of the UHR, which has included usability testing, direct interaction with users of the UHR, and monitoring of utilization data.

### Specific Aims

- Recruit two rural primary care clinics that use UHR and two primary care clinics that use an alternative, non-UHR EMR system to participate in a 3-year research demonstration project. **(Ongoing)**
- Apply formative evaluation methods to assess and improve usability, usefulness, and adoption of the UHR personal health system by patients. **(Ongoing)**
- Enroll patients from the four participating rural clinics into a prospective cohort study to assess the impact of the UHR personal health system on patient-centered care. **(Ongoing)**
- Examine patterns of use of the UHR personal health system. **(Ongoing)**
- Increase awareness, confidence, and skills to use personal health records and Internet health resources among rural community residents, leveraging local libraries and health departments. **(Upcoming)**

**2008 Activities:** Many activities have been undertaken to support development and testing of the UHR. The project team conducted a literature review and solicited expert feedback to develop the data collection tools for the project. The project team has tested and evaluated the tools to ensure their reliability and validity. The team has completed a patient usability beta test of the UHR to identify additional modifications to be made to the tool, forming a "super-user" group from those in the beta test for additional feedback. This work helped in developing the formal usability testing now in progress. The project team has identified and recruited both UHR and non-UHR comparison study sites. HealthInsight, a study partner, has worked one-on-one with the clinic sites to support integration of the EMR into the organization's workflow. The project team has organized key individuals from each of the organizations working on the project to evaluate the level of adoption of the UHR in the study clinics and prepare them to respond to patient-initiated communication through the UHR.

Development of the UHR has gone through several iterations of planning, testing, and evaluation. The team has collected and analyzed qualitative and utilization data through a round of beta testing, individual patient pilot tests, and provider surveys to identify further required modifications to the UHR and the study protocols. The UHR software developers at CaduRx have tested their programming for internal consistency and operation errors. The UHR was then tested by the team's practicing physician to ensure the system met the needs of health care providers, and tested by public health professionals to ensure that the patient perspective and vocabulary are represented. The project team has made progress in developing methods of presenting information to patients that is significant to clinicians. The team is developing their

strategy to anticipate patients' approaches in documenting their health and health care information, as compared with how this information needs to be recorded in the clinics' medical records.

**Preliminary Impact and Findings:** Through the project team's recruitment efforts, members have collected anecdotal evidence that patients are very interested in having a PHR linked with their health care provider and to their clinic records. The team anticipates a challenge in ensuring that patients are aware of how the tool is integrated with the clinic and understand how to use it successfully. Patients who are chronically ill but have low levels of computer literacy may benefit from more structured training, as learned through the beta testing and patient pilot testing. The clinic staff might be ideal teachers for their patients on the use of the UHR. The project team anticipates that working with the staff may complement the project's dissemination aim.

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### **Selected Outputs**

Priority matrix for software developed based on beta tester's feedback.

Script and protocol for formative usability testing.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Progress is on track in some respects but not others.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Harnessing Health Information Technology for Self-Management Support and Medication Activation in a Medicaid Health Plan
<b>Principal Investigator:</b>	Schillinger, Dean, M.D.
<b>Organization:</b>	University of California, San Francisco
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017261
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,130,769
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project, approximately mid-way through its scheduled funding period, enhances an automated telephone self-management (ATSM) support system to provide ethnically diverse, publicly insured patients who have diabetes with surveillance and education and to prioritize additional telephone care management through questions on patient behavior. This work builds on a previously funded AHRQ project by promoting dissemination of these results as well as modifications for improved outcomes and adaptation for sustained implementation. Through a randomized, controlled trial, the project team will examine the effects of interacting with the ATSM on members of the San Francisco Health Plan (SFHP), a Medicaid plan. Upon enrollment into the study, patients will be randomized to the ATSM-only group, the ATSM-plus group, or the usual care waitlist comparison group (subsequently to receive ATMS-only or ATSM-plus services). In the ATSM-only model, patients will respond to a rotating set of questions on self-care, psychosocial aspects of care, and receipt of preventive services. Patients with an answer that is ‘out of range’ on an item receive an immediate automated health education message. Patients with an answer ‘significantly out of range’ receive the automated message plus a follow-up person-to-person call from an SFHP manager. In addition to those services, the ATSM-plus model has supplementary phone communications from the ATSM care manager to the patient triggered by data derived from pharmacy claims and a diabetes registry. These calls further activate patients with respect to medication adherence and/or intensification based on clinical criteria developed by a clinical advisory board.

To measure patient-centeredness, the team will conduct patient surveys to analyze outcomes such as perspectives on the structure of their care and the interpersonal processes of care. To analyze patient safety, the team will explore characteristics of adverse events: triggers, frequencies, their nature, preventability and/or ability to be ameliorated, and clinician awareness. To analyze effects of the intervention on relevant metabolic and clinical process and outcome measures, the team will use electronically available clinical and administrative data.

### Specific Aims

- Measure the effects of a Medicaid health plan-directed ATSM on patient-centered outcomes among ethnically diverse health plan enrollees with diabetes. **(Upcoming)**
- Explore whether combining ATSM with an additional patient-directed health IT innovation—a medication activation communication strategy triggered by pharmacy claims data—yields differential effects on patient-centered outcomes compared to ATSM alone. **(Upcoming)**

- Quantify and characterize patient safety events triggered and/or identified through active surveillance among ATSM participants. **(Upcoming)**
- Measure differences in the frequency and nature of patient safety events among participants receiving ATSM-only vs. ATSM-plus medication activation. **(Upcoming)**
- Explore the effects of ATSM interventions on Healthcare Effectiveness Data and Information Set (HEDIS)-relevant metabolic and clinical process and outcome measures when compared to usual care. **(Upcoming)**
- Explore whether ATSM-plus medication activation is superior to ATSM-only with respect to HEDIS-relevant metabolic and clinical process and outcome measures. **(Upcoming)**

**2008 Activities:** Throughout the past year, the team has developed or secured project materials such as the pre-invitation postcard, information card, flow chart of the overall project, patient welcome letter, patient wallet card, postcard from a care manager to patients, provider pre-enrollment notification card, notification of enrollment letter to the patient's primary care provider, consent forms, and gift cards for participants. The expert advisory panel met monthly during the initial project period to provide advice on and develop medication intensification protocols for care managers' counseling efforts. The team has worked with SFHP to create protocols for program invitation, orientation, study enrollment, data collection, and triggers for ATSM calls. The two groups also collaborated in the development of user-friendly enrollment and orientation scripts. The team created a database for identifying and tracking enrollees and data entry form for care managers. The project team revised ATSM scripts, implemented the development of the scripts into audio wave files, piloted, and finalized the audio files.

**Preliminary Impact and Findings:** The project team completed a study of cost effectiveness ratio of ATSM intervention based on prior work that is directly relevant to this project. Cost-utility was measured by examining the costs per quality adjusted life years (QALY) for ATSM patients relative to usual care. The cost-utility ratio in the main analysis was \$65,167 for start up and ongoing implementation costs combined, and \$32,333 for ongoing program costs alone. The cost-utility ratio in the sensitivity analyses ranged from \$10,666 to \$72,404 per QALY. The per-patient cost to achieve a 10 percent increase in the number of intervention patients meeting American Diabetes Association exercise guidelines was estimated to be \$537 for all costs, and \$267 for ongoing implementation costs.

The project team's study of adverse events (AEs) showed that multiple factors contribute to AEs and potential AEs and that patients are key drivers of safety and AEs. Among the 111 patients, 86 percent had at least one event detected over the 9-month observation period. Overall, 111 AEs and 153 Potential AEs were identified. For all events, medication management was the most common domain (166 events, 63 percent). Often, a combination of system, clinician, and patient factors contributed to the occurrence of events; the project team ascertained a single contributing cause for only 20 percent of events. Patient actions were implicated in 205 events (77 percent), systems issues contributed to 183 events (69 percent), and impaired physician-patient communication contributed to 155 events (59 percent). Aside from communication, primary care clinician actions contributed to the occurrence of the event in 16 cases (6 percent).

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### **Selected Outputs**

Schillinger D. Effects of self-management support on structure, process and outcomes among vulnerable patients with diabetes: a 3-arm practical clinical trial. *Diabetes Care* 2009;32(4):559-566.

Schillinger D, Hammer H, Wang F, et al. Seeing in 3-D: examining the reach of diabetes self-management support strategies in a public health care system. *Health Educ Behav* 2008;35(5):664-82.

Handley M, Shumway M, Schillinger D. Cost-effectiveness of automated telephone self-management support with nurse care management among patients with diabetes. *Ann Fam Med* 2008;6(5):1-7.

Sarkar U, Handley M, Gupta R, et al. Use of an interactive telephone-based self-management support program to identify adverse events among ambulatory diabetes patients. *J Gen Intern Med* 2007;23(4):459-65.

Schillinger D. Developing partnerships between literacy providers and public health. National Institute for Literacy (NIFL) Summit; 2008; San Francisco, CA.

Schillinger D. Systems re-design to provide diabetes self-management support. California Health Care Safety Net Institute (SNI) Spreading Effective and Efficient Diabetes Care (SEED); 2008; Oakland, CA.

Schillinger D. Using health IT to cross the language and literacy divide. California Diabetes Program; 2008; Sacramento, CA.

Schillinger D. Self-management support strategies for the underserved. Project Summer Educational Experience for the Disadvantaged (SEED); 2008; Oakland, CA.

Schillinger D. Ecology matters: patient perspectives on self-management support. AHRQ Practice-Based Research Network (PBRN) Conference; 2008; Washington, DC.

Schillinger D. Health literacy as a public health challenge. California Department of Public Health; 2008; Sacramento, CA.

Schillinger D. Engaging ethnic media for strategic health communications. New America Media; 2008; Sacramento, CA.

Schillinger D. What has literacy to do with health outcomes. International Conference on Healthcare Transformation; 2008; Singapore.

Schillinger D. Productive interactions in chronic care. Disease Management Conference; 2008; Singapore.

AHRQ 2008 Annual Conference presentation: Enabling chronic disease care through health IT ([PowerPoint® File](#), 7.2 MB; [PDF File](#), 830 KB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** About 65-80 percent of the project's milestones are being met, but there is a viable plan for achieving the others. The project team is significantly behind in its timeline for beginning outreach and enrollment due to a number of personnel changes at the senior level in SFHP. With new leadership in place at SFHP, enrollment is scheduled to begin on a full scale on May 1, 2009. Investigators will be requesting a 1-year no-cost extension to complete the project.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Can Risk Score Alerts Improve Office Care for Chest Pain?
<b>Principal Investigator:</b>	Sequist, Thomas, M.D., M.P.H.
<b>Organization:</b>	Brigham and Women's Hospital
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017075
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$687,539
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. With a randomized, controlled study design, this study implements and evaluates an intervention to improve the treatment of primary care patients with acute chest pain in a large, integrated health care delivery system. This study implements and evaluates electronic risk alerts to risk stratify outpatients with chest pain and present this information to primary care clinicians within the context of an electronic health record (EHR). The intervention takes place within Harvard Vanguard Medical Associates (HVMA), a multispecialty integrated group practice with 140 primary care physicians caring for approximately 300,000 patients at 14 centers in eastern Massachusetts. HVMA has a long history of using advanced EHRs and other forms of health information technology (health IT) to improve ambulatory patient safety and quality. Since 1999, HVMA has integrated the Epic EMR system (Epic Hyperspace Spring 2007 IU3), a Certification Commission for Healthcare Information Technology (CCHIT) certified product, into all aspects of ambulatory care within the organization, including point-of-care services such as electronic order entry and reminders, as well as centralized functions such as patient scheduling.

This study has important implications for determining how the treatment of outpatients with chest pain syndromes can be optimized through the innovative use of electronic decision support, while documenting the cost implications of such a strategy. This work will also provide a model for how ambulatory practices across the country can use EHRs to present real-time patient risk information to clinicians with the goal of improving patient safety and quality, which has important implications for both acute and chronic care.

### Specific Aims

- Identify predictors of risk-appropriate evaluation and treatment of patients presenting to primary care offices with acute chest pain, including race and sex. **(Ongoing)**
- Determine whether rates of appropriate evaluation and treatment of patients with acute chest pain can be improved through the use of point-of-care electronic risk alerts that provide individual patient cardiac risk profiles and tailored evaluation and treatment recommendations to primary care clinicians. **(Ongoing)**
- Perform a cost analysis for the provision of electronic decision support for patients with acute chest pain. **(Upcoming)**

**2008 Activities:** The databases for the primary study endpoints (performance of electrocardiogram (EKG), administration of aspirin, performance of exercise stress tests), as well as all secondary endpoints have all been prepared, and project staff are training research team staff to conduct the necessary chart reviews. More importantly, the project team has created several automated reporting mechanisms that will record vital information for the study, including Framingham Risk Score data at the time of the office visit. These reports were programmed into the EHR to facilitate data collection for the study.

In October 2008, project staff completed randomization of 276 clinicians (102 nurse practitioners, 174 primary care physicians) with blocking according to training background (doctor of medicine (MD) versus nurse practitioner (NP)), clinical site, and volume of patients evaluated with chest pain in the prior 12 months. In addition, the project definition of eligible patients has been updated to exclude any patient visits that represent: 1) follow-up for a recent emergency department visit or hospitalization for evaluation of chest pain within 30 days prior to the office, and 2) routine annual exams. Based on preliminary data collection over the past 6 months, the project team has updated the power calculations and estimate that 15 months (rather than 12 months) will be required to achieve reasonable power, based on the updated data and eligibility requirements. Project staff have updated ClinicalTrials.gov to represent these changes.

The project intervention went live on October 27, 2008, and will run for 15 consecutive months. Project staff will continue to monitor the intervention via regular data extracts to ensure that the alert is firing during appropriate office visits for patients with chest pain. They will be analyzing the association between clinician risk thresholds and treatment/triage strategies for patients with chest pain using the Jackson Personality Index (JPI) and have completed the baseline survey process among all clinicians in the intervention, achieving a high response rate of 85 percent using a three-step process of paper mailing, reminder e-mail, and follow-up paper mailing.

A key component for the successful delivery of the intervention is the training of medical assistants to accurately identify patients presenting to primary care physicians with chest pain, and enter into the electronic record a coded "chief complaint" of chest pain. This code will then be used as the electronic trigger for the delivery of the decision support tool. Training has been completed for over 150 medical assistants across all of the health care centers, focusing on the identification of patients with chest pain and use of the electronic chief complaint codes within the EHR. Project staff plan to conduct regular site visits during the 15-month intervention period to refresh the medical assistant training.

The core of this intervention involves the delivery of electronic decision support to clinicians within the context of evaluating patients presenting to the office with chest pain. The decision support will be provided in the form of an electronic alert ("pop up") within the EMR system. The project has contracted with Epic Systems to build this decision support tool for this project. This involved creation of specifications regarding calculation of cardiac risk scores (Framingham Risk Score), as well as the design of the interface with the electronic record. A prototype of this tool has been completed and tested by study staff in a test environment within Epic. The project has subsequently migrated the electronic tool into the active clinical production environment within Epic and completed testing.

**Preliminary Impact and Findings:** The first project year has been focused entirely on obtaining human subjects approval, engaging the clinical leadership, training medical assistants and physicians, conducting physician surveys, and programming the electronic decision support tool. Key study findings are not yet available.

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## Selected Outputs

**Electronic Decision Support Tool:** the tool has completed initial development and was successfully tested by clinicians at the pilot site. The tool uses routinely available data fields within the EHR (patient age, gender, blood pressure, cholesterol, and smoking status) to calculate the Framingham Risk Score.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project has increased the project management effort to support the ongoing training of medical assistants to identify patients with acute chest pain. These extended efforts are crucial to the success of the overall project. In addition, given the need to extend the length of the randomized trial, the project will also use additional funds to provide increased support for the project team through Project Year 3.

**Milestones:** Progress is mostly on track.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Health Information Exchange: A Frontier Model
<b>Principal Investigator:</b>	Shank, Nancy, M.B.A.
<b>Organization:</b>	Chadron Community Hospital
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016143
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,498,623
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The Health Information Exchange: A Frontier Model project is in the process of implementing a regional health information organization (RHIO) in Nebraska within an established collaborative of rural hospitals, clinics, public health providers, behavioral health providers, and others across a 14,000 square mile, remote area. The project will demonstrate phased health information exchange (HIE) mechanisms among partners who have committed over \$1 million annually. The exchange will accommodate partners with substantial, standards-compliant existing assets and will equip partners with little or no assets to develop capacities, with an emphasis on economies that are achievable through collaborative purchasing, training, and support.

Upon completion of the project: 1) electronic medical records (EMR) will be established and integrated with other functional systems (decision support systems, computerized physician order entry (CPOE)/e-Prescribing, results management, laboratory) in all critical access hospitals and rural health clinics through a common process and shared resources in order to enhance local and regional capacity development toward HIE; 2) HIE systems will be established that will provide current information, from all hospitals and rural health clinics, at the point of care; and 3) an operational entity and incorporated RHIO will provide the sustainable infrastructure necessary to support regional HIE and common developments in the electronic health records.

The plan will model a solution applicable to small hospitals across the Nation because the plan will accommodate the wide variability in technological capacity and readiness represented by the partnering organizations. Project partners include all the area's hospitals, the public health entity, a membership organization of nearly all health and human services providers, and the University of Nebraska.

### Specific Aims

- Develop business plan. **(Ongoing)**
- Provide standardized education, training, and user capacity. **(Achieved)**
- Select products for organizations with an electronic health record. **(Ongoing)**
- Operationalize the RHIO. **(Ongoing)**

**2008 Activities:** In 2008, development of the business plan continued in order to ensure that there is long-term sustainability of the HIE. Education and training was also completed, which consisted of Project Mapping Webinars, Project Management and Microsoft Project trainings, and a Managing and

Maintaining Computers course (A+ Certification) for appropriate users. Different participating health care organizations implemented EMRs and other necessary software throughout this past year, and the product selection for local organizations without electronic health records will continue into 2009. Provider satisfaction surveys, which measure the level of satisfaction among health care providers regarding the implementation of health information technology (IT), are currently being analyzed and a report on the findings will be available in the first quarter of 2009. Individualized Inpatient Summary Reports were also distributed to each hospital using information gathered from inpatient satisfaction surveys. An Acceptance and Use of Technology Survey was also administered and analyzed.

In 2008, the RHIO has been primarily focused on vendor selection for a regional sharing solution to operate the HIE and shared decisions regarding instituting the administrative product in a collaborative fashion. Although the selected vendor provided the desired project, concerns were raised that it is no longer within the financial range of this project. As a result, discussions were started regarding balancing functionality of the HIE given the limitation of funding available. Concerns with scaling back the project are primarily associated with the value the scaled back project would have to the regional providers if they are only able to see partial information, such as lab and radiology reports.

**Preliminary Impact and Findings:** Results of the Acceptance and Use of Technology Survey revealed that the providers reacted favorably to the implementation of the Regional West Medical Center (RWMC) Portal in late 2006 and early 2007. In general, the providers indicated interest in using the RWMC Portal and said it would be useful for their work. Approximately 97 percent of the providers who responded to the survey indicated that they planned to use the RWMC Portal within the next 6 months. A preliminary analysis of the portal data indicates that relatively few providers actually used the RWMC portal during the initial period. However, at the end of 2008, portal use appears to have maintained a fairly steady pattern of use.

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### **Selected Outputs**

Carrell B. Panhandle Collaborative Exchange. ACCESS, Newsletter of the Nebraska Office of Rural Health Association. May 2008; 51:5.

Woods K. Western Nebraska Health Information Exchange Closer to Reality. ACCESS, Newsletter of the Nebraska Office of Rural Health Association. October 2007; 49:3.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project was granted a no-cost extension to allow additional time to complete its work to execute all needed aspects of the health IT implementation.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

**Project Title:** Using Electronic Data to Improve Care of Patients with Known or Suspected Cancer

**Principal Investigator:** Singh, Hardeep, M.D., M.P.H.

**Organization:** Baylor College of Medicine

**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)

**Grant Number:** R18 HS 017820

**Project Period:** 09/08 – 09/11

**AHRQ Funding Amount:** \$1,199,531

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Dr. Singh and his team launched their project in late September 2008. This project proposes to test the use of health information technology (IT) to identify and intervene for patients where the diagnosis and treatment of cancer has been delayed and to facilitate their movement through the health care system. The project team will develop, test and refine queries to mine a clinical data warehouse for triggers that might signal delays in care, harvesting data from the Veterans Administration's (VA) electronic health record (EHR), the Computerized Patient Record System (CPRS), maintained by the Veterans Health Information Systems and Technology Architecture (VISTA), and the Scott and White Health system's EHR, EMRx, from Synthesis Technologies, Inc. They will test, using a prospective randomized, controlled trial, whether health IT-based interventions can reduce care delays relative to usual care. The study team proposes to use data warehouses both within and outside the VA setting. These data warehouses contain clinical information such as visits, test results, cost data, demographic information, and other fields. The queries being developed to operationalize the triggers will be implemented using Structured Query Language (SQL).

### Specific Aims

- Identify patients with cancer-related diagnostic and treatment delays using 'trigger'-based data mining of an EHR repository. **(Ongoing)**
- Determine the effectiveness of a health IT-based intervention (consisting of the process described in Aim 1 followed by targeted electronic communication and surveillance techniques) to expedite cancer diagnoses and treatment initiation. **(Upcoming)**

**2008 Activities:** Dr. Singh and his team received Institutional Review Board (IRB) approval from both of their sites. Triggers are being tested and refined to extract data from the Scott & White Health System data warehouse. They have recruited all key personnel in Houston and have established the infrastructure needed in order to extract the data and securely store it at their facility.

**Preliminary Impact and Findings:** There are no key outcome findings because the project just started.

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**Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is generally on track, meeting 80-99 percent of milestones. Project spending is under spent by 5-20 percent. They anticipate using their full budget once the project is fully operational.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Using an Electronic Personal Health Record to Empower Patients with Hypertension
<b>Principal Investigator:</b>	Sodomka, Patricia, M.H.A., F.A.C.H.E.
<b>Organization:</b>	Medical College of Georgia
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017234
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,181,369
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The project, approximately mid-way through its scheduled duration, examines the feasibility, acceptability, and impact of an electronic personal health record (ePHR) for patients with hypertension. The project is using the Cerner PY-275131IQ Health ePHR under the Medical College of Georgia (MCG) Health brand name *My HealthLink*. To foster personal wellness and chronic condition management, *My HealthLink* allows consumers to log entries into their ePHR, track progress against their customized care plan developed by their provider, complete health assessments, securely communicate with their provider, access health education content, and check for interactions between medications.

The project team has included patients and families in the design of the ePHR to incorporate the experiences, perspectives, and insights of patients and their family members. The team enrolled patients from the MCG Medical Center and conducted two iterative pilot beta tests to test the modified ePHR. Each beta-test session had participants use the ePHR for 2 weeks. Subsequently, the project team has been conducting acceptability interviews and identifying themes from the feedback received. Throughout this process, the project team is working with the Cerner IT group to modify the ePHR. Once the modifications suggested by the beta-test participants have been fully incorporated, the project team will conduct a clustered, randomized, controlled trial to compare a group using *My HealthLink* with those receiving usual care. The team will evaluate the effectiveness of *My HealthLink* through questionnaires and biological measurements, including outcomes of: patient activation and perception of care; biological markers, specifically blood pressure, body mass index, and lipid levels; collaborative patient-physician communication; congruence of medication treatment with guidelines; and frequency of use of medical services. The team will also evaluate physician and staff perceptions of the ePHR and toward patient- and family-centered practices via surveys and in-depth interviews.

### Specific Aims

- Improve the application of patient- and family-centered care (PFCC) elements in an existing ePHR system. **(Achieved)**
- Implement and test the effectiveness of the revised ePHR, *My HealthLink*, with patients being treated for hypertension by a team of physicians, mid-level practitioners, nurse clinicians, and support staff in two ambulatory settings. **(Ongoing)**
- Monitor the shift in provider and support staff awareness and incorporation of PFCC concepts as a result of the implementation of the ePHR. **(Ongoing)**

**2008 Activities:** The project team has completed the two waves of beta tests. To accomplish this, the patients used the ePHR for 2 weeks, performing tasks assigned to them by the project team. The researchers then conducted in-depth interviews with the patients, revised the ePHR based on their feedback, and conducted another beta-test round using the same procedures. To collect feedback from a broader group of patients, the team held a national patient conference call to uncover themes pertinent to further enhancement of the ePHR. After a detailed analysis of the patients' feedback, the team worked collaboratively with Cerner personnel to prioritize, evaluate, and implement the appropriate changes.

In addition, the project team conducted a focus group with physicians to collect their insight on the intervention protocols and tool itself. To engage providers in the intervention, the team held meetings, Web conferences, and live demonstrations for physicians, nurses, faculty, and staff on topics such as study design, introduction to the ePHR, and workflow. To engage physicians further in anticipation of the intervention, physicians at the intervention sites were shadowed during their rounds by an ePHR expert to answer questions and solicit feedback on the best ways to incorporate the new technology into their workflow.

Other project activities completed in 2008 include an institutional survey designed to measure perceptions of PFCC among members of the MCG Health System via a simple random sample. Additionally, the project team developed various instructional materials, including the user manual, brochure, and public computer access map. In their recruitment efforts, the team has developed the recruitment protocols, conducted randomization of the physicians (serving as clusters within which the patients are nested), and began subject enrollment.

**Preliminary Impact and Findings:** No impacts or findings have yet been reported.

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### **Selected Outputs**

Institutional PFCC survey: measures perceptions of patient and family-centered care.

Internet Accessibility Questionnaire: measures computer experience, access, and Internet usage.

ePHR Tri-Fold: a tutorial highlighting the portions of the ePHR expected to have the highest utilization rate.

Public Access Computed Map: a map with public libraries and other locations that provide free Internet computer access to the public.

ePHR User Manual: an owners guide to *My HealthLink*, including screen shots and detailed instructions.

AHRQ 2008 Annual Conference presentation; Sept. 7-10; Bethesda MD.: Design of Patient-Centered Care Health IT: Patient Advisor Involvement in ePHR Design and Outcomes Research ([PowerPoint® File](#), 3.2 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** About 65-80 percent of the project's milestones are being met, but there is a viable plan for achieving the others. Enrollment of subjects under Aim 2 began roughly 6 months later than anticipated due to the need for extra time to make the product changes requested by the two patient advisors. Enrollment plans have been adjusted in discussion with the AHRQ project officer with the intent of continuing to enroll subjects beyond the initially planned time period. Other than this delay, the project is on track. The project is significantly under spent because, initially, spending for salaries was slightly behind schedule, and a consulting invoice was paid later than anticipated. The project's current spending is approaching the original budget plan.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Enabling Sleep Apnea Patient-Centered Care Via an Internet Intervention
<b>Principal Investigator:</b>	Stepnowsky, Carl, Ph.D.
<b>Organization:</b>	Veterans Medical Research Foundation
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017246
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,155,062
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The project develops and evaluates an integrated remote monitoring device and Internet-based portal for patients with Obstructive Sleep Apnea (OSA) syndrome who are prescribed continuous positive airway pressure (CPAP) treatment. This project, approximately mid-way through its progress, evaluates the intervention’s effect on patients’ experience of care, CPAP adherence, and OSA outcomes.

OSA is a common sleep apnea caused by obstruction of the airway that is treated with a CPAP flow generator, a machine that blows air at a prescribed pressure, determined by a physician, into a facemask or nasal pillow. The team is using the ResMed developed ReStraxx Data Center (RDC), a wireless monitoring module that affixes to and transmits data from the CPAP flow generator. The objectively measured adherence data from the RDC will be transmitted to both patient and provider and used as the central outcome measure to evaluate the intervention. The provider portal contains information such as: 1) adherence, 2) amount of air leaking out, and 3) number of apneas/hypopneas per hour. With this information, the provider can monitor the patient’s progress, as well as make a decision to contact the patient and/or alter their treatment plans.

The team organizes the data provided by the RDC into user-friendly pieces of information provided to the patient through the Internet Positive Airway Pressure (i-PAP) patient portal. In addition, to monitor the automatically generated indicators, the portal also contains tailored measures that the patients can observe over time as well as the capability to add self-defined measures. The i-PAP patient portal contains a learning center with information on sleep apnea and the CPAP device; charts indicating adherence, efficiency data, and changes in weight, sleepiness, and physical activity over time; a troubleshooting instruction guide regarding the CPAP device; self-assessment materials, including research surveys; a journal for self-documentation; a message board for users to interact with a support network of other CPAP users; and links to external sources of additional information on sleep apnea.

The project is conducting a randomized, controlled clinical trial to evaluate the effects of the interactive portion of the CPAP treatment. Both the usual care group and the i-PAP patients will be provided with the CPAP devices and education materials on OSA. The trial will evaluate the effect of having the Internet-based portal to facilitate the free flow of information and communication between providers and patients in addition to the CPAP device. The team will evaluate whether the i-PAP intervention has an effect on OSA-related outcomes, CPAP adherence, the patient-centeredness of care, patient assessment of and satisfaction with care, patient activation, and other measures. In addition, the team will evaluate the

possible mechanisms that account for those impacts, through indicators such as use of the Web site and frequencies/nature of clinical contacts.

### **Specific Aims**

- Examine the effect of the i-PAP intervention compared to usual care on the patient's experience of the quality of patient-centered, collaborative care. **(Ongoing)**
- Examine the effect of the i-PAP Internet intervention compared to usual care on the level of CPAP adherence. **(Ongoing)**
- Examine the effect of i-PAP compared to usual care on obstructive sleep apnea outcomes. **(Ongoing)**
- Perform a basic cost analysis of the i-PAP intervention compared to usual care, applying a micro-cost methodology of measuring the quantity of inputs used in the production of care and the unit cost of each. **(Ongoing)**

**2008 Activities:** The project team conducted a thorough environmental scan of existing interactive materials on sleep apnea and CPAP. The team has selected assessment instruments and study procedures based on their findings as well as interactions with software programmers and experts in the field. The online assessments have been created and undergone extensive validation and quality improvement procedures, including: development of the user interface; determination of the navigation process through the i-PAP; and development of the i-PAP portal functionalities. This has included moving from a text-based to a more user-friendly Web site, simplifying the Web portal's layout, and automating some of CPAP troubleshooting process. The team developed a speaking virtual assistant to provide additional support to patients using the Web site, in addition to a series of instruction guides. The project team worked with ResMed to finalize the procedures for automated CPAP adherence and efficient data transmission. Specific data management procedures undertaken include quality assurance measures, pilot tests of completion and transmission of online surveys, and building the tracking components for the project team.

Beginning in September 2008, the project team has been actively recruiting and enrolling study participants. As of April 13, 2009, the project has enrolled 59 participants into the study.

**Preliminary Impact and Findings:** Preliminary findings from the team's review of sleep apnea and CPAP Web sites identified over 90 websites and coded 49 of them for descriptive and evaluative variables. The project team is reviewing the information for type of interactivity. Preliminary findings suggest that less than five Web sites had any interactive content, and only one had graphical interactive content. No data analyses have been performed on the main study.

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### **Selected Outputs**

Overview of "Web 2.0" as Applied to Healthcare. Veteran's Health Administration (VA) San Diego Healthcare System's Health Services Research & Development Service Monthly Scholarly Conference; 2008 March; San Diego.

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**Grantee's Most Recent Self-Reported Quarterly Status:** About 65-80 percent of the project's milestones are being met, but there is a viable plan for achieving the others. The project is behind in their recruiting targets, as unplanned additional time was spent in the development and refinement of the patient portal. The study is now recruiting at the planned rate of 12 new participants per month. The project does plan to enroll at a higher rate to make up for a later-than-planned enrollment start date. The project's budget was under spent at one point. The bulk of this was due to the lagging of actual payments for personnel agreements, which leads to actual expenses paid being recorded at a lesser value than they

should. The project team anticipates that the current year's budget is an appropriate projection of aggregate actual spending.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Patient-Centered Online Disease Management Using a Personal Health Record System
<b>Principal Investigator:</b>	Tang, Paul, M.D.
<b>Organization:</b>	Palo Alto Medical Foundation
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017179
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,158,401
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This study, approximately mid-way through its progress, expands on the project team’s prior work in developing a Personalized Health Care Program (PHCP) that actively supports a partnership between the patient and his/her multidisciplinary care management (CM) team using an online disease management (ODM) system. This CM team includes a nurse diabetes care coordinator, a clinical pharmacist, a nutritionist, and the patient’s physician(s). The ODM system is integrated with Epic Systems’ EpicCare (Epic version Spring 2007), a comprehensive, Certified Commission for Health Information Technology (CCHIT) certified electronic health record (EHR) system. Patients of the Palo Alto Medical Foundation (PAMF) have access to an integrated personal health record (PHR), PAMFOnline, which is a customized version of Epic Systems’ *MyChart* PHR. PAMFOnline provides patients with a health summary from their EHR (diagnoses, medications, allergies, lab test results with physician annotations, immunizations, and a health maintenance schedule); physician-endorsed information resources about health topics; the ability to request a prescription renewal or appointment; a list of pending appointments and lab orders; and private notes patients enter themselves, which are not visible to the clinical staff. In addition, patients can communicate electronically with their health care team.

The EMPOWER-D (Engaging and Motivating Patients Online With Enhanced Resources—for Diabetes) study applies the PHCP tools to support patients with type 2 diabetes. Using a specially designed wireless adaptor that attaches to their glucometer, patients can wirelessly upload their glucometer readings to their PHR from anywhere. When they log into PAMFOnline, they can view the information graphically and correlate their glucose trends with other information about their health behavior (e.g., diet, exercise, medication use). Working from a shared action plan developed specifically for each individual, the patient works with the CM team, primarily using online communication, to adjust their medications or make further lifestyle changes. Custom-tailored “nuggets” of patient education and advice are “dispensed” to a patient based on his/her specific clinical situation (e.g., responding to uploaded glucose readings, nutrition logs, test results, or patient questions). These “nuggets” can be personalized text, videos, graphs, or hyperlinks on topics such as hypoglycemia, controlling food portions, and exercise. The project team also provides a Diabetes Summary Report that consolidates all the relevant information pertaining to their diabetes in a single report. Importantly, the report correlates the patient’s specific action plan with their risk of major complications of diabetes (e.g., stroke, kidney failure, heart attack, blindness).

The project team is evaluating the ODM program for diabetes as compared to usual medical care in a two-arm randomized, controlled trial (RCT) at PAMF. To be included in the trial, patients must have inadequately controlled type 2 diabetes, defined as hemoglobin A1c (HbA1c) >7.5 percent, and be without severe complications. The primary hypothesis under evaluation is that patients in the intervention arm will have lower HbA1c at 12 months post-randomization than those receiving usual medical care. Secondary hypotheses are that, compared with usual medical care, the intervention will be associated with improved self-management practices (e.g., medication adherence, home monitoring of glucose and blood pressure, diet, and exercise); improved biologic measurements such as blood pressure and lipids; better processes of care (e.g., frequency of monitoring tests); lower cardiovascular risk; enhanced patient experience and satisfaction with care; and improved patient psychosocial well-being. These measures will be assessed in both groups by lab testing, EHR data extraction, and an online questionnaire at baseline, 6 months, and 12 months post-randomization.

### Specific Aims

- Refine the PHCP platform with a particular focus on enhancing the customization capability of the ODM system and ensuring a seamless incorporation of ODM into the work flow of clinicians on the CM team and with the self-management process of patients. **(Achieved)**
- Evaluate the ODM program for diabetes, relative to usual medical care, in a two-arm RCT. **(Ongoing)**
- Disseminate results of the RCT in the scientific literature and deploy the PHCP program in PAMF and other ambulatory care settings for use with diabetes and other chronic conditions. **(Upcoming)**

**2008 Activities:** For the initial groundwork activities, the project team obtained institutional review board (IRB) approval of study protocols, materials and clearance to access EHRs; developed the Data and Safety Monitoring Board Charter, presentations, and paper-based materials for orienting PAMF clinicians to the study; and conducted presentations at several sites. The team enhanced the online intervention and conducted alpha and beta testing of two versions of the system with diabetic patients, making additional changes based on the patients' feedback.

The project team has begun recruitment and enrollment into the trial, but has experienced much slower enrollment than expected due to a diabetic population that is 40 percent better controlled than the national benchmark. In response, the project team modified the recruitment procedures and expanded the pool of potential participants to include another geographic location, the Santa Cruz Medical Clinic, which recently merged with the Palo Alto Medical Clinic.

**Preliminary Impact and Findings:** From beta tests, patients valued their relationship with the nurse diabetes care coordinator and the comprehensive patient-specific risk information in the Diabetes Summary Report, and found online messaging a convenient and efficient alternative to phone calls. Patients commented that starting with manual entry of glucometer and health behavior data provided valuable insights about changes in glucose readings in relation to their dietary intake and physical activity. Following the initial learning period, they valued the efficiency gained through wireless uploading of glucose readings, which makes it easier for them to continue measuring and uploading their readings on a sustained basis.

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### Selected Outputs

Goknar E. Innovative online diabetes management program will launch in May. *Healthcare Journal of Northern California*. December 2007.

Bohan S. Online diabetes care shows promise. Oakland Tribune. November 5, 2007. Available at: [http://findarticles.com/p/articles/mi\\_qn4176/is\\_20071105/ai\\_n21089015/](http://findarticles.com/p/articles/mi_qn4176/is_20071105/ai_n21089015/). Accessed June 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project has experienced an unanticipated challenge in finding enough diabetics who are not adequately controlled. The project team has expanded their geographic sites for recruitment and modified their recruitment procedures. The revised recruitment process has significantly increased the efficiency and yield of recruitment.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Electronic Prescribing and Decision Support to Improve Rural Primary Care Quality
<b>Principal Investigator:</b>	Veline, James, M.S., M.A.
<b>Organization:</b>	Avera Health
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017149
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,181,866
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The purpose of Avera Health’s Improving Quality Through the Use of Electronic Prescribing with Electronic Decision Support project is to examine whether, in rural ambulatory care settings, the use of an electronic prescribing (e-prescribing) system with clinical decision support related to medication management increases patient prescription adherence, improves health outcomes in hypertensive patients, and improves the medication management process. As part of its overall Avera HealthCARE™ Initiative, the health system is working with twenty-eight hospitals and one hundred sixteen clinics to implement a regional electronic medical record (EMR). The technology package will include advanced e-prescribing software that provides physicians the capacity to track the fill status of prescribed medications, as well as provide interaction alerts, formulary listings, dosing options, patient medication history, and printed wallet-size medication lists. The study examines the impact of the technology on the medication management of hypertensive patients in nine rural/frontier primary care facilities. The project will focus on the following health information technology (health IT) systems:

- DrFirst Rcopia electronic prescription management system as a stand-alone product
- DrFirst Rcopia integrated within the Meditech/LSS Medical EMR and Practice Management (MPM) Suite, the electronic health record (EHR) system being implemented by Avera Health in the ambulatory setting. The Meditech/LSS EHR Includes Zynx Health decision support technology and is certified by the Certification Commission for Healthcare Information Technology (CCHIT).

The project takes advantage of a staged implementation, first gathering baseline measures, then tracking clinics using e-prescribing as a stand-alone tool before moving to an EMR, and those clinics moving directly to the EMR with integrated e-prescribing. To examine whether patient prescription adherence improves, medical claims data and the e-prescribing patient-fill histories will be used. Improved outcomes will be measured in blood pressure levels and changes in treatment for patients with blood pressure over 140/90. Patients and providers in rural communities face unique challenges with medication management. The long-term goal is to determine if and how health IT helps overcome these obstacles. This study is based on the observation of a “natural” process of disseminating and implementing a set of health IT innovations to rural clinics in the Avera Health system. As such, the experiment can be characterized as a

quasi-experimental design with opportunistic, non-random assignment of clinics to the experimental condition.

### Specific Aims

- Improve the rate of patient adherence to prescribed medications among hypertensive patients in rural communities. **(Ongoing)**
- Impact adherence to prescribed medications among hypertensive patients through use of e-prescribing tools in rural care settings. **(Ongoing)**
- Impact health outcomes for hypertensive patients in rural communities through the use of e-prescribing and associated clinical decision support tools. **(Ongoing)**
- Enhance patient and provider satisfaction with the e-prescribing tool. **(Ongoing)**
- Overcome barriers to successful adoption of e-prescribing. **(Ongoing)**

**2008 Activities:** During 2008, one-way interfaces were created to transmit patient demographic information from the Mysis, LSS, and ASPC practice management systems to DrFirst, an e-prescribing tool. Therefore, as new patients are added or as existing patients are updated in the practice management systems the information will automatically be added/updated in DrFirst. The interfaces help facilitate an efficient workflow, as office staff are not required to add/update information in both the clinics' practice management systems and DrFirst.

In addition, the project team has successfully implemented DrFirst Rcopia e-prescribing in all participating clinics. First, the project team created numerous test scenarios, which will run through the DrFirst test engine and compare actual calculated metrics to expected outcomes. The project completed user acceptance testing, is enabling the enhancements for a few pilot providers in production, and will monitor results. Additionally, the project receives weekly files containing prescriptions with matched claims data. The project team has several test scripts written to ensure all of the business requirements relative to the data have been met. The next step is for the trainers to train the clinics on how to use the compliance and adherence enhancements messages to improve the quality of care they provide.

Finally, the project team has successfully completed collecting baseline patient and provider satisfaction data. To date the response rate to the Patient Satisfaction Survey is 46 percent, significantly more than we expected. Baseline data collection will begin soon on the remaining metrics.

**Preliminary Impact and Findings:** The project team has collected information from the participating pharmacies. First, pharmacies have reported a number of errors being transmitted. Most of the errors reported are due to incorrect product selection or improper use of text fields by the clinics. The project team continues to work with the clinics to ensure proper use of the system, but many errors are introduced simply by slight of hand, as it can be difficult to use a mouse and select the correct product, strength, etc., from small drop down boxes. E-prescribing is thought to improve quality and reduce dispensing errors. There appear to be fewer data entry errors by pharmacies. However, if the potential for error has shifted to a different step in the process, the real impact e-prescribing has on quality remains in question. Additionally, pharmacies are reporting a lack of interoperability. In an ideal e-prescribing transaction, the dispensing pharmacist should be required to perform little to no data entry. However, pharmacists are often required to enter much of the prescription data, as e-prescribed data is not matching data in the pharmacy dispensing software. Finally, although e-prescribing transactions are typically delivered to the dispensing pharmacy in a matter of minutes, pharmacies have experienced transmissions taking in excess of 45 minutes. This can be especially problematic in rural areas. In fact, it is conceivable that a patient may arrive at the pharmacy before the e-prescription in a rural community if the pharmacy is located near the clinic and the prescription arrives just 10 minutes after transmission.

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## **Selected Outputs**

Baseline Patient Satisfaction Survey Report: Evaluators reported on the results of the baseline Patient Satisfaction Survey.

### Local Reports

- AHRQ metric reference: crosswalk of AHRQ measures being calculated by grantee.
- Avera Total eRxs per week: Total eRxs issues per week across all clinics.
- Avera Compliance Blueprint: The business requirements for the study data and compliance and adherence enhancements.
- Avera C&A User Guide: Most current draft of training material for compliance and adherence enhancements.
- Average Rxs per provider per week: Average eRxs per provider per week across all clinics.
- eRx Style of Use: A graphical display of how DrFirst is being used.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 100 percent of its milestones; the project is on time on all tasks.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Using Information Technology for Patient-Centered Communication and Decisionmaking about Medications
<b>Principal Investigator:</b>	Wolf, Michael, Ph.D.
<b>Organization:</b>	Northwestern University
<b>Mechanism:</b>	RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
<b>Grant Number:</b>	R18 HS 017220
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,199,997
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The overarching objective of this multi-component intervention is to develop a protocol to reconcile medications through the phases of the patient-provider clinical encounter. The project, approximately mid-way through its progress, provides patient education materials and medication lists automatically extracted from the Certification Commission for Healthcare Information Technology (CCHIT) certified Epic Systems' electronic medical record (EMR), which is known as EpicCare (Epic version Spring 2007 IU 2), to patients as they check into the multi-specialty, primary care center for their physician visit. Patients then review the medication information contained within the system, indicating if there are any discrepancies or if they have any related questions or concerns. The nurse reviews patient-provided information and places the output into the rooming sheet for the physician. The physician will then clarify any issues with the patient, update the patient's medication list in the EMR, and, if prescribing a new medication, the system will automatically generate a plain-language medication information sheet for the patient. The information sheet is automatically generated through project-developed dot phrases (system macros that automatically fill in descriptive text prompted by key words) in the EMR, an enhancement to the functionality of the pre-existing Epic EMR.

The clustered, controlled clinical trial will be randomized at the “pod” level, as the clinic is organized into four areas (“pods”) with separate nursing staff and physicians. Through the post-visit interviews and data extracted from the EMR, the project will measure outcomes such as post-visit discrepancies in the medication list and the patient's functional understanding of their medication regimen, questions on adherence and safety, as well as a series of process measures to assure that the intervention is translatable to other organizations.

### Specific Aims

- Develop and test a multimedia program (which has been since revised to an educational print piece) to help patients understand the importance of both giving and receiving accurate information about medications (Pre-Visit Patient Intervention). **(Ongoing)**
- Use the EMR to encourage patient-centered medication management and extend the EMR medication management capability by training nurses to engage in a patient-centered review of *current medications* immediately before a patient sees the doctor. Leverage the EMR by developing a template that physicians can easily access and display on-screen to engage in a patient-centered discussion about *new medications* under consideration. **(Ongoing)**

- Work with the Practice-Based Research Network to disseminate and track the use of effective interventions, and create pathways for facilitating national distribution to other practices. **(Upcoming)**

**2008 Activities:** The team has created a physician-patient working group and conducted a series of focus groups with patients to collect feedback on both medication information sheets and patient education materials. The team developed content for a patient education DVD, and subsequently decided that it would be more feasible, effective, and disseminable to use the content in print materials provided to the patient upon check-in for their doctor's visit. After this decision, the team developed a folder of general medication management and tailored informational materials for patients. The tailored materials include medication information sheets automatically generated through dot phrases in the EMR. The team has developed low-literacy, plain-language content describing the medication's purpose, dosage instructions, side effects, and proper responses for patients for 400–500 of the top prescribed medications. The content and medication reconciliation protocols were developed through an iterative process, incorporating feedback from patients, physicians, pharmacists, IT specialists, health literacy experts, and other key informants. The team has pilot-tested Phase One of the reconciliation process and completed data collection from 200 patients for their baseline data.

**Preliminary Impact and Findings:** The baseline data collection was completed and the data have been analyzed. Preliminary findings showed that 50 percent of participants indicated a medication discrepancy where at least one medication on their medication list was one that the patient was not actually taking. Another 50 percent indicated that they were taking a medication on the printout in a manner differently than it was listed. Five percent of patients indicated taking a prescription that was not listed on the printout at all, out of 35 percent who indicated taking either an over-the-counter or prescription medication that was not listed.

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### **Selected Outputs**

The team has developed prototype print materials to support patients' ability to engage in a medication review and reconcile medications at the time of the encounter.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The team is in the process of remediating the under spending. Modifications to the protocol have been finalized, and the materials for the intervention have been purchased (four large printers for clinics and myMeds medication folders). A candidate has been selected to fill the position of research assistant (to replace the budgeted study nurse, who is no longer needed under the new protocol), beginning in May 2009.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Taconic Health Information Network & Community (THINC)
<b>Principal Investigator:</b>	Blair III, A. John, M.D.
<b>Organization:</b>	Taconic Independent Practice Association (TIPA)
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015316
<b>Project Period:</b>	09/04 – 03/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,500,000
<b>Summary Status as of:</b>	March 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** The Taconic Independent Practice Association (TIPA), formed in 1989, is a not-for-profit health care corporation, and, at the inception of this grant, had a network representing over 3,000 physicians in 9 counties of southeastern New York State. TIPA physicians were located in over 600 offices ranging from solo practitioners in rural areas to large multi-specialty, multi-location practitioners in urban areas with an average of 3 practitioners per office. In 2001, TIPA completed the initial plan for the deployment of the Hudson Valley Health Information Exchange (HVHIE). The initial stakeholders were MVP Healthcare (MVP), Vassar Brothers Medical Center, Kingston Hospital, MDS Laboratories, and 50 TIPA physicians. The project was to leverage a 3-year effort to bring health information technology (IT) to the Hudson Valley of New York. Fifty providers from a large physician organization made up of independent practitioners, a regional health plan, three hospitals, and a reference lab were key stakeholders in a regional health information exchange (HIE). This grant project anticipated adding a longitudinal viewing capability to the then-existing community-wide data exchange (CWDE) portal. A uniform implementation of ambulatory electronic medical records (EMRs) was completed. Also, the project engaged multiple payers in addition to MVP for incentive payments for technology adoption. Finally, a formal research project was performed to evaluate the project.

### Specific Aims

- 10 participating hospitals in the CWDE. **(Ongoing\*)**
- 500 physicians using EMR. **(Achieved)**
- 500 physicians using clinical messaging application. **(Achieved)**
- Two participating laboratories in the CWDE. **(Achieved)**
- Five payers participating in pay-for-performance initiative. **(Achieved with THINC RHIO)**

*\* This aim was not completed prior to schedule conclusion of the grant March, 2008, yet, as other sources of funding have been secured, it is still targeted for completion.*

**2008 Activities:** Findings regarding use of EMR, particularly the lab result-viewing functionality, were published. Results of the study of electronic prescribing systems are currently being analyzed and prepared for publication.

**Preliminary Impact and Findings:** Interfaces that had been built over the 3 years prior to this grant were able to be used in introducing a new HIE system; this reduced the typical implementation time from

12 to 3 months. Once an HIE is built, good strategic planning will allow leveraging of existing infrastructure with savings of time and money when adding new functionality. End-user involvement is critical for the success of deploying new technology in the community and is necessary in the decisionmaking process of choosing new functionality. The current rate of adoption is 36 percent, with 37 percent in group practices with under 6 physicians. These figures represent a doubling of EMR penetration during the time of this project, with small practices in the region catching up with the rest of the region. The higher rate of EMR adoption by small physician practices in this project is believed to be attributable to the low up-front cost structure and implementation approach. The enhanced and ongoing combined implementation and support method is possible due to the concentration of users and support staff within the community. Although these results are preliminary, they raise questions about the traditional national EMR vendor implementation approach, and whether that approach may be a factor in the low EMR adoption rate for small physician practices. Survey results suggest that electronic laboratory result viewing was independently associated with higher ambulatory care quality; future longitudinal studies are needed to confirm this association. Stand-alone electronic prescribing with clinical decision support significantly reduced the rate of errors and is an important tool for reducing ambulatory medication error rates.

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### **Selected Outputs**

Kern L, Barron Y, Blair AJ 3rd, et al. Electronic result viewing and quality of care in small group practices. *J Gen Intern Med* 2008;23(4):405-10

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**Grantee's Most Recent Self-Reported Status:** This grant has been completed. The major aims of project and supporting data collection are complete. Data from the e-prescribing system/prescription error study are still being analyzed and prepared for publication. The organization THINC Regional Health Information Organization (RHIO), which had arisen during the course of the project to promote multi-payer collaboration, continues to function independently of this grant, and it has begun work on a new project encouraging the development of National Committee for Quality Assurance-accredited medical home practices in the area.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Showing Health Information Value in a Community Network
<b>Principal Investigator:</b>	Lobach, David F., M.D., Ph.D., M.S.
<b>Organization:</b>	Duke University
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015057
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,487,072
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** The use of health information technology (IT) has been identified as a promising strategy for improving the quality of health care. However, little is known of the specific benefits of using health IT to share information in a community setting using a population health management care model. The purpose of this project was to: 1) increase knowledge and understanding regarding the value of health IT at clinical, organizational, and financial levels within a community partnership focusing on care management of a vulnerable population; 2) to determine its value to various stakeholders; and 3) to demonstrate a generalizable approach to health IT in a community setting that can be replicated at other sites. A study population of 20,108 Medicaid beneficiaries in Durham, North Carolina, was randomly assigned by family unit to receive either health IT-augmented care or usual care. For the intervention group, sentinel health events were detected using a standards-based clinical decision support tool that conducted routine surveillance on a centralized regional health information exchange database. Events are grouped as events of commission (i.e., reflecting an activity done by a patient) that were the target of Phase 1 of the study; events of omission (i.e., reflecting activities neglected by a patient such as preventive health services) that were the focus of Phase 2; and events self-reported by patients through questionnaires on health risk and barriers to care access completed by patients on free-standing public kiosks. During the study period, less than 150 patient-reported events were detected from all of the possible question responses from the 4 kiosks in Durham County, so these findings are not included as part of the analysis due to small sample size. Notifications were sent to patients' assigned care managers through weekly e-mails, to patients' assigned clinical homes via quarterly feedback reports, and to patients directly through weekly postal letters. The impact of the three notification methods on emergency care use, hospitalizations, and care quality was compared to usual care and to each other using regression model techniques. Patient satisfaction and quality of life were assessed using the Computer Assessment of Healthcare Providers and Systems (CAHPS®) and the EuroQoL survey instruments, respectively. Provider opinions were assessed using validated survey instruments for assessing usability.

### Specific Aims

- Evaluate the clinical, organizational, and financial value of health IT in a community network from a societal perspective. **(Achieved)**
- Evaluate the value of health IT in a community network from the perspective of specific stakeholder groups. These groups include patients, providers, hospitals, payers, and purchasers. **(Ongoing\*)**

- Disseminate the design of our community-based health information network, the techniques of our intervention approaches and the results of our evaluation to interested stakeholders. **(Ongoing\*)**

*\* Some aims of the grant were not completed prior to conclusion of the AHRQ funding period in August 2008. Yet, since other sources of funding have been secured, these aims are still targeted for timely completion.*

**2008 Activities:** Data collection continued through the middle of 2008. Data for the primary and secondary outcomes were obtained from claims data from the North Carolina Department of Health and Human Services. Analyses were delayed by at least 6 months after the completion of each study phase to ensure that the claims dataset was complete and stable. As a consequence of these delays, preliminary analyses have not been performed for all phases, but the completed and verified analyses from Phase 1 provide the primary content for this report. After further validation and sub-analyses, the results from the subsequent phases will be submitted for peer reviewed publication.

**Preliminary Impact and Findings:** The primary finding from this investigation is that e-mail notices sent to care managers weekly regarding sentinel health events—a diagnosis for an individual that may indicate a broader need for preventative care—can lower emergency department use for low-severity issues. These notifications are well-received by care managers and are reported to enhance productivity. In contrast, feedback reports sent quarterly to clinic managers did not impact emergency department (ED) use or hospitalizations, nor did letters sent to patients. None of the interventions appeared to have a significant verifiable impact on health care costs or quality. No deterioration of quality was detected in the setting of reduced ED utilization for low severity issues.

With regard to this study's primary stakeholders (patients, providers, hospitals, payers, and purchasers), the net effect of the intervention was to decrease emergency department use and inpatient reimbursements (for ED and hospital care) for patients randomized to the group whose care managers received weekly email notifications about sentinel events. There were no hospital effects for patients in the two other intervention groups. There also was an increase in outpatient costs; however, these were for mental health services that were not associated with the interventions provided in this study. The cost changes observed in this study were associated with reductions in co-payments for study patients randomized to care manager notices and with increases in payer reimbursements for patients randomized to patient letters. The net results on stakeholder groups are that patients may get more appropriate care, which could mean higher quality; providers could see patients in more appropriate settings and feel that they are delivering better care; hospitals (and their EDs) may save money by handling fewer Medicaid cases; and payers and purchasers experience no benefits or detriments because there were no net changes in total costs.

CAHPS-Medicaid patient surveys were completed by 146 adults and on behalf of one 174 children by a parent or guardian. There were no statistically significant differences except that adult respondents in the control group indicated a greater need for specialists relative to the intervention group ( $p=0.0393$ ). The EuroQol quality of life survey was completed by 143 adults. When compared with the combined intervention groups, the control group had higher scores for pain/discomfort ( $p=0.0379$ ) and for anxiety/depression ( $p=0.0237$ ). Several valuable lessons were learned through the development, implementation and operational support of this population health management system. In the area of system development, resolving political issues related to the exchange of clinical information and identifying resources to implement the data exchange are often more challenging and time consuming than the technical aspects of information exchange. However, once the exchanged information was in use for proactive care management, clinical sites began to offer their information to the HIE so that they could reap the benefits of the proactive care notices.

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## Selected Outputs

Lobach DF, Kawamoto K, Anstrom KJ, et al. Development, deployment and usability of a point-of-care decision support system for chronic disease management using the recently-approved HL7 Decision Support Service Standard. *MedInfo 2007*;861-5.

Lobach DF, Silvey G, Willis J, et al. Coupling direct collection of health risk information from patients through kiosks with decision support for proactive care management. *AMIA Annu Symp Proc 2008*;429-33.

Eisenstein EL, Lobach DF, Montgomery P, et al. Evaluating Implementation Fidelity in Health Information Technology Interventions. *AMIA Annu Symp Proc 2007*;211-5.

Lobach DF, Kawamoto K, Anstrom KJ, et al. Proactive population health management in the context of a regional health information exchange using standards-based decision support. *AMIA Annu Symp Proc 2007*;473-7.

Eisenstein EL, Ortiz M, Anstrom KJ, et al. Assessment of the quality of medical information technology economic evaluations: room for improvement. *AMIA Annu Symp Proc 2006*;234-8.

Eisenstein EL, Anstrom KJ, Macri JM, et al. Assessing the potential economic value of health information technology interventions. *AMIA Annu Symp Proc 2005*;221-5.

Kawamoto K, Lobach DF. Design, implementation, use, and preliminary evaluation of SEBASTIAN, a standards-based Web service for clinical decision support. *AMIA Annu Symp Proc 2005*;380-4.

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**Grantee's Most Recent Self-Reported Status:** Data collection and some preliminary analyses are complete, including all analysis of Phase 1. Further conclusions will be disseminated through peer-reviewed publication and other mechanisms as they are developed. All principal aims of the project are complete or on track to be completed. During data validation efforts, missing claims data were discovered in the master Medicaid dataset. Collaboration with state employees eventually resolved these errors, but these incidents illustrated the need to defer analysis of all data until they can be confirmed to be complete, delaying analysis by several months.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

**Project Title:** Valuation of Primary Care-Integrated Telehealth  
**Principal Investigator:** McConnochie, Kenneth M., M.D., M.P.H.  
**Organization:** University of Rochester  
**Mechanism:** RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)  
**Grant Number:** R01 HS 015165  
**Project Period:** 09/04 – 09/08, Including No-Cost Extension  
**AHRQ Funding Amount:** \$1,464,778  
**Summary Status as of:** September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** Childhood illness places parents in a difficult situation. One study found that a child's illness accounted for 40 percent of missed work for parents of young children. Another study, based on a nationally representative sample of working women, found that only 39 percent had someone they could call on to help with childcare the next time their child is sick. Most women reported either that they would need to miss work (49 percent) or that they would not know what to do (7 percent) if this occurred. Work absence due to care for a sick child means loss of pay for most women of lower socioeconomic status. Inner city parents may jeopardize employment by leaving work as demanded. Other parents, anxious to keep jobs that they cannot afford to lose, try to avoid or delay picking up their child, or they hasten the return of ill children to childcare.

Childcare programs and elementary schools have the difficult responsibility of determining whether to exclude a child due to illness. Almost all childcare programs and schools in Rochester adhere to recommendations of the American Academy of Pediatrics (AAP) and the American Public Health Association (APHA). While the AAP/APHA recommendations have been thoughtfully crafted to reduce the spread of serious infectious disease and encourage treatable children to seek medical attention, exclusion policies are subject to judgment, and the decision to exclude a child because of illness is often a source of tension between childcare staff and parents. Prevailing policies often require an office visit for a physician to certify readiness for return to childcare.

The project's telemedicine network is intended to address these problems. Health-e-Access (HeA) was chosen as the name for this organizational innovation because HeA is essentially a form of communications infrastructure to facilitate access to health services. Accordingly, the organizational and technical design of HeA focuses on: establishing and sustaining access sites in convenient community locations, using information technology to enhance communication with clinicians in a remote location, and enabling connection with clinicians from the patient's own primary care medical home. In preliminary work, completed prior to the awarding of this grant, a study of five inner-city childcare programs demonstrated a large reduction in absence due to illness (63 percent) for children served by Health-e-Access. The Health-e-Access telemedicine model was designed to enable diagnosis and treatment decisions for acute problems that commonly arise in childcare and elementary school settings. Direct participants in telemedicine encounters include: a child with a health problem; a telemedicine assistant and sometimes a parent, all at the child site; plus a telemedicine clinician at a remote site. Visits are completed through real-time interactive (videoconference), store-and-forward, or both forms of

telemedicine. The clinician site may be located anywhere with broadband Internet access and modest personal computer equipment.

### Specific Aims

- Expand Health-e-Access (HeA) as a telehealth model. **(Achieved)**
- Assess the value of telehealth in child programs (childcare, schools) to the health care system. **(Achieved)**
- Describe the process of integrating telehealth in primary care and assess the value of integrated telehealth to both families and clinicians. **(Achieved)**

**2008 Activities:** The observation period for Health-e-Access continued through April 30, 2008. Subsequently, analyses were conducted and findings prepared for publication.

**Preliminary Impact and Findings:** The HeA Network expanded to include 22 child sites and 10 primary care practices serving the children at these sites. Child sites in the city included five childcare programs and seven elementary schools. Suburban child sites included five childcare programs and five elementary schools. The 10 medical practices were equally split between those located in city and suburban areas. Over the 7 years between May 1, 2001, when the first HeA visits were done and April 30, 2008, the end of the study observation period, 6,511 telemedicine visits were attempted. Analysis demonstrated strong, and largely expected, relationships ( $p < .001$ ) between several potentially confounding variables and utilization. An exception was the relationship between socioeconomic area and overall utilization rate for acute illness, where there was no statistically significant difference. In stark contrast to use for illness, emergency department (ED) use rates were significantly greater for inner city (57.2 visits per 100 child-years) and rest-of-city children (51.2) than for suburban children (15.6). Overall illness use rates, including both visits to traditional sites (ambulatory and ED visits) and telemedicine visits were 22.9 percent greater for intervention than control children (336.4 vs. 273.7 visits per 100 child-years). The higher overall use for intervention children is attributable to telemedicine use, at a rate of 83.6 per 100 child-years. Rates among the intervention group for ED visits and illness office visits, however, were 23.7 percent less (44.1 vs. 57.7 per 100 child-years) and 3.3 percent less (208.8 vs. 216.0 per hundred child-years), respectively, than those for the control group.

Parents were interviewed before and after experience with telemedicine to assess acceptance and satisfaction. The 896 completed surveys included 578 pre-telemedicine surveys and 318 surveys completed following at least one telemedicine encounter. Surveys were completed by 800 unique individuals. Both pre- and post-telemedicine surveys were completed by 96 respondents, allowing 96 pre versus post comparisons. Almost all (94.5 percent) of the 800 respondents identified a source of primary care for their children, and 57.4 percent of these primary caregivers were affiliated with HeA. Children with a primary care practice located in the city were much more likely ( $p < .001$ ) to use a primary care practice that participated in HeA than children using a suburban practice. On average, parents estimated the total time for a doctor's office visit, including transportation, was 2.44 hours. Among the 572 respondents working at the time of they were surveyed, 34.9 percent indicated they would lose pay when they missed work due to a child's illness. Among all 800 respondents, 61.3 percent had, at some time, picked up a child due to illness and 72.5 percent had, at some time, kept a child home from school or childcare due to illness. For parents who had missed work or school to pick up a child within the past 3 months, the estimated number of times averaged 1.79 and the estimate hours lost averaged 7.72. For parents who had missed work or school to keep an ill child home within the past 3 months, the estimated number of times averaged 1.77 and the estimated hours lost averaged 11.94. Open-ended questions revealed strongly positive attitudes and perceptions among the 318 respondents who had experienced telemedicine.

The impact of Health-e-Access, especially the 63 percent reduction in absence from childcare due to illness, is partly attributable to protocols and procedures adopted in telemedicine implementation rather than the technology itself. For example, lines of communication and expectations established through Health-e-Access encouraged child-site staff to engage clinicians and parents directly in useful communication, centered on management of the child's health problem on-the-spot, rather than simply requiring parents to remove their child from school.

Overall, this study validates commitment to family convenience as an effective means to decrease costs while improving access.

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### **Selected Outputs**

McConnochie KM, Wood NE, Herendeen NE, et al. Changes in the care pattern for illness visits due to telemedicine. *Pediatrics* 2009; (In Press).

Kopycka-Kedzierawski D, Billings R, McConnochie KM. Dental screening of preschool children using teledentistry: a feasibility study. *Pediatric Dentistry* 2007 May-Jun; 29:209-13.

McConnochie KM, Tan J, Wood NE, et al. Acute illness utilization patterns before and after telemedicine in childcare for inner-city children: a cohort study. *Telemedicine and e-Health* 2007;13:381-90.

McConnochie KM. Potential of telemedicine in pediatric primary care. *Pediatr Rev* 2006 Sep;27(9):58-65.

McConnochie KM, Conners GP, Brayer AF, et al. Differences in diagnosis and treatment using telemedicine versus in-person evaluation of acute illness. *Ambulatory Pediatrics* 2006; 6:187-95.

McConnochie KM, Conners GP, Brayer AF, et al. Effectiveness of telemedicine in replacing in-person evaluation for acute childhood illness in office settings. *Telemedicine and e-Health* 2006;12:308-16.

McConnochie KM, Wood NE, Kitzman HJ, et al. Telemedicine reduces absences due to illness in urban childcare: evaluation of an innovation. *Pediatrics* 2005;115:1273-82.

AHRQ 2008 Annual Conference presentation: Health-e-Access: Improving Care for Rochester's Vulnerable Children ([PowerPoint® File](#), 1.5 MB; [Web Version](#)).

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**Grantee's Most Recent Grantee Self-Reported Quarterly Status:** This grant has been completed.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

**Project Title:** Improving Rural Health Care: Implementing Innovative Integration Solutions

**Principal Investigator:** Sims, Thomas R., M.S.

**Organization:** Mt. Ascutney Hospital and Health Center

**Mechanism:** RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (TQHIT)

**Grant Number:** UC1 HS 016142

**Project Period:** 09/05 – 09/08, Including No-Cost Extension

**AHRQ Funding Amount:** \$792,324

**Summary Status as of:** September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** Mt. Ascutney Hospital is a progressive community hospital with five locations and approximately 500 employees serving a population of 30,000 patients. The hospital remained a member of the Dartmouth Hitchcock Alliance (DHA), a regional network of non-profit health care providers prior to and throughout the completed project. Historically, the hospital and its alliance partners have suffered from communication deficiencies, where inpatient and outpatient care facilities are unable to communicate with each other's information systems. Mt. Ascutney Hospital has implemented numerous information systems over the years to satisfy user efficiency, support departmental operations, track patient safety and care, and provide required reporting data to internal and external entities. Multiple billing systems are in place to accommodate payer rules for care provision activities and claims submissions. Individual departments leverage ambulatory care systems to meet their needs for documentation and work flow. The inpatient units maintain numerous systems, including paper charts, to document their care and patient education activities. Patient demographic and insurance information is maintained in each of these systems, thereby requiring the patient to be registered and have their information verified at each encounter to accommodate the numerous systems and reporting requirements.

A proof of concept of an enhanced health information technology (IT) system was achieved as a result of an AHRQ planning grant (RFA HS04-010, grant P20 HS14896) awarded to Mt. Ascutney Hospital in 2004. Through this proof of concept, the software and technology that supports this solution without the need to replace existing information systems was extensively tested and selected for its user customization features, quick time to go-live, low cost of sustainability, and user defined database and cross-platform capabilities.

The project was divided into three year-long phases as follows. First, implement the Provider Portal and the integration of data from two primary systems, the hospital information system (HIS) and the clinic electronic medical record (EMR) system, using a single sign-on and synchronized data. Then, integrate data from the picture archive communicating system (PACS) system and data retrieved from the portal, and integrate the Dartmouth Hitchcock Medical Center Clinical Information System (DHMC CIS) data and single sign-on to the clinical information system (CIS). Finally, evaluate, implement, and integrate other key internal and external systems deemed appropriate for the display and synchronization of data.

## Specific Aims

- Achieve interoperability of critical and disparate internal and external legacy information systems to reduce redundancy of patient registration activities at each encounter. **(Achieved)**
- Provide a single view of critical user- and enterprise-defined data elements that support the continuum of care and organizational operations. **(Achieved)**
- Eliminate or reduce the costs and number of vendor developed and supported interfaces. **(Achieved)**
- Provide patient context, single sign-on access to multiple systems to reduce the amount of time and keystrokes required to login and search for additional patient information prior to or during a patient encounter. **(Achieved)**
- Facilitate efficient reporting of patient management and care outcomes. **(Achieved)**
- Implement a strategic information system that is parallel to other active or planned initiatives and can send and receive electronic data when necessary. **(Achieved)**
- Provide internal and remote read-only access to the provider portal. **(Achieved)**
- Incorporate an information security model consistent with systems and organizational policies for user access to data. **(Achieved)**

**2008 Activities:** In 2008, the third phase of the project was undertaken—the identification and incorporation of additional internal and external systems. This stage was modified to incorporate the PACS system that went live in October 2007. Work to identify rules for data synchronization continued with a minimal set of demographic data identified as feasible to update automatically across systems. Data feeds to the Blueprint CIS were initiated and tested to provide real-time admit, discharge, and transfer data, along with patient lab results to the CIS repository, as identified through the Blueprint project companion guide. This phase was also identified as the period to implement Secure Socket Layer security to enable Web-based access to the portal without the need for virtual private network connectivity.

**Preliminary Impact and Findings:** The integration engine is an organizationally maintained utility that allows message development, transport, filtering, and tracking. When the basic legacy interfaces were initially routed through the engine, it eliminated any questions of where interface errors originated. The engine allows the identification and capture of errors within message feeds and can hold them until administratively corrected, or automatically correct them and continue their transmission. It also allows for the redirection and reformatting of existing feeds to be sent to additional receiving locations. User adoption is a key consideration for the success of health IT implementations. The existing impact on user adoption is the large number of information exchange activities and systems that providers will be expected to access and provide information to. In Vermont, there is also a statewide medication history project where information is provided by payers and pharmacies in a registry system. The CIS will provide information on chronic disease patients for provider decision support. Internal systems require provider interaction to document care resulting from their patient encounters. These competing projects employ the same metrics for user adoption and maintain expectations that providers will access those systems. Providers wonder how they can be expected to interact with all of these systems during patient encounters. Worse, they wonder what, if any, implications there will be if they do not access a system where pertinent information resides and an adverse event could have been prevented if those systems had been accessed. From a sustainability perspective, the only ongoing cost to Mt. Ascutney hospital for the products implemented for this project is an annual support fee that can be purchased at the individual organization's discretion.

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## Selected Outputs

None available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This project has been completed. Integrated health information systems have gone live at several sites, and because of favorable licensing contracts, these projects appear sustainable. Although substantive results have not been returned in the areas of provider satisfaction and billing efficiency due to insufficient data, early indications suggest that implementation was a success.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Ambulatory Electronic Medical Record and Shared Access
<b>Principal Investigator:</b>	DeLuca, Michael, M.B.A., M.S.
<b>Organization:</b>	Sarah Bush Lincoln Health Center
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016128
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,500,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** The goal of this project is to implement an ambulatory electronic medical record (EMR) system across multiple and varied health care settings in a medically underserved region of east central Illinois. To meet this goal, the project is using a Certification Commission for Healthcare Information Technology (CCHIT) certified EMR, the Medical Practice Management (MPM) suite of software developed by LSS Data Systems. The first site went live on the MPM software in October of 2007, and use of the system has expanded to six additional sites. All implementation sites thus far are smaller clinics; the project aim of deploying the MPM system at Sarah Bush Lincoln Health Center, which has a high-traffic ambulatory practice, is on hold. The hardware and software being used have been subject to significant revisions, requiring postponement of the project’s timetable. In addition, efforts to promote clinician buy-in have produced less significant results than initially hoped.

### Specific Aims

- Upgrade broadband network infrastructure at implementation sites. **(Achieved)**
- Customize system software for implementation sites, including data dictionaries, analogues of paper forms, a billing module, and backup procedures in case of system downtime. **(Ongoing)**
- Implement system at 20 clinics in the local area. **(Ongoing)**

**2008 Activities:** System development continued into 2008, with revisions being made to the scope of the systems, particularly its billing functionality and its data dictionaries. Implementation occurred at several sites.

**Preliminary Impact and Findings:** Despite the use of expert consultants, the hardware selection process was not optimal, resulting in project delays. Clinician buy-in has proven difficult to secure; progress has been incremental, and this process is ongoing. Several sites have had successful implementations. Software improvement is an ongoing process in collaboration with the vendor, LSS Data Systems.

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### Selected Outputs

The project developed a training manual for the EMR system.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Project momentum was interrupted due to technological delays, including development of some system functionality and availability of compatible point-of-care tablet PC devices. Efforts to expand system implementation to other practices continue.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Improving Quality Care for Children with Special Needs
<b>Principal Investigator:</b>	Lozzio, Carmen B, M.D., F.A.C.M.G.
<b>Organization:</b>	University of Tennessee, Knoxville
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016133
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,096,491
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** This 4-year project focuses on using health information technology (IT) to improve quality of care to children with special health care needs (CSHCN). The researchers are developing a secure, Web-based electronic health record (EHR) called the Tennessee Child Health Profile (TN-CHP) that will provide comprehensive information on CSHCN after parental approval. The TN-CHP will be designed to link the data on newborn screening (NBS) and newborn hearing screening (NHS) from the public health database of the Tennessee Department of Health with data on diagnosis, treatment, and follow-up from programs providing services to CSHCN. Outcome measures for follow-up of NBS and NHS and tracking of diagnosis, including follow-up services for CSHCN, will be analyzed. The lag time will be investigated by birth weight of the babies tracked over time from date of birth. TN-CHP will help the primary care providers and parents or legal guardians access and manage CSHCN information more easily, which will make primary diagnosis more efficient.

### Specific Aims

- Make the TN-CHP available to providers and parents/legal guardians. **(Ongoing)**
- Develop an integrated TN-CHP for CSHCN. **(Ongoing)**
- Perform statistical analysis of data to measure outcomes. **(Ongoing)**
- Improve the safety and quality of care of CSHCN. **(Ongoing)**

**2008 Activities:** In 2008, the researchers continued to develop the EHR, TN-CHP for CSHCN. There were extensive meetings and conference calls with the six key providers of services to CSHCN, the Tennessee Department of Health, and the Vanderbilt Center for Better Health. The Web browser and the TN-CHP demo were also developed. There was progress in the statistical analysis of data to measure outcomes. An informational brochure on this project was produced and distributed to the providers and parents. Institutional Review Board (IRB) approval was received for the project, and patient recruitment began.

**Preliminary Impact and Findings:** The goals and specific aims of this project and the development of the TN-CHP as an EHR that summarizes complex medical and developmental information on CSHCN have been received with enthusiasm by providers of specialized care for children with genetic disorders and developmental disabilities. It is expected that the use of TN-CHP by pediatricians and other providers of ambulatory care will improve the coordination of services and quality of care provided to these children.

The preliminary outcome measures imply that the birth weight is an important factor in the length of time required to report abnormal results in premature infants.

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### **Selected Outputs**

The principal investigator participated in the AHRQ 2008 Annual Conference for “Promoting Quality...Partnering for Change.” September 2008, Bethesda, MD.

Researchers collaborated with the Tennessee Department of Health, Vanderbilt Center for Better Health, and the MidSouth eHealth Alliance to improve coordination of services and quality of care for CSHCN.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** During the last reporting quarter in 2008, researchers explored the possibility of linking the TN-CHP to the Tennessee Information Infrastructure (TNII) connectivity system. The NBS Web site was improved to make access easier to providers, and the educational section is also being improved and updated. Access to NBS results was improved by using relevant identifiers. Progress was made in analyzing the lag times between birth, first collection, and repeat screening for the NBS tests performed by the State laboratory in children born in Tennessee during 2007 and 2008. The budget was managed during the third year of funding (9/2007–8/2008), to accommodate continued activity in the project’s no-cost extension year (9/2008–9/2009).

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Evaluating Smart Forms and Quality Dashboards in an Electronic Health Record (EHR)
<b>Principal Investigator:</b>	Middleton, Blackford, M.D., M.P.H., M.Sc.
<b>Organization:</b>	Brigham and Women's Hospital
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015169
<b>Project Period:</b>	09/04 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,153,892
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** The Evaluating Smart Forms (SFs) and Quality Dashboards (QDs) in an electronic health record (EHR) project aim to improve the management of patients with acute and chronic medical conditions through the creation of clinical decision support (CDS) tools integrated with clinical documentation workflow and through provision of physician performance feedback on quality and benchmarks in the EHR. The nearly completed grant seeks to provide value to the clinician, as well as to increase patient safety and quality, and address the combined needs of clinical workflow support and decision support with innovative EHR technology.

The project examines two EHR-based interventions. The first intervention focuses on the impact of a forms-based, clinical documentation-centric approach to decision support (Smart Forms). The SFs incorporate on-screen patient chart review, effective coded data capture, note generation, and actionable CDS at the point-of-care to help physicians with chronic and acute disease management, including coronary artery disease (CAD), diabetes mellitus (DM), and acute respiratory infection (ARI). In addition, patient education materials regarding self-management skills can be generated from the same screen. The second EHR-based intervention focuses on providing clinician-specific performance reports regarding guideline compliance and quality benchmark achievement (Quality Dashboards). The QDs are a helpful tool for physicians, medical directors, and practice leaders as they provide a report to the physicians on their patients regarding adherence with recommended clinical guidelines. The QD graphical displays allow for comparison with other physicians within a practice as well as with local and national benchmarks. This project aims to demonstrate that use of the SFs and QDs in chronic and acute conditions will significantly improve patient clinical outcomes.

In order to evaluate the SF and QD technology integrated with a pre-existing EHR system (the Longitudinal Medical Record [LMR], a CCHIT-certified EHR developed in-house at Partners HealthCare), the following randomized, controlled trials are being implemented: Acute Respiratory Infection Smart Form Randomized Controlled Trial (ARI SF RCT); Coronary Artery Disease/Diabetes Mellitus Smart Form Randomized Controlled Trial (CAD/DM SF RCT); Acute Respiratory Infection Quality Dashboard Randomized Controlled Trial (ARI QD RCT); and Coronary Artery Disease Quality Dashboard Randomized Controlled Trial (CAD QD RCT). In each RCT, Partners-affiliated primary care practices were randomized to receive either usual care, or the SF, or the SF plus QD. Data collected from the RCTs and physician surveys will be used to answer the following questions: 1) can a usable EHR-based intervention be developed that provides CDS in the context of clinical documentation workflow,

and that integrates population-based performance feedback to the physician; and 2) do such tools improve the quality of clinical documentation, capture of key clinical data for CDS and quality assessment, and compliance with best practice guidelines? This project will answer these fundamental value questions, which are critical to the broad adoption of information technology (IT) in practice. If the end-user does not perceive the value of these tools primarily in the clinical workflow, health care IT adoption will be severely limited, and secondary gains in patient safety, quality, and costs will be hindered.

### Specific Aims

- Design and implement an integrated documentation-based CDS and physician feedback system provided in an EHR to improve the management of patients with acute and chronic medical conditions. **(Ongoing)**
- Determine the effectiveness of documentation-based CDS with respect to documentation and the clinical management of patients with CAD and ARI for the following:
  - ARI SF RCT **(Completed)**
  - CAD/DM SF RCT **(Completed)**
  - Analysis of surveys related to CAD/DM SF RCT. **(Ongoing)**
- Assess the usefulness of QDs by clinicians and their marginal impact over SFs on compliance with best practices in ARI and CAD for the following:
  - ARI QD RCT **(Completed)**
  - Data retrieval and analysis of ARI QD RCT. **(Ongoing)**
  - CAD QD RCT **(Ongoing)**
  - Data retrieval and analysis of CAD QD RCT. **(Upcoming)**

**2008 Activities:** The ARI SF RCT intervention was completed in 2006. Data analysis is completed and manuscript development is currently underway.

The CAD/DM SF RCT was completed in May 2008; 159 physicians at Partners-affiliated primary care clinics participated in this RCT. Data retrieval was completed and data consolidation has begun in order to facilitate data analysis. Results of a post-RCT survey for the CAD/DM SF RCT were also collected and analyzed.

In August 2007, the ARI QD RCT was completed along with data retrieval. Data analysis and manuscript development are still underway.

In March 2008, the CAD QD RCT began in 15 clinics and is still underway. The RCT was expected to be completed in March 2009. A post-survey RCT was planned for 78 CAD QD users in April 2009, and data analysis will be conducted.

Additionally, multiple manuscripts for the SFQD study have been published. See below in “Selected Outputs” for a list of current publications.

**Preliminary Impact and Findings:** Pilot evaluation results of the ARI SF showed that clinicians found the tool to be useful and effective. Sixty percent of respondents would recommend the ARI SF to their colleagues unchanged, and 80 percent reported that the ARI SF was either time-neutral or time-saving.

Analysis of a post-RCT survey for the CAD/DM SF RCT found that 45 percent of the physicians who responded believed that the CAD/DM SF CDS features changed what they normally would have done to treat blood pressure and cholesterol levels, and over half believed the tool helped them comply better with CAD/DM guidelines. Additionally, 66 percent of the respondents found the “Patient Instruction Handout” feature to be helpful, and 56 percent found the “Patient View” feature helpful.

Pilot evaluation results of the ARI QD indicate that clinicians find antibiotic prescribing reports using both medications and billing data for ARIs useful and insightful. The ARI QD has the potential to reduce inappropriate antibiotic prescribing for ARIs.

The CAD QD application has been rolled out, and the RCT is scheduled to be completed in March 2009. To date, this tool has been primarily accessed by practice managers.

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### **Selected Outputs**

Linder J, Rigotti N, Schneider L, et al. Electronic health record-based intervention to improve tobacco treatment in primary care: a cluster randomized control trial. *Arch Intern Med* 2009 Apr 27;169(8):781-7.

Schnipper J, Linder J, Palchuk M, et al. “Smart Forms” in an electronic medical record: documentation-based clinical decision support to improve disease management. *J Am Med Inform Assoc* 2008 Jul-Aug;15(4):513-23.

Linder JA, Rose AF, Palchuk MB, et al. Decision support for acute problems: the role of the standardized patient in usability testing. *J Biomed Inform* 2006 Dec; 39(6):648-655.

Cheston, E, Schnipper J, Linder J, et al. Can Smart Forms Change Physician Habits Regarding Chronic Disease Management? Results of a Physician Survey. Accepted as Poster Presentation at Society of General Internal Medicine Conference; Miami Beach, FL; May 2009.

Schnipper J, McColgan, K, Linder J, et al. Improving management of chronic diseases with documentation-based clinical decision support: results of a pilot study. *AMIA Annual Symposium Proceedings*; November 2008.

Palchuk M, Postilnik A, Olsha-Yehiav M, et al. User interface accelerators for clinical documentation in Smart Forms. *AMIA Annual Symposium Proceedings*; October 2007.

Melnikas A, Schnipper J, Linder J, et al. Can a “Smart Form” increase physicians’ satisfaction with managing patient health behavior risks? Results of a physician satisfaction survey. *AMIA Annual Symposium Proceedings*; October 2007.

Linder J, Schnipper J, Volk L, et al. Clinical decision support to improve antibiotic prescribing for acute respiratory infections: results of a pilot study. *AMIA Annual Symposium Proceedings*; October 2007.

Linder JA, Schnipper JL, Tsurikova R, et al. Barriers to electronic health record use during patient visits. *AMIA Annu Symp Proc*; 2006:499-503.

#### **EHR-based Applications:**

*ARI SF*: application integrated into an EHR that provides a forms-based, clinical documentation-centric approach to decision support at the point-of-care for diagnosis and treatment of ARIs.

*CAD/DM SF*: application integrated into an EHR that provides a forms-based, clinical documentation-centric approach to decision support at the point-of-care for diagnosis and treatment of CAD and DM.

*ARI QD*: application integrated into an EHR that provides clinician-specific performance reports regarding guideline compliance and quality benchmark achievement specifically for diagnosis and treatment of ARIs.

*CAD QD*: application integrated into an EHR that provides clinician-specific performance reports regarding guideline compliance and quality benchmark achievement specifically for diagnosis and treatment of CAD.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Overall, the project is mostly on schedule with some slippage. Specifically, the intervention portion of the CAD QD RCT was delayed. The main reasons were the complexity of the QD application itself and unexpected complications during the implementation process. Additionally, implementation was slowed as roll-out of the application had to occur one practice at a time due to the intricate randomization schema. Although all milestones have not been met, there is a viable plan for achieving those that remain.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

**Project Title:** Value of Health Information Exchange in Ambulatory Care  
**Principal Investigator:** Overhage, J. Marc, M.D., Ph.D.  
**Organization:** Indiana University / Purdue University at Indianapolis  
**Mechanism:** RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)  
**Grant Number:** R01 HS 015409  
**Project Period:** 09/04 – 09/09, Including No-Cost Extension  
**AHRQ Funding Amount:** \$1,499,662  
**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** This project will refine an established economic model of health information exchange (HIE), create a “laboratory” in which we can test that model, and finally, test the model’s predictions in a randomized, controlled trial. An existing HIE (the Indiana Network for Patient Care [INPC]) will be used as the foundation for this project. In addition, several payers have been engaged by this project to provide clinical data and also to lay the foundation for changes in reimbursement models that will be based on conclusions drawn from the project’s findings. In this project, we will bridge the macro and micro approaches by using a macro-model (derived from the Center for Information Technology and Leadership [CITL] model described below) to gauge the aggregate savings and to identify areas of highest value, which we will examine in more detail with an empirically-based micro-approach.

Our project to assess the value of HIE in the ambulatory setting is entering the data extraction and analysis phase. HIE is a critical component of any broad health information technology (IT) effort. Any health IT-based application requires the appropriate data, and it is rare that all of the data required are generated within that technology or a single care delivery organization, particularly in the ambulatory setting. We integrated data from the INPC, our locally developed HIE, into 21 primary care ambulatory practices as well as a subset of specialty practices to which they refer patients. In order to measure the value of making these data from the HIE available, we randomly allocated access to these data by patient, which allows us to control for practice and provider characteristics, which we have identified as important covariates in our previous studies of HIE value. We will use claims data to measure any reduction in charges that result from the intervention. In addition, we have created a revised model of the value of HIE based on initial work by the CITL. We parameterized the model for Indianapolis, the market in which we are conducting the trial, and validated the model’s predictions with practice managers and hospital financial experts in the market. One of our key insights from this effort was that significant portions of the savings predicted by the model are “shadow costs.” Shadow costs are costs that would occur if the organization were carrying out the activity. The CITL model, for example, assumes that providers are forwarding patient information to consultants for every referral, which obviously would require an investment of staff time and other resources, such as facsimile transmission and mailing. Our validation highlighted that, in fact, the practice is often not sending these data and, therefore, not incurring these costs and so they will not achieve any savings from HIE by eliminating this task. It has value but will not reduce the practice’s expenses. We will use the insights gained from this modeling exercise to design our analyses. Particularly given the incentives and investments included in the American Recovery and Reinvestment Act (ARRA), it is important to understand the return that we may expect to gain from

investments in HIE, especially at the level of the individual physician practice, and our study should provide some of this important information.

### Specific Aims

- Apply a previously developed economic model for the benefits of HIE to a specific geographic community or Metropolitan Statistical Area (Indianapolis MSA) in order to determine the expected savings for the community; the model will identify the categories of data (e.g., laboratory, radiology, administrative) that contribute the most to these savings and which participants (e.g., physicians, hospitals, payers) benefit. **(Achieved)**
- Create an HIE “laboratory” to measure the value of HIE. **(Achieved)**
- Conduct a randomized, controlled trial to measure the value of HIE. **(Ongoing)**

**2008 Activities:** We initiated the randomized, controlled trial to measure the value of HIE during 2008 and continued to support the infrastructure and the end users during this period.

**Preliminary Impact and Findings:** We have learned a variety of lessons during the course of our study that could be of broader interest. First, our experience implementing HIE with ambulatory practices reinforced our appreciation for how resource-limited these environments are, particularly in terms of management attention. Second, while the INPC contains a considerable amount of data for patients being seen in these practices and can organize and synthesize it efficiently, providers subjectively found only marginal value for most patient encounters. There were two main drivers for this perception. First, for many patients, there were some important data sources that INPC does not include, reducing the value; and second, for most patients, the provider already had all of the relevant data (in part as a result of the DOCS4DOCS® results delivery system that is part of the exchange, which electronically delivers data to providers). There were certainly examples where the data available in the INPC were highly relevant and important but not for the majority of patients. This perception led the providers to implement a “pull” approach—looking up data on patients when they identified a need—rather than a “push” approach that we initially proposed. A third important lesson that we learned is how to think about the results of economic models for HIE more precisely. Specifically, we now categorize projected savings into three categories—hard savings, soft savings, and shadow savings. Hard savings are those that a practice can actually expect to achieve. Soft savings are those that free resources for other purposes but do not actually result in a reduction of expenditures. An employee function for which the model predicts a 10 percent full-time equivalent (FTE) reduction, for example, would be treated as a soft saving since, at least in a small practice setting, the time savings are too small to expect an actual staff reduction, but the person’s time might be reallocated to other useful functions. Finally, shadow savings are those that the model predicts the practice should achieve but in fact the practice is not doing those activities, so no savings will occur. From a very pragmatic standpoint, only hard savings are meaningful to the practice.

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### Selected Outputs

None available.

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### Grantee’s Most Recent Self-Reported Quarterly Status:

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Creating Online Newborn Intensive Care Unit (NICU) Networks to Educate, Consult & Team
<b>Principal Investigator:</b>	Rachal, Valerie R.N., Ph.D.
<b>Organization:</b>	University of Southern Mississippi
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016147
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,499,995
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** The Creating Online Newborn Intensive Care Unit (NICU) Networks to Educate, Consult & Team project brings together the University of Southern Mississippi; Forrest General Hospital, a county acute care hospital; Southern Mississippi Neonatology Group, a private neonatology practice; Hattiesburg Clinic, the largest multi-specialty clinic in the State; and Southeast Mississippi Rural Health Initiative and its nine rural family health centers, which serve medically underserved communities. This project will implement several health information technology (IT) solutions in the treatment of NICU infants and toddlers, including portable personal developmental/health records (PDHRs) and a system to facilitate electronic sharing of medical records from vendor Misys Connect. Specifically, technology will be used to prevent duplication of tests and increase direct consumer involvement in the health care decisionmaking process, resulting in improved neurological and general health of infants discharged from the NICU. NICU infants are often seen by many follow-up specialists, family practice physicians, nurse practitioners, and emergency room physicians in the first years of life. PDHRs created for the most at-risk infants will allow parents to have a portable, up-to-date health record, which they can provide to primary practitioners in the community, ensuring developmental follow-up and continuity of care. Evaluation of these tools will be measured by analyzing their use and surveying patient and physician satisfaction with the PDHR as compared to paper medical records, as well as gauging agency and personnel buy-in for the movement toward shared electronic medical records.

### Specific Aims

- Facilitate adoption of an interoperable system for electronic sharing of medical records among agencies. **(Achieved)**
- Develop and test multimedia portable personal developmental/health records on CD/DVD. **(Achieved)**
- Develop and maintain multimedia Web-based resources to serve as a decision support system and for training and information sharing. **(Achieved)**
- Use telemedicine technologies to enhance and expand the use of developmental care practices in Mississippi NICUs. **(Achieved)**

**2008 Activities:** In 2008, the summative evaluation of PDHRs for NICU began with a mailed survey and telephone interviews, but patient response rates were very low and delayed the completion of the evaluation. As a result, the evaluation was redesigned to target selected patients who return to the NICU

Follow-Up Clinic at the hospital. In addition, a final version of the Web-based decision support tool, called the Developmental Surveillance for Children Born Prematurely, and an online evaluation tool were posted online in July 2008 for review by pediatricians. The link to the Web-based tool was disseminated through the National Academy of Pediatrics. Evaluation data were also collected for the use of telemedicine technologies to enhance and expand the use of developmental care practices in Mississippi NICUs. The project also completed work with the Misys Connect vendor to implement an interoperable system for electronic sharing of medical records between Forrest General Hospital and Hattiesburg Clinic. A focus group of physicians, administrators, medical records key staff, and IT key staff was conducted in late July 2008 to evaluate this system, and these qualitative data are in the process of being analyzed.

**Preliminary Impact and Findings:** The evaluation design planned for several aspects of the project included mailed parent questionnaires and phone interviews. However, response to the mailed questionnaire was very poor with less than a 10 percent response rate, and phone interviews were also problematic. Patients seem to avoid contact with anyone from the hospital, possibly due to concerns of bill collectors. Additionally, this population is very transient and difficult to locate post discharge. The project has revised this methodology to collect the data at the NICU Developmental follow-up clinic, where project staff can request participation in the evaluation face-to-face. This clinic only meets once a month, so it will take a number of months to collect sufficient data to begin to analyze this project.

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### **Selected Outputs**

**Developmental Surveillance for Children Born Prematurely Tool:** The tool, which has undergone continual development, evaluation, and revision, shows promise as a Web-based decision-support device to assist physicians and nurse practitioners in deciding when to refer or track infants and toddlers with histories of prematurity for neurodevelopmental testing. An article was published in *Neonatology Today* to describe the tool and its uses:

Atkinson TE, Daniels TH, Prehn J, et al. Monitoring preterm infant motor development: Web-based decision support. *Neonatology Today* 2009;4(3):5-6.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Substantial portions of this project were delayed by a multitude of issues. The evaluation portion of the project should have begun in October 2007, but was delayed for nearly 6 months due to difficulties with data collection, particularly with the parents of high-risk premature infants after they were discharged from the hospital. The project team plans to work with an evaluation consultant to collaborate with project staff in developing alternate strategies for collecting data, developing data collection instruments, and overseeing the evaluation.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, approximately 5 to 20 percent.

**Project Title:** Improving Laboratory Monitoring in Community Practices: A Randomized Trial

**Principal Investigator:** Simon, Steven, M.D., M.P.H.

**Organization:** Harvard Pilgrim Health Care, Inc.

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)

**Grant Number:** R18 HS 017201

**Project Period:** 09/07 – 08/10

**AHRQ Funding Amount:** \$990,640

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The Massachusetts e-Health Collaborative (MAeHC) provides an important opportunity to study implementation of health information technology (health IT) innovations in a community setting. In 2007, the MAeHC completed the implementation of commercially available electronic health records (EHRs) for 441 physicians in more than 200 office practices in 3 diverse communities in Massachusetts. In this group of small- to medium-sized office practices in both urban and rural regions of the State, this research grant is conducting a cluster-randomized controlled trial (RCT) of computerized point-of-care alerts in the EHR to prevent errors related to laboratory monitoring at the initiation and continuation of drug therapy. This project also creates a results management system to prevent errors related to the delay in follow-up of abnormal laboratory testing. The results of this study will be important because they will demonstrate and accelerate the dissemination of clinicians' use of health IT to improve patient safety and health care quality beyond integrated delivery systems and should be broadly generalizable to small- and medium-sized office practices in community settings.

The overall aim of the project is the development of clinical decision support (CDS) [point-of-care alerts] in a widely used, commercially available EHR, eClinicalWorks Version 8, which is a Certification Commission for Healthcare Information Technology (CCHIT) certified EHR vendor, that addresses the barriers to and facilitators of laboratory monitoring and that would be adaptable to other EHRs certified by CCHIT. The 3-year study tests the effectiveness of computerized CDS (point-of care alerts) and a results management system in community primary care and medical subspecialty practices in a cluster-randomized controlled trial with 2x2 factorial design. The project includes a qualitative analysis of the barriers to and facilitators of laboratory monitoring and timely follow-up of abnormal results among clinicians in MAeHC communities. This information will be used to develop, implement, and evaluate computerized CDS to facilitate the indicated laboratory monitoring of medications at the initiation or continuation of therapy and an enhanced computerized results management system. Baseline analyses will yield novel information on the rates and correlates of laboratory monitoring errors and the management of abnormal test results in community-based primary care and medical subspecialty settings. The study incorporates a dissemination plan, which includes not only publication and presentation of the results in scientific settings but also the creation of a dissemination guide that will be made freely available to aid other community-based ambulatory practices implementing EHRs and CDS.

## Specific Aims

- Identify the barriers to and facilitators of laboratory monitoring and timely follow-up of abnormal results. **(Ongoing)**
- Design, implement, and evaluate CDS (point-of-care alerts) for laboratory monitoring in a widely used, commercially available EHR that address the barriers to and facilitators of laboratory monitoring. **(Ongoing)**
- Design, implement, and evaluate a results management system for the timely handling of abnormal laboratory test results in ambulatory care. **(Upcoming)**
- Develop a detailed dissemination guide that will be made widely available to other practices and communities interested in implementing the same or similar interventions. **(Upcoming)**

**2008 Activities:** The project's study design has been changed to implement the laboratory monitoring alerts and results management intervention simultaneously due to time constraints. There will still be four arms to the study as originally intended, but there will be only one phase. Project staff are planning to implement the results management intervention in June 2009.

The project has conducted focus groups to identify the barriers to and facilitators of laboratory monitoring and timely follow-up of abnormal results, and submitted their findings in a manuscript to the *Archives of Internal Medicine*. In addition, the project convened the panel for discussion of laboratory monitoring medications and will reconvene as study needs arise. The specifications for the alerts have been developed, and project staff are now meeting weekly with the EHR vendor to complete the alert programming. Project staff intend to finalize the alert programming and to test and pilot the system in the second quarter of 2009. In addition, project staff are currently communicating with the EHR vendor about the feasibility of building a results management system in the necessary time period.

In the summer of 2009, the plan is to implement the alerts in participating practices. Training will be conducted with participating clinicians prior to implementation. Project staff previously finalized a list of medications based on expert opinions that require laboratory monitoring that are included in the alerts. The project team also prepared a list of alerts and specifications for the EHR vendor. The EHR vendor is reviewing the alert requirements and working with their development team to include these in the next version upgrade for MAeHC practices.

**Preliminary Impact and Findings:** Focus group participants viewed laboratory monitoring as a critical, time-consuming task integral to their practice of medicine. Most believed they commit few laboratory monitoring errors and were surprised at the error rates reported in the literature. They listed various barriers to monitoring, including not knowing which physician was responsible for ensuring the completion of laboratory monitoring, uncertainty regarding the necessity of monitoring, lack of alerts/reminders, and patient non-adherence with recommended monitoring. The primary facilitator of monitoring was ordering laboratory tests while the patient is in the office. PCPs felt more strongly than specialists that computerized alerts could improve laboratory monitoring. Participants wanted to individualize alerts for their practices and warned that alerts must not interrupt workflow or require too many clicks. Physicians in community practice recognized the potential of computerized alerts to enhance their monitoring protocols for some medications. They viewed patient non-adherence as a barrier to optimal monitoring. Interventions to improve laboratory monitoring should address physician workflow issues, in addition to patients' awareness of the importance of fulfilling recommended therapeutic monitoring to prevent adverse drug events.

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## Selected Outputs

A manuscript of the focus group findings has been submitted for review to the *Journal of General Internal Medicine*.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Current project plans are slightly delayed; a no-cost extension year may be requested. It is expected that all funds will be used by the end of the project.

**Milestones:** Progress is on track in some respects but not others

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Home Heart Failure (HF) Care: Comparing Patient-Driven Technology Models
<b>Principal Investigator:</b>	Goldberg, Lee R., M.D., M.P.H.
<b>Organization:</b>	St. Vincent Healthcare
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015459
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,454,568
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

**Summary:** Increasing prevalence, hospitalizations, and deaths have made heart failure (HF) a major chronic condition in the United States. HF is the most common diagnosis in hospital patients age 65 years and older. Although mortality for HF is declining, the growing number of older adults who require HF treatment will have a substantial impact on national health care resources and expenditures. As a result of complex clinical management problems, elders with HF have high hospital readmission rates, ranging from 29 to 47 percent; with more effective management, an estimated one-third to one-half of these readmissions would be preventable. The objective of this concluded grant was to assess the impact of health information technologies (IT) on clinical and financial outcomes for patients with symptomatic (NYHA Class II – IV) HF. The health IT in this study included remote monitoring (or telemonitoring) of vital signs and symptoms, an electronic health record system, and clinical decision support systems. This study tested a scalable, reproducible model for technology-supported HF management, which was intended to assist purchasers, payers, and policymakers in selecting health IT to improve clinical and financial outcomes. Two different configurations of health IT were evaluated. One was Technology Supported Case Management, a combination of telemonitoring and telephone nurse case management. The other was Technology Supported Self Management, which combined telemonitoring with an expert clinical decision support system that assessed vital signs and symptoms and guided patients through an individually-tailored self-care algorithm. These two interventions had many features in common; for clarity, they will be referred to as Case Management and Self Management. Patients were recruited from geographically, socially, and ethnically diverse settings: rural areas of southern Montana and northern Wyoming, including a Native American population; urban and suburban Philadelphia, where the study included African American, Caucasian, and Hispanic patients; and a third site in Charleston, South Carolina, which was added to the project in 2005.

### Specific Aims

- Demonstrate improvements in access to care. **(Ongoing\*)**
- Demonstrate improvements in quality of care. **(Ongoing\*)**
- Reduce costs, particularly costs related to hospital readmission. **(Ongoing\*)**
- Improve patient involvement and satisfaction. **(Ongoing\*)**

*\* Several aims of the grant were not completed prior to 9/08, but, as other sources of funding have been secured, these aims are still targeted for completion.*

**2008 Activities:** Data collection concluded in July of 2008. Analyses and dissemination efforts are ongoing.

**Preliminary Impact and Findings:** The study was placed on hold under Institutional Review Board (IRB) direction and approval in late March 2005. A pilot study was developed by the researchers and implemented under IRB approval on 14 healthy subjects in April 2005, using the device and care protocols planned for the HF patient trials. As the research staff and the IRB wanted to be thorough in testing the technology, this pilot required pushing the timetable for the HF study out by at least 6 months. The first subject was voluntarily consented and enrolled in the study on or about 6/22/2005. There were additional administrative challenges during the first year, and several of those challenges extended well into year two of the award. Changes among tribal leadership as well as the research team staff at the Montana/Wyoming site delayed implementation of the study there. Challenges related to participant enrollment at all sites necessitated an abbreviated data collection period of 9 months of active participation plus 3 months of follow-up monitoring. Patient enrollment concluded in May 2007; active study participation thus concluded in March 2008, with 3 months of additional data collection afterward. Data are not yet available to verify the project's research hypotheses.

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### **Selected Outputs**

Farberow B, Hatton V, Leenknecht C, et al. Caveat Emptor: The Need for Evidence, Regulation, and Certification of Home Telehealth Systems for the Management of Chronic Conditions. *Am J Med Qual* 2008 May-Jun;23(3):208-14.

AHRQ 2008 Annual Conference presentation; 2008 Sept. 7-10; Bethesda MD: Be Careful What You Wish For - Managing Devices and Data In Your Patient's Home ([PowerPoint® File](#), 167 KB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** Grantee did not provide self-assessment for the most recent quarter.

**Milestones:** Grantee did not provide self-assessment.

**Budget:** Grantee did not provide self-assessment.

<b>Project Title:</b>	New Mexico Health Information Collaborative (NMHIC)
<b>Principal Investigator:</b>	Gunter, Margaret J., Ph.D.
<b>Organization:</b>	Lovelace Clinic Foundation (LCF)
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015447
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$992,377
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

**Summary:** The driving vision of our health information exchange (HIE) initiative was the development of a community-driven partnership among providers, patients, payers, employers, and the public sector to change the culture of care from complete dependence to one of patient and institutional accountability, where health care becomes everyone’s responsibility, and a true community culture of health is established. The scope of the AHRQ-funded NMHIC project was the start-up and development of an HIE network to serve the Albuquerque, NM, area (Bernalillo County) with a rural pilot in Taos, New Mexico (led by Holy Cross Hospital). This early geographic scope was informed by the fact that New Mexico is a rural State with one large metropolitan area (Albuquerque), which is the base for the major large health systems and plans that serve the State as a whole. The objective was that the project would provide the foundation for expansion of NMHIC statewide and for eventual operational sustainability. In response to community preferences, we selected a Federated Distributed model for NMHIC in which each provider maintains its own data silo, and the HIE maintains a master list of patients for whom data are available in the different silos; the HIE locates and transfers data between providers and users. The core technical components developed included a master patient index (MPI), a patient referral module, a record locator service, and the software needed to transmit newborn audiology screening results to the New Mexico Department of Health (NMDOH) for one of the Taos pilot HIE demonstrations.

### Specific Aims

- Create the community/organizational infrastructure for the health information collaborative. **(Achieved)**
- Establish the initial technology approach and core architecture. **(Achieved)**
- Establish a rural pilot of the HIE. **(Achieved)**
- Evaluate the progress of the HIE. **(Achieved)**
- Position NMHIC for further development and sustainability in the post-project period. **(Achieved)**

**2008 Activities:** The NMHIC successes in planning, software design, and the Taos pilot projects led to the award of a Federal contract for \$3.5 million from the Office of the National Coordinator for Health Information Technology (ONC) to participate in the Nationwide Health Information Network (NHIN) Trial Implementations. This allowed NMHIC to strengthen its infrastructure rapidly, provide additional network services, and extend these services to more New Mexico hospitals, laboratories, and doctors. In order for NMHIC to become self-sustaining, it must demonstrate that the value of the network services it

offers will more than justify user fees, member subscriptions, and/or annual contributions from the NMHIC stakeholders (providers, payers, employers, and public health) that benefit from these services.

**Preliminary Impact and Findings:** The initial evaluation plan included both formative and summative evaluation components, with the summative evaluation focusing primarily on assessing the various impacts of a fully operational HIE. As noted in NMHIC quarterly reports, data and privacy issues and fiscal constraints resulted in delays in NMHIC's evolution into a fully operational HIE, which did not take place during the 3-year project period. Accordingly, NMHIC's evaluation was largely limited to a formative or process evaluation in which factors that lead to successes and barriers that prevented establishment of an operational HIE were emphasized. The overall conclusion of this evaluation was that achieving and maintaining stakeholder cooperation and trust is a far larger hurdle than technology or even privacy and security considerations in the creation of a regional HIE. Community support and agreement on goals are clearly critical to the likelihood of success. NMHIC technical staff built the electronic means to exchange patient-specific information between practitioners, such as referring patients, sending reports, or receiving results of patient care actions. This functionality was first piloted in November 2006 by Taos medical community practitioners, who used NMHIC to convey referrals within a program for coordinating care of patients with diabetes. NMHIC allowed them to process referrals securely to multiple sites within the community. A second pilot followed planning and exploration discussions with Taos practitioners and the New Mexico Department of Health. This culminated in pilot testing of NMHIC in February 2007 for personnel at Taos Holy Cross Hospital to transmit normal test results from the newborn hearing screening to the Department of Health. The hearing test results of 40 babies screened in this small rural New Mexico community were transmitted by NMHIC. This process was evaluated by Taos hospital staff, NMDOH, community health care providers, and NMHIC staff in August 2007. Although the process worked satisfactorily, NMHIC connections to patient information at Taos Holy Cross Hospital were not substantial enough in 2007 to save hospital staff time.

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### Selected Outputs

White RE. Can health information technology shift the medical care paradigm? *J Gen. Internal Med* 2008;23:495-9.

White R, Smith T, Carter S. Using a Regional Health Information Exchange to enhance state mandated newborn hearing screening and intervention. *Academy Health Meeting*; June 2007; Orlando, FL.

Gunter MJ. New Mexico Health Information Collaborative. *The World Health Care Innovation and Technology Congress*; November 2005; Washington, DC.

Gunter MJ, Fields D, Carter S. New Mexico Health Information Collaborative (NMHIC): a unique partnership for New Mexico's healthier future. *11<sup>th</sup> Annual HMO Research Network Conference*; April 2005; Santa Fe, NM.

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**Grantee's Most Recent Self-Reported Status:** The term of this grant is completed. Although the original project aim of implementing a fully operational HIE by 2008 was not met, community stakeholders have been engaged by the project, and software architecture has been developed. Further, funding has been secured beyond the expiration of the AHRQ grant, with the expectation of continuing development of the HIE. The timeline for HIE development was pushed extended beyond AHRQ-funded window for this grant, but other support has been secured to complete remaining tasks.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	A Community-Shared Clinical Abstract to Improve Care
<b>Principal Investigator:</b>	Connelly, Donald, M.D., Ph.D.
<b>Organization:</b>	Fairview Health Services
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016155
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,482,674
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

**Summary:** The goal of this nearly completed project is to improve emergency department (ED) care using a health information exchange (HIE) model. By promoting greater continuity of care, the project hopes to assess the effect of additional clinical information on patients' transitions among the three health care systems participating in the project. Handoffs between medical providers are recognized as a potential source of medical error, and these risks are compounded during emergency visits, when a patient may have to use the nearest available ED rather than their usual source of care. The project's initial goal was to exchange full continuity of care documentation among the participating health care systems in three of their EDs, and the project had been in close communication with these systems' electronic medical record (EMR) vendor about implementing such software. However, due to recent additions to Minnesota privacy law, this goal was deemed currently infeasible by project stakeholders and revised. Instead, ED clerical personnel will prepare patient record abstracts drawn from the ambulatory care EMR and make them available to clinicians in a participating ED; the project, then, will measure what effects this intervention offers and the likely size of the population that would stand to benefit. Although project partners are still interested in advancing the HIE model and applying it to the local area, regulatory changes, as well as the early state of the Minnesota Health Information Exchange (MN HIE), which is to be the health information exchange for the State, have delayed exchange of patient record abstracts beyond the timeframe of this project.

### Specific Aims

- Extract and analyze de-identified patient ED visit data from participating facilities in order to determine which populations would be best served by implementation of the HIE. **(Ongoing)**
- Resolve technical and non-technical issues related to the changing legal landscape for medical privacy in Minnesota and the designation of the MN HIE as the State-recognized HIE. **(Ongoing)**
- Implement the HIE technology at participating hospitals, and collect data on the efficacy of the intervention. **(Upcoming)**

**2008 Activities:** The intervention being evaluated, supplementing normal ED procedure with an additional medical abstract, was developed and approved by all parties.

**Preliminary Impact and Findings:** Data have been collected from the three EDs for 6,123 patients whose visits had an associated CHF diagnosis code. These patients were divided into those who had EHR-based evidence of previous care in the health system which owned the hospital that housed the ED

(Internal) and patients with no such evidence (External). Investigations have revealed that External patients have more laboratory tests and are more likely to be hospitalized than Internal patients even when adjusting for sex, age and co-morbidities. This supports our hypothesis that patients with more complete clinical data in the EMR experience better outcomes and reduced costs in comparison to patients who do not have such information available.

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### **Selected Outputs**

Kijsanayotin B et. al. Improving access to clinical information in an emergency department: A qualitative study. AMIA 2008 Annual Symposium; Washington, DC: 2008 November 8-12.

Theera-Ampornpant N et. al. Creating a large database test bed with typographical errors for record linkage evaluation. AMIA 2008 Annual Symposium; Washington, DC: 2008 November 8-12.

AHRQ 2008 Annual Conference presentation: Health Information Exchange: Myths, Mirages and Reality ([PowerPoint® File](#), 1.7 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The evolution of Minnesota privacy law during the course of this grant has led to legal uncertainties regarding HIE. This and the early state of Minnesota's HIE organization have impeded progress with information exchange. This delay has required changes to be made to the project. It is anticipated that all revised aims will be achieved by the end of the no-cost extension in September 2009.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Improving Safety and Quality with Integrated Technology
<b>Principal Investigator:</b>	Guise, Jeanne-Marie, M.D.
<b>Organization:</b>	Oregon Health and Science University (OHSU)
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015321
<b>Project Period:</b>	09/04 – 08/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,461,150
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

**Summary:** Improving Safety and Quality with Integrated Technology is a project to demonstrate the value of an integrated inpatient and outpatient electronic health record (EHR) and electronic alert system to improve quality of health care and patient safety. Obstetrics (OB) was chosen as the health care setting because pregnant women inevitably transition across inpatient and outpatient settings in a matter of months. Group B Streptococcus (GBS), a common and potentially life-threatening condition, was chosen to measure the impact of the integrated EHR. Evidence-based treatment guidelines have been developed, and the project hopes to foster both identification and treatment of GBS. The implementation includes alerts to both increase the likelihood of patient screening and decrease the unnecessary prescription of antibiotics for women who are GBS negative. Data will be collected on tests performed and on the course of treatment. These data will increase knowledge about the value of integrated health information technology (IT) systems to produce measurable improvements in safety and quality. The findings, though applied specifically for OB, can be applied to many areas of medicine and surgery and may inform stakeholders making decisions regarding other health IT systems in both inpatient and outpatient settings.

### Specific Aims

- Test whether a system that transmits GBS results with inpatient alerts improves adherence to evidence-based treatment guidelines for women who are GBS positive and reduces inappropriate antibiotic use in women who are GBS negative. **(Ongoing)**
- Demonstrate the value of an integrated outpatient and inpatient EHR to improve quality of care and safety for women and infants. **(Ongoing)**
- Demonstrate the value of an electronic alert system to increase GBS screening in the outpatient setting. **(Ongoing)**

**2008 Activities:** In 2008, the first phase of data analysis of the impact of the integrated inpatient and outpatient EHR on clinical practice was completed, which consisted of a survey of providers to determine their satisfaction with the system. The team also completed the first phase of data analysis for the value of the outpatient alert system to increase GBS screening. In addition, we completed an assessment of the impact of the integrated EHR with outpatient alert system on workflow. The planning process began for the cost-benefit analysis to assess the economic impact of implementing the integrated EHR with outpatient alert system.

**Preliminary Impact and Findings:** Analysis found that from October 2004, when only paper records were used, through March 2008, when a fully integrated inpatient and outpatient EHR with an outpatient alert system for GBS screening was used, the rate of patients missing GBS lab results dropped from 11 percent to 6 percent for OHSU patients, while the proportion of the patients without GBS labs who delivered at OHSU but received prenatal care elsewhere increased from 22 percent to 28 percent over the same time period. These together suggest that improvements in compliance with clinical guidelines at OHSU were a significant factor in the change. Final results also found that the implementation of an integrated inpatient and outpatient EHR with outpatient alert system increased one-on-one time of clinical staff and patients.

Preliminary results from a survey evaluating the impact of the integrated EHR with outpatient alert system on clinical practice and satisfaction found that providers frequently/always felt that the non-integrated EHR records were missing important OB information (45.9 percent non-integrated EHR vs. 9.5 percent integrated EHR) and that use of the decision support tools was high, especially with regard to the frequently/always use of the dating calculator (84.9 percent), guidelines (57.6 percent), and Bishop's calculator (66.7 percent). Key features of the integrated EHR that providers would most hate to lose include data pulling forward into notes (71.4 percent) and the problem list (76.1 percent).

The study also found that the introduction of a customized OB EHR system (STORC) improved documentation completeness in a busy obstetric unit without reducing direct patient care.

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### **Selected Outputs**

Campbell EM, Li H, Mori T, et al. The Impact of Health Information Technology on Work Process and Patient Care on Labor and Delivery. *Advances in Patient Safety*, August 2009.

Eden KB, Messina R, Li H, et al. Examining the value of electronic health records on labor and delivery. *Am J Obstet Gynecol* 2008; 199: 307.e1 – 307.e9.

Guise JM, Eden K, Osterweil P, et al. Electronic health records with decision support reduce uncertainty in Group B Streptococcus status. American College of Obstetricians and Gynecologists 57th Annual Clinical Meeting (ACM); May 2009; Chicago.

Guise JM, Messina R, Li H, et al. STORC OB SAFETY INITIATIVE: Catalyzing research while promoting clinical care and safety through OB Electronic Health Records. The Annual Meeting of the Society for Maternal Fetal Medicine; February 2008.

Awarded the Blue Ribbon for Scientific Presentation at the American College of Obstetricians and Gynecologists 57th Annual Clinical Meeting (ACM) May 2009.

STORC – A Fully Integrated Electronic Health Record (EHR): STORC, the integrated inpatient and outpatient obstetric EHR, is proprietary and not open-source. STORC was developed prior to the Certification Commission for Healthcare Information Technology (CCHIT) and is currently not CCHIT-compliant.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project received a no-cost extension, which has impacted its progress toward milestones and its use of the budget.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

**Table 10: Grant-Specific Summaries (Improved Decisionmaking)**

**HEALTH IT PORTFOLIO STRATEGIC GOAL:**

Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management (Improved Decisionmaking).

<b>AHRQ BUSINESS GOAL: IMPLEMENTATION AND USE</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Funding Opportunity Announcement</b>	<b>Summary</b>
Yes	Bentley, Polly M, RN, RHIT	Connecting Healthcare in Central Appalachia	<a href="#">HS04-011</a>	<a href="#">Page 273</a>
Yes	Mingle, Daniel B, MD	Improving Health Information Technology Implementation in a Rural Health System	<a href="#">HS04-011</a>	<a href="#">Page 275</a>
Yes	Mullen, R'nee	Rural Community Partnerships-Electronic Medical Record Implementation Project	<a href="#">HS04-011</a>	<a href="#">Page 278</a>
Yes	O'Brien, John, MBA	Electronic Health Record Implementation for Continuum of Care in Rural Iowa	<a href="#">HS05-013</a>	<a href="#">Page 280</a>
Yes	Waters, Teresa, PhD	Technology Exchange for Cancer Health Network (TECH-Net)	<a href="#">HS04-011</a>	<a href="#">Page 282</a>
No	Baker, David, MD	Using Precision Performance Measurement to Conduct Focused Quality Improvement	<a href="#">HS07-006</a>	<a href="#">Page 284</a>
No	Davidson, Arthur, MD	Colorado Associated Community Health Information Exchange (CACHIE)	<a href="#">HS07-002</a>	<a href="#">Page 286</a>
No	Dorr, David, MD, MS	Enhancing Complex Care through an Integrated Care Coordination Information System	<a href="#">HS08-002</a>	<a href="#">Page 289</a>
No	Fox, Karen, PhD	The Bettering Lives Utilizing Electronic Systems (BLUES) Project: Improving Diabetes Outcomes in Mississippi with Health Information Technology	<a href="#">HS07-006</a>	<a href="#">Page 291</a>
No	Fricton, James, DDS, MS	eHealth Records to Improve Dental Care for Patients with Chronic Illnesses	<a href="#">HS07-006</a>	<a href="#">Page 294</a>
No	Kopal, Helene, MPH, MPA	Evaluation of a Computerized Clinical Decision Support System and Electronic Health Record (EHR)-Linked Registry to Improve Management of Hypertension in Community-Based Health Centers	<a href="#">HS07-006</a>	<a href="#">Page 297</a>
No	McColm, Denni, MBA	Standardization and Automatic Extraction of Quality Measures in an Ambulatory Electronic Medical Record	<a href="#">HS07-002</a>	<a href="#">Page 299</a>
No	Mostashari, Farzad, MD	Bringing Measurement to the Point of Care	<a href="#">HS07-002</a>	<a href="#">Page 301</a>

No	Nocella, Kiki Coyne, PhD, MHA	Accessing the Cutting Edge: Implementing Technology to Transform Quality in SE Kern	<a href="#">HS05-013</a>	<a href="#">Page 303</a>
No	Pohl, Joanne, PhD	A Partnership for Clinician Electronic Health Record (EHR) Use and Quality of Care	<a href="#">HS07-006</a>	<a href="#">Page 305</a>
No	Sakuda, Christine M, MBA	Holomua Project Improving Transitional Care in Hawaii	<a href="#">HS05-013</a>	<a href="#">Page 307</a>
No	Wheeler, Donald A, MHA, FACHE	Critical Access Hospital Partnership Health Information Technology Implementation	<a href="#">HS05-013</a>	<a href="#">Page 310</a>
<b>AHRQ BUSINESS GOAL: KNOWLEDGE CREATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Funding Opportunity Announcement</b>	<b>Summary</b>
Yes	Bryant, Charles A, MD	INTEGRIS Telewoundcare Network	<a href="#">HS04-011</a>	<a href="#">Page 313</a>
Yes	Cebul, Randall D, MD	Trial of Decision Support to Improve Diabetes Outcomes	<a href="#">HS04-012</a>	<a href="#">Page 315</a>
Yes	Ferris, Timothy G, MD, MPH	Improving Pediatric Safety and Quality with Healthcare Information Technology	<a href="#">HS04-012</a>	<a href="#">Page 317</a>
Yes	Hsu, John, MD, MBA, MSCE	Impact of Health Information Technology on Clinical Care	<a href="#">HS04-012</a>	<a href="#">Page 319</a>
Yes	Keenan, Gail M, PhD, RN	Health Information Technology Support for Safe Nursing Care	<a href="#">HS04-012</a>	<a href="#">Page 322</a>
Yes	Stuen, Cynthia, PhD, DSW	Creating an Evidence Base for Vision Rehabilitation	<a href="#">HS04-011</a>	<a href="#">Page 325</a>
No	Berner, Eta, EdD	Closing the Feedback Loop to Improve Diagnostic Quality	<a href="#">HS07-002</a>	<a href="#">Page 328</a>
No	Hazlehurst, Brian, MD	Automating Assessment of Asthma Care Quality	<a href="#">HS07-002</a>	<a href="#">Page 331</a>
No	Kaushal, Rainu, MD	Developing and Using Valid Clinical Quality Metrics for Health Information Technology (Health IT) with Health Information Exchange (HIE)	<a href="#">HS07-002</a>	<a href="#">Page 333</a>
No	Kilbridge, Peter, MD	Surveillance for Adverse Drug Events in Ambulatory Pediatrics	<a href="#">HS07-002</a>	<a href="#">Page 335</a>
No	Kmetik, Karen, PhD	Cardio-Hit Phase II	<a href="#">HS07-002</a>	<a href="#">Page 337</a>
No	Lazarus, Ross, MBBS, MPH, Mmed, GDCCompSci	Electronic Support for Public Health - Vaccine Adverse Event Reporting System (ESP:VAERS)	<a href="#">HS07-002</a>	<a href="#">Page 340</a>
No	Schneider, Eric, MD	Massachusetts Quality E-Measure Validation Study	<a href="#">HS07-002</a>	<a href="#">Page 342</a>

No	Thomas, Eric, MD	Using Electronic Records to Detect and Learn from Ambulatory Diagnostic Errors	<a href="#">HS07-002</a>	<a href="#">Page 344</a>
No	Turchin, Alexander, MD	Monitoring Intensification of Treatment for Hyperglycemia and Hyperlipidemia	<a href="#">HS07-002</a>	<a href="#">Page 346</a>
No	Vogt, Thomas, MD	Using Information Technology (IT) to Improve the Quality of Cardiovascular Disease (CVD) Prevention and Management	<a href="#">HS07-002</a>	<a href="#">Page 349</a>
No	Weiner, Mark, MD	Crossing the Quality Assessment Chasm: Aligning Measured and True Quality of Care	<a href="#">HS07-002</a>	<a href="#">Page 352</a>
<b>AHRQ BUSINESS GOAL: SYNTHESIS AND DISSEMINATION</b>				
Completed in 2008	Principal Investigator	Project Title	Funding Opportunity Announcement	Summary
Yes	Horn, Susan D, PhD	Nursing Home Information Technology (IT): Optimal Medication and Care Delivery	<a href="#">HS04-011</a>	<a href="#">Page 354</a>
No	Lehmann, Christoph, MD	Medication Monitoring for Vulnerable Populations via Information Technology (MMITI)	<a href="#">HS07-002</a>	<a href="#">Page 357</a>
No	Logan, Judith, MD	Improving Quality In Cancer Screening: The Excellence Report For Colonoscopy	<a href="#">HS07-002</a>	<a href="#">Page 359</a>
No	Selby, Joe, MD	Feedback of Treatment Intensification Data to Reduce Cardiovascular Disease Risk	<a href="#">HS07-002</a>	<a href="#">Page 361</a>

<b>Project Title:</b>	Connecting Healthcare in Central Appalachia
<b>Principal Investigator:</b>	Bentley, Polly, R.N., R.H.I.T.
<b>Organization:</b>	Appalachian Regional Healthcare, Inc.
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015182
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,500,000
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** As an integrated, not-for-profit rural health care system serving Eastern Kentucky and Southern West Virginia, Appalachian Regional Healthcare, Inc., (ARH) planned to implement electronic medical records (EMRs) at the system's nine hospitals. ARH is an integrated health care delivery system serving approximately 20 rural counties throughout Central Appalachia that serves a rural population. The system provides a continuum of care for its patients, including clinics, inpatient and outpatient medical services, psychiatric services, rehabilitation, and home health and durable medical equipment and supplies. Hospitals range in size from Critical Access facilities (at most 25 beds) to this proposal's lead applicant, a 308-bed regional medical center in Hazard, Kentucky. The rural care setting and wide range of services offered by this system require an intense focus on building connectivity via technology. Prior to this grant, ARH had successfully implemented financial/billing systems; the rollout process and train-the-trainer method of education used with this implementation served as models for the hospitals' EMR adoption effort. ARH recognizes that the incremental introduction of a comprehensive clinical system is critical to its success as a quality health care provider. By electronically capturing and managing all patient care-related information, ARH will reduce medical errors, improve clinical documentation and optimize the patient care encounter. Some of the desirable outcomes linked to EMR implementation include the following: improvement in access to patient information, improvement in the timeliness of care, reduction in errors, streamlining of workflows, improvement in data security, reduction in overall costs, and improvement in patient and provider satisfaction.

### Specific Aims

- Increase connectivity between ARH facilities and staff through the adoption of electronic medical records that accommodates the needs of the ARH system. **(Achieved)**
- Develop the necessary infrastructure to transfer current patient files to the electronic system and alter workflow simultaneously. **(Achieved)**
- Implement the rollout and evaluation of the EMR system. **(Achieved)**
- Prepare ARH for further implementation of clinical information system components through evaluation and analysis of current rollout and future needs. **(Achieved)**

**2008 Activities:** Four of the nine facilities had their go-live dates in 2008, joining the other five hospitals in adopting the EMR system. Evaluation and quality improvement continued throughout.

**Preliminary Impact and Findings:** Evaluation of the success of the system's implementation, to a certain extent, has been measured through attendance and participation at training sessions, successful

competency rates, and smooth transition from a paper to a paperless environment with favorable feedback from clinicians and other staff, use of the system, and forms standardization. Other good measurements include turnaround times on chart scanning and indexing, which determines how soon after discharge the EMR is available to the physician, and chart delinquency rates. Principal findings relative to training were positive overall and in line with other prior ARH implementations. Staff found that facilities with a full-time Education Coordinator had a more organized training schedule with better results—more staff were trained prior to go-live (including physicians) with less chaos on the units at the time of go-live. Use of the system has grown over time, and currently 80 percent of physicians access at least parts of the record electronically.

One of the principal findings of this project involves the work done on forms standardization. Once work on forms standardization began, it became evident that the situation was much worse than predicted, and a major initiative was launched. It was determined that there were over 2,000 bootleg forms throughout the organization (600-plus at the Hazard, Kentucky, location). In addition to standardizing the forms, barcodes had to be assigned and applied. The turnaround for charts after discharge has improved. With the EMR system in place, clerks make timely rounds of the nursing units to pick up charts of discharged patients and take them to their Health Information Management department. The charts are then scanned and indexed to assure that all the forms in each chart are electronically ‘filed’ in the right folders—most of this ‘filing’ is done automatically by the system through the use of the barcoded forms developed as part of the project. As soon as a chart has been indexed, it is available and accessible online to anyone who needs it, like coders, abstractors, billers, or physicians. These improvements in standardization and newfound commitment to system-wide quality improvement processes which have been triggered by this project indicate that ARH stands to benefit substantially from health information technology (IT) adoption. Implementation of the overall EMR, a process that began with this project’s adoption of an EMR and subsequent implementations of clinical documentation, clinical decision support, and provider order entry, will facilitate improvement in the overall patient care process by giving ARH an opportunity to critically rethink and redesign key processes. The success of this implementation has encouraged the ARH system to push forward with further development of health IT capabilities, and this project has given the staff confidence that significant changes can be accomplished.

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### **Selected Outputs**

None available.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** At the conclusion of the grant, all milestones had been met.

**Milestones:** Progress is completely on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Improving Health Information Technology Implementation in a Rural Health System
<b>Principal Investigator:</b>	Mingle, Daniel B., M.D.
<b>Organization:</b>	MaineGeneral Medical Center
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015337
<b>Project Period:</b>	09/04 – 03/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,375,179
<b>Summary Status as of:</b>	March 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** Through this completed grant, MaineGeneral Health (MGH) has pursued its longstanding commitment to the successful implementation of an outpatient (ambulatory) electronic medical record (EMR). MGH serves 140,000 patients in rural central Maine. Of the 104 practices affiliated with MGH, 29 are primary care practices, 59 are solo practitioners, and 33 are groups of 5 physicians or fewer. All are in communities classified as rural by the United States Department of Agriculture. In 2000, a process was launched to evaluate local providers' needs and to choose an EMR. In 2002, the Touchworks product from the vendor Allscripts was chosen for implementation as an enterprise-wide EMR for practices owned by MaineGeneral and independent practices affiliated with MaineGeneral. Seven primary care practices owned and operated by MaineGeneral were chosen as pilot sites, and a staged implementation was begun in January 2003. At the time of this award, the first phase of EMR implementation had been completed at seven sites, which included electronic prescribing, allergy list, medication list, problem list, and tasking functionalities. It was intended to complete the installation of all modules, including clinical decision support (CDS) in the original seven pilot practices and add 12 new practices within the span of the grant, with the hope of emerging from the grant period with a plan to implement in all MaineGeneral-affiliated practices. Implementation of the EMR system and all of its functional modules was intended to improve patient safety, increase quality of care, and improve the efficiency of primary care, allowing doctors to serve more patients. Data were collected to show the effects of the EMR on health care quality, safety, access, cost, and practice finances. Where possible, comparison data from similar Maine non-participating practices were used to assess the impact of the implementation.

### Specific Aims

- Complete installation of EMR modules at initial seven sites. **(Achieved)**
- Implement EMR system at 12 additional sites. **(Achieved)**
- Develop implementation procedures and a sustainability plan. **(Achieved)**
- Improve safety, quality, and accessibility of care. **(Achieved)**
- Implement CDS, data-sharing, and e-prescribing tools. **(Achieved)**

**2008 Activities:** Data have been collected on system performance and patient outcomes, although the sample size has been too small for conclusions to be drawn from statistical analyses. Also in 2008, MGH encountered significant budget challenges and chose to freeze efforts to expand EMR functionality and implementation. The remaining budget, though decreased, is sufficient to support current users and functionality, but no funds will be expended to advance functionality or to expand participation. There is

no evidence that deinstallation at current sites is likely, and advancement efforts are likely to resume when budget issues are resolved.

**Preliminary Impact and Findings:** Implementation of the EMR system exceeded expectations, reaching 30 practices by the end of the grant term, with 12 more in queue in the pre-implementation phase. The community has been engaged by the project, and a reproducible process has been developed to implement the EMR in subsequent practices without significant loss of productivity. Despite budget cuts that required the postponement of expanding the EMR system, current use of the system is financially secure and sustainable. Evaluation metrics are still in development; although use of functions like e-prescription is being tracked, associated cost savings and patient safety improvement have proven more difficult to measure. Other metrics, including average per-patient costs, efficiency of office visits, and measures of quality improvement have not demonstrated trends toward improvement; in some cases, EMR-implementing sites performed worse than comparable practices that do not yet use the system. Cost to the patient was up 34 percent in participating practices, compared to 27 percent in control practices, over the measurement period. This difference appears to be primarily due to increases in emergency room (ER) and hospital use and in pharmaceutical expenditures. ER costs rose 93 percent, and hospitalization costs rose 16 percent in participating practices compared to 30 percent and 9 percent, respectively, in control practices. Pharmaceutical costs are up 47 percent in participating practices compared to 42 percent in control practices. The rise in ER costs is apparently a direct result of the implementation. Clinicians report that the EMR provided more accessible and more compelling data at each patient visit. They report that the EMR led them to provide more interventions for each patient at each visit. Each patient visit was more complex and more time consuming; consequently, they saw fewer patients overall. Cost data suggest that the displaced patients sought services in the ER instead. Increased pharmaceutical costs might reflect accelerated rates and intensity of treatment for poorly controlled chronic diseases, changes in prescribing patterns relating to increased ER use, or both. The project concludes that implementation of ambulatory EMR is a complex process—the project can be a technical success, and can achieve clinician participation, buy-in, and engagement, but it may still fail to deliver the expected performance or return on investment.

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### **Selected Outputs**

Mingle D. The Role of Stark Reform in the Transformation of Healthcare in Rural Maine. Healthcare Information and Management Systems Society (HIMSS) Summit; June 2008; Washington, DC.

Mingle D. What to Consider When You are Considering ePrescribing. Brinkman Physicians in Rural Practice Symposium; March 2007; Farmington, ME. Farmington: Franklin Community Health Network.

Mingle D. The Foundational Role of EHR in a Successful RHIO, Lessons from Rural Maine. Annual Healthcare Information and Management Systems Society (HIMSS) Conference; February 2006; San Diego, CA.

Mingle D. Using the EHR, to Strengthen the Collaboration between Providers and Community Resources for Diabetes Care. Annual Meeting of the Maine Diabetes and Control Project; August 2005; Augusta, ME.

Mingle D. Electronic Health Record (EHR) Roll Out, Learning from the MaineGeneral Experience. Annual Patient Safety and Health Information Technology Conference; June 2005; Washington, DC.

Mingle D. Taking Care to the Community: Using the EMR to Initiate Health Practice Change. Annual Meeting of the Society of Teachers of Family Medicine; October 2004; Rye Brook, NY.

AHRQ 2008 Annual Conference presentation: EHR Implementation and Adoption Ambulatory EHR at MaineGeneral Medical Center ([PowerPoint® File](#), 1 MB; [Web Version](#)). September 2008, Bethesda, MD.

AHRQ 2007 Annual Conference presentation: Putting the Electronic in Ambulatory Record ([PowerPoint® File](#), 2.8 MB; [Web Version](#)). September 2008, Bethesda, MD.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This grant has been completed. The EMR system has been successfully implemented in 30 practices, and the system has sufficient administrative, clinician, and financial support to be sustainable. Primary aims for the project were generally met on schedule. The EMR system was implemented at a larger number of practices, although financial difficulties left it less fully developed than had been planned. Data were collected, but analysis suffered from small sample sizes.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Rural Community Partnerships—Electronic Medical Record (EMR) Implementation Project
<b>Principal Investigator:</b>	Mullen, R’Nee
<b>Organization:</b>	Magic Valley Regional Medical Center
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015302
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$924,216
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** The completed project’s specific purpose and aim was to implement an ambulatory electronic medical record (AEMR) in multiple, rural primary and specialty care provider settings managed by Magic Health Partners, L.L.C. (MHP) and Magic Valley Regional Medical Center (MVRMC) via Magic Healthcare Partners (MHCP). In addition, critical to the ongoing success, was the College of Southern Idaho (CSI) involvement in integrating AEMR case scenarios into the curricula of the Health Sciences and Human Services Department. This was to ensure that future health care providers would have adequate training and exposure to AEMR technology. Each member committed to use of this technology with the objective of improving overall patient and provider access to high quality care and information. MVRMC provided expertise and leadership for the AEMR implementation; it is the largest, most comprehensive rural hospital in the service area. The preferred system that was implemented to facilitate the AEMR is the Centricity product from GE Medical Systems (GEMS). Preliminary data were gathered during the planning period for the implementation of the AEMR with MHP and MHCP. Observations cited a total of 12,671 charts pulled from practitioners’ archives over the course of a typical 30-day period; this is significant since MHP serves 6,800 to 7,100 unique patients each month. When a chart is checked out to one location, there is potential for it to be unavailable at another point of care. It also represents a significant cost in labor to continually pull and return charts. The potential for information availability related to missing charts was significantly increased by the need to keep charts out of the filing system while updating them with new information. The need for improved verification and access is central to high quality care. The delivery of the right information at the right time at the right place was a key driver for the implementation of the AEMR.

### Specific Aims

- Implement AEMR in 18 rural primary and specialist care practices managed by MHP and MHCP via MVRMC to improve medical accuracy, improve patient safety processes, and facilitate non-duplicated tracking and reporting of care services provided to patients located in south central Idaho and northern Nevada. **(Ongoing\*)**
- Implement AEMR to facilitate and enhance community wellness via immunizations, screening, and proactive acute chronic condition management within MHP providers via MVRMC. **(Ongoing\*)**
- Improve overall business-related outcomes following AEMR implementation by reducing the overall costs of transcription, expenditures on office supplies, costs related to filing expenses, and by the number of lost charges at MHP and MHCP via MVRMC. **(Achieved)**

- Implement and integrate AEMR functionality case scenarios into CSI Health Science curricula to ensure health care provider preparedness for transitioning into workplaces with health care information technology systems. **(Achieved)**

*\* Several aims of the grant were not completed prior to 8/08, but, as other sources of funding have been secured, these aims are still targeted for completion.*

**2008 Activities:** Data were collected and analyzed from the live system.

**Preliminary Impact and Findings:** Initial focus on transcription costs revealed instant cost savings, so continual monitoring was not put in place. A decision not to monitor office supplies and filing expenses was made in order to spend the time focusing on developing a return on investment (ROI) model for the purchase and implementation of the system. Results of doing pre- and post-implementation analysis of medication, allergy, and problem lists being documented completely and accurately indicated a marked improvement in presence and accuracy in the chart in all but two cases. In these cases, there was a decrease seen in documentation completeness and accuracy for the patient problem list. This was due to inadequate codifiable choices for the physician to select from in the AEMR. This was rectified quickly as those physicians identified the missing choices from the selection list of problems. Documentation of patient encounters without chart access and documentation of requests for additional information not found in the patients chart was also analyzed pre- and post-implementation. The lesson learned with Physician Center was to have the scanning solution in place, to conduct retrospective scanning at least 30 days prior to go-live and to make sure there was enough staff to keep up with the retrospective scanning to keep patients entered into the AEMR for their first “electronic” visit at least 72 hours prior to their scheduled appointment. This process was used for two providers and significant improvement in chart completeness was realized. Physician satisfaction surveys were conducted pre- and post-implementation to determine level of satisfaction and discrete improvements in work life. Overall satisfaction with the AEMR system and its impact on their work life was seen. CSI students went through training and evaluation with the AEMR system.

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### **Selected Outputs**

Mullen R, Donnelly JT. Keeping it real—building an ROI model for an ambulatory EMR initiative that the physician practices espouse. *Healthc Inf Manag* 2006 Winter;20(1):42-52.

Physician Satisfaction Survey

Patient Satisfaction Survey

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**Grantee’s Most Recent Self-Reported Quarterly Status:** Although implementation took place at fewer sites than originally anticipated, cost effectiveness, and improvements in workflow and quality of care were apparent in post-live data. AEMR curriculum was developed and taught to nursing students at CSI. Some milestones are still ongoing, but stakeholder buy-in suggests that implementation will expand in the future.

**Milestones:** Grantee did not provide self-assessment during 2008.

**Budget:** Grantee did not provide self-assessment during 2008.

<b>Project Title:</b>	Electronic Health Record Implementation for Continuum of Care in Rural Iowa
<b>Principal Investigator:</b>	O'Brien, John, M.B.A.
<b>Organization:</b>	Hancock County Health Services
<b>Mechanism:</b>	RFA: HS05-013 - Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016156
<b>Project Period:</b>	09/05 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,474,178
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** The purpose of the project was to implement and evaluate a comprehensive electronic health record (EHR) system to improve quality of care in rural Iowa. This EHR system includes various functionalities, including: computerized physician order entry (CPOE), evidence-based care guidelines, and decision support tools. The project also included implementing a barcoded medication administration (BCMA) system that was integrated with the EHR and electronic medication administration record in order to prevent medication errors. The system connected seven rural Critical Access Hospitals with the same system used by their rural referral hospital, which is part of the fourth largest Catholic health care system in the United States. The project was led by Hancock County Memorial Hospital, a Critical Access Hospital, and six additional Critical Access Hospitals in north Iowa in partnership with Mercy Medical Center-North Iowa; Trinity Health, based in Novi, Michigan; and the University of Iowa Department of Health Management and Policy. As additional funding has been secured to continue work, project researchers are conducting additional interviews and surveys, analyzing data on post-live perceptions, evaluation of readiness activities, and refining post-live support.

### Specific Aims

- Complete go-live. **(Achieved)**
- Conduct a post-go-live evaluation. **(Ongoing\*)**
- Define and provide post-live support. **(Ongoing\*)**
- Conduct end-user training. **(Achieved)**
- Develop hardware and infrastructure readiness. **(Achieved)**
- Increase use of standardized evidence-based care practices. **(Ongoing\*)**
- Enhance the abilities of providers to coordinate patient care across the North Iowa network and beyond. **(Ongoing\*)**
- Maximize use of clinical expertise and learning within and across network organizations. **(Ongoing\*)**
- Produce significant, measurable, and sustainable improvements in patient safety and quality of care, as well as increased organizational and financial efficiencies. **(Ongoing\*)**

*\* Several aims of the grant were not completed prior to 9/30/08, but, as other sources of funding have been secured, these aims are still targeted for completion.*

**2008 Activities:** While the grant period officially ended in September 2008, work continued toward meeting some unfinished specific aims. In February 2009, all seven sites were making progress in activating BCMA. Key informant interviews for post-go-live evaluation are being analyzed. Post-live support processes are also on track, which will allow essential communications between all sites. Hardware and infrastructure assessments, upgrades, and configurations have been completed.

**Preliminary Impact and Findings:** Despite some project delays in 2008, as of Spring 2009, all sites are live with BCMA.

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### **Selected Outputs**

Hardware reconfiguration has been completed for the device used for the BCMA.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This grant has officially ended, but work has continued into 2009 to achieve original specific aims.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Technology Exchange for Cancer Health Network (TECH-Net)
<b>Principal Investigator:</b>	Waters, Teresa, Ph.D.
<b>Organization:</b>	University of Tennessee Health Science Center
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015437
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,429,265
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** Dr. Waters concluded this 4-year grant in September 2008. The Technology Exchange for Cancer Health Network (TECH-Net) is a collaborative, multistate effort to implement a systematic care program to improve cancer management in the rural communities of west Tennessee, north Mississippi, and east Arkansas. These efforts continue past the term of this grant, as other sources of funding have been secured. The Federal Bureau of Health Professions designated all of the counties targeted by TECH-Net, excluding Shelby County, as Health Professional Shortage Areas. Residents with special health care needs who live in these rural communities of the Mississippi Delta are typically referred to larger urban areas for care. These referrals involve time, travel, and lost wages. When these barriers become significant, the patient may delay recommended referrals or treatments, further exacerbating their condition and increasing health care costs and the likelihood of an adverse outcome. Programs that bring specialty oncology and hematology care to these rural communities can provide rural physicians and their patients access to state-of-the-art care for improving health outcomes in a cost-effective and efficient manner. This rurality and corresponding lack of access to care is the first component that makes this population particularly vulnerable to diseases such as cancer. This health information technology (health IT) project builds upon a two-pronged approach to total clinical decision support. The first component provides access to oncology, hematology, and other specialists through the dedicated telehealth network of the University of Tennessee’s Health Science Center (UTHSC). The second component involves a distributed electronic health record (EHR) integrated with decision support systems, online management of cancer protocols, electronic orders, and medication management systems. The primary goal of this implementation project has been to determine the extent to which a multistate health IT collaborative network can contribute to measurable and sustainable improvements in the cost, safety, and overall quality of cancer care for a region. TECH-Net has linked six separate cancer outreach clinics in a tri-state area with the specialists and researchers of UTHSC and with Methodist University Hospital, a major tertiary care hospital, for comprehensive care and communications across the spectrum of adult cancer care. Implementation of this telehealth and EHR program took a phased approach, sequentially building clinical decision support into existing workflows.

### Specific Aims

- Implement a collaborative, multistate Health Information Technology System that meets the needs of patients, families, and providers in a rural cancer care setting. **(Achieved)**
- Improve access to appropriate care, increase the quality and safety of care, and achieve better health outcomes at equal or lower cost for cancer patients in rural communities through an integrated Health Information Technology System. **(Achieved)**

- Produce and distribute a generalizable, replicable model for implementing an integrated Health Information Technology System for cancer care. **(Achieved)**

**2008 Activities:** Data collection from the evaluation study continued through the end of the grant period; as such, final analyses had not been concluded by the end of 2008.

**Preliminary Impact and Findings:** TECH-Net has linked six separate cancer outreach clinics in a tri-state area with the specialists and researchers of UTHSC and with Methodist University Hospital, a major tertiary care hospital, for comprehensive care and communications across the spectrum of adult cancer care. The program has been so well-received by clinicians and patients that the telehealth/EHR connections have remained active after the completion of the grant. These connections are currently being funded by UTCI. Two hundred and seventeen (217) patients (134 rural, 83 urban) were enrolled in the evaluation study from 05/25/05 to 09/30/08. Patient satisfaction has been high—95 percent of patients indicated that their telemedicine visit was as good as or better than an in-person office visit. Patients also report high satisfaction with reduced transportation costs and appointment wait times. Cost analysis comparing cost savings (physician travel time) with telemedicine costs (equipment, high speed lines) indicates that the cost-benefit depends critically on distance to the rural facility and number of physician trips avoided. Initial cost data indicate that telemedicine must save at least 5 hours of physician travel time per month to break even. Telemedicine also appears to be associated with significant improvements in access to care for rural patients. Using patient self-reported health care utilization (verified with local providers for accuracy), variations in health care visits between urban and rural patients fell from an initial high point of a three-fold difference at month 1 to less than a two-fold difference at 6 months. Analysis of other study measures (medical errors, medication errors, treatment success/failure, adverse outcomes, use of investigational protocols, and protocol adherence) is still ongoing; this process was delayed in order to allow time for one-year follow-ups. Telemedicine offers a promising method for increasing access to oncology care in rural areas that is well-accepted by patients. Cost savings are achievable, even at relatively low patient volumes. The health care visit improvements observed for rural patients also suggest that telemedicine facilitates access to a wider range of health care professionals. It is likely that the regular care and follow-up provided through telemedicine visits identifies unmet need and early problems that might otherwise go undetected or untreated. A successful system implementation has produced data on patient outcomes currently being studied, and early indicators from the cost savings model suggest that the system has improved the efficiency of care.

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### **Selected Outputs**

Yunus F, Gray S, Fox KC, et al. The impact of telemedicine in cancer care. Proceedings of the American Society of Clinical Oncology; June 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is on track in some respects in terms of its progress.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Using Precision Performance Measurement to Conduct Focused Quality Improvement
<b>Principal Investigator:</b>	Baker, David, M.D.
<b>Organization:</b>	Northwestern University
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017163
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,199,415
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The project creates systems that improve quality data and that seamlessly link these data to practice-level quality improvement programs and point-of-care interventions. The project uses previously developed quality measurement programs using electronic health record (EHR) data to measure quality of care for coronary artery disease, heart failure, diabetes, hypertension, and preventive services. This study began at a large academic internal medicine practice and is now being implemented in four community practices that use the same Certification Commission for Healthcare Information Technology (CCHIT) certified EHR, Epic® (version Spring 2007). Exception codes are being introduced into the EHR for 18 national quality measures. Data will be extracted from the EHR every month to assess changes in the primary outcome: the proportion of eligible patients who do not satisfy a measure and do not have an exclusion criteria documented. The statistical significance of changes will be assessed with time series analysis. In addition, physicians will be surveyed multiple times to assess their attitudes toward the interventions described in the aims listed below, and the outcomes of the quality improvement activities will be monitored along with the costs of the intervention. In addition, this study will produce computerized tools and educational materials that can be provided to over 1,000 sites that use the Epic® ambulatory product.

### Specific Aims

- Integrate simple, standard ways for clinicians to document patient reasons or medical reasons for why quality measures are not met and assess the use of these exception codes, the impact of exception reporting on measured levels of quality, and the impact of using these codes on physician satisfaction and self-reported efficiency. **(Ongoing)**
- Use the exception codes (patient reasons and medical reasons) that clinicians enter to target three forms of quality improvement, including 1) peer review of all medical reasons for not adhering to guidelines followed by academic detailing if a clinician enters an unjustified reason for not following guidelines, 2) counseling for patients whose physician enters an exclusion code stating that the patient cannot afford a needed medication to determine ways of overcoming barriers, and 3) educational outreach to all patients who refuse recommended interventions (e.g., colorectal cancer screening), including mailing of plain language health education materials or DVDs. **(Ongoing)**

- Provide clinicians with highly accurate information on patients' quality deficits immediately prior to their visit as part of routine workflow and assess whether this intervention increases provision of recommended therapies/tests, and documentation of exclusion codes. **(Upcoming)**

**2008 Activities:** The Northwestern Medical Faculty Foundation (NMFF) and Evanston Northwestern Healthcare (ENH) teams have been working collaboratively and have created a new Best Practice Alert system that allows physicians to enter "not done, medical reason," "not done, patient reason, cost," and "not done, patient reason, non-cost." The system also allows physicians to enter a code to remove patients from disease registries (e.g., the patient does not actually have coronary artery disease, but this was entered as a diagnosis code in the past); indicate if a patient has a "global exception" to turn off all alerts (e.g., metastatic cancer); or indicate if a patient is no longer seen by the practice. A system was created so that the exception codes are visible under a separate heading in the EHR where physicians can easily see why a medication or test was not ordered. The EHR tools for clinicians to document patient reasons or medical reasons for why quality measures were not met were developed from September 2007 through January 2008. The EHR tools are fully implemented and operational. The project originally proposed 17 measures, but added aspirin for diabetes as the 18th. To date the project has completed outreach and quality reviews for approximately 500 patients each and is beginning analyses to evaluate the outcomes of this with the plan to submit two papers, one for each of these topics.

**Preliminary Impact and Findings:** For the first aim, changes in quality of care from February 7, 2008, to December 31, 2008, have been seen. Significant improvements have been seen for nine measures compared to baseline, and for four other measures there has been a significant improvement at the same rate as before the intervention began. For the second aim, to date, 6.5 percent of the quality reviews have identified an issue requiring feedback from an investigator to a clinician who entered a medical exception. For the patient outreach, the majority of patients do not want to talk about their refusal. Of all patients, 13.5 percent actually completed a test or medication that they originally declined.

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### Selected Outputs

The project team was invited to present live demonstrations or summaries of the project tools to the NMFF Board of Directors, the NMFF Information Technology Leadership Committee, and the ENH Department of Family Medicine Faculty Meeting. In addition, the project team has presented at the Healthcare Information and Management Systems Society (HIMSS) conference, 2008 AHRQ Annual Conference, and the Epic User's Group meeting.

AHRQ 2008 Annual Conference presentation: Use of Information Technology for Precision Performance Measurement and Focused Quality Improvement ([PowerPoint® File](#), 2.3 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The team has requested to use some of the funds that have not been spent to add a group of Federally Qualified Health Centers as a dissemination site. This is very important because it is an underserved population, and they use a different EHR records tool (G.E. Centricity).

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Colorado Associated Community Health Information Exchange (CACHIE)
<b>Principal Investigator:</b>	Davidson, Arthur, M.D.
<b>Organization:</b>	Denver Health and Hospital Authority
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017205
<b>Project Period:</b>	01/08 – 09/09
<b>AHRQ Funding Amount:</b>	\$986,302
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in January 2008 and has completed the first half of the grant period. This project is designing, developing, implementing, and evaluating an interoperable quality information system (QIS) for a collaborative network of seven community health centers (CHC) that permits real-time and synchronous quality reporting to inform patient care, quality interventions, and health policy and advocacy efforts. The QIS is foundational in nature, ultimately supporting many types of quality and safety analyses. The QIS will aggregate data elements from disparate electronic health records (EHRs) using a data warehouse and business intelligence programming to generate meaningful quality measures and reports at the patient, physician, practice, and population level. The initial chronic disease focus is diabetes mellitus, and the second condition currently planned is tobacco cessation.

The initial proposal included the implementation of Guideline Information System (GIS) to garner consensus regarding disease/condition management guidelines and the implementation of guideline-concordant templates into disparate EHRs. The GIS was to include a modular template design allowing efficient updating, reuse, and blending of templates for patient encounters that require concurrent use of multiple disease guidelines. The GIS was to assist with: 1) the provision and documentation of evidence-based care, and 2) the export and standardization of data elements to allow both quality reporting and ultimate real-time clinical decision support. Over the course of the project, the focus has shifted, based on the needs of the stakeholders. The current primary focus with clinician stakeholders is to develop consensus on the quality measures required for diabetes reporting and on the ancillary information that allows the report to be actionable for quality improvement. Some physician leaders had concerns and negative attitudes regarding the need for templates in clinical care, while other CHCs were working on template development independent of this project. It was decided that the baseline reporting and benchmarking available via the QIS would assist in identifying and supporting the need for future templates. Clinical reporting both inspires and allows providers and practices to “question the data,” hence uncovering areas whether appropriate care was either not provided or it was provided, but not documented in a manner amenable to data extraction. Efficient guideline-concordant templates should address both of these problems, given they are readily used.

A second focus for this effort is to establish a replicable process for quality report measure and actionable report development in other clinical domains, as diabetes is used as the prototype. This involves the clinicians as well as technical support staff involved in the goal of creating a standard and efficient process for building consensus, documenting functional requirements, data mapping, and then

implementing. This is essential if Colorado Associated Community Health Information Exchange (CACHIE) is to extend beyond diabetes measures.

The QIS system is standardizing data using emerging national standard vocabularies and will report quality measures in a timely, efficient, and user-convenient manner. The QIS supports: 1) identification of best practices; 2) establishment of appropriate CHC benchmarks; 3) development, implementation, and evaluation of targeted quality improvement interventions; 4) use of clinical decision support systems; and 5) promotion of public policies to improve health and health services to low income populations. The Certification Commission for Healthcare Information Technology (CCHIT) certified EHRs used in this project include NextGen 5.4.28 and GE Centricity as the pilot EHRs. Other future EHRs involved in the project include EHS 5.0j.113 and Noteworthy 5.4.2. None of the EHR vendors working with this project were ready to start exchanging continuity of care documents (CCDs), nor could they be assured that all of the information of interest would be included in the exchange. NextGen and GE technical departments are committed to incorporating CCD formats when CCD standards are finalized and become the standards for interoperability.

### Specific Aims

- Obtain detailed business and technical requirements for development of: 1) a flexible, evidence-based, clinical template system that interoperates with four vendor-based EHRs, and 2) a timely and efficient quality information reporting system that aggregates and integrates multiple data sources within seven CHCs. **(Ongoing)**
- Develop a system for garnering consensus among various CHCs on DM quality measures and actionable report measures. **(Ongoing)**
- Extract data from two disparate EHRs, standardize to nationally recognized vocabularies, and import into a shared data warehouse. **(Ongoing)**
- Implement and deploy a business intelligence tool for self-service and static reporting. **(Ongoing)**
- Guide, support, and evaluate each CHC practice to build capacity and monitor associated costs as they independently (e.g., without vendor support) implement an evidence-based guideline template. **(Upcoming)**
- Evaluate the usability, utility, accuracy and best methods for incorporating quality measure reporting as a feedback mechanism to providers and practice managers. **(Upcoming)**

**2008 Activities:** The project prepared materials such as guidelines, quality measures, and flow diagrams for the business process analysis (BPA). The first round of BPA focus groups and site visits were conducted with the CHCs to inform user and business requirements for the GIS and QIS. User requirements were developed and disseminated and used to create the Request for Information (RFI) and Request for Proposal (RFP) distributed in the vendor selection process. Activities to support the design and implementation of evidence-based templates were put on hold because the CHCs had already and/or were in the process of implementing templates of their own. The project established a Clinical Advisory Work Group to finalize the diabetes outcome measures for reporting. The project also elected to create a CHC stakeholder committee to address and develop policies and procedures for appropriate use and governance for the shared QIS.

An RFI to support the QIS was disseminated to over 30 vendors. A key factor explored through the vendor selection process was the capacity for the vendors to use standard messaging such as health level seven (HL7) and CCD for interfacing and connectivity. The report prepared by one of the project consultants found that most EMR vendors are not ready to implement CCD exchange for bidirectional communication. Subsequently, a formal RFP was distributed in November 2008 to four vendors regarding extraction, transformation, loading, data warehousing, and business intelligence for CACHIE.

**Preliminary Impact and Findings:** Publicly available findings will be disseminated closer to the end of the project.

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### **Selected Outputs**

A one-page Use Case and Workflow illustrating the visit and post-visit constructs of the QIS.

AHRQ 2008 Annual Conference presentation: Creating a Shared Quality Improvement Reporting System ([PowerPoint® File](#), 1.7 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 30 to 65 percent of its milestones. The project did not focus on template design and implementation because the CHCs had already completed work in this area prior to this project. To overcome the delays, the project will leverage a pre-existing effort within the CHCs to implement a tobacco cessation template as the project's second disease/condition topic. It is expected that with these changes and the selection of QIS vendors, completion of the project will be achieved. The project is somewhat under spent by 5 to 20 percent due to the decision to stop activities related to template design. Full use of the budget is expected as the project moves forward with extraction, transformation and loading activities, building a data warehouse, and business intelligence tools. The extensive early planning activities have resulted in a more comprehensive list of functional requirements and documentation of specific quality information system reporting needs. By building consensus, the prototype or pilot development was limited so that the first iterations will likely be completed over the next 6 months with greater specificity of outputs and outcomes based on extensive early business analysis.

**Milestones:** Progress in meeting many milestones is stalled.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Enhancing Complex Care through an Integrated Care Coordination Information System
<b>Principal Investigator:</b>	Dorr, David, M.D., M.S.
<b>Organization:</b>	Oregon Health and Science University
<b>Mechanism:</b>	RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health IT (MCP)
<b>Grant Number:</b>	R18 HS 017832
<b>Project Period:</b>	09/08 – 09/11
<b>AHRQ Funding Amount:</b>	\$1,155,147
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** Dr. Dorr and his team launched their project in late September 2008. This project proposes to investigate whether care for patients with complex needs can be improved by implementing an integrated care coordination information system (ICCIS) that incorporates population management techniques, patient-centered goals, quality measures, and clinical reminders. In the first year, Dr. Dorr’s team will help the enrolled clinics build the care management functions into their existing information systems. Enrolled clinics include two inner city locations and four rural locations. All enrolled clinics are required to have a Certification Commission for Healthcare Information Technology (CCHIT) certified electronic health record (EHR) with Continuity of Care Record (Document) (CCR-D) export standardization or, for paper-based clinics, use of the Web-enabled tool that provides ICCIS functions. ICCIS is a self-developed system. In the second and third years, Dr. Dorr and his team will evaluate how well care coordination functions are used at the clinics. Measures will include indicators of patient activation, clinic-level quality of care, clinic-level process measures, and patient health outcomes.

### Specific Aims

- Implement the Care Management Plus and Integrated Care Coordination Implementation System models. **(Ongoing)**
- Assess the implementation. **(Upcoming)**
- Perform a cluster randomized trial in the six clinics on the ability to use the IT functions to monitor and deliver care to high risk patients through a care coordination (arm 1) or a quality performance model (arm 2). **(Upcoming)**
- Understand and disseminate the outcome benefits, challenges, and unintended consequences from use of these functions for patients and the system. **(Upcoming)**

**2008 Activities:** The main activity for Dr. Dorr and his team this quarter has been to build the system. They are about halfway done and have developed a shell with security requirements and authentication to test. In addition, they have interviewed all six clinics to establish a baseline of workflow processes and conducted baseline usability testing on the four rural Oregon clinics to better understand the content and context for the clinics. From the interviews, they developed a set of the top five requests for functionality to incorporate into the system. They have also identified the need to develop a process for prioritizing and responding to other requests for support by the clinics—this process development will have implications for future scalability and dissemination of the system.

**Preliminary Impact and Findings:** There are no findings at this time because they are still developing the intervention.

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**Selected Outputs**

ICCIS Information System: prototype available for review, populated with test patients.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is generally on track, meeting 80-99 percent of milestones.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

**Project Title:** The Bettering Lives Utilizing Electronic Systems (BLUES) Project: Improving Diabetes Outcomes in Mississippi with Health Information Technology

**Principal Investigator:** Fox, Karen, Ph.D.

**Organization:** Delta Health Alliance, Inc.

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)

**Grant Number:** R18 HS 017233

**Project Period:** 09/07 – 09/10

**AHRQ Funding Amount:** \$1,163,573

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The Delta Health Alliance (DHA) project will demonstrate, at several ambulatory clinics throughout Mississippi, the effects of diabetes management practices when using well-designed, comprehensive health information technology (health IT). The project uses TouchWorks Analytics (Analytics), a research and measurement module of the Allscripts Electronic Health Record (EHR) Version 11 that enables users to easily query patient records to review key clinical performance indicators. The Allscripts EHR is currently certified by the Certification Commission for Healthcare Information Technology (CCHIT) for: functionality (the ability to create and manage electronic records for all patients, as well as automating workflow in a physician’s office); interoperability (the ability to receive and send electronic data to other entities such as laboratories); and security (the ability to keep patient information safe). Additionally, the EHR currently supports interoperability standards including the Continuity of Care Record (CCR) preliminary schema, CCR version 1.0, Clinical Document Architecture/Care Record Summary—better known as Medical Summary, the Health Level 7-specified format for referrals and encounter summary information—through several different Integrating the Healthcare Enterprise (IHE) profiles including both the Cross-Enterprise Document Sharing and point-to-point protocols.

This EHR system combines databases such as patient demographics and clinical outcomes, reported lab values, and prescription fill history across patient “dimensions,” thereby centralizing and standardizing data analysis and reporting methodologies. It can be used to create and automate a variety of business functions, including pay-for-performance measures, clinical findings, care planning statistics, and population disease management. Another important contribution of the EHR to this project is the system’s ability to integrate and maximize the effectiveness of third-party technologies that aid diabetic care. This capability is provided by a Universal Application Integrator within the EHR that allows third-party providers of applications and medical devices to easily develop software interfaces for the EHR.

The Bettering Lives Utilizing Electronic Systems (BLUES) Project will determine whether use of health IT in diabetes management enhances delivery of health care and improves health outcomes among patients. Four diabetes management clinics that employ the same model of diabetes care are participating in this study: two are located in an urban setting (one of which utilizes the health IT system), and two in a

rural setting (one of which utilizes the health IT system). The timing of this project coincides with independent plans to implement EHRs at these sites, which provides an invaluable opportunity to compare similar practices of health care providers and health outcomes of their patients with and without use of a comprehensive health IT system. The research design for the BLUES Project includes three specific aims and an overall evaluation to determine the effectiveness of the study and assess its impact. Finally, the following methods of data analysis will be used to measure the success of the three aims: 1) clinician use of the various components of the EHR will be modeled as a continuous measure (percent or proportion) rather than a strict yes/no type measure, and a mixed model analysis of covariance (ANCOVA) approach will be used to analyze the continuous measures, controlling for fixed (clinic, time) and random (patient) effects; 2) individual generalized estimating equations (GEE) analyses will be used to model changes over time in the proportions of patients accessing the various components of the Patients Interactive Module; and 3) a multivariate model will be built to investigate changes from baseline to end-of-study for the three measures combined.

### Specific Aims

- Implement an EHR system in two existing diabetes management clinics, focusing on integration of the EHR into clinician workflows. **(Ongoing)**
- Evaluate the impact of the EHR system on clinical processes of care and patient outcomes. **(Ongoing)**
- Produce and distribute a generalizable, replicable model of care for implementing an integrated health IT system for diabetes management care throughout the United States. **(Upcoming)**

**2008 Activities:** The DHA continues its legal, administrative, and technical work with their various partners. The project evaluation plan was created in cooperation with partners located at the School of Health Related Professions and external evaluators located at the University of Chicago. Additionally, project staff worked with Mathematica Policy Research, Inc., to develop a comprehensive logic model for the project, which identifies inputs, outputs, and outcomes that will serve as the foundation for a generalizable, replicable model to be used for dissemination once the project measures are evaluated. From a technology perspective, efforts were initiated to plan specific interface protocols for message and information transfer. One of the clinics has been “live” with the EHR system since June 2008; however, DHA staff continue to work with them to increase system use. An additional site went live with the EHR system during the fifth quarter of the grant (9/30/08 – 12/30/08). The DHA BLUES Project staff is also gathering baseline data prior to implementation, as well as comparison data with the sites. As of December 31, 2008, there were 151 EHR users, including 113 physicians. The project has continued to expand its staff by hiring experts in areas such as data collection and health information management.

Baseline data collection tools were created, which resulted in data collection from 200 manual chart reviews from 2 sites by the end of 2008. In addition, the Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys had been administered to more than 75 patients by the end of the December 2008. Project staff have convened meetings with all grant partners to continually ascertain project outcomes and to determine their ability to measure the project outcomes. Staff also consulted with the evaluation team and statisticians to ensure that comprehensive measures were instituted for this project. A database for baseline data was created, which will serve as a repository for all BLUES Project and relevant EHR data collection efforts. Additionally, researchers will enter patient satisfaction surveys via a secure Web site survey tool.

Going forward, the project staff will continue to monitor project activities and gather the necessary process and outcomes measures for evaluation purposes. Project staff also implemented processes to address any deviations from the project plan. Over the 2008 calendar year, there have been two modifications in test sites, due to the closure of sites originally chosen, as well as hiring of additional staff to aid in data collection and entry.

**Preliminary Impact and Findings:** The project staff anticipate being able to measure the impact of the EHR system on clinical process of care and patient outcomes within the next year.

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### **Selected Outputs**

The project has developed data collection tools for baseline data for the BLUES Project, as well as measures of impact and outcomes measures.

The project submitted two abstracts for consideration at national conferences including the 81<sup>st</sup> Annual American Health Information Management Association (AHIMA) Convention and Exhibit (October 3-8, 2009), and the AHIMA Faculty Development Institute and Assembly on Education Symposium (July 25-29, 2009).

The project also led an EHR conference for the Health Resources and Services Administration (HRSA), Office of Health Information Technology.

AHRQ 2008 Annual Conference presentation: The BLUES Project ([PowerPoint® File](#), 550 KB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** Project staff are currently implementing full use of funding. Additional staff have been hired to complete chart reviews, create a database, provide data entry services, and assist with evaluation and dissemination of results. Travel funding is being used in the current funding cycle to train the project manager in EHR systems and to provide dissemination of preliminary results and processes used in the BLUES Project.

**Milestones:** Project is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	eHealth Records to Improve Dental Care for Patients with Chronic Illnesses
<b>Principal Investigator:</b>	Fricton, James, D.D.S., M.S.
<b>Organization:</b>	HealthPartners Research Foundation
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017270
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$996,737
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The primary goal of this proposal is to conduct a randomized clinical trial to evaluate the effectiveness of an integrated electronic health record system that includes an eMedical Record (EMR), eDental Record (EDR), and a Personal eHealth Record (PHR) to improve the quality and safety of dental care for patients with chronic illnesses. The EMR is EPIC Hyperspace Spring 2007 version IU3 made by Epic Systems Corporation and is Certification Commission for Healthcare Information Technology (CCHIT) certified. The EDR is GSD Group 6.0 made by General Systems Design Group, Inc. and is not CCHIT certified since they do not have a certification process for EDRs. The tethered PHR is EPIC mychart and also a HealthPartners Web-based patient portal. An EDR integrated with an EMR and PHR provides a unique opportunity to improve the dental care of patients with chronic conditions by both alerting patients to their special care requirements as well alerting dentists at the point of care. Furthermore, the integration of an EMR, PHR, and EDR into an integrated electronic health record system improves health information exchange, enhanced communication, and improved and cost effective care, particularly for patients with chronic illnesses.

This project is a 3-arm, 2-year prospective, group-randomized clinical trial of 47 dentists in 17 clinics to evaluate the effectiveness of 2 interventions that use simple reminders within the integrated electronic health record. The study examines two interventions versus a usual care (UC) control. The interventions are designed to address how, and to whom, special dental care needs are communicated. The interventions are: 1) a reminder to patients delivered primarily via their PHRs through e-mail or, if e-mail is not available, through phone by the dental clinic staff and/or postal mail (Group A); or 2) a point-of-care reminder to the dentist within the EDR (Group B). These reminders reflect the special dental care needs of four chronic conditions: diabetes mellitus, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and xerostomia (dry mouth) as caused by medications or related conditions. This project demonstrates how leveraging an integrated electronic health record system can improve patient outcomes, increase awareness, and improve clinical decisionmaking by identifying problems needing remediation and providing immediate evidence-based recommendations.

### Specific Aims

- Determine the effectiveness of integrated EHR-based interventions toward changing dentist and patient behavior. Data collection is ongoing and in process. **(Ongoing)**

- Determine the impact of an integrated EHR- based interventions upon the use of emergency and/or restorative dental care. Data collection is ongoing and in process. **(Ongoing)**
- Based on the lessons learned and evaluation results, produce and distribute a generalizable, replicable model of evidence-based care recommendations for implementing an integrated health IT system for diabetes and other chronic illness management within dental care throughout the United States. **(Ongoing)**

**2008 Activities:** The principal investigator, co-investigators, and programmers have been successful in meeting regularly with each other and in achieving all of the goals set in the timetable. They have an overall meeting with the Proposal Administration Group, Programming Subcommittee, and an Outcomes Subcommittee to complete the project goals. In Phase 1, the research team has finalized the interventions and outcome measures in light of a thorough literature review, previous experience, and discussion with consultants at the University of Minnesota. The interventions are currently being programmed into the integrated health record system to be accessed by the EDR and PHR interventions. The interventions are simple, easily understood alert reminders of action steps that need to be taken by the dentist to meet the patient's special dental care needs as advised by consultants. The recommendations have been submitted and now approved by HealthPartners' Guidelines Committee. Outcomes have been defined to correlate with them and measured through the EDR.

During Phase 2, a beta version of the modified integrated health record system is being piloted at a sample clinic and revised accordingly. Dentists and clinics have been randomly assigned to one of the study arms. Beta testing of the system to alert dental providers has been completed and is currently being revised for final implementation. An initial period of baseline utilization is currently in process to determine how the dental providers will use the Web site without alerts from the EDR or the patients through the PHR and/or letters. Use was higher immediately after training (41 hits and 29 users) in weeks 1 and 2. In Phase 3, subjects will be followed with relevant data collected. This is expected to start in May 2009. These data will be analyzed and results presented at meetings and submitted for publication in scholarly journals during Phase 4.

**Preliminary Impact and Findings:** Considerable time has been spent on defining the clinical guidelines for managing dental patients with chronic medical conditions and the specific personalized recommendations for each patient. The guidelines have been reviewed by the HealthPartners Guidelines' Committee and approved. In addition, the guidelines have been modified to comply with the needs of a Web site presentation with links. The Software of Excellence EDR has been modified to accommodate the needs of the study, including an easily recognizable medical alert (MedAlert) icon that blinks and a MedAlert Link that brings the dental provider either to specific personalized recommendations in the EDR Alert and PHR Alert groups or to the general recommendation. The personal health record at HealthPartners has been implemented with this project as the first project to use it. Since the patient use has been gradually increasing, the PHR alerts will be sent to patients through both letters and e-mails.

To date, the project team has developed software that has the potential to be distributed widely through EDRs. The software presents personalized recommendations for the patients with medical conditions in the EDR and PHR arms of the study based on the patients' medical histories. It is being revised to accommodate the EDR at HealthPartners but will be open source when completed.

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### **Selected Outputs**

Web-based Clinical Guidelines: include recommendations for dentists to follow when patients have a chronic illness including COPD, CHF, xerostomia, or diabetes. The Web-based Clinical Guidelines are able to present personalized recommendations for the patients in the EDR and PHR arms of the study. The site is not yet available to outsiders but will be in the next budgeting period.

Training Protocol for Dental Providers: developed for use of the new system.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is completely on track with its milestones and is on time.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Evaluation of a Computerized Clinical Decision Support System and Electronic Health Record (EHR)-Linked Registry to Improve Management of Hypertension in Community-Based Health Centers
<b>Principal Investigator:</b>	Kopal, Helene, M.P.A., M.P.H.
<b>Organization:</b>	Primary Care Development Corporation
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017167
<b>Project Period:</b>	09/07 – 09/10
<b>AHRQ Funding Amount:</b>	\$1,132,569
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The project aims to address the need for more empirical outcome data on effective information technology strategies for improving control of hypertension among low-income immigrant populations. Primary Care Development Corporation, in collaboration with Open Door Family Medical Center (Open Door)—a not-for-profit organization that operates four primary care sites serving low-income, primarily Latino immigrants—New York University College of Dentistry and School of Medicine, and the Columbia University Mailman School of Public Health are analyzing the effects of a multi-component, technology-driven quality improvement intervention on hypertension control. This multi-disciplinary collaborative effort provides a unique opportunity to target an underserved immigrant population that is difficult to reach. The project hypothesized that clinical decision support (CDS) and electronic registry-linked performance feedback will be more effective for improving hypertension control than a usual, standard care electronic health record (EHR) in community health clinics (CHCs) serving low-income, primarily Latino patients. The project will extract data from the eClinicalWorks Electronic Health Record 8.0.47.3, which is Certification Commission for Healthcare Information Technology (CCHIT) certified, on a monthly basis and will estimate the effect of the intervention using AutoRegressive Integrated Moving Average (ARIMA) modeling. The large number of minority and low-income patients served by Open Door CHCs and the existing practice-based research infrastructure provided by Primary Care Development Corporation and Open Door offers a unique opportunity to investigate the efficacy of these interventions in CHCs serving this hard to reach immigrant population.

#### Specific Aims

- Test the hypothesis that an office-based EHR with decision support and registry-linked provider performance feedback will be more effective in improving hypertension control than a standard EHR alone. **(Ongoing)**
- Assess the implementation process and delineate factors that influence adoption of the EHR-supported quality improvement intervention. **(Ongoing)**

**2008 Activities:** Process data related to the management of hypertension, use of clinical guidelines, and use of EHR and technology was analyzed, which included the analysis of structured interviews of Open Door providers as well as surveys. Transmission of EHR data has been occurring monthly as planned.

The study intervention for the project is almost complete. However, the following tasks are still in progress: creating functional and technical specifications, programming the intervention in the EHR, and assessing user acceptance of EHR functionality. In the upcoming quarters, the team plans to train clinic users on the CDS application and is currently working on the preparation for the training, which is on track.

**Preliminary Impact and Findings:** The project does not have a preliminary impacts or findings at this time.

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### **Selected Outputs**

Baseline Clinician Interview Script

Healthcare Provider Survey

AHRQ 2008 Annual Conference presentation: Evaluation of a Clinical Decision Support System (CDSS) and Electronic Medical Record (EMR) Based Registry to Improve Management of Hypertension in a Community Health Center ([PowerPoint® File](#), 420 KB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** Due to a compulsory EHR upgrade, which occurred at the study site in November 2008, the team delayed the implementation of the study intervention by approximately 6 months. Accordingly, the project anticipates extending the project by 6 months. This delay does not affect the goals, milestones, scope, or other major component of the timeline.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Standardization and Automatic Extraction of Quality Measures in an Ambulatory Electronic Medical Record (EMR)
<b>Principal Investigator:</b>	McColm, Denni, M.B.A.
<b>Organization:</b>	Citizens Memorial Hospital District and Citizens Memorial Healthcare Foundation (CMH)
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017094
<b>Project Period:</b>	09/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$889,681
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. This project establishes the standardization efforts necessary for data capture of 72 of the Physician Quality Reporting Initiative (PQRI) quality measures in an ambulatory electronic medical record (EMR) system. It also demonstrates the efficiency and accuracy of using a data extraction and reporting expert to perform quality measurement in 15 primary care, certified rural health clinics and specialty physician practices operated or affiliated with Citizens Memorial Healthcare (CMH). CMH is standardizing and integrating data capture for quality of care measurement into the normal documentation of care within the EMR. The standardization effort includes both tools and processes for physician documentation, medication prescription ordering, and collection and recording of allergies. Workflow analysis is being performed to examine existing processes and to design new, standard processes for implementation. Proven adoption strategies are also being used to assist providers in learning and adapting to the changes in processes. The research also includes a measure of the number of consensus quality measures that can be captured in “extractable” formats from the ambulatory EMR and a comparison of the automatic data extraction with the G-code quality reporting method currently used by CMH. The evaluation includes comparisons of before and after standardization of tools and processes, and comparisons of both methodologies used simultaneously in a standardized environment.

CMH’s EMR vendor partner is Certification Commission for Healthcare Information Technology (CCHIT) certified LSS Data Systems. LSS collaborates with Zynx Health, Inc., on evidence-based medicine and content delivery to promote quality measurement. The Institute for Health Metrics (IHM) is CMH’s expert quality extraction vendor.

### Specific Aims

- Establish the standardization efforts that will need to be adopted by vendors and their ambulatory clients in order to facilitate access to quality measures. **(Ongoing)**
- Demonstrate the efficiency and accuracy of utilizing an expert data partner and extraction tools to automate quality measurement as compared to the abstraction and G-code method by analyzing the accuracy and cost associated with both forms of quality measurement and reporting. **(Ongoing)**

**2008 Activities:** The new design for care documentation includes changes to care documentation, health maintenance, medication reconciliation and prescriptions, allergy capture, and ambulatory care ordering processes. Allergy tracking was converted from a system in which allergies were manually maintained

and linked to a new version of allergy maintenance where First Data Bank's database will update the allergies and links to medications quarterly. To perform the conversion, all national drug code (NDC) identifiers were required to be updated. The software provider is developing two health maintenance functionality changes to allow users to document the reason/exclusion for "skipping" a recommended test or treatment and to enter numeric lab results obtained from outside the CMH system for health maintenance. Configuration and testing of ambulatory ordering processes continue. Creation of favorite lists, pick lists, and order groups have been developed to streamline physician ordering during a visit. Training of clinicians on the new processes began in September, and it is anticipated that training will continue throughout the project timeline to achieve full utilization of the system. The Institute for Health Metrics has automated nightly data extraction from the CMH system. Database setup has been expanded to include all types of extracted data including the custom queries relevant to PQRI exclusion and the initial monthly report design. Coding for quality measures continued throughout the year to use the abstraction method as a comparison to the extraction method. The comparison of methods will begin after the new care design is fully implemented; the data mapping, validation, and extraction has begun. In addition, PQRI measures to be extracted have been updated for the added and discontinued 2009 measures. Finally, the development of a PQRI toolkit with categories of measures is underway. The toolkit will allow physician practices to rapidly implement and revise quality measures following a proven format.

**Preliminary Impact and Findings:** Publicly available findings will be made available closer to the end of the project.

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### **Selected Outputs**

McColm D. Automated Quality Data Extraction and Analysis. MUSE (Medical Users Software Exchange) International Conference, May 2008.

AHRQ 2008 Annual Conference presentation: Enabling Quality Measurement through Health IT: Standardization and Automatic Extraction of Quality Measures in an Ambulatory Electronic Medical Record (EMR). ([PowerPoint® File](#), 1.4 MB; [Web Version](#)).

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is meeting 80 to 99 percent of its milestones.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

**Project Title:** Bringing Measurement to the Point of Care  
**Principal Investigator:** Mostashari, Farzad, M.D.  
**Organization:** New York City Department of Health and Mental Hygiene  
**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)  
**Grant Number:** R18 HS 017059  
**Project Period:** 09/07 – 09/09  
**AHRQ Funding Amount:** \$694,961  
**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. The overall goal of this project is to enable meaningful measurement of the quality of care, with a focus on public health priority issues, disadvantaged populations, and small office practices. The New York City Department of Health and Mental Hygiene’s (NYCDOHMH) Take Care New York (TCNY) initiative has articulated 10 priority public health issues that require coordinated action between health care providers, patients, community organizations, and government agencies. The NYCDOHMH Primary Care Information Project is using health information technology for population-wide measurement and improvement of clinical care in these 10 domains, particularly among disadvantaged populations. Over 1,000 medical providers have implemented electronic health records (EHRs) with enhanced preventive care functionality. Ambulatory Certification Commission for Healthcare Information Technology (CCHIT) certified EHR products will include Epic™ and NextGen™, which are sent through either a consolidated hub from the vendor or sent individually by the practice, and eClinicalWorks™ (version 8.0). Clinical partners include all of New York City’s federally qualified health centers (FQHC), several hospital outpatient departments, and hundreds of primary care providers in small office settings.

A set of 38 clinical quality measures designed to address priority public health issues has been developed, and automated reporting of these measures internally and to the NYCDOHMH is being coordinated with the EHR vendors. The project has also designed and is testing a simple and intuitive Clinical Decision Support System (CDSS) with eClinicalWorks™ suitable for small office practices that integrates quality measurement and clinical decision support at the point of care. The CDSS displays a dashboard of quality indicators as part of the patient’s record. Another feature within the EHR, the Quality Reporting Tool (QRT), allows providers to view a list of patients who have or have not met the recommended quality goals. A randomized controlled trial will be conducted to assess the impact of both the CDSS and pay-for-quality incentives on quality measurement and improvement across four of the quality measurement areas.

In addition, the project is developing a brief quantitative survey instrument to assess provider attitudes towards measuring performance and incentivizing quality care. Using a pre-post EHR go-live design, this survey is intended to measure the impact of EHR adoption on provider attitudes and engagement with quality measurement. Six key informant interviews were conducted to characterize these attitudes and opinions and guide the development of the survey.

## Specific Aims

- Validate a set of automated clinical quality measures that address priority public health issues. **(Ongoing)**
- Characterize provider attitudes, and measure provider satisfaction with performance indicators. **(Ongoing)**
- Design a simple and intuitive point-of-care quality measurement and decision support user interface (quality dashboard). **(Achieved)**
- Conduct a randomized clinical trial to determine the impact of this quality dashboard on the accuracy of and provider satisfaction with EHR-derived quality measures. **(Ongoing)**
- Disseminate our findings through the National Quality Forum's (NQF) Standardizing Ambulatory Care Performance Measures project, through the EHR vendors' participation in this project, and through reviewed publications. **(Ongoing)**

**2008 Activities:** The project continued to work with the EHR vendors to incorporate the quality measures into their systems so that automated reporting and validation of the EHR-derived quality measures in comparison to medical chart review could begin. The TCNY measures were successfully incorporated as functions within eClinicalWorks™ EHR as CDSS and QRT. However, it became evident that EHR upgrades were necessary to support installation of the CDSS. The project's development team continued to work with the practices on the upgrades and train them on using the system. This step must be completed prior to the randomized controlled trial portion of the project. Progress has been made to assess provider attitudes towards quality measurement and satisfaction with a point-of-care quality alert. The project conducted individual, in-person interviews with several small practice providers; interview transcripts are being reviewed and informant interviews are being coded to generate items for the provider survey, which will be fielded in early 2009.

**Preliminary Impact and Findings:** Publicly available findings will be made available closer to the end of the project.

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## Selected Outputs

A list of EHR-generated quality measures for the 10 clinical areas was finalized, and Dr. Mostashari developed the CDSS and QRT for the eClinicalWorks™ EHR TCNY 1.0 version.

A pre-interview survey and interview guide were implemented, and the results will inform the survey to be used with providers implementing eClinicalWorks™.

Dr. Mostashari published an opinion article in the *Journal of American Medical Association (JAMA)* about the need to redesign the health care system to support EHR adoption that focuses on quality improvement. The article is entitled "Health Care as if Health Mattered."

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is on track with 65 to 80 percent of its milestones. There are slight delays with the randomized controlled trial. The medical chart abstractions and practice selection components are on hold in order to align the study with EHR operational timelines and other factors. Contributing to the delays are the necessary EHR software upgrades required to ensure that the functionality allowing transmission of automated quality reports is operating as intended. As a result of the milestone delays, adjustments have been made to the budget to distribute the appropriate level of support over the lifetime of the grant. As such, temporarily the project is somewhat under spent by 5 to 20 percent. A modest no-cost extension is anticipated in September 2009; over time, full use of the budget is planned and completion of the project is expected.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Accessing the Cutting Edge: Implementing Technology to Transform Quality in SE Kern
<b>Principal Investigator:</b>	Nocella, Kiki, Ph.D., M.H.A.
<b>Organization:</b>	Tehachapi Hospital
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016146
<b>Project Period:</b>	09/05 – 05/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,484,361
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** The purpose of the project is to increase health quality in California’s rural Southeast Kern County by implementing health information technology (IT), including electronic health records (EHRs), health information exchange (HIE), tele-ophthalmology, and retinal imaging. EHRs have been implemented in three rural health centers (RHCs) and two provider offices, which will allow these practices to electronically access patients’ medical records. HIE is currently in the “production” mode, and its implementation will allow the clinical data exchange between different health care information systems to facilitate effective and efficient patient care. A “browser model” is being designed for the primary care providers who have not implemented EHRs in order to facilitate their participation and provide them access to the required health information of patients and the admission/discharge/transfer (ADT) feeds of HIE. Research is being conducted by surveying 200 participants in order to determine if tele-ophthalmology is a practical option in rural settings.

### Specific Aims

- Implement ambulatory EHR, including clinical data repository and master patient index. **(Achieved)**
- Develop and implement HIE in a variety of care settings. **(Achieved)**
- Implement tele-ophthalmology and retinal imaging services. **(Achieved)**

**2008 Activities:** EHRs have been implemented in three RHCs and two provider offices, along with technical support and training provided to the staff. A technician team was formed to develop standards, call procedures, and policies. The browser model is being upgraded, and the HIE system has 30,699 individual demographic records. The staff in the practices participating in HIE have been trained on the HIE “demo site.” A Wikimedia site has been established for the documentation purpose. The team worked toward completing customized community-based HIE, which includes finalizing lab interfaces, interfacing with pharmacy data, and developing data entry tables. For tele-ophthalmology and retinal imaging, survey data have been entered into Excel and will be uploaded to SPSS for next quarter.

**Preliminary Impact and Findings:** None available at this time.

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### Selected Outputs

A community-centric personal health record (PHR) product, MyHealthKeePer, was produced.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** Technical support and training are provided to the five clinics where the EHRs are implemented. Progress is being made to complete the browser model “upgrade” and provide appropriate training to clinicians. Surveys are being coded and entered into Excel in order to conduct statistical analysis in SPSS.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	A Partnership for Clinician Electronic Health Record (EHR) Use and Quality of Care
<b>Principal Investigator:</b>	Pohl, Joanne, Ph.D.
<b>Organization:</b>	Michigan Public Health Institute
<b>Mechanism:</b>	RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health IT (IQHIT)
<b>Grant Number:</b>	R18 HS 017191
<b>Project Period:</b>	09/07 – 08/10
<b>AHRQ Funding Amount:</b>	\$1,184,765
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project was initiated in September 2007 and has completed the first third of the grant period. The Institute for Nursing Centers (INC) and the Alliance of Chicago Community Health Services (Alliance) project studies the effectiveness of a partnership that shares resources and utilizes a data-driven approach to promote full clinician use of an electronic health record (EHR). This project is being conducted in three nurse-managed health centers and three community health centers in order to improve the quality of care in areas of preventive care, chronic disease management, and medication management for vulnerable populations. These partners have a track record of highly productive research, successful EHR implementation, commitment to data-supported high quality health care for vulnerable populations, and a history of building and maintaining strong collaborations.

The goals of this project address one of the key problems in leveraging health information technology (health IT) to support high quality patient care: the fact that, despite the potential, clinical decision support (CDS) is often not used effectively or consistently by clinicians, even when an EHR is available. The research design of this project incorporates quantitative and qualitative methods as well as individual and center-level analyses. The critical link between full use of EHR functionality (including CDS features) and clinical performance and quality outcomes will be examined with rigorous quantitative methodology. The product is the integrated General Electric Centricity (GE Centricity) Practice Management (PM) EHR System (CPS 2006 Version: 8.00.3224), which has been certified by the Certification Commission for Healthcare Information Technology (CCHIT) as meeting requirements related to functionality, security and reliability, and interoperability—with substantial customization of clinical decision support in templates developed by the Alliance. The quality indicators that have been selected are those that the Institute of Medicine has identified as priority areas for improvement, and are areas where significant disparities across race, ethnic, and income groups exist. Qualitative methodology will add to the field’s understanding of health center leadership and change management required for successful use of EHR. This project consists of an experienced team in a unique partnership between INC, whose patients are from nurse-managed health centers (NMHCs), and Alliance, whose patients are from community health centers (CHCs), to achieve its aim.

**Specific Aims**

- Study the effectiveness of a partnership that shares resources and uses a data-driven approach to promote full use of an EHR by clinicians in settings that serve vulnerable populations, in order to

improve the quality of care in the areas of preventive care, chronic disease management, and medication management. **(Ongoing)**

- Test the links between clinician use of an EHR and quality of preventive care, chronic disease management, and medication safety. **(Ongoing)**
- Examine organizational processes in the implementation and full use of an EHR in relationship to care delivery and outcomes. **(Ongoing)**

**2008 Activities:** The project continues to support and maintain EHR use by monitoring help desk calls and system use measures. No significant problems have been reported, and routine/ongoing post go-live training and support continue. Development of an end user satisfaction tool and data collection and evaluation tools continues, and the following tools have already been implemented: patient satisfaction survey, query of EHR usage, queries of productivity, clinician satisfaction surveys, implementation interviews, and the baseline implementation of the Physician Practice Patient Safety Assessment (PPPSA). Data collection and analysis are continuing at participating sites, dependent on completion of institutional review board approval. In addition, the EHR is fully implemented at two of the sites.

**Preliminary Impact and Findings:** The project has collected some preliminary numbers related to productivity depicted by the number of patient encounters per clinician per half-day shift. The project has collected some preliminary numbers from the Glide End User Survey showing that the majority of respondents (>50 percent) answered positively regarding most statements about their EHR use environment, but that they would still like more training. Despite apparent negative perceptions of the GE Centricity's functionality and impact on clinicians, 58 percent of respondents reported overall satisfaction with it, and 91 percent were in favor of its continued use.

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### **Selected Outputs**

Zheng K, McGrath D, Hamilton A, et al. Assessing organizational readiness for adopting electronic health record system: A case study in ambulatory practices. *Journal of Decision Systems* (In Press).

Presented the project and study design at the Michigan Association for Local Public Health (MALPH) technology conference.

The project produced the following documents: Communications Tracking Tool, Computer Literacy Survey, and the Pilot – End User Survey

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**Grantee's Most Recent Self-Reported Quarterly Status:** Under spending is a result of delays in the implementation timeline at two sites. These sites are on track now to complete implementation in summer 2009; research full-time equivalent was reduced initially, but is being increased as sites go live and begin contributing data. In addition, a seventh site was requested and approved to participate in the study.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Holomua Project Improving Transitional Care in Hawai'i
<b>Principal Investigator:</b>	Sakuda, Christine, M.B.A.
<b>Organization:</b>	Hawaii Primary Care Association
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016160
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,476,200
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** The Holomua Project brings together the Hawaii Primary Care Association, the Kalihi-Palama Health Center, Kokua Kalihi Valley Health Center, Hawaii Pacific Health, and the Queens Medical Center in an approach to information sharing during transitional care. The nearly completed project consists of both technological and non-technological solutions to the problem of transitional care. The technological solution involves the development and implementation of a Holomua Master Visit Registry (HMVR), developed and implemented with vendor Sun Microsystems, as a means of sharing health information from pre-existing electronic health records (EHRs) between systems. The non-technological solutions involve charting workflow related to transitional care, policies and procedures relative to transitional care, and using dialogue and communication to facilitate transitional care. The technological method was chosen as it represents a scalable, interoperable solution that takes into account the disparate resources of all the partner organizations. The non-technological methods are based on abundant research that illustrates the necessity of attending to the human side of information to ensure success of implementation efforts.

The implementation plan will assist the Holomua partners in achieving the ultimate project goal of increasing patient safety, quality, and continuity of care during transitional care for vulnerable populations in Hawaii through improving the flow of information between patients/families, community health centers and hospitals using health information technology (IT). With goals of reducing medical errors, eliminating duplication of procedures and tests, and improving the relationship of patients and their families to their care, this project will explore the ways in which health IT can be used to improve patient care and safety

### Specific Aims

- Complete privacy and security contract documents needed for health information exchange. **(Ongoing)**
- Complete production, implementation and support phases of health information exchange, known as HMVR. **(Ongoing)**
- Increase accuracy and timeliness of shared patient information during transitional care between primary care and tertiary care facilities. **(Ongoing)**
- Increase participation and involvement in decisionmaking by patients or family on health related matters. **(Ongoing)**

- Determine mechanisms by which information resources, information systems, and other IT initiatives and/or networks in Hawaii can best support both short- and long-term implementation activities of the Holomua Project. **(Ongoing)**
- Begin use of HMVR. **(Ongoing)**
- Reduce incidence of medical errors that may occur due to linguistic and/or cultural barriers between patients and medical providers that prevent accurate communication of health information such as previous medical history and treatment, medication, and referrals. **(Upcoming)**
- Reduce occurrences of duplicated diagnostic procedures performed on patients due to lack of communication between primary care and tertiary care facilities. **(Upcoming)**

**2008 Activities:** In 2008, a major milestone was achieved in that all partner institutions agreed on a common data set for the health information exchange. The first two data extracts from all four health care systems were completed during the development and testing phase of the HMVR. The project also finalized the extensive testing of the four-screen HMVR application with the software developer, finalized the preparation of end-user training materials and scheduled demonstrations of the HMVR application at all partner sites. The project identified over 200 potential end-users at each of the partner institutions, and all institutions completed an initial review of the data sharing agreement. Pre-HMVR provider, patient, and community member focus groups were completed but qualitative data analysis has been delayed until full Institutional Review Board (IRB) approval is reinstated. New study protocols and informed consent forms are in the process of being completed for resubmission in the middle of 2009.

**Preliminary Impact and Findings:** Continual and consistent “buy-in” from all of the partner institutions’ executive committee members has been very important in the continuing success of the project. The current perception of the project is that it will yield only limited data, mostly demographic in nature, offering only one piece of clinical information, the diagnosis code. However, most end-users and executive committee members understand that this project is the beginning of a bigger plan to create a regional health information organization (RHIO). Each institution has its own perceptions, agenda, and ideas of how to improve the transitional care of their shared patients during the hand-off process: some may be focused more on non-technical solutions and may not be prepared to cover the costs of technical solutions, while others may be focused on and prepared to cover the costs of the more technical solutions.

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### Selected Outputs

Chin BJ, Sakuda CM, Balaraman V. Improving transitional care in Hawaii: opening communication between community-based and tertiary-care healthcare providers. *J Healthc Inf Manag* 2009;23(1):46-9.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The major hurdle the project has faced is the development of the HMVR software, which has been significantly and repeatedly delayed. Negotiations of the multi-institutional data sharing agreement and privacy and security policy and procedures have also been complicated and, therefore, lengthy. The Holomua Executive Committee is also finalizing discussions about liability coverage and indemnity for each of the partner institutions, and the possibility of obtaining additional insurance coverage for potential privacy and security breaches for possible non-intended usage of the HMVR, which has caused delays. Problems with IRB approval in 2008 also caused research-related activities to be placed on hold. Lastly, multiple internal staff changes over the course of the project and within the last year have contributed to some of the delays. However, project staff positions have been filled and the team is now fully functioning.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Critical Access Hospital Partnership Health Information Technology Implementation
<b>Principal Investigator:</b>	Wheeler, Donald A., M.H.A., F.A.C.H.E.
<b>Organization:</b>	Upper Peninsula Health Care Network
<b>Mechanism:</b>	RFA: HS05-013: Limited Competition for AHRQ Transforming Healthcare Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 016152
<b>Project Period:</b>	09/05 – 09/09, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,484,167
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** The Critical Access Hospital Partnership Health Information Technology (IT) Implementation project will create a Web-based, portal/repository application that allows selected clinical information to be accessed by authorized physicians and other health care providers for patient care delivery and quality reporting. This project is being implemented in Michigan’s Upper Peninsula at nine independent Critical Access Hospitals (CAHs), which recently joined with the region’s only medical center to form the Michigan Upper Peninsula Health Information Technology Network. The goal of this network is to “improve patient safety and quality of care through the regional planning, development, and implementation of Health Information Technologies.”

The health IT infrastructure connecting the participants was already in place, and it is currently being used for video teleconferencing and patient education. This project creates network health IT applications, which include: 1) health IT systems at each partner hospital that capture and send patient demographic and clinical data to the regional data repository, 2) a regional health IT master patient index/unique patient identifier, 3) a regional health IT interface engine to accept and reformat incoming data from the project’s partners’ health IT systems, 4) a regional health IT clinical data repository that contains a consolidated summary of patient information, and 5) a Web-based portal viewer allowing clinical information to be accessed by providers.

Project goals for the CAH Partnership Health IT Implementation Project include: 1) establish data vocabulary and exchange requirements to ensure comparability and interoperability, 2) install local network health IT systems in a phased manner, 3) implement the regional health IT systems and associated support services, 4) implement the local health IT to regional data sharing components, 5) analyze and verify the data and technology-related aspects of the project, 6) evaluate the impact of the health IT network on patient care delivery, and 7) evaluate the success of the implementation. The project results will be shared with other CAHs and other State CAH programs to improve health IT implementation nationwide.

### Specific Aims

- Monitor health IT installations at the project’s partner hospitals in Michigan. **(Achieved)**
- Plan, test, and implement local health IT to the regional health information exchange (HIE). **(Ongoing)**
- Implement regional HIE systems, central data repository (CDR), and services. **(Upcoming)**

- Evaluate the impact of technology-supported patient data exchanges and reporting on patient care. **(Ongoing)**
- Evaluate the success of the overall project implementation. **(Upcoming)**

**2008 Activities:** In 2008, the project began developing a secure network architecture and a Web interface to permit physicians and staff to access patient records under a secure format using a Web browser. In addition, work began on developing a dynamic method to update and assign roles to patient records and on setting standards for consistency of data in the central repository. As of June 2008, all of the nine participating CAHs in Michigan had completed the installation of their respective health IT systems at their facilities, and the CAH partners are now awaiting the ability to connect with the regional HIE system being provided by Marquette General Hospital.

**Preliminary Impact and Findings:** The previous HIE vendor (KliniTek) was unable to implement installation of the HIE system at the two pilot sites in the past 2 years as scheduled. The management change at the Network Data Systems Vendor, Marquette General Hospital, in fall 2007 resulted in the adoption of a new HIE vendor and the development of a revised project implementation schedule and budget.

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### Selected Outputs

None available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Substantial delays were caused by the fact that the project's Network Data Systems Vendor, Marquette General Hospital, underwent significant management changes in fall 2007. As a result of these changes, by mid-2008, Marquette General made a decision to discontinue the use of the Klinitek UPCare HIE system and replace it with a newer HIE solution. A no-cost extension was granted so that the UPCare system could be replaced with the newer HIE system (described below) and meet the goals of the project.

Michigan Tech University (MTU), working with SETECS, has established a medical information exchange (MIX) server that will be placed locally at each hospital site and interface with the EMR to pull information regarding patient medical records. Currently, the development has successfully extracted and parsed Health Level 7 (HL7) messages regarding patient demographic, medical data, insurance, etc. into the MIX server. The server has been designed to make this data interoperable within the secure regional system designed by MTU, and through a Web graphical user interface (GUI) being used as the front-end for end-site users. The HIE design incorporates advanced search features that will enable real-time pulling of patient medical data, as well as options to electronically transfer documents. Testing of this architecture is currently being conducted within the research lab at Michigan Tech University. The design of medical smart cards for patients, physicians and staff (with stringent security mechanisms and use of biometrics) are also being implemented within the current system architecture.

Once testing is completed in the spring of 2009, the technology will be installed at each of the four pilot sites for additional testing to ensure accuracy, to answer questions regarding system capabilities, and to provide training for physicians and staff of each hospital. The four pilot sites represent each of the EMRs that are currently active in the Upper Peninsula (Meditech, McKesson, Healthland, and Computer Programs and Systems, Inc. All 14 hospitals involved in this project and the Upper Peninsula Health Network (UPHCN) will be provided the same level of services as the deployment of this architecture is conducted. The project is currently beginning system testing within the pilot sites.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	INTEGRIS Telewoundcare Network
<b>Principal Investigator:</b>	Bryant, Charles A., M.D.
<b>Organization:</b>	Integrus Health, Inc.
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015359
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,063,213
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** Chronic wounds are a national health problem. Chronic wounds, defined as wounds not healed in 30 days, have a high rate of occurrence and have significant clinical, cost, and social implications. It is estimated that five million patients in the United States have chronic wounds, and that one to two million people develop new pressure ulcers each year. Costs to treat chronic wounds are high. Wound care constitutes 48 percent of home health services provided in the Nation according to the most recently available Centers for Medicare and Medicaid Services (CMS) Case Mix Report. A major, but often overlooked, contributing co-morbidity to chronic and non-healing wounds is diabetes. If blood sugars are too high, healing will not occur; thus, controlling blood sugars should be addressed as part of the wound treatment plan.

Oklahoma has the second highest diabetes rate in the Nation and the second lowest in expenditure for diabetes services. Many Oklahomans with diabetes remain undiagnosed since the disease is generally asymptomatic until complications develop.

The study design was a controlled trial to evaluate outcomes utilizing a telehealth strategy incorporating evidence-based practice guidelines as compared with outcomes using the current standard of care in the community. Most physicians were willing to refer to the telewound intervention group but never referred to the standard care group. They voiced concern over referring to the standard group because it was extra work for their staff without immediate benefit to the patient. As a result, although a total of 56 individuals participated in this study, only 2 individuals were allocated to the comparison group. Because the comparison sample's small size prohibits between-group comparison, analysis had to be made within the telewound group for outcomes.

### Specific Aims

- Add to the network pioneered during prior grants by increasing physician and case manager awareness of telemedicine services, linking with additional sites, expanding coverage to new care settings, and demonstrating evidence-based practice. **(Achieved)**
- Improve the quality of wound care by collecting wound care and diabetes documentation, improving diabetes management using videoconferencing and vital sign monitoring, and more timely interventions. **(Achieved)**
- Develop business strategies for sustainability. **(Achieved)**

**2008 Activities:** Data collection for the study of wound care outcomes continued into 2008 and concluded during the year so that analyses could be conducted. Educational presentations about chronic wounds, diabetes, and home health services continued.

**Preliminary Impact and Findings:** The study investigated whether patients with longstanding wounds healed relatively quickly; however, the results were mixed. Certain patients with longstanding wounds healed quickly once enrolled in the program, but overall only about half of all wounds were healed by the end of the study. Underscoring the relationship between diabetes and wound care, 73 percent of the patients had characteristics of diabetes or other metabolic syndromes at enrollment, and about half of those metabolic conditions were uncontrolled or undiagnosed. Due to incomplete data collection for blood glucose and A1C, as well as the small sample size, no specific conclusions could be drawn from longitudinal tracking of the clinical outcomes data. Data suggest that early identification and intervention resulted in significant decreases in healing time; however, this has not reached statistical significance, and so the question of whether using an evidence-based telewound approach leads to superior healing times remains open. It can be speculated, however, that the improved access to specialized evidence-based wound care provided via telemedicine led to more timely referral and intervention.

Providers involved in the study often cited the educational component as a major benefit to them. Group education was offered quarterly on diabetes care over broadband videoconferencing to rural sites, while metro participants attended on-site. Educational materials were sent to the attending sites in advance. The class was conducted by a Certified Diabetes Educator with time at the end of the session for question and answers. Wound care group education was offered twice over videoconferencing, and a few home health in-services were provided locally. Finally, there were confounding technical issues, including unfamiliarity with digital cameras, a lack of time or expertise in sending the pictures to the central data administrator, fear pictures would be accidentally erased, or a general lack of computer skills. One change from the original protocol implemented as an alternative was to save photos of wounds onto a memory card, then to send the memory card in a self-addressed, stamped envelope weekly to the project manager. This slowed the availability of the pictures to the system, but it did increase participation at three sites. Another technical issue was use of the online vital signs monitoring in conjunction with an electronic health record. In some sites, computers were old or did not have the required operating capabilities to use the ASP-based database. In addition, broadband, required for the Web site, was not always available at the care sites. Limitations inherent in real world settings, including lack of incentive for control group participation, resistance to adding to staff workloads, competitive concerns, medical liability concerns, and technical issues, make more traditional research models difficult to implement. The results this project was able to produce reflect these realities. Although a statistically valid comparison of telewound care to standard practices was not feasible, it is hoped that this study will contribute to the understanding of care for chronic conditions, co-morbidities, and home monitoring.

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### **Selected Outputs**

None available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Project is completed. Although the initial goal of implementing a controlled trial was not achieved due to referral problems, some patient outcomes improved dramatically, and the dissemination of information about telehealth programs and health information technology will be beneficial to the community.

**Milestones:** Progress is mostly on track.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Trial of Decision Support to Improve Diabetes Outcomes
<b>Principal Investigator:</b>	Cebul, Randall D., M.D.
<b>Organization:</b>	Case Western Reserve University
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015123
<b>Project Period:</b>	09/04 – 02/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,495,569
<b>Summary Status as of:</b>	February 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** Diabetes is an epidemic in the United States, and the most common cause of adult blindness, amputations, kidney failure, and cardiovascular disease. The disease and its complications are more prevalent among African Americans and Hispanic Americans than among Caucasian Americans. The Centers for Disease Control and Prevention estimates that 90 percent of these complications could be eliminated if the gap between what is possible and what is actually done in the care of diabetic patients is closed. Much of this care depends on physician decisionmaking in clinical settings, while a growing body of work also highlights the key roles of patient-centered self-management and contextual variables, such as the adequacy of health insurance. Whether electronic medical record (EMR)-catalyzed clinical decision support (CDS) can help close the gap is unclear. Approaches that are now possible include sophisticated CDS focused on physicians and helping their practices undertake disease management for diabetes (DM<sup>2</sup>). This project examined the quality and utilization-related effects of CDS on patients with diabetes in 24 practice sites of 2 large health care systems. Parallel 2-year cluster trials were undertaken that included a common feature (DM<sup>2</sup>) as well as patient-centered Web-portal access (PA) CDS that can be enhanced by disease-specific features (PA-E).

### Specific Aims

- Estimate the incremental effects of DM<sup>2</sup> on patient quality measures, including changes in hemoglobin A1c levels and a composite eight-item American Diabetes Association (ADA) score, further divided into sub-scores related to patient-centered standards (ADA-5) and physician-centered standards (ADA-3). **(Achieved)**
- Estimate the effects of insurance on baseline glycemia, adjusting for patient demographics, clinical co-morbidities and adherence-related measures, census-derived contextual measures, and site of care. **(Achieved)**
- Estimate the incremental effects of DM<sup>2</sup> on patient quality measures in specific sub-groups, including race/ethnicity and insurance status (Medicare, Commercial, Medicaid, Uninsured). **(Achieved, subject to limitations of the data set)**
- Estimate the incremental effects of DM<sup>2</sup> on health services utilization overall and in categories divided according to desirability. **(Achieved)**
- Estimate the incremental effects of DM<sup>2</sup> on health services utilization in specific sub-groups, including race/ethnicity and insurance status, as above. **(Achieved, subject to limitations of the data set)**
- Examine adoption of our CDS interventions, including physician adoption of and satisfaction with DM<sup>2</sup> and patient adoption of PA, PA-E, and PA-E plus DM<sup>2</sup>. **(Achieved)**

- Describe general and intervention-specific unintended consequences of interventions, including consequences related to patient safety and care for co-morbid illnesses. **(Achieved)**

**2008 Activities:** Data collection was essentially complete by the beginning of 2008. The year was primarily spent analyzing data and developing conclusions.

**Preliminary Impact and Findings:** There were no significant cross-group changes in hemoglobin A1c levels associated with DM<sup>2</sup>, but there were borderline improvements in the ADA-8 score, and significant 25 percent relative improvements in the 3-item MD-centered sub-score ( $p < 0.001$ ). DM<sup>2</sup> was associated with a 20 percent reduction in hospitalizations ( $p = 0.01$ ), but no significant reductions in emergency department (ED) or primary care visits. Successive logistic regression models examined the insurance effect on “poor glycemic control” after sequentially adding: 1) age and sex; 2) race, show rate, and comorbidity count; 3) census tract characteristics; and 4) site of care. Commercially insured patients were used as the referent to examine the multivariate odds ratios associated with having Medicare, Medicaid, or no insurance. Uninsured patients had 49 percent increased odds of poor glycemic control (MOR 1.49,  $p < 0.01$ ) and Medicare patients had 21 percent decreased odds of poor control (MOR 0.79,  $p < 0.01$ ). There was more Web-portal adoption among patients in the PA-E and PA-E plus DM<sup>2</sup> groups as compared to PA alone. Thus, CDS substantially improved physician-centered, but not patient-centered, quality measures, and it appears to have reduced hospitalization rates. Disease-enhanced features may increase patient Web-portal use.

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### Selected Outputs

Love TE, Cebul RD, Einstadter D, et al. Electronic medical record-assisted design of a cluster-randomized trial to improve diabetes care and outcomes. *J Gen Intern Med* 2008 Apr; 23(4):383-91.

Cebul RD. Using electronic medical records to measure and improve performance. *Am Clin Climatol Assoc* 2008; 119: 65-76.

Cebul RD, Dawson NV, Love TE. Cluster-randomized trials and their relevance to health care research. In: Machin D, Day S, Green S, eds. *Textbook of Clinical Trials*. Wiley, Inc; 2006.

Cebul RD. Real-Time Decision Support in the EMR Era. 28<sup>th</sup> Annual Meeting of the Society for Medical Decision; Boston, MA; October 2006.

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**Grantee’s Most Recent Self-Reported Status:** All primary aims were achieved.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Improving Pediatric Safety and Quality with Healthcare Information Technology
<b>Principal Investigator:</b>	Ferris, Timothy G., M.D., M.P.H.
<b>Organization:</b>	Massachusetts General Hospital
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015002
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,489,826
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** Health information technology (IT) and clinical decision support (CDS) tools are promising strategies for improving care. A common thread running through much of the current thinking regarding health IT is the potential for the electronic health record (EHR) to improve the safety and quality of health care. The EHR may be conceptualized as the collection of traditional hard copy (paper and ink) medical records in electronic media. Health information in an electronic format may itself improve health care in several specific ways, most notably with respect to portability of health information. Nonetheless, many, if not most, of the benefits from an EHR involve computerized CDS—tapping into the power of organized electronic information to warn, remind, and even correct clinicians at the point of care delivery. Many pediatric practices in the United States have not adopted EHR, in part due to cost, but also because of limited information on the value of CDS. Relatively little research has quantified the value of CDS in pediatrics. Additionally, many who use EHRs have not adopted CDS features, due either to the lack of data demonstrating added value of CDS and/or to poor availability of pediatric-specific CDS features. This grant included the following projects: 1) developed pediatric-specific CDS components and 2) measured the value to patients and clinicians resulting from these features. CDS was tested related to: 1) weight-based dosing, 2) reminders for preventive and chronic illness care, 3) electronic results management, and 4) documentation templates. Nine group randomized controlled trials were conducted at 15 pediatric practices. The project then measured outcomes—including dosing errors, guideline adherence, quality of documentation—related to each intervention and surveys assessed the impact of the CDS on physician workflow and satisfaction.

**Specific Aims:**

- Assess the influences of decision support for medication prescribing on dosing and selection of preferred agents. The controlled trial was designed to assess effects of an EHR with weight-based dosing decision support on rates of dosing errors and adverse drug events (ADEs). **(Achieved)**
- Assess the influences of decision support for medication prescribing on selection of preferred agents. The controlled trial determined effects of diagnosis based medication recommendations (smart forms) on rates of guideline adherent medication prescribing and physician satisfaction. **(Achieved)**
- Assess the influence of a test results tracking system, Results Manager, on the management of laboratory tests. This assessment determined effects of Results Manager on the protocol for follow-up of common tests performed in pediatric practice, effects of results manager on time to

follow-up of common tests, and physician attitudes regarding the value (safety and quality benefits) of electronic results management. **(Achieved)**

- Assess the influence of reminders for guideline adherence in delivery of preventive services and in the care of children with chronic conditions. These controlled trials assessed the following outcomes: 1) the effects of reminders and templates on recorded weights, review of symptoms, and ordering of lipid profiles for children with obesity; 2) the effects of reminders and templates on the frequency of symptoms checks among children with attention deficit disorder; 3) the effects of reminders on lead screening, Chlamydia screening, and anemia screening in eligible patients; and 4) the physician attitudes regarding the value of reminders. **(Achieved)**

**2008 Activities:** Activities during 2008 included the end of data collection and data analysis, as well as several poster presentations of results. Results are being disseminated, including pediatric CDS tools on the AHRQ Web site. All aims have been achieved. Hypotheses were confirmed with statistical significance.

**Preliminary Impact and Findings:** CDS was found to significantly improve medication safety, practice efficiency, guideline adherence, and documentation. Improvements were found in all three clinical domains, including preventive services, acute illness care, and chronic illness care. Low usage of CDS limited the effectiveness of the interventions. The reduction in dosing errors was partially offset by errors resulting from improper use of the CDS. Further improvements in quality and safety are possible through increased physician use of CDS, but this will require physician willingness to change their workflow as well as improvements to EHR software.

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### **Selected Outputs**

Provided content for the Pediatric Rules, Reminders, and Documentation Templates as part of the National Resource Center's (NRC) Health IT tools on AHRQ's NRC Web site. Available at: Agency for Healthcare Research and Quality (<http://healthit.ahrq.gov>). Pediatric Rules and Reminders. Pediatric Documentation Templates. Accessed May 19, 2009.

AHRQ 2008 Annual Conference presentation: IPSQWHIT: Measuring the Quality Improvements Associated with Decision Support in Pediatrics (PowerPoint® File, 280 KB; Web Version).

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**Grantee's Most Recent Self-Reported Quarterly Status:** This grant has been completed.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Impact of Health Information Technology on Clinical Care
<b>Principal Investigator:</b>	Hsu, John, M.D., M.B.A., M.S.C.E.
<b>Organization:</b>	Kaiser Permanente Division of Research
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015280
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,487,606
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This study evaluated the impact of health information technology (health IT) on clinical care for patients with chronic diseases in a large, prepaid integrated delivery system (IDS), Kaiser Permanente-Northern California (KPNC). This natural experiment involved the staggered introduction of a commercially available ambulatory health IT system with an electronic medical record (EMR), computer-based provider order entry (CPOE), and embedded computer-based decision support systems (CDSS) across primary care teams serving over three million patients. Prior to this implementation, the health system introduced Web-based health IT tools in 2004 to assist with documentation (eChart), ordering (eRefill), and consultations (eConsult); these tools permitted clinicians to perform the basic clinical functions with minimal decision support and, importantly, did not replace the paper medical record. In contrast, the new systems are intended to replace traditional records entirely. Using a quasi-experimental design with concurrent controls, we evaluated health IT-associated changes in quality, safety, and resource use in chronic disease care patients between 2004 and 2008. We focused on the 780,000 patients with chronic diseases (asthma, congestive heart failure, coronary artery disease, diabetes mellitus, and hypertension) because these patients tend to require regular and complex ambulatory care, and they may be sensitive to health IT effects. We used measures of quality, safety, and resource use that are quantifiable both before and after the health IT intervention. To evaluate quality and safety, the association between health IT and guideline-consistent drug use and laboratory monitoring, drug adherence, and lab results were tested. These measures represent areas for which the Integrated Delivery System (IDS) has clinical guidelines and consistent data records, yet significant room for improvement exists. These measures also may be affected indirectly by health IT, such as through the use of performance feedback or greater care coordination between providers. To evaluate resource use, we assessed the association between health IT and office visits, emergency department (ED) visits, and hospitalizations.

### Specific Aims

- Design and implement provider and staff surveys. **(Achieved)**
- Collect and analyze automated data. **(Ongoing\*)**
- Disseminate findings. **(Ongoing\*)**

*\* Several aims of the grant were not completed prior to 9/08, but, as other sources of funding have been secured, these aims are still targeted for completion.*

**2008 Activities:** Clinics continued to implement health IT systems throughout the year. Data collection and analysis continued. Preliminary findings suggest that a longer time frame for the study would be beneficial, as our data show a delay in the impacts of health IT systems after implementation.

**Preliminary Impact and Findings:** To date, a number of preliminary examinations of the data have been conducted. Automated data (2004–2006) were used from outpatient visits to assess the association between the implementation of the new health IT system and clinical data quality, including the timeliness of data and the thoroughness of documentation for patient diagnoses in an integrated health system. The implementation of a new health IT system was found to be associated with a dramatic increase in the timeliness of diagnostic information from that system, but not in the number of diagnoses charted during patient visits. Preliminary analysis found no statistically significant association between health IT implementation and changes in physiologic outcomes for diabetics; however, there were substantial secular changes in low-density lipoprotein (LDL) cholesterol levels. Further research is needed to assess the long-term effects; in analyses using longer follow-up periods, there appear to be statistically significant associations between health IT use and our quality outcomes. In addition, various measures of health IT use have been examined. Based on these analyses, health IT presence alone, i.e., adoption or introduction date, is believed to not be a sensitive or useful predictor. Using clinician survey data collected in 2005, the levels and patterns of clinician use of available health IT tools during primary care visits and the factors associated with systematic health IT use were examined. It was found that all clinicians reported at least some health IT use; however, the level of use varied significantly by function. In multivariate analyses, factors associated with systematic health IT use included perceived training adequacy, health IT incorporation into the clinical workflow, and hours worked per week. Clinician survey data collected in 2005 and 2006 were used to examine the impact of having an integrated health IT system on primary care clinician reports of the completeness and timeliness of all relevant clinical information, agreement on treatment goals and plans, and agreement on roles and responsibilities when multiple clinicians are involved with a patient's care. Health IT introduction was found to be associated with substantial improvements in the timeliness and completeness of relevant clinical information and agreements on treatment goals and plans.

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### Selected Outputs

Care Coordination Across Clinicians and Health Information Technology, Manuscript.

Clinical Data Quality and Health Information Technology, Manuscript.

Systematic Use of Health Information Technology. *International Journal of Medical Informatics*. Under review.

Variation in Chronic Disease Care in Primary Care Teams of a Large Integrated Delivery System, Manuscript.

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**Grantee's Most Recent Self-Reported Status:** This grant has been completed. Development of methods to examine effects of health IT across multiple chronic conditions continues, incorporating data throughout the health IT implementation period (2008). While implementation of health IT was completed in 2008, data for all of the study covariates and outcomes will not be available until early 2009. In addition, it would be ideal to be able to incorporate as much additional follow-up time post-implementation as possible for many of the sites in order to capture any pattern in health IT-related outcomes after implementation. As of the conclusion of the grant, all milestones were either completed or on track, given the time frame across different primary care teams.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Health Information Technology Support for Safe Nursing Care
<b>Principal Investigator:</b>	Keenan, Gail M., Ph.D., R.N.
<b>Organization:</b>	University of Michigan at Ann Arbor
<b>Mechanism:</b>	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
<b>Grant Number:</b>	R01 HS 015054
<b>Project Period:</b>	09/04 – 08/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,486,634
<b>Summary Status as of:</b>	August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** In today’s health systems, a patient’s care can involve a large number of clinicians, due to both specialization and shift rotations, whose actions are interdependent. In health care organizations, the term “collective mind” refers to this concept. Ideally, members of a patient’s interdependent team, which may include numerous clinicians caring for patients in a hospital setting, will function as a team using a collective mind with respect to having a shared understanding of the patient’s care. The focus of this completed study was on enabling the collective mind, since it is a vital precursor to continuity, safety, and quality of care. Without a collective mind, the patient’s care team is not operating with reliable and valid information necessary to make optimal decisions about care. The “HANDS” Plan of Care (POC) Method was previously developed and refined through 8 years of research that included a real-time pilot on one intensive care unit (ICU) unit. The HANDS Method consists of an electronic application (standardized database and user interface), rules for data entry to create and update POCs in the electronic application (what, how, when), and a standardized handoff procedure. The user interface, database, and rules for use had been carefully refined over the years through iterative research. The HANDS design reduces cognitive load by providing an external memory aid that facilitates quick understanding of large amounts of information. As part of HANDS, the nurse is taught and expected to mindfully create and update a patient’s plan and “heedfully interrelate” about it at every handoff. The main research question for this study was: “Does the previously piloted HANDS intervention successfully represent the “collective mind” of a patient’s team in diverse settings across time?” Of course, this concept cannot be captured by any single measure or even a single type of analysis; therefore, a variety of cross-sectional and repeated measures, both quantitative and qualitative, were used to assess goals of the system, including mindfulness, heedful interrelating, a culture of safety, trust, and error reduction. The sample selected for this study consisted of eight diverse acute care units located in four organizations. Units were chosen to represent a wide range of: patient types, including medical-surgical, neurology, neurosurgery, thoracic surgery, progressive care, older adult/stroke, cardiac, and acute care elderly; organization types; geographic locations; unit physical setups, including large, small, ICU, step-down, and regular; cultures; nurse characteristics; and staffing patterns.

### Specific Aims

- Support nurse mindfulness in planning care. **(Achieved)**
- Assist nurses during handoffs by emphasizing continuity of care. **(Achieved)**
- Develop electronic documentation to accurately and consistently reflect the plan of care. **(Achieved)**

**2008 Activities:** Analyses of some data were still ongoing at the end of 2008, with dissemination efforts to follow.

**Preliminary Impact and Findings:** Several components of the study used pre- and post-implementation comparisons, including workflow observation and a survey of the culture of safety, while other analytic tools were deployed after go-live, including error reporting and interviews. The project was able to implement and sustain the HANDS Method in all of the targeted clinical units for the duration of the study. Registered nurses (RNs) indicated that HANDS was significantly more useful than previous POC methods and were also significantly more familiar and satisfied with the standardized terminologies used within HANDS. Compliance rates for POC submission to the electronic application were extraordinarily impressive and ranged from 78 to 91 percent among the eight study units, providing evidence of ongoing mindfulness. Additionally, patterns of changes made to the plans by the RNs also provided evidence of the sustained mindfulness in the process. However, compliance in the handoff protocol was less robust, suggesting that there remains more progress to be made. Although observations of handoff instructions demonstrated a body of common knowledge and terminology, many of the features of the software system were under-utilized.

This study demonstrated that when the POC is not used as a major driver of team communication, it can become a secondary source that is not kept fully current and is thus a less-useful archive. In contrast, primary sources are kept fully current, reliable, and valid because they are seen as essential to care decisions. Developing the POC, and in particular the HANDS method, into a primary source of information is expected to improve its content and thus improve patient safety. The RNs in this study were fully supportive of using the related handoff protocol, but they indicated a need for better training and support to fulfill its potential. In conclusion, this study has helped make progress toward understanding what is needed to create a valid and reliable representation of the team's collective mind, improving the culture of patient safety.

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### Selected Outputs

Anderson C, Keenan G, Jones J. Using bibliometrics to support your selection of a nursing terminology set. *Computers Informatics Nursing* 2009 Mar; 27(2):82-90.

Keenan G, Tschannen D, Wesley M. Standardized terminologies can transform practice. *J Nurs Adm* 2008 Mar;38(3):103-6.

Westra B, Delaney C, Konicek D, Keenan G. Nursing standards to support the electronic health record. *Nursing Outlook* 2008;56(5):258-66.

Keenan G, Yakel E, Marriott D. HANDS: A revitalized technology supported care planning method to improve nursing handoffs. In: Park HA, Murray P, Delaney C, editors. *Consumer-Centered Computer-Supported Care for Healthy People. Proceedings of 9th International Congress on Nursing Informatics*; 2006 Jun 11-14; Seoul, South Korea. *Stud Health Technol Inform* 2006;122:580-4.

Keenan G, Yakel E, Tschannen D, et al. In: Hughes R, editor. *Patient safety and quality: An evidence based handbook for nurses*. Rockville, MD: Agency for Healthcare Research and Quality, 2008. Chapter 49, Documentation and the nurse care planning process. Available at: Agency for Healthcare Research and Quality. Documentation and the nurse care planning process. [http://www.ahrq.gov/qual/nursesfdbk/docs/KeenanG\\_DNCCPP.pdf](http://www.ahrq.gov/qual/nursesfdbk/docs/KeenanG_DNCCPP.pdf). Accessed May 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is complete and mostly on track in meeting its milestones.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

**Project Title:** Creating an Evidence Base for Vision Rehabilitation  
**Principal Investigator:** Stuen, Cynthia, Ph.D., D.S.W.  
**Organization:** Lighthouse International  
**Mechanism:** RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)  
**Grant Number:** UC1 HS 015052  
**Project Period:** 09/04 – 08/08, Including No-Cost Extension  
**AHRQ Funding Amount:** \$1,442,113  
**Summary Status as of:** August 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** The primary purpose of this completed project was to implement the Electronic Vision Rehabilitation Record (EVRR<sup>®</sup>), a patient care system that would improve the consistency and quality of vision rehabilitation interventions across agencies and individual providers, with the goal of appropriately restoring safe functioning and self-reliance for those with visual impairment. Vision rehabilitation services include: individualized therapeutic interventions and counseling designed to restore functioning, safety, and self-sufficiency to people with vision loss; offering assistance with techniques of orientation and mobility; independent living, including cooking and child care safety; and psycho-social interventions.

The field of vision rehabilitation, however, lacks standardized measurement and evaluation tools to quantify improvement. Hence, the first step required was to establish uniform definitions and measurements of functioning across vision rehabilitation health care providers, and then to collect sufficient evidence to support and document best practice assessments. The subsequent implementation of the project and its activities were intended to assure that patients receive consistent, high-quality, standardized care, thereby delaying the functional decline associated with vision loss.

The system compiled a large outcome-measures database by which to evaluate the effectiveness of current best practices and contribute to the quality improvement process. Three major activities were involved in the development of best-practice protocols. The first was the development of a training manual that integrated the use of best-practice protocols and the operation of the EVRR system. As the EVRR system was re-designed and moved to a Web-based application, the training manual was revised accordingly and integrated into the system, with a redesigned search and Frequently Asked Questions function. The online manual is accessible for blind and visually impaired users. The second key task was training rehabilitation staff in the use of the system and its core components by an IT expert, and in assessment of patient functioning, operation of the scheduling, visit record, and progress noting function by the respective intervention subject matter experts. The third major task was the formation of a group of providers who were extremely proficient users and who were assigned as the “go-to” persons in each of the intervention areas in case users had questions on system use. These “EVRR Champions” also participated in monthly meetings with IT and research and evaluation staff members to report on progress in the use of the system among providers, as well as to provide suggestions on how the system can be improved.

## Specific Aims

- Significantly increase patients' functional ability from the pre-service to the post-service period in each of the interventions, i.e., orientation and mobility, independent living/vision rehabilitation teaching, and psycho-social services. **(Achieved)**
- Determine socio-demographic and service predictors of optimal post-intervention functional ability. **(Achieved)**
- Achieve optimal levels of perceived patient satisfaction. **(Achieved)**

**2008 Activities:** Data collection continued through the official ending date of the project, with analyses occurring afterward. Some findings were published in 2008, and additional project outputs were prepared for dissemination.

**Preliminary Impact and Findings:** Receiving orientation and mobility services consistently emerged as a predictor of self-assessed optimal functioning and provider rated optimal functioning. All interventions delivered had an impact on improving functional ability with the exception of the psycho-social intervention at one partner agency. The patient surveys indicated EVRR users valued the system and were satisfied with their care. Due to technical problems encountered during the course of this project, Lighthouse International was forced to completely overhaul EVRR by redesigning it as a Web-based system as opposed to a server-based system. In addition, assessment instruments were modified and new assessments were designed (e.g., occupational therapy). Some of the features of this new software include the following: user friendly, Web-enabled, fully accessible for visually impaired users, multi-browser support, built-in administrative tools, defined user roles, tool tips with Integrated Help and Frequently Asked Questions, error handling, system audit trail, and integrated scheduling with Microsoft© Outlook. Post-service self-assessments of functional ability were significantly higher for all the interventions at almost all agencies. Paired sample t-tests for provider ratings showed a similar trend with significantly higher provider ratings from pre- to post-assessment for most interventions at all agencies. Hence, it appears that the use of the EVRR system and its tools, specifically interventions that are based on standardized assessments, facilitates the restoration of functioning in patients with impaired vision and consequently helps in reducing the disabling effects of vision loss. Receiving orientation and mobility services consistently emerged as a predictor of self-assessed optimal functioning and provider-rated optimal functioning. This suggests that in order to improve patients' overall functioning, many individuals with impaired vision could benefit from receiving instructions in safe travel/mobility techniques.

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## Selected Outputs

Stuen C, Parsard J. EVRR—A Technology Solution for Service Providers. In: Proceedings of Vision 2008 International Conference on Low Vision; July 2008; Montreal, Canada. International Society of Low-Vision Rehabilitation and Research.

Available at: Agency for Healthcare Research and Quality. Supported Electronic Record System Focused on Best Practice for Vision Rehabilitation.

[http://healthit.ahrq.gov/portal/server.pt?open=514&objID=5562&mode=2&holderDisplayURL=http://proportallb.ahrq.gov:7087/publishedcontent/publish/communities/a\\_e/ahrq\\_funded\\_projects/health\\_it\\_implementation\\_stories/healthitimplementationstories/ahrq\\_supported\\_electronic\\_record\\_system\\_focuses\\_on\\_best\\_practices\\_for\\_vision\\_rehabilitation.html](http://healthit.ahrq.gov/portal/server.pt?open=514&objID=5562&mode=2&holderDisplayURL=http://proportallb.ahrq.gov:7087/publishedcontent/publish/communities/a_e/ahrq_funded_projects/health_it_implementation_stories/healthitimplementationstories/ahrq_supported_electronic_record_system_focuses_on_best_practices_for_vision_rehabilitation.html) . Accessed May 2009.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This grant has been completed. Based on patient and provider surveys, implementation of the EVRR system was successful, and related

interventions improved patient quality of life. Demonstrations and orientation programs have been given by Webinar to 10 clinics around the world, encouraging further integration of information technology into ophthalmology. The Canadian National Institute for the Blind and the Fife Society for the Blind in Scotland are now deploying EVRR, making the potential for an international database a reality

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Closing the Feedback Loop to Improve Diagnostic Quality
<b>Principal Investigator:</b>	Berner, Eta, Ed.D.
<b>Organization:</b>	University of Alabama at Birmingham
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017060
<b>Project Period:</b>	11/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$998,509
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. This project is developing ways to close the loop of outpatient diagnosis in an effort to improve the quality of diagnostic and therapeutic decisionmaking in ambulatory settings. The project is developing automated processes for proactive follow-up and ongoing rapid feedback to physicians to measure the quality of diagnoses and medication prescribing (clinic settings only). The project includes two health care settings: three ambulatory clinics (United Cerebral Palsy of Greater Birmingham, University of Alabama at Birmingham-Huntsville Family Practice, and the University of Alabama at Birmingham-HIV Clinic) and one emergency department (ED) setting (Shands-Jacksonville Emergency Medicine Department). These sites all have different electronic health records (EHRs) from which data will be extracted to include a proprietary EHR, the Certification Commission for Healthcare Information Technology (CCHIT) certified WorldVista EHR VOE/1.0, and the CCHIT-certified Allscripts Touchworks version 10.2.4.46, EHR. In the ED study, the systems are the CCHIT-certified McKesson Horizon Patient Folder and a proprietary ED system (Xpress Charts) that provides a computer-generated paper template customized according to the patient’s chief complaint.

The two health care settings involve two different interventions. The clinic site intervention is an interactive voice response (IVR) system that has been designed to collect follow-up data on patients who are treated on an outpatient basis and a system to provide feedback to physicians on patient health status and medication adherence. The feedback report will be provided using an interface between the EHR and a database that can be integrated with a variety of systems. The ED intervention is an automated follow-up and feedback report to the ED physicians on the final diagnoses of patients who were admitted to the hospital compared to their initial ED diagnoses.

In addition, providers’ responses to the feedback will be assessed as well as provider satisfaction with the feedback process. For all settings, outcomes assessed include impact on diagnostic and therapeutic quality, extent of adoption of the IVR and ED feedback systems, and use of the feedback by physicians for quality improvement. For the clinic sites, additional outcomes assessed include patient satisfaction and impact on health care costs.

### Specific Aims

- Develop a system within three different ambulatory electronic medical record systems in three different types of ambulatory settings that includes: 1) pro-active follow up of patients’ response

to treatment (including medication adherence and adverse events) and 2) feedback to health care providers. **(Ongoing)**

- Assess the impact of automating the follow-up/feedback system. Impact will be measured in terms of: 1) diagnostic quality, 2) prevention of adverse events, 3) patient satisfaction with their clinical care, and 4) health care costs. **(Upcoming)**
- Develop and evaluate an automated system for feedback to emergency medicine physicians of the concordance between their diagnoses and patients' final diagnostic outcomes. **(Ongoing)**

**2008 Activities:** Dr. Berner and her team made significant progress on the interventions designed for the two health care settings: clinics and ED. In the clinic settings, a patient consent process, patient follow-up protocols, physician feedback format and protocols, and the documentation of physician response as a result of the feedback were developed. This included developing and receiving Institutional Review Board (IRB) approval for the data collection tool used during patient follow-up, the initial patient screening card, and informational materials accompanying the screening card. The baseline follow-up/feedback processes are being implemented and results analyzed in preparation for automation. The development, pilot testing, and refinement of automated methods linked to the EHR were also completed. These included developing processes for the data extraction from the EHR to populate the data collection form prior to patient follow-up, electronic capture of follow-up patient interview data, collection of post-interview data, and export of standard files for data analysis. A data dictionary was also developed for the sites to export data from their systems in the same format.

In the ED setting, a process was developed to merge a patient's ED diagnosis with the final hospital discharge diagnosis and provide feedback to the physician along with pilot testing of ways to automate the process. In addition, the team developed a protocol for adjudicating differences between a patient's ED and hospital discharge diagnoses, and a process of developing and evaluating an adjudication method for differences between the ED and hospital discharge diagnoses.

**Preliminary Impact and Findings:** Publicly available findings will be disseminated closer to the end of the project.

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### Selected Outputs

Berner E. Closing the Feedback Loop to Improve Diagnostic Quality. Diagnostic Error in Medicine Conference; May 2008. AHRQ and American Medical Informatics Association (AMIA).

Berner E. Closing the Feedback Loop to Improve Diagnostic Quality. Health Information Technology/Patient Safety Conference; September 2008. AHRQ.

Data Collection Tool: includes data elements necessary to collect prior to follow-up and during follow-up.

Patient Screening Tool: to identify patients that volunteer to be part of the study.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is slightly delayed because the procedures and data collection forms required another round of IRB approval due to a change in process at one of the clinics. IRB approval was achieved, and a full completion of the project is expected. In addition, one of the clinics decided to install the Clinician Documentation/Notification Application (CDNA) in use at another facility versus developing their own. The installation is taking longer than expected, but the project team is working closely with the site to assure progress. The project is somewhat under spent by five to twenty percent due to the project delays associated with baseline data collection and implementation of the automation process. Full use of the budget is expected by the end of the project.

**Milestones:** Project is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Automating Assessment of Asthma Care Quality
<b>Principal Investigator:</b>	Hazlehurst, Brian, M.D.
<b>Organization:</b>	Kaiser Foundation Research Institute
<b>Mechanism:</b>	RFA HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017022
<b>Project Period:</b>	09/07 – 09/09
<b>AHRQ Funding Amount:</b>	\$871,711
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. This project aims to develop, validate, apply, and evaluate a scalable method for routine and comprehensive measurement of outpatient asthma care quality. To accomplish this, the project will employ MediClass (a “Medical Classifier”), which is a proven natural language processing technology for extracting care quality data from both coded data and free-text clinical notes in the Electronic Medical Record (EMR). The project will perform retrospective analysis of EMR data from two distinct health systems: a mid-sized HMO (Kaiser Permanente Northwest [KPNW]) and a consortium of Federally Qualified Health Center clinics (OCHIN, Inc.) including a diverse sample of patients, providers, and health care practices in the Pacific Northwest. The data will be extracted from Kaiser Permanente’s Epic-based EMR HealthConnect and OCHIN’s Certification Commission for Healthcare Information Technology (CCHIT) certified Epic-based EMR EpicCare Spring 2007. Since these EMR systems reside in separate health systems, the implementation of the products generates differences in the data, which must be accommodated when these data are interpreted for quality assessments. This project is leveraging MediClass to implement methods for collecting and transforming data into common formats for quality assessment across multiple data capture, representation, and storage processes. This project leverages health IT to assess and improve quality of care for insured and the indigent, uninsured, and underinsured populations of this region.

### Specific Aims

- Refine asthma care quality measures from the RAND Quality Assessment Tools Project for use as a quality measure set to evaluate ambulatory asthma care performance. **(Achieved)**
- Develop and validate an automated (generalizable and scalable) method for applying the above care quality measures using comprehensive EMR data. **(Ongoing)**
- Apply the automated method developed above to assess ambulatory asthma care quality in two distinct health plans representing diverse patient populations and care practices. **(Ongoing)**
- Evaluate the association between our automated measures of adherence to recommended asthma care processes and measures of clinical outcomes using KPNW data only. **(Upcoming)**

**2008 Activities:** Dr. Hazlehurst and his team successfully formulated the definitions for the Asthma Care Quality (ACQ) measure set which includes 22 distinct aspects of ambulatory care for patients with persistent asthma. Following the completion of the measure set, work on development, implementation, and validation of the ACQ measurement instrument commenced. This is the most extensive portion of the

project and entails: 1) developing a method for extracting data from specific EMR implementations, 2) developing a processing engine to identify key clinical events required by the measures from within both text and coded fields, and 3) combining the clinical events to implement the individual measures. Preparation for assessing asthma care quality is also in process. The data to be extracted has been defined, and extraction of the data from the data warehouses is in progress. The chart abstraction procedures and forms to evaluate the performance of the measures using manual abstraction of EMR records are in testing.

**Preliminary Impact and Findings:** Preliminary findings focus on data capture in the EMR and data flow out of the EMR. For example: 1) Many data elements required for in-depth, comprehensive, domain-specific (e.g., asthma care) quality assessment do not flow automatically to a data warehouse from the clinical information system (EMR). This flow is required for automated assessment, but will require specific configuration of the data warehousing practices at each implementation site. 2) Many diverse pathways exist for clinicians to document the care they deliver. Within progress notes of the EMR, the common use of automated templates and macros for adding content may increase documentation speed but may also make the interpretation of these loosely organized content segments difficult or ambiguous.

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### **Selected Outputs**

An abstract on the ACQ project was accepted for inclusion at the 2009 American Thoracic Society Annual Conference.

Operations Manual on the architecture and implementation details of the ACQ measurement instrument as they pertain to each site.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is mostly on track and meeting 80 percent of its milestones with a projected slight delay in developing and validating the automated instrument. The delay is due to the uniqueness of the EMR implementation and flow of data within each site. Validation of the measure set is somewhat delayed by limitations in personnel available for the required manual chart review that serves as a gold standard.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

**Project Title:** Developing and Using Valid Clinical Quality Metrics for Health Information Technology (Health IT) with Health Information Exchange (HIE)

**Principal Investigator:** Kaushal, Rainu, M.D.

**Organization:** Joan and Sanford I. Weill Medical College of Cornell University

**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)

**Grant Number:** R18 HS 017067

**Project Period:** 09/07 – 09/09

**AHRQ Funding Amount:** \$974,545

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. The goals of this project are: 1) to develop a set of quality metrics that can be retrieved electronically and that is sensitive to the types of changes in quality that electronic health records (EHR) with health information exchange (HIE) may contribute to ambulatory care; 2) to validate this metric set with a national expert panel; 3) to test the reliability of electronic reporting of these metrics, compared to manual review of EHRs; and 4) to use the metric set to measure changes in quality over time. This project has developed a set of quality metrics through review and rating of existing quality metrics, plus development of novel metrics to address topics not well represented among existing metrics. Selected existing and novel quality metrics were validated by a panel of national experts in quality measurement and HIE. The project intends to test the accuracy of electronic retrieval of data for the metric set, compared to manual review of EHRs, using data from the Hudson Valley region of New York. The project will also repeat electronic reporting of the metric set to determine changes in quality in the Hudson Valley over time. Completion of the project is intended to result in a shared and transparent framework for evaluating the quality of health care delivery in an ambulatory care setting that exchanges clinical data electronically across care settings, benefiting patients, providers, and payers in addition to influencing discussions of how to implement HIE for optimal outcomes. The selection of the EHR product that will be used to test the reliability of electronic reporting of the metric set is being finalized.

#### Specific Aims

- Develop a modified set of quality metrics that can be retrieved electronically and that is sensitive to the types of improvements in quality that health IT with HIE may contribute in an ambulatory care setting. **(Achieved)**
- Validate the modified quality metric set. **(Achieved)**
- Test the reliability of electronic retrieval of the modified quality metric set. **(Ongoing)**
- Use the modified quality metric set, evaluate the long-term effects of using health IT with HIE on improving health care quality. **(Upcoming)**

**2008 Activities:** The project successfully developed and validated a modified set of quality metrics that can be retrieved electronically, and a manuscript describing the final metric set and methodology by which it was created has been submitted to a peer-reviewed journal. The metrics were developed through a series of steps, which included working with members of an expert panel in quality measurement and

HIE to rate the measures pre-defined criteria. The final set of metrics, selected from existing metric sets, covers a range of topics including asthma, cardiovascular diseases, congestive heart failure, diabetes, medication/allergy management, osteoporosis, and prevention. The investigators are in the process of identifying the EHR vendor in the Hudson Valley most able to report these metrics electronically.

**Preliminary Impact and Findings:** Publicly available findings will be made available closer to the end of the project.

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### **Selected Outputs**

AHRQ 2008 Annual Conference presentation: Developing a Metric Set for Measuring and Reporting Ambulatory Quality of Care in the Setting of Health IT with HIE ([PowerPoint® File](#), 185 KB; [Web Version](#))

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**Grantee's Most Recent Self-Reported Quarterly Status:** Testing the reliability of the electronic retrieval of the modified quality metrics set and data collection is delayed because most EHR vendors cannot currently report the measures. As a result, the timeline for activities related to testing the reliability of electronic reporting and measuring changes in quality over time is delayed. The project budget is somewhat under spent by 5 to 20 percent, partially due to the technical delays cited above and to changes in staffing. The project recently hired a junior biostatistician, which, along with progress against the remaining milestones, will lead to a fully utilized budget by the end of the project.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Surveillance for Adverse Drug Events in Ambulatory Pediatrics
<b>Principal Investigator:</b>	Kilbridge, Peter, M.D.
<b>Organization:</b>	Washington University
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017010
<b>Project Period:</b>	09/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$992,600
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. This project is using automated surveillance to reliably measure the incidence of adverse drug events (ADEs), or harm to patients from drugs, suffered by children with sickle cell disease, cystic fibrosis, and cancer that occur in the outpatient setting, in the emergency department, or during the transitions of hospital admission and discharge. This automated surveillance system has been implemented and outcomes are being monitored. The project will analyze data generated from BJC Health Care System, which includes St. Louis Children’s Hospital (SLCH). The SLCH Emergency Department (ED) uses Wellsoft ED computer system and the McKesson Corporation’s Certification Commission for Healthcare Information Technology (CCHIT) certified Horizon Expert Documentation version 7.6 SP2 for inpatient care. The BJC Medical Informatics Laboratory group is using its computer system and an expert systems architecture or natural language processing (NLP) based on the open-source cancer Text Informatics Extraction System (caTIES) version 2.3 to automatically scan laboratory, pharmacy, demographic, documentation, and diagnostic code data from the target populations for “signals,” or data combinations that suggest the occurrence of an ADE. The NLP is being evaluated for efficiency (positive predictive value and time/resource efficiency) and effectiveness in ADE detection compared with targeted explicit chart review, and the project will examine the impact of access to ADE metrics by practitioners. The data from the system will be used to improve medication use safety in clinic, emergency, and inpatient environments.

### Specific Aims

- Implement an automated surveillance system for measuring the incidence of ADEs occurring in the outpatient setting (including the emergency department) in pediatric patients with specific chronic diseases that result in the need for emergency department care or admission to the SLCH. **(Achieved)**
- Use the automated surveillance system for measuring the incidence of ADEs occurring in these patient populations during the transition in care from outpatient to inpatient setting, e.g., originating during the admission process. **(Ongoing)**
- Use the automated surveillance system for measuring the incidence of ADEs in the target pediatric populations within four weeks of discharge. **(Ongoing)**
- Evaluate the performance of the event detection system as employed in the three aims listed above. **(Ongoing)**

**2008 Activities:** The project is analyzing both discrete data, such as lab values, and written test reports. The collection of data from the automated system for the discrete data rule alerts began at the start of 2008 and is ongoing. The Web interfaces and signal reports are now produced daily in real time for the evaluation of alerts by a physician and a pharmacist. Since early fall 2008, the project has been operating the enhanced surveillance system, which incorporates NLP for document review. The project now receives documents from the clinical data repository, which are being parsed. The project team has worked diligently to overcome challenges including reducing the number of administrative documents received, working out memory problems with caTIES, and fine-tuning document preparation for the NLP.

**Preliminary Impact and Findings:** A preliminary analysis of pediatric automated ADE application data from January and February of 2008 showed a positive predictive value of 13 percent, discovering 4 events with harm per 1,000 inpatient days. Actual data is being prepared for publication, but the project reported that ADEs have been identified in the population from alerts generated by both discrete rules and NLP rules. The success of the ADE surveillance system in the first 6 months of the project has prompted implementation of a BJC Health Care System-wide ADE surveillance program for all 12 of the BJC hospitals, focused on rules more typically used in adult hospitals.

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### **Selected Outputs**

Two abstracts were submitted and accepted for presentation at the November 2008 American Medical Informatics Association (AMIA) conference.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is somewhat under spent by 5 to 20 percent due to difficulty acquiring a qualified project manager. The project carried over much of the balance from Year 1 to augment the budget for natural language processing, which was necessary due to the loss of the original vendor and the need to reform the database to accept the caTIES output.

**Milestones:** Progress is completely on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Cardio-Hit Phase II
<b>Principal Investigator:</b>	Kmetik, Karen, Ph.D.
<b>Organization:</b>	American Medical Association
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017160
<b>Project Period:</b>	09/07 – 09/09
<b>AHRQ Funding Amount:</b>	\$996,166
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. This project is a 2-year, observational study of quality measure exception (or exclusion) reporting, building on Dr. Kmetik’s prior work under Cardio-HIT, a research collaborative of five electronic health record system (EHRS)-enabled independent cardiology and internal medicine group practices. These practices have integrated the American College of Cardiology (ACC)/American Heart Association (AHA)/Physician Consortium for Performance Improvement (PCPI)-developed physician clinical performance measures for Coronary Artery Disease (CAD) and Heart Failure (HF) into their EHRS.

The project is using two sources of data for the study: 1) the CAD and HF performance measure data, which are currently being collected in practice site EHRS and exported to a data warehouse by all Cardio-HIT sites, and 2) detailed data on reported exceptions, which are being collected via “manual” EHRS medical record abstraction by trained abstractors. The process of integrating the ACC/AHA/PCPI measures into the EHRS, importing de-identified data to a central warehouse, and the subsequent report development and distribution is a multi-phased approach involving each practice and the Iowa Foundation for Medical Care (IFMC), which is managing the Cardio-HIT clinical data warehouse.

The Cardio-HIT project is designed to study the feasibility and implementation of integrating the nationally recognized ACC/AHA/PCPI-developed physician performance measures for CAD and HF into five EHRS-equipped cardiology and internal medicine practices. The data to inform the work are being collected from the following vendor products: Epic Spring 2007 IU 1; NextGen® EMR 5.5.25; Cardioworks®, Touchworks by Allscripts® 10.2.3, and GE Centricity® EMR 2005. All vendors are Certification Commission for Healthcare Information Technology (CCHIT) certified with the exception of Cardioworks®. Although each installation of the products differs, the project results are likely to be generalizable to users of EHRS products.

The data generated through the Cardio-HIT project will also provide actionable feedback to physicians about the quality of care being provided by the analyses of the integrated performance measures exception reporting data. The ability to collect and analyze exception data may prove valuable in understanding variations in care. Physician access to exception data from the EHRS at the point of care is critical for clinical decisionmaking and improving patient outcomes.

## Specific Aims

- Build an empirical understanding about prevalence and patterns of exception reporting among physicians using EHRs and reporting national performance measurements. To achieve this aim, the project will use exception reporting data from the Cardio-HIT sites to quantify prevalence and patterns of exclusions for two measure sets: CAD and HF. **(Ongoing)**
- Evaluate the feasibility and accuracy of exception reporting among physicians. To achieve this aim, the project will: 1) conduct organizational evaluations to characterize and assess the ability of EHRs-enabled practices to capture data required for exception reporting, and to assess variation in this process; and 2) evaluate the accuracy and validity of automated exception reports and identify key sources of measurement error. **(Ongoing)**
- Analyze and then address stakeholder concerns on exception reporting in physician performance measurement to develop refined principles and methods regarding the use of exception reporting in performance measures. To achieve this aim, the project will convene key stakeholders in physician performance measurement, document stakeholder perspectives, and develop a consensus guideline concerning the use and operationalization of exclusions in national physician performance measures. **(Ongoing)**

**2008 Activities:** To assess the feasibility and accuracy of exception reporting, the IFMC data warehouse team developed electronic data abstraction tools for the CAD and HF measures to be used during their “manual” practice site abstraction visits. The abstractors reviewed samples of warehouse data and reported exceptions and apparent quality failures for the CAD measures from all five sites. IFMC generated preliminary sample CAD analysis tables that included: Reported exceptions, Opportunities for improvement/apparent quality failures, and Validation (agreement) rates.

These findings were reviewed and discussed by the practice sites at an in-person meeting held September 11, 2008. The results were then shared with a broad group of stakeholders at an in-person meeting held the next day to gain their varying perspectives regarding the use of exception reporting. Following the 2-day meeting, the CAD analysis tables were updated and finalized based on input received during these discussions.

To document the prevalence and patterns of exception reporting in the measures, each of the five Cardio-HIT sites continues to submit clinical performance data for both CAD and HF to the data warehouse and to receive de-identified, aggregate performance and exception reports.

**Preliminary Impact and Findings:** Statistical analyses of the CAD data revealed several preliminary key findings and the team continues to conduct further analyses with the data. Preliminary key findings from the warehouse data include: overall performance rates derived from EHRs data across the CAD measures; exception rates across measures and sites; and potential opportunities for improvement. Preliminary abstracted sample findings include: rates of agreement between the reported exception and EHRs documentation; location of exception documentation among the various EHRs products used by the five sites; and actual exception reason documented in the EHRs by measure.

A similar process will be followed to analyze exception reporting for three HF measures. A third abstraction sample will collect numerator information for the measures met for six HF measures to determine the sensitivity and specificity of the measures. A manuscript describing Cardio-HIT, Year One, Phase II is also in development.

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## Selected Outputs

Web-based EHRs data extraction tools were developed for both the CAD and HF measures and CAD data analyses results: these data analyses can be used by physicians to identify potential exception

categories to use and track patient care. Measure developers can also use these tools to aid in the development of patient focused performance measures and provide information for the possible expansion of exception categories, and vendors can use them to provide information as to why physicians may decide to “override” an exception and improve the exception location within an EHRS. EHRS modifications can be implemented to create easier adaptation of performance measure integration and exception reporting.

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**Grantee’s Most Recent Self-Reported Quarterly Status:** The project is mostly on track with its milestones and anticipates full use of the budget by the end of the project.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Electronic Support for Public Health – Vaccine Adverse Event Reporting System (ESP: VAERS)
<b>Project Investigator:</b>	Lazarus, Ross, M.B.B.S., M.P.H., M.Med., G.D.Comp.Sci.
<b>Organization:</b>	Harvard Pilgrim Health Care, Inc.
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017045
<b>Project Period:</b>	12/07 – 09/09
<b>AHRQ Funding:</b>	\$999,995
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in December 2007 and has completed the first half of the grant period. The goal of this project is to improve the quality of vaccination programs by improving the quality of physician adverse vaccine event detection and reporting to the national Vaccine Adverse Event Reporting System (VAERS). This project is serving as an extension of the Electronic Support for Public Health (ESP) project, an automated system using electronic health record (EHR) data to detect and securely report cases of certain diseases to a local public health authority. ESP provides a ready-made platform for automatically converting clinical, laboratory, prescription, and demographic data from almost any EHR system into database tables on a completely independent server, physically located and secured by the same logical and physical security as the EHR data itself. The ESP: VAERS project is specifically developing criteria and algorithms to identify important adverse events related to vaccinations in ambulatory care EHR data, and formatting and securely sending electronic VAERS reports directly to the Centers for Disease Control and Prevention (CDC).

Patient data are available from Epic System’s Certification Commission for Healthcare Information Technology (CCHIT) certified EpicCare Spring 2008 system at all ambulatory care encounters within Atrius Health, a large multispecialty group practice with over 35 facilities. Every patient receiving a vaccine is automatically identified, and for the next 30 days, their health care diagnostic codes, laboratory tests, and medication prescriptions are evaluated for values suggestive of an adverse vaccine event. When a possible adverse event is detected, it is recorded, and the appropriate clinician is notified electronically. Clinicians will be able to preview a pre-populated report with information from the EHR about the patient, including vaccine type, lot number, and possible adverse effect, to inform their clinical judgment regarding whether the clinician wishes to send a report to VAERS. Clinicians have the option of adding free-text comments to pre-populated VAERS reports or to document their decision not to send a report. The CDC’s Public Health Information Network Messaging System (PHIN-MS) software has been installed within the facilities so that the approved reports are securely transferred to VAERS as electronic messages in an interoperable health data exchange format using Health Level 7 (HL7).

The project will evaluate the system by comparing adverse event findings to those in the Vaccine Safety Datalink project—which is a collaborative effort between CDC’s Immunization Safety Office and eight large managed care organizations—and in a randomized trial. The trial will test the hypothesis that the combination of secure, computer-assisted, clinician-approved, adverse event detection and automated electronic reporting will substantially increase the number, completeness, validity, and timeliness of physician-approved case reports to VAERS compared to the existing spontaneous reporting system.

## Specific Aims

- Identify required data elements, and develop systems to monitor ambulatory care EHRs for adverse events following vaccine administration. **(Achieved)**
- Prepare and securely submit clinician-approved, electronic reports to the national VAERS. **(Ongoing)**
- Comprehensively evaluate ESP: VAERS performance in a randomized trial, and in comparison to existing VAERS and Vaccine Safety Datalink data. **(Upcoming)**
- Distribute documentation and application software developed and refined in the first two aims listed above that are portable to other ambulatory care settings and to other EMR systems. **(Achieved)**

**2008 Activities:** Dr. Lazarus and his team identified the required data elements and developed systems to monitor ambulatory care electronic health records for adverse events following vaccine administration. A draft document was prepared describing the required data elements, algorithms, interval of interest after vaccination, and actions for broad classes of post-vaccination events. These events include those to be reported immediately without delay (such as acute anaphylactic reaction following vaccination), those never to be reported (such as routine check-ups following vaccination), and those to be reported at the discretion, and with additional information, from the attending physician through a feedback mechanism. The draft document was then widely circulated for comment by relevant staff in the CDC and among the clinical staff at Atrius Health. Feedback received was incorporated, and the document was finalized. The ESP: VAERS case management Web site is currently under construction and will be completed once the more fundamental code is tested and stable. The existing Web site at <http://esphealth.org> will serve as the prototype as planned. In collaboration with the CDC and Constella, the initial HL7 specifications describing the elements for an electronic message to be submitted have been reviewed and approved. Sample test data have been supplied, and the project has begun the design and testing of the computer software needed to generate the messages and installation of PHIN-MS for testing.

**Preliminary Impact and Findings:** Currently there has been no data collection that would inform preliminary findings at this time.

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## Selected Outputs

An ESP: VAERS introductory poster was presented at the CDC Vaccine Safety Datalink (VSD) Annual Meeting in Atlanta, GA, in April 2008. A similar presentation was given during the CDC Public Health Informatics Network (PHIN) Conference in August 2008.

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**Grantee's Most Recent Self-Reported Quarterly Status:** Progress in meeting many milestones is stalled. The project is meeting about 30 to 65 percent of its milestones; there is a plan for achieving some milestones but not others. The project team is still grappling with systemic programming delays that were encountered toward the end of the last reporting period (September 2008), due in large part to loss of a few key senior programming staff. These delays have influenced reaching milestones in a timely manner. However, staffing is now back to optimal levels, and the team expects activity to resume once new hires have been adequately brought up to speed with current operating systems and project development thus far. As a result of the delays in installing the PHIN-MS software, the project is somewhat under spent on its budget by 5 to 20 percent. Full use of the budget is anticipated given the increase in project activities during late 2008. The team hired a new programmer early in 2009, and this will help move the programming tasks forward and is covered by the existing budget.

**Milestones:** Progress in meeting many milestones is stalled.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Massachusetts Quality E-Measure Validation Study
<b>Principal Investigator:</b>	Schneider, Eric, M.D.
<b>Organization:</b>	Harvard University School of Public Health
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017048
<b>Project Period:</b>	09/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$995,575
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. This project is evaluating the readiness of structured electronic health record (EHR) data to support ambulatory clinical quality measurement by using the AQA Alliance (AQA) ambulatory care measurement set to compare quality measurement based on a structured EHR data measurement method to two standard measurement methods: 1) a “hybrid method,” combining claims data with medical record review; and 2) a “claims-only method” based upon claims data aggregated across commercial health plans and the Medicare program. The project includes primary analyses with formal hypothesis testing and secondary analyses that will help to identify and prioritize the high-impact, short- and long-term modifications to community-wide, office-based EHR systems that could support and accelerate the dissemination of ambulatory clinical quality measurement. The data used for this grant are being collected and aggregated as part of the Massachusetts eHealth Collaborative’s (MAeHC) community-wide interoperable EHR implementation pilot in three Massachusetts communities. Massachusetts Health Quality Partners (MHQP) is developing EHR-based quality measure specifications and data extraction logic for the AQA ambulatory quality measure set. In addition to the implementation of interoperable EHRs, the Quality and Usage Data Coordinating Center (QUDCC) was developed and implemented for selective retrieval, linkage, and storage of patient-level clinical data elements that can be used to calculate clinical quality measure results.

### Specific Aims

- Recruit a cohort of adult ambulatory patients from three communities that are piloting community-wide implementation of structured EHRs to compare a quality measurement method based on a structured EHR data to a hybrid method involving a combination of aggregated claims data and medical record review. **(Ongoing)**
- Compare a measurement method based on structured EHR data to a claims-only method based on a novel database that aggregates claims data from commercial health plans and Medicare. **(Ongoing)**

**2008 Activities:** Dr. Schneider and his team accomplished the majority of the planning necessary for the project. Patient recruitment materials were developed and received Institutional Review Board (IRB) approval. The materials include a physician notification letter, a patient invitation letter for inclusion in the project, a patient opt-out form, a formal invitation letter for patients who agree to participate, and a study consent form. The project initially identified and recruited three health plans that have large percentages of enrollees in the three MAeHC communities for the purpose of patient identification and

recruitment. One of the plans opted not to participate, and the project has begun to identify a third plan to ensure adequate sample size. The IRB-approved study materials were submitted to the health plans for their review, with approval expected in early 2009. The sample patient frame for use in the first aim listed above was specified and includes a cohort of adult ambulatory patients from the three MAeHC communities that are 18–80 years of age and eligible for the selected AQA measures. To further inform the effort, the project is using a subcontractor, the Center for Survey Research, to develop a patient survey. The initial draft of the survey was completed, and cognitive testing began with the expectation that the survey would be refined and fielded in early 2009. To conduct the evaluation, development of a medical record review tool commenced and includes a schema for each quality measure component that specifies the data elements and potential data values represented in the EHR, claims data files, the medical record abstraction tool, and the patient survey. In parallel, a measure-specific medical record abstraction module is under development. Once complete, the quality measure specifications and measure-specific modules will be combined to form the medical record review tool.

**Preliminary Impact and Findings:** Publicly available findings will be made available closer to the end of the project.

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### **Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is on track across 65 to 80 percent of its milestones. There were initial delays in identifying patients, but that issue has been resolved and is now on track. Patient surveys were expected to occur in January 2009, and the medical record review process was scheduled for June 2009. The shift in timeline allows additional patient data to be accrued by the health information exchange (HIE) and for MHQP to complete the quality measure specification process which is the overall basis for the evaluation. The project continued to conserve funds to ensure sufficient monies were available to move forward once the patient identification and HIE implementation components were in place. Full use of the budget is planned, and completion of the project is expected.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

**Project Title:** Using Electronic Records to Detect and Learn from Ambulatory Diagnostic Errors

**Principal Investigator:** Thomas, Eric, MD

**Organization:** University of Texas Health Science Center Houston

**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)

**Grant Number:** R18 HS 017244

**Project Period:** 11/07 – 09/09

**AHRQ Funding Amount:** \$873,108

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in November 2007, and has completed the first half of the grant period. This project is utilizing data from electronic health records (EHR) in the Michael E. DeBakey Veterans Administration Medical Center (VAMC) in Houston and in the Scott & White Regional Health System's primary care clinics to detect diagnostic errors in primary care, understand their causes, and lay the groundwork to formulate future prevention strategies. The project incorporates two interventions (see Specific Aims). The first intervention includes applying a trigger algorithm to the EHR at both sites to identify primary care visits of interest and detect patterns of visits that could have been precipitated by diagnostic errors. Manual chart reviews of the electronic records are being conducted to verify the presence of diagnostic errors. The second intervention uses the alert management software of the VAMC only to track and identify records of patients in cases when responsible providers did not electronically acknowledge pre-specified abnormal test results. Manual chart reviews of the electronic records are being performed to determine the presence or absence of diagnostic errors related to test result follow-up. To test the validity of both interventions, the project is comparing their positive predictive values (PPV) with a random sample of visits that do not meet the trigger criteria. To improve the triggers, a logistics regression model will be used to test the additive PPV of integrating the trigger with specific independent clinical variables such as vital signs, laboratory values, or radiology data.

The data for this project are collected from the VAMC's Certification Commission for Healthcare Information Technology (CCHIT) certified VistA Computerized Patient Record System (CPRS) and Scott and White's proprietary Electronic Medical Record Exchange (EMRx) system which serves as a document repository for all clinical data pertaining to patient care within the Scott and White system, including physician notes, laboratory and radiology reports, and all other electronic data generated. To access information from CPRS, the project is using the South Central Veterans Health Care Network Data Warehouse, which is a collection of administrative and clinical data from ten Veterans Administration (VA) hospitals in the south central United States. The Scott and White EMRx system includes a single interface known as Sequoia to allow access to the data collected in the EMRx system. Thirty thousand new documents, representing outpatient notes, admission notes, consultation notes, lab/pathology reports, and radiology reports, are automatically sorted, marked-up, and added to the clinical data repository each day.

## Specific Aims

- Apply and improve computerized triggers based on visit patterns to detect, measure, and learn from diagnostic errors in diverse primary care settings. **(Ongoing)**
- Test whether a method of computerized tracking for abnormal test results that are potentially lost to follow-up can be used as a trigger to identify diagnostic near-misses in primary care. **(Ongoing)**

**2008 Activities:** Resident physician chart reviewers were identified and trained at both the VAMC and Scott and White facilities. The data collection instruments and training manuals were designed and tested. Queries were run on the data from the VAMC facility for the aims listed above, and the patient lists were sent to the reviewers to begin data collection from the electronic record. Data collection at the Scott and White facilities is delayed until 2009 due to the length of time required to identify and train the appropriate reviewers. The project obtained Institutional Review Board (IRB) approval from all participating institutions.

**Preliminary Impact and Findings:** Publicly available findings will be made available closer to the end of the project.

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## Selected Outputs

Chart review data collection instrument.

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**Grantee's Most Recent Self-Reported Quarterly Status:** There is a delay in the schedule with the chart reviews at Scott and White which impacts the timeline for data collection. It is anticipated that project timelines will require some revision but that a full completion of the project milestones is expected. Project funds are somewhat under spent by 5 to 20 percent due to the limited work hours of the Scott and White chart reviewers, and the funds carried forward. The project anticipates spending to increase for the Scott and White site next quarter, allowing for complete use of the budget by the end of the project.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

**Project Title:** Monitoring Intensification of Treatment for Hyperglycemia and Hyperlipidemia

**Principal Investigator:** Turchin, Alexander, M.D.

**Organization:** Brigham and Women's Hospital

**Mechanism:** RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health IT (EQM)

**Grant Number:** R18 HS 017030

**Project Period:** 09/07 – 09/09

**AHRQ Funding Amount:** \$533,431

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. Low frequency of treatment intensification has been linked to increased prevalence of elevated blood pressure and glycosylated hemoglobin (HbA1c). Dr. Turchin and his team are developing a physician performance process measure using both structured and unstructured data targeted at the frequency of treatment intensification in managing hyperglycemia and hyperlipidemia. Two informatics tools or algorithms have been developed to determine whether medication for the treatment of hyperglycemia and hyperlipidemia was increased based on data found in the electronic health record (EHR). The first algorithm is designed to extract structured data from the EHR, and the second is a natural language processing (NLP) tool developed to assess whether accurate measures of treatment intensification can be obtained through computational analysis of the text from physician notes. It is expected that these tools will be made available using the public domain. The project will test the sensitivity and specificity of the informatics tools using manual review of the electronic patient records by two independent reviewers who did not participate in the tool development. To determine if the measures of treatment intensification obtained through the use of the informatics tools are clinically valid, the project will use a variety of statistical analyses to demonstrate a relationship between HbA1c and low-density lipoprotein (LDL) cholesterol levels and two measures of treatment intensification: frequency of treatment intensification and time to treatment intensification. Statistical analyses will also be used to 1) identify specific patient and visit characteristics that affect the probability of anti-hyperglycemic and anti-hyperlipidemic treatment intensification at a given visit and 2) to test that case mix-adjusted measure of intensification of treating hyperglycemia and hyperlipidemia is more strongly associated with clinical outcomes than currently used process measures of diabetes care.

This project is applying the informatics tools to retrospective data generated from an internally developed EHR, Longitudinal Medical Record (LMR), and is collected in Partners Healthcare System's proprietary Research Patient Data Registry (RPDR). The data collected are based on patient visits to primary care practices or endocrinology practices affiliated with Massachusetts General Hospital and Brigham and Women's Hospital.

## Specific Aims

- Test the hypothesis that an accurate measure of treatment intensification in the management of hyperglycemia and hyperlipidemia can be obtained through computational analysis of the text of physician notes in the EHR. **(Ongoing)**
- Test the hypothesis that the measure of treatment intensification developed in the first aim is related to glucose and lipid control. **(Upcoming)**
- Identify specific patient and visit characteristics that affect the probability of anti-hyperglycemic and anti-hyperlipidemic treatment intensification at a given visit. **(Upcoming)**
- Test the hypothesis that case mix-adjusted measure of intensification of treating hyperglycemia and hyperlipidemia is more strongly associated with clinical outcomes than currently used process measures of diabetes care. **(Upcoming)**

**2008 Activities:** Data acquisition was completed early in 2008 along with the recruitment and training of a computer programmer. Following the completion of these activities, Dr. Turchin and his team compared structured data found in the medication section of the EHR and unstructured data found in the text of physician notes as the sources of information on medication intensification. Based on the comparison results, the project includes both structured and unstructured data sources in its analysis of medication intensification. A tool to analyze the structured data has been developed. Design of the overall framework of the general informatics tool to identify documentation of any (anti-hyperglycemic or anti-hyperlipidemic) medication intensification in the text notes is completed, and development of the tools is underway. An evaluation of the accuracy of the NLP tool in determining whether medication non-adherence was documented in physician notes was performed, and the findings were presented in a full paper at the 2008 American Medical Informatics Association (AMIA) Annual Symposium.

**Preliminary Impact and Findings:** The project's findings illustrate that medication intensification data from structured and narrative sources are complementary and in both cases independently associated with changes in relevant clinical outcomes. A manuscript that describes the comparison of structured versus unstructured data sources has been submitted to a peer-reviewed journal. Documentation data of patient medication adherence obtained using the informatics tool was developed, and the findings showed that patients who are documented to be non-adherent to their medications are more likely to have significantly elevated blood pressure (> 150/95). This finding confirms clinical relevance of the information computationally extracted from the text of the notes.

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## Selected Outputs

A manuscript describing the evaluation of the tool for identification of documentation of medication non-adherence from narrative provider notes in the EHR was published in the AMIA 2008 Symposium Proceedings, pp. 732-6.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is making some progress but has experienced delays. It is currently delayed across three of its four aims because of a 2-month delay in the start date. The project did not officially begin until December 2007 because additional non-AHRQ funds necessary to supplement the project were not received on time. A plan has been developed to achieve the other aims by the project end date. For example, fellows and students have been recruited to help with the development of the NLP tools. As a result of the aforementioned delays, adjustments have been made to the budget to distribute the appropriate level of support over the lifetime of the grant. As such, the project is temporarily under spent by 5 to 20 percent. However, based on upcoming activities to achieve the aims described in the project, full use of the budget is planned.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Using Information Technology (IT) to Improve the Quality of Cardiovascular Disease (CVD) Prevention and Management
<b>Principal Investigator:</b>	Vogt, Thomas, M.D.
<b>Organization:</b>	Kaiser Foundation Research Institute
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017016
<b>Project Period:</b>	11/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$605,862
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in November 2007 and has completed the first half of the grant period. This ongoing project is using Epic’s Certification Commission for Healthcare Information Technology (CCHIT) certified Electronic Medical Record (EMR) HealthConnect (Hyperspace Spring 2007 IU2; November 10, 2008, K- package level) in two large health care systems to refine and test a promising method for determining the actual relationship between patterns of preventive and disease management care of cardiovascular disease (CVD). The preventive and disease management services that are being analyzed include: blood pressure management, tobacco counseling, weight/nutrition counseling, and blood pressure screening. The project includes data sets from Kaiser Permanente Hawaii and Kaiser Permanente Portland. A longitudinal dataset (4–5 years) for each individual will be generated. Using a person-time methodology that evaluates adherence to prevention and selected CVD management guidelines, this project will describe variations at the practice level in CVD prevention and preventive management of patients with hypertension, hyperlipidemia, diabetes, congestive heart failure, and past myocardial infarction. Those variations will be related to morbidity, mortality, and health care costs over the follow-up period. Patients without diabetes, hypertension, hyperlipidemia, and prior CVD are being examined separately for preventive services. Patients with prior CVD and related diagnoses are being examined for both preventive and management guidelines adherence. These data will clarify the relationships between evidence-based guidelines adherence and outcomes. The information will then be provided to managers in order to determine the impact on health care process and policies.

### Specific Aims

- Identify practice-level primary care variations in preventive care, weight management, and selected chronic disease management, including drug prescription patterns aimed at reducing cardiovascular disease morbidity. **(Ongoing)**
- Determine the associations of quality of preventive care and disease management practices to morbidity, mortality, and costs of care. **(Ongoing)**
- Improve delivery of care. **(Upcoming)**

**2008 Activities:** Dr. Vogt and his team decided to extend the data for blood pressure screening and management and weight/nutrition management to Kaiser Permanente Northwest due to greater follow-up duration, resulting in a memorandum of understanding between the two groups along with transfer of funds. Throughout the year, the project work plan and timeline were continually updated to reflect

changes in key milestones, and project management processes were put in place to coordinate between the two sites.

The provisional analyses of blood pressure management services were conducted. The results indicated inconsistencies in handling data across the two involved health systems, leading to a revision in the data specifications. Concurrently, the data specification templates were drafted for glycosylated hemoglobin (HbA1c) screening, HbA1c management, and post-myocardial infarction beta-blocker use. The basic tables program was re-written and refined to reflect additional data that needed to be included and changes to the output format.

**Preliminary Impact and Findings:** Preliminary data on quality of blood pressure management showed a reduction in quality of blood pressure management from 2004–2007, a period that coincides both with the implementation of the EMR system and with cutbacks related to financial shortfalls in the system. Two major lessons learned include: 1) awareness of the difficulties and complexities of assuring that cross-system data are equivalent; and 2) the recognition that our quality scores can detect patterns consistent with known changes in the system. Blood pressure management data runs were planned again for January 2009, and extractions and basic tables for tobacco/smoking and obesity management runs were planned for February and March 2009.

The first attempt to relate blood pressure management to outcomes resulted in data that were not consistent across the two health systems and not credible in terms of result. Extensive revision both of the extraction request and of the summary tables was nearly complete by the end of 2008. Problems of appropriate adjustment of models for co-morbidities across patient populations of individual clinical practices are still being reviewed, but will be settled soon. Cost analyses await the morbidity outcome data.

While Dr. Vogt and the team would like to use the project's intervention to determine the impact of these data on care, the incorporation of Aim 3 was requested by the project's review committee without additional budget. As a result of the 2-year funding period and lack of additional funds, the project team does not expect to conduct an adequate evaluation of the ability of these data to change practice. In lieu of an in-depth evaluation, the project is planning to mail out some limited results to physicians and obtain feedback on their response to it. Recent challenges around linking the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey data to clinician performance and changes in performance have also arisen. Contrary to prior input from the health system, there is a chance that the available serial CAHPS data may not allow for linking to primary care physician data. Dr. Vogt continues to work on this issue but it is possible that the failure of linkage of patient to physician may be a problem for the CAHPS component of the study.

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## Selected Outputs

Blood Pressure Management Data Request Tool and Practice Survey Questionnaire designed to help inform the provision of feedback to managers on guidelines adherence at the practice, health care team, and system levels.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is somewhat delayed in conducting provisional final analyses of the first preventive service, blood pressure management, due to inconsistencies in handling the data across two involved health systems which resulted in inaccurate findings. The blood pressure management analyses will be repeated during the next quarter to resolve the issue. In addition, the basic tables program for all preventive services being evaluated is being re-written due to problems with the output and is expected to be ready by the beginning of next quarter. The linkage of these quality scores to practice level change in patient satisfaction may be problematic if we are unable

to obtain CAHPS data that can be linked to primary care physicians. As a result of the milestone delays, adjustments have been made to the budget to distribute the appropriate level of support over the lifetime of the grant. As such, temporarily the project is significantly under spent by 20 percent. A modest no-cost extension is anticipated in August 2009; over time, full use of the budget is planned and completion of the project is expected.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Significantly under spent, more than 20 percent.

<b>Project Title:</b>	Crossing the Quality Assessment Chasm: Aligning Measured and True Quality of Care
<b>Principal Investigator:</b>	Weiner, Mark, M.D.
<b>Organization:</b>	University of Pennsylvania
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017099
<b>Project Period:</b>	09/07 – 09/09
<b>AHRQ Funding Amount:</b>	\$812,237
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. The purpose of this study is to identify and quantify the impact on quality assessments of real-world circumstances in a Veterans Administration Medical Center (VAMC) and at the University of Pennsylvania Medical Center's (UPMC) ambulatory practices where the current cross-sectional measures of quality do not reflect the true quality of care being rendered. The project is leveraging more detailed and discrete data available from electronic medical records (EMRs) in order to develop measures that account for heterogeneity among different diabetic patient panels, credit improvement in the control of diabetes among individuals in a given population over time, recognize provider effort in medical management, and incorporate management of diabetes co-morbidities such as high blood pressure and hyperlipidemia. The project is reanalyzing data from the Diabetes Control and Complications Trial (DCCT) to determine evidence in a randomized controlled trial setting regarding the impact of an individual's variability in glycosylated hemoglobin (HbA1c) control on outcomes and the suitability of using HbA1c variability over time in addition to or as an alternative to the absolute level of HbA1c, as a quality measure. The result of the analysis is intended to create a new set of quality measures that is more consistent with actual clinical care.

The project team is collecting and analyzing data from two different EMRs. The UPMC uses Epic's Certification Commission for Healthcare Information Technology (CCHIT) certified EpicCare Hyperspace (version Spring 2007IU3), and the VAMC uses the VistA-based Computerized Patient Record System (CPRS).

### Specific Aims

- Evaluate structural and clinical issues that may affect the validity of comparisons among providers made using quality measures for diabetes. Among the issues to be explored are: 1) the manner in which diabetes is defined, 2) the way patients are linked to providers, and 3) the concordance between use of diabetes medications and achieving thresholds for quality of care. **(Ongoing)**
- Develop a new quality measure for diabetes that accounts for patient heterogeneity in terms of baseline HbA1c and expected trajectory of improvement in diabetes control based on clinical parameters and other data available through the EHR. **(Ongoing)**

- Explore the DCCT and patient data for year-to-year individual variability in diabetes control to assess the impact of variability in an individual's diabetes control over time on microvascular outcomes. **(Ongoing)**
- Disseminate findings through public policy communications through the Leonard Davis Institute, and work with practitioners and additional institutions to assess their quality of care under the old and proposed new quality-of-care measures. **(Upcoming)**

**2008 Activities:** The project began to compare and contrast the quality of diabetes care at UPMC and the VAMC. A set of patients seen at both institutions was identified to better examine the extent to which diabetes was recognized at both institutions, the patterns of HbA1c testing, and results of patients seen at both facilities. The degree of blood pressure control, HbA1c, and lipid levels are being analyzed. Differing definitions of diabetes for the quality measures are being considered, and to date the project has defined patient entry into an analyzable dataset as two diagnoses of diabetes assigned at some point in the past 2 years. A candidate set of characteristics used to predict expected diabetes control were tested with final results for the predictive model demonstrating that predicting control of HbA1c is attributed primarily to prior level of control versus a combination of co-morbidities, age, duration of diabetes, visit activity, and sex. The project received Institutional Review Board (IRB) approval in early 2008 and approval for continuing reviews of the project protocols in late 2008.

**Preliminary Impact and Findings:** Preliminary data on the predictive expectations of HbA1c control indicated that predicting control of HbA1c is attributed primarily to the prior level of controls versus other factors such as co-morbidities, age, duration of diabetes, visit activity, and sex. When comparing diabetes patients seen at the Veterans Administration (VA) and at the University of Pennsylvania Health System (UPHS), Dr. Weiner and his team found that over one-third of VA patients had been seen in primary care or subspecialty practices within UPHS. Only a minority of the patients had a corresponding diagnosis of diabetes known within UPHS, and there was a substantial redundancy in HbA1c ordering across the institutions and opportunities where data from the other institution could impact the measures of quality.

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### **Selected Outputs**

Merging Data across VA and Non-VA Settings: Exploring the Promise of Interoperability. 2008 VA eHealth University Meeting.

Persistently Elevated HbA1c: Poor Quality Doctors or Challenging Patients. 2008 Society of General and Internal Medicine Conference.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is on track with most of its milestones.

**Milestones:** Progress is mostly on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Nursing Home Information Technology (IT): Optimal Medication and Care Delivery
<b>Principal Investigator:</b>	Horn, Susan, Ph.D.
<b>Organization:</b>	International Severity Info Systems, Inc.
<b>Mechanism:</b>	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
<b>Grant Number:</b>	UC1 HS 015350
<b>Project Period:</b>	09/04 – 09/08, Including No-Cost Extension
<b>AHRQ Funding Amount:</b>	\$1,486,452
<b>Summary Status as of:</b>	September 2008, Conclusion of Grant

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** The objectives of the nursing home grant were to implement a health information technology (IT) system with added best practices decision support modules in 15 participating nursing homes (NHs) and evaluate impact on care processes; resident health outcomes, including pressure ulcers (PrUs); and staff efficiency and satisfaction. Fourteen of the 15 NHs were not-for-profit; facility size averaged 100 beds, ranging from 50 to 250 beds. Project work spanned 3 years: 1 year for planning, 1 year for initial implementation, and 1 year for continued implementation and sustainability strategies. Facilities implemented health IT incrementally, focusing implementation in one or more areas: 1) certified nursing assistant (CNA) daily documentation; 2) registered nurse (RN)/clinical team care delivery and planning activities; and 3) medication administration. Starting 6 months after implementation, and each 6-month period thereafter, we re-measured areas assessed at baseline in order to evaluate change over time using data from Center for Medicare and Medicaid (CMS) Nursing Home Compare and staff feedback on workflow.

All 15 NHs implemented health IT for CNA documentation and clinical reports to summarize CNA information into meaningful trends (e.g., weight loss, meal intake, and other indicators) for high risk of pressure ulcer development. All 15 nursing homes implemented health IT for various components of nursing documentation. Also, five facilities implemented health IT for electronic medication administration record (eMAR)/electronic treatment authorization record (eTAR), but because of vendor delays the implementation did not occur fully until the last year of the project.

Facilities experienced positive impact on workflow and staff morale: improved documentation completeness, reduced time gathering and compiling information, improved access to information and multi-disciplinary communications, and staff satisfaction with technology versus paper processes. There were overall decreases of 18 percent in the CMS high-risk PrU and weight loss quality measures in 18 months. The grant concluded in September 2008.

### Specific Aims

- Implement a health IT solution in NHs that will improve clinical practices and health outcomes through electronic CNA documentation; clinical decision support focused on incontinence care, nutrition management, skin assessment, behavior management, and restorative care best practices; and electronic medication documentation and administration. **(Achieved)**

- Identify health IT implementation best practices in use of technology in NHs through: collaborative, multi-disciplinary partnerships of NH provider leadership and implementation teams, evaluation team, and health IT vendor; workflow analysis and clinical process redesign efforts throughout each stage of implementation; and ongoing assessment of implementation processes and refinement based on results. **(Achieved)**
- Conduct comprehensive evaluation of the role of health IT in changing clinical practices and improving resident safety, quality of care, and health outcomes, focusing on: clinical practices, including documentation and care planning; clinical outcomes, including fewer PrUs and less weight loss; provider satisfaction; and efficiency of care delivery. **(Achieved)**

**2008 Activities:** Final narrative report was submitted on March 11, 2008.

**Preliminary Impact and Findings:** Each facility team monitored outcomes and processes pre-and post-implementation as part of the effort to identify promoters and/or challenges to implementation of health IT and assess the impact. We assessed impact in four major areas:

- Workflow: How does health IT implementation impact daily workflow for providers?
- Provider Adoption and Attitudes: How does health IT implementation impact staff satisfaction?
- Health Outcomes: How are changes in clinical practice using health IT associated with improved health outcomes for NH residents?
- Lessons Learned: How can lessons learned from the project impact future implementation efforts and dissemination of health IT into nursing homes?

#### *CNA Staff Feedback*

Over 325 CNAs provided feedback indicating improvement from baseline (pre-health IT) compared to 18 months post-implementation in the following areas: spending the right amount of time documenting resident information, receiving enough information about the resident at the beginning of the shift to provide quality resident care, understanding what needs to be done for the residents before starting work, and not having to document 2 days worth of documentation at the same time because of not having time to do it the previous day.

#### *Nursing Feedback*

Over 125 nurses provided feedback indicating improvement from baseline to 12 months post-HIT implementation in the following areas: able to review CNA documentation for completeness before the end of the shift, CNAs understand care to be provided to the residents at the beginning of their shift, spending the right amount of time on shift report to communicate resident needs, aware of all residents on their unit who have PrU(s) or significant weight loss or decreased meal intake and transmit these to CNAs, and taking minimal effort to assemble resident summaries for the MDS nurse.

#### *Minimum Data Set for nursing home residents (MDS) Feedback*

Based on feedback from 26 MDS coordinators, the following areas of impact were found: time to gather MDS information decreased approximately 24 minutes for an admission assessment, 28 minutes for a significant change assessment, 10 minutes for an annual assessment, and 8 minutes for a quarterly assessment. Facilities reported that this was especially true for Section G of the MDS (ADLs). MDS coordinators reported improved completeness and accuracy in several areas: behaviors, bathing, urinary continence, ADLs—toileting, and ADLs—eating.

### *Dietary Feedback*

Based on feedback from 19 dietary staff, the following questions showed improvement: change from zero percent daily or weekly weight change calculations per resident by dietary staff to 40 percent daily or weekly, dietary staff participation in care planning meetings, nurses notifying dietary staff when a resident has significant decreased meal intake, and finding information about resident behaviors.

### *Clinical Outcomes*

The pre- and 18-months post-health IT implementation data for the CMS quality measure (QM) for high risk residents with PrUs decreased overall from 10.8 to 8.9, a decline of 18 percent. The CMS quality measure (QM) for unintended weight loss decreased overall from 9.2 to 7.5, a decline of 18.5 percent.

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### **Selected Outputs**

Presentations about the AHRQ NH HIT project have been made at eight national meetings from 2005-2007.

AHRQ 2008 Annual Conference presentation: On-Time Quality Improvement for Long-Term Care: Using Nursing Home IT for Optimal Care Delivery ([PowerPoint® File](#), 1.2 MB; [Web Version](#)). September 2008, Bethesda, MD.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is concluded.

**Milestones:** Progress is completely on track.

**Budget:** Spending is roughly on target.

<b>Project Title:</b>	Medication Monitoring for Vulnerable Populations via Information Technology (MMITI)
<b>Principal Investigator:</b>	Lehmann, Christoph, M.D.
<b>Organization:</b>	Johns Hopkins University
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017018
<b>Project Period:</b>	09/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$994,325
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in September 2007 and has completed the first half of the grant period. The overall goal of this project is a practice-based cross-sectional demonstration of the ability of interoperable health information exchange and the Certification Commission for Healthcare Information Technology (CCHIT) certified Misys 8.10.1 electronic health record (EHR) to provide useful quality and safety measures for the vulnerable populations served by two clinics that are part of the Baltimore Medical System (BMS) Community Health Center (CHC). The EHR version was 8.0 at the start of the MMITI project and has undergone one major release upgrade and four updates since then to be at the current 8.10.1 version. The quality and safety measures being evaluated were developed for ambulatory care by the National Committee for Quality Assurance (NCQA), supported by the National Quality Forum (NQF), and focus on the safety monitoring for chronic medications that are commonly used by patients with heart disease and diabetes mellitus. The project’s intervention includes a monitoring bulletin (i.e., performance report card) provided to physicians every 2 months to inform them of patients that require therapeutic monitoring tests for one or more of the quality measures. The project is also evaluating the relationship between contextual factors (teamwork and safety climate at BMS) and provider assessments of EHR quality and safety data as useful and actionable, as well as evaluating whether deployment of EHR quality and safety measurement efforts will improve teamwork and safety climate at the clinics.

To identify patients eligible for inclusion in the quality measures, and therefore the monitoring bulletin, a machine query was developed that uses the BMS EHR to find patients eligible for the measures. Data to fulfill the measures are collected using a newly developed bi-directional interface and patient laboratory history back-loading capability between Johns Hopkins’ Pathology Data Systems Department and the BMS EHRs. There were challenges in establishing the interfaces, including divergent data standards in both systems, and challenges in the coordination among the stakeholders, each of which had unique data system issues. For example, patient identifiers in the BMS and Johns Hopkins laboratory data did not always match, requiring in-depth investigation to ensure that patient information remained linked to the correct patient during data exchange. The high volume of patient records necessary for back-loading of data required that it be done in batches over a period of several weeks.

## Specific Aims

- Develop and implement via EHR accurate quality and safety measures focused on medication monitoring for vulnerable populations that are served by BMS CHC, and explore factors that influence accuracy of EHR-derived measures. **(Achieved)**
- Develop and implement EHR-based quality and safety measures of medication monitoring for vulnerable populations that are served by BMS CHC that are useful to clinicians and senior leaders. **(Ongoing)**
- Develop and implement EHR-based quality and safety measures of medication monitoring for vulnerable populations that are served by BMS CHC that impact patient outcomes. **(Ongoing)**
- Evaluate the relationship between contextual factors (teamwork and safety climate at BMS) and provider assessments of EHR quality and safety data as useful and actionable, as well as evaluate whether deployment of EHR quality and safety measurement efforts will improve teamwork and safety climate at CHC. **(Ongoing)**

**2008 Activities:** Dr. Lehmann and the project team made significant progress on each of the project aims. A machine query that uses the EHR to find patients eligible for the project quality measures was designed and implemented. The query was validated and found to perform better than manual chart review to identify eligible patients. The interface implementation was completed by the end of the fourth quarter along with back-loading 2 years of laboratory data history. The monitoring bulletin and interview instrument to ascertain provider reactions were developed and administered twice over the course of the year. The Safety and Attitudes Questionnaire (SAQ) was also administered twice to all staff of both BMS clinic sites.

**Preliminary Impact and Findings:** The preliminary impact of the lab interface activity has reduced the number of tasks involved in accessing patient information by providers. Additional findings related to patient identification between the programmed query and manual review are included in a manuscript being submitted for publication and will be made available closer to the completion of the project.

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## Selected Outputs

Monitoring bulletin for providers, a provider survey designed to measure provider experiences using the bulletin.

Interview guide designed to further investigate a provider's understanding of a patient's health status if the guidelines identified in the monitoring bulletin are not implemented.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is under spent due to the technological delays in implementing the laboratory interface, an activity that was essential to address the research aims of this project. This affected some of the associated downstream activities like machine query verification, administration of the bulletins and surveys to the providers at both the BMS sites, and delay in data collection and analysis. The project has revised the timeline accordingly, and the team will complete the delayed activities during the second year of the project.

**Milestones:** Progress is completely on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Improving Quality in Cancer Screening: The Excellence Report for Colonoscopy
<b>Principal Investigator:</b>	Logan, Judith, M.D.
<b>Organization:</b>	Oregon Health and Science University
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017017
<b>Project Period:</b>	08/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$616,207
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in August 2007 and has completed the first half of the grant period. This initiative is designed to evaluate and improve the quality of screening and diagnostic colonoscopies in ambulatory care settings. Using the Clinical Outcomes Research Initiative (CORI) software application and the National Endoscopic Database (NED), the project is developing and testing the Excellence Report, a quality report card for gastrointestinal (GI) endoscopy, focusing on nationally recognized quality process measures for colonoscopy. Using a clustered randomized trial design, CORI-affiliated clinicians working in ambulatory care centers or offices are receiving monthly reports through a secure Web site of their quality measures along with comparisons to other CORI clinicians and national benchmarks. The effects on reporting of quality measures data, adherence to the quality recommendations, and durability of changes upon ceasing the reports are being measured. Concurrently, field observations and interviews are performed with a representative sample of clinicians who are receiving the Excellence Report. Based on these observations and interviews, a survey will be created and administered to all participating clinicians. The objectives of the project are: 1) to understand clinician perceptions of reliability and validity of the data presented, 2) to understand clinician acceptance of the quality initiative, and 3) to look for effects on workflow and any unintended consequences of the Excellence Report. Concurrently, this project is coordinating a series of four Webcasts with representatives from GI reporting software vendors, imaging system vendors, and GI pathology laboratories, along with the GI specialty societies, on the development of a sustainable and standards-based architecture that will allow the Excellence Report to expand beyond CORI.

### Specific Aims

- Create the Excellence Report, a quality report card of individual performance on quality measures recommended by the U.S. Multisociety Task Force on Colorectal Cancer and the American Society of Gastroenterologic Endoscopy (ASGE)/American College of Gastroenterology (ACG) Task Force on Quality in Endoscopy, and present this as monthly feedback to the ambulatory care providers of CORI. **(Ongoing)**
- Measure the effect of the quality report card on individual performance in adherence to the recommended quality measures for colonoscopy. **(Upcoming)**
- Perform a qualitative assessment of the effect of the report card on providers. We will study the acceptance of the individual quality report card and effects on workflow, and will search for unintended consequences. **(Ongoing)**

- Lead an industry consortium including endoscopy reporting software vendors, pathology laboratories, and endoscopy imaging vendors to develop industry-wide standards for the exchange of data on colonoscopy quality measures. **(Upcoming)**

**2008 Activities:** The project completed the design and implementation of the Excellence Report. The report currently includes 12 GI endoscopy measures with three additions expected to be added in early 2009. The Excellence Report was officially launched in September 2008 as a database-driven Web site. Forty-six percent of providers included in the project have logged into the site, created an account, and are using the reports. Bimonthly e-mails are sent to clinicians and clinic managers to update them on the project. Benchmark data on compliance with the quality measures were collected during the period of January–June 2008 for the 142 clinicians included in the program, with analysis occurring in 2009.

In order to perform a qualitative assessment of the effect of the report card on providers, four sites have been selected for visits by the project team. The first site visit occurred in December 2008. During the visit, the project team observed endoscopy procedures to understand workflow for documentation within the CORI system. The project team also conducted interviews with clinicians on their opinions of quality measures, who should be able to access performance data, and whether these data lead to changes in their practice.

An initial series of teleconferences and meetings with vendors and GI specialty societies occurred in the first half of 2008, and Dr. Logan attended work group meetings for various industry efforts such as Health Information Technology Standards Panel (HITSP).

**Preliminary Impact and Findings:** Publicly available findings will be made available closer to the end of the project.

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### **Selected Outputs**

A set of Frequently Asked Questions to support clinicians' use of The Excellence Report was developed.

A clinician interview guide for use during the site visits was also created.

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**Grantee's Most Recent Self-Reported Quarterly Status:** The project is slightly delayed in convening an industry consortium to develop industry-wide standards for the exchange of data on colonoscopy measures. To advance this aim, the project has proposed conducting four Webcasts with appropriate GI clinicians, standards experts, and quality measure experts. The outcomes of these discussions will inform whether an in-person meeting at the ACG conference in October 2009 is necessary. As a result of the delays in convening an industry consortium, the project is somewhat under spent by 5 to 20 percent of its budget. Full use of the budget is anticipated given the upcoming Webcasts.

**Milestones:** Progress is on track in some respects but not others.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

<b>Project Title:</b>	Feedback of Treatment Intensification Data to Reduce Cardiovascular Disease Risk
<b>Principal Investigator:</b>	Selby, Joseph, M.D.
<b>Organization:</b>	Kaiser Foundation Research Institute
<b>Mechanism:</b>	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health IT (EQM)
<b>Grant Number:</b>	R18 HS 017031
<b>Project Period:</b>	11/07 – 08/09
<b>AHRQ Funding Amount:</b>	\$997,069
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project was initiated in November 2007 and has completed the first third of the grant period. The Intensification Feedback and Outcomes Study involves eight primary care and large medical facilities of Kaiser Permanente Northern California to assess whether the use of systematic feedback on need for treatment intensification in patients with poor control of cardiovascular disease (CVD) risk factors improves risk factor control. Using a cluster randomized trial design, this project is leveraging health information technology, including Kaiser Permanente’s Epic-based Electronic Medical Record (EMR) HealthConnect and the population management software tool used for the PHASE (Preventing Heart Attacks and Strokes Everyday) program, to create and deliver this information to providers about patients at high CVD risk. At intervention facilities, patient-level information is obtained from the EMR on the need for treatment intensification for systolic blood pressure (SBP), low-density lipoprotein cholesterol (LDL-c), and glycosylated hemoglobin test (hemoglobin A1c) and on recent medication adherence. This information is added to the PHASE population management database and fed back through software currently used by the PHASE staff working with primary care providers. Staff at control facilities continue to use the same population management database and software but receive information only on risk factor levels and selected medications. Positive findings should point the way for other systems to achieve an effective means of lowering the occurrence of CVD and will also serve to validate treatment intensification as a new process of care quality metric.

### Specific Aims

- Evaluate the effectiveness of measuring, reporting, and feeding back information on the need for treatment intensification in patients at high risk for CVD for improving rates of treatment intensification and for reducing levels of poorly controlled SBP, LDL-c, and A1c. **(Ongoing)**
- Evaluate the impact of the intervention, compared to current population management practice, on total numbers of patient contacts, outpatient visits, and costs of care in relation to improvements in risk factor control. **(Ongoing)**
- Evaluate the effect of the intervention on physician and staff perceptions of the value (effectiveness and efficiency) of the population management program for high risk patients. **(Ongoing)**

**2008 Activities:** The project began implementing the intervention in July 2008 to allow the sites time to complete their own organizational goals. During the first half of the year, the project team convened

monthly advisory meetings with key stakeholders to plan the intervention, prioritize site outreach activities, improve understanding of staff needs in terms of information, and tailor the feedback messages that will be delivered about patients' need for treatment intensification. Since July 2008, the intervention has been in place. Data are extracted from the EMR, analyzed, and entered into a database linked to the PHASE patient management tool to provide the staff with new information about which patients require treatment intensification. The information in the database is refreshed once a month, and patients are prioritized based on whether they have higher values and therefore are at higher risk. Following the launch of the intervention, the project team met with staff at the sites to facilitate use of the intervention. The project continues to pull preliminary data and is developing the appropriate analysis to evaluate the impact of the intervention, compared to current population management practice, on total numbers of patient contacts, outpatient visits, and costs of care in relation to improvements in risk factor control. A set of pre-intervention and post-intervention interviews were conducted at the four intervention sites and the four control sites. Post-intervention interviews were also conducted at an additional three facilities to further inform the project on what was occurring regionally. The purpose of these interviews was to evaluate the effect of the intervention on physician and staff perceptions of the value (effectiveness and efficiency) of the population management program for high-risk patients. The project anticipates completing the intervention in early 2009.

**Preliminary Impact and Findings:** Preliminary data from the first 2 months of the intervention period suggest that intervention facilities have slightly higher rates of treatment intensification than the control facilities; however, it is too early to state whether these differences will be statistically significant. A second finding pertains to program efficiency. Approximately half of the patients eligible for the intervention were being contacted by PHASE staff. These patients do have higher rates of intensification, suggesting that the lower than expected contact rates with patients may be impacting the intervention's overall effectiveness.

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### **Selected Outputs**

None Available.

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**Grantee's Most Recent Self-Reported Quarterly Status:** There is a slight delay across the project's milestones due to the decision to introduce the intervention in June 2008 versus the original date of January 2008. The project is somewhat under spent by approximately 5 to 20 percent due to the delayed start for implementing the intervention. Full use of the budget is expected by completion of the project.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat under spent, approximately 5 to 20 percent.

## VIII. Contract-Specific Summaries

This section contains project tables and the project-specific summaries for the 26 AHRQ-funded contracts active in calendar year 2008.

Contract-specific summaries are organized by one of three Health IT Portfolio strategic goals, which are as follows:

1. **Medication Management:** To develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.
2. **Patient-Centered Care (PCC) or Health Information Exchange (HIE):** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.
3. **Improved Decisionmaking:** To develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Within each strategic goal section, summaries are organized by AHRQ business goal, which include: Implementation and Use, Knowledge Creation, and Synthesis and Dissemination. Contracts that were complete as of December 2008 are listed first, followed by those contracts that continue into calendar year 2009. Contracts within these categories are organized by PI's last name, first name. A Project Table at the beginning of each strategic goal section summarizes the contracts included in that portion of the report, providing information on the Project Title, Principal Investigator, and Contract Number, as well as listing whether the grant was completed in 2008. A page number for each summary and hyperlink to that page within the document is also provided.

Each project-specific summary uses headers to display basic project information including the Project Title, Principal Investigator, Organization, Contract Number, Project Period, and AHRQ Funding Amount. The header also indicates whether the summary represents the project's status as of December 2008 or as of the conclusion of the contract. The text of the summary contains information on the strategic and business goals addressed by the project, as well as a project summary. Other information that can be found in each summary includes: Specific Aims and the status of progress in achieving those aims, 2008 Activities, Preliminary Impact and Findings, and Selected Outputs.

To find project-specific summaries on AHRQ's National Resource Center for Health IT Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)), select "AHRQ-Funded Projects" or the United States map, then follow the instructions and make selections on the AHRQ-Funded Projects page.

**Table 11: Contract-Specific Summaries (Medication Management)**

**HEALTH IT PORTFOLIO STRATEGIC GOAL:**

Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies (Medication Management).

<b>AHRQ BUSINESS GOALS: IMPLEMENTATION AND USE, KNOWLEDGE CREATION, SYNTHESIS AND DISSEMINATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Gaylin, Dan, MPA	National Resource Center for Health Information Technology (NRC)	290-04-0016	<a href="#">Page 365</a>
<b>AHRQ BUSINESS GOAL: IMPLEMENTATION AND USE</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Bell, Douglas, MD	Building an Implementation Toolset for E-Prescribing	290-06-0017-4	<a href="#">Page 373</a>
No	Davidson, Arthur, MD, MSPH	Colorado Connecting Communities – Health Information Collaborative State and Regional Demonstration Project (currently known as CORHIO)	290-04-0014	<a href="#">Page 375</a>
No	Frisse, Mark, MD	State and Regional Demonstrations in Health Information Technology (currently known as Mid-South eHealth Alliance – MSeHA)	290-04-0006	<a href="#">Page 377</a>
No	Overhage, Marc, MD, PhD	An Evolving Statewide Indiana Information Infrastructure State and Regional Demonstration Project (currently known as Indiana Network for Patient Care – INPC)	290-04-0015	<a href="#">Page 381</a>
No	Perez, Gina	Delaware Health Information Network (DHIN) State and Regional Demonstration Project	290-05-0012	<a href="#">Page 384</a>
No	Root, Jan, PhD	Improving Communications Between Health Care Providers via a Statewide Infrastructure: Utah Health Information Network (UHIN) Clinical State and Regional Demonstration Project (currently known as UHIN)	290-04-0002	<a href="#">Page 387</a>
No	Zimmerman, Amy, MPH	Rhode Island Statewide Health Information Exchange (HIE) State and Regional Demonstration Project (currently known as currentcare)	290-04-0007	<a href="#">Page 390</a>
<b>AHRQ BUSINESS GOAL: KNOWLEDGE CREATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Simonatits, Linas, MD, MS	Improving Lab Follow-up by Delivering an Enhance Medication List to Outpatient Physician Practices	290-06-0013-2	<a href="#">Page 393</a>

<b>Project Title:</b>	National Resource Center for Health Information Technology (NRC)
<b>Principal Investigator:</b>	Gaylin, Dan, M.P.A.
<b>Organization:</b>	National Opinion Research Center at the University of Chicago (NORC)
<b>Contract Number:</b>	290-04-0016
<b>Project Period:</b>	10/04 – 09/09
<b>AHRQ Funding Amount:</b>	\$22,374,134
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** The National Resource Center for Health IT crosses all of the AHRQ Strategic Goals:

- Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.
- Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.
- Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** The National Resource Center for Health IT crosses all of the AHRQ Business Goals:

- Knowledge Creation
- Synthesis and Dissemination
- Implementation and Use

**Summary:** The National Opinion Research Center (NORC) serves as the master contractor for the AHRQ National Resource Center for Health IT (NRC), 2004-2009. The NRC plays a pivotal role in supporting AHRQ's monitoring of all grants and many AHRQ-sponsored health IT portfolio contracts. The NRC was created in 2004 initially to provide direct support to AHRQ-funded health IT grants and some contracts, and to provide an open-access, easy-to-use platform for disseminating findings from those research projects. In 2005, the public NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)) was created to serve as the primary dissemination vehicle of information and tools in health IT to the wider health IT community. Under the direction of AHRQ, the NRC is instrumental in categorizing the health IT portfolio, synthesizing results, generating new tools, and engaging experts on important health IT initiatives, challenges, and opportunities. The NRC provides a number of important functions, including:

- Maintaining the NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)).
- Providing direct technical and evaluation assistance to grantees, contractors, and would-be contractors through a variety of media, e-mail, telephone, Web-based conferencing, and in-person meetings.
- Collecting and disseminating lessons learned from AHRQ health IT projects via Implementation Stories, Podcasts, Issue Papers, Decisionmaker Briefs, and Emerging Lessons.
- Creating new resources, tools, and best practices to support those in implementing and evaluating health IT.
- Gathering and categorizing existing health IT resources for dissemination via the NRC Knowledge Repository.
- Supporting the AHRQ Annual Meeting, including logistics, preparation, and hosting of grantee networking activities.

NORC at the University of Chicago is the prime contractor for the NRC with a number of partners, including Regenstrief Institute; the Vanderbilt Center for Better Health (VCBH); the Center for IT Leadership (CITL); and John Snow, Incorporated. The NRC has a number of teams that support a set of core activities involving the grantees and contractors, as well as teams that build and maintain the infrastructure and content of the NRC Web site. These teams include the Value and Evaluation Team, the Technical Assistance Team, the Knowledge Repository Team, and the Dissemination Team. In addition, the NRC supports AHRQ in their administration of specific contract initiatives, including the State Regional Demonstration Projects and the Clinical Decision Support Projects. Frequently, the NRC will support additional specific targeted initiatives, such as the e-Prescribing work done in 2008.

This contract has also supported some trans-Federal health IT initiatives through AHRQ's work with the Office of the National Coordinator for Health Information Technology (ONC).

**2008 Activities:** Below are brief summaries of activities of the core NRC teams in 2008. Several of the example products mentioned below are identified in the Output section of the summary, where Web links are provided.

#### Value and Evaluation Team

In 2008, the Value and Evaluation Team (E&V) consisted of individuals from Indiana University/Regenstrief Institute; CITL; VCBH; John Snow, Inc.; and NORC. During the year, the E&V team provided ongoing direct evaluation support to AHRQ-funded health IT projects in the form of teleconferences, written and verbal feedback around evaluation plans, and in-person site visits to assist in the revision of evaluation plans. The team developed, released, and populated a compendium of surveys in order to provide the health IT community access to publicly available surveys involving health IT evaluation. A set of pediatric reminders and templates were packaged and made available on the Web site so that implementers of decision support might have a starting point when creating similar tools. The previously written evaluation toolkits underwent revisions in order to expand and refine sections on project design, evaluation measures, evaluation resources and statistical support. Some of the toolkits' measures were expanded to build Quick Reference Guides to provide additional guidance to those wanting to evaluate particular measures. The team prepared two summary reports for AHRQ and hosted a national teleconference on evaluation, entitled "The Importance of Evaluation in Health IT Implementation: Practical Advice for Providers and Health," on May 15, 2008.

#### Technical Assistance Team

In 2008, the Technical Assistance Team (TA) consisted of individuals from Astech Consulting; Booz Allen Hamilton; Indiana University/Regenstrief Institute; CITL; VCBH; John Snow, Inc.; and NORC. The TA team continued to provide direct technical assistance to AHRQ health IT projects throughout 2008. This technical assistance took the form of one-on-one calls and e-mail support, grantee open-forums, facilitation of grantee interaction, and organization of teleconferences around a variety of topics. The team continued to provide points of contact (POCs) for each of the grantees and conducted regular touch-base calls. The team continued to build and refine a taxonomy to categorize grantees and their technologies of focus and care settings. Throughout 2008, the TA team was largely focused on "knowledge capture" and "tool development," developing a series of publications on lessons learned from the AHRQ Health IT portfolio; these areas included Telehealth, Chronic Disease Management, Barcoded Medication Administration, and Inpatient and Ambulatory Computerized Order Entry. The results of this research were released to the NRC Web site as part of the Emerging Lessons section, short Decisionmaker Brief summaries, and longer Issue Papers. Two additional areas of focus were begun in 2008, including Rural and Underserved Populations, and Long-Term Care. Finally, the TA team planned, scheduled, and hosted eight national teleconferences on key health IT topics. The transcripts and

PowerPoint Presentations are available for all of these teleconferences in the Events section of the NRC Web site, [www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov). The documents noted are listed in the Outputs section, below.

### Knowledge Repository Team

The Knowledge Repository (KR) Team continued its efforts to expand and improve the use of a knowledge repository containing health IT best practices in 2008. Efforts to maintain and improve this knowledge repository involved a broad team of content experts and knowledge assistants, including individuals from CITL, Indiana University/Regenstrief Institute, NORC, and VCBH. In 2008, over 50 expert-reviewed documents were added to the central Knowledge Library Repository (KL), and over 1,100 documents were aggregated from external sources and added to the KL. The content of the NRC Web site was maintained by the KR team, including updating the Health IT Events calendar, as well as adding regular content to the Emerging Lessons, Health IT Tools, and Funding Opportunities sections. Grantee profiles and the grantee map were updated in 2008. Peer-reviewed publications by AHRQ-funded grantees were added to grantee profiles, as well as to the News and Publications page. In 2008, focus groups were held with targeted groups to elicit feedback around the NRC Web site in order to determine future initiatives. In 2008, 45 new portal communities were added to the vibrant NRC Extranet portal community. These communities support collaboration, social networking, and Web conferences within and among each other. The NRC portal itself provides the necessary Web 2.0 tools to share documents and links, host discussion forums, support Web pages, and provide RSS feeds, as well as integrated search functionality to find resources and administration modules to manage users within a community. There are currently more than 200 communities actively collaborating and participating with more than 6,000 users.

### Dissemination Team

In 2008, the Dissemination Team consisted of individuals from Burness Communications, Indiana University/Regenstrief Institute, CITL, and NORC. Dissemination activities included writing implementation stories and podcast scripts, producing the grantee e-mail newsletter, editing Web content, and participating in national conferences.

### State Regional Demonstration and Clinical Decision Support Project Support

Throughout 2008, the NRC provided support to both the State Regional Demonstration (SRD) and Clinical Decision Support (CDS) projects. This support included organizing and facilitating 11 meetings between all 6 SRD projects and AHRQ, 9 of which were held by teleconference and 2 as in-person meetings. Evaluation support was provided to the SRDs throughout the year. The NRC tracked the SRD contracts' monthly progress reports and deliverables. A framework for SRD sustainability plans was developed by the NRC and a Liability Insurance report was written.

The NRC facilitated bi-weekly calls with ARHQ project officers for project planning and oversight of the CDS projects. Project and work plans of both CDS contracts were reviewed, and feedback was presented to ARHQ. The NRC formed a 15-member technical expert panel to conduct key activities for CDS projects. In addition, the NRC organized and facilitated four technical expert panel meetings, two of which were in-person meetings. The NRC contracted and oversaw the development of three white papers on CDS topics. The NRC made the preparations for a CDS Town Hall meeting with AMIA and a CDS DesignShop meeting with VCBH.

### Support of e-Prescribing Activities

In 2006, the NRC hosted an e-prescribing standards expert meeting. In addition, they organized and hosted three national teleconferences on findings from the evaluation of e-prescribing pilot sites, managed

the electronic prior authorization (e-PA) subcontract, and produced a program brief focused on e-prescribing.

The AHRQ NRC Steering Committee held their annual meeting on June 5, 2008. The Steering Committee includes a diverse group of leaders in the field of health IT, and representatives from AHRQ and HRSA attended the meeting. The agenda for this year's meeting was divided into three segments: 1) a retrospective overview of NRC activities to date; 2) a group discussion of recommended activities in the near future, including recommendations about how to best disseminate outputs and activities of the NRC; and 3) a group discussion of a broader long-term vision for the NRC. The Steering Committee was asked to consider specific recommendations and next steps for the NRC.

The members of this group are as follows:

- **Cheryl Austein-Casnoff, M.P.H.** Associate Administrator for Health Information Technology, Health Resources and Services Administration, U.S. Department of Health and Human Services
- **Michael S. Barr, M.D., M.B.A., F.A.C.P.** Vice President, Practice Advocacy and Improvement for the American College of Physicians
- **Meryl Bloomrosen, M.B.A.** (representing Don Detmer, M.D., M.A., American Medical Informatics Association) Associate Vice President, American Medical Informatics Association
- **Pascale Carayon, Ph.D.** Procter & Gamble Bascom Professor and Director of the Center for Quality and Productivity Improvement, University of Wisconsin-Madison
- **Karen C. Fox, Ph.D.** Chief Operating Officer, Delta Health Alliance
- **Mark Frisse, M.D., M.B.A., M.Sc.** Accenture Professor and Director, Vanderbilt University
- **Betsy L. Humphreys, B.A., M.L.S.** Deputy Director, U.S. National Library of Medicine
- **Charles D. Kennedy, M.D.** Vice President of Health Information Technology, WellPoint, Inc.
- **Carmen B. Lozzio, M.D., F.A.C.M.G.** Professor, University of Tennessee
- **Blackford Middleton, M.D., M.P.H., M.Sc.** Corporate Director, Clinical Informatics Research & Development; Chairman, Center for Information Technology Leadership at Partners Healthcare System; Assistant Professor, Brigham and Women's Hospital
- **J. Marc Overhage, M.D., Ph.D.** President and CEO, Indiana Health Information Exchange; Director of Medical Informatics, Regenstrief Institute, Inc.; Professor, Indiana University School of Medicine
- **David D. Parker, R.N., M.H.S.** (For Theresa Cullen, M.D., M.S., I.T.S.C.) Indian Health Service, Office of Information Technology

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## Selected Outputs

### [Health IT Tools Landing Page](#)

The Health IT Tools landing page was a new addition to the Web site in 2008. This page provides direct links to tools developed or obtained by the NRC to assist health care organizations as they implement health IT into their practices. A sample of these tools is summarized below:

- [Compendium of Surveys](#)  
A searchable database of publicly available surveys focused on the evaluation of health IT projects. The surveys are categorized by survey type, technology, care setting, and respondent type. Each of the survey authors have given their permission for unrestricted use of the surveys so that organizations may download them and use them as is, or modify them for their own use.
- [Evaluation Toolkits](#)  
The evaluation toolkits provide guidance for health IT project teams to assist them in their development of evaluation plans and choosing measures for those plans. One toolkit is focused on health IT projects in general, the other focused on Health Information Exchange projects.
- [Quick Reference Guides](#)  
The quick reference guides provide detailed information about specific measures that can be incorporated into an evaluation plan. Each guide includes a brief description of the measure, summary of current literature on the measure, measurement methodology, and study design and analysis considerations.
- [Pediatric Rules, Reminders](#)  
This tool provides pediatricians with information about the use of rules and reminders in an electronic health record to improve adherence to clinical guidelines. A set of pediatric rules and reminders developed at Partner's Healthcare in Boston are available for download.
- [Pediatric Templates](#)  
These templates for acute and chronic pediatric conditions serve as an efficient way for clinicians to document a visit in an electronic health record and enhance adherence to clinical guidelines for those conditions. The templates were developed at Partner's Healthcare in Boston and are available for download.
- [Health IT Bibliography](#)  
The health IT bibliography compiles high quality resources to provide a wealth of information for individuals interested in health IT. The items in the health IT bibliography come from both peer reviewed journals and Web-based resources from reputable health care organizations.

### [The Clinical Decision Support \(CDS\) Initiative](#)

AHRQ has funded a variety of projects to further the use and development of CDS systems, which include demonstrations, white papers, and guides for implementing CDS. A dedicated portion of the NRC Web site was developed in 2008 to house materials developed under these projects.

### [Implementation Stories](#)

These stories feature AHRQ-funded projects where investigators successfully implemented health IT into everyday clinical practice and greatly improved patient care. The following implementation stories were developed in 2008:

- **Project:** [ECHO Extension for Community Healthcare Outcomes](#)  
**Principal Investigator:** Sanjeev Arora, M.D.
- **Project:** [Holomua Project Improving Transitional Care in Hawai'i](#)  
**Principal Investigator:** Christine Maii Sakuda, M.B.A.
- **Project:** [New Studies on Return on Investment for Health Information Technology Adoption](#)  
**Principal Investigator:** Mark Frisse, M.D.
- **Project:** [Enhancing Quality in Patient Care \(EQUIP\) Project](#)  
**Principal Investigator:** Fred Rachman, M.D.
- **Project:** [Improving Care in a Rural Region with Consolidated Imaging](#)  
**Principal Investigator:** Robert Coleman
- **Project:** [Creating an Evidence Base for Vision Rehabilitation](#)  
**Principal Investigator:** Cynthia Stuen, Ph.D.
- **Project:** [Implementing an Ambulatory Electronic Medical Record and Improving Shared Access](#)  
**Principal Investigator:** Michael Deluca, M.B.A., M.S.

#### Podcasts

Podcasts feature interviews with several principal investigators of AHRQ-funded Health IT projects who have had great success implementing health IT into their practice. The following Podcasts were released in 2008:

- **Project:** [ECHO Extension for Community Healthcare Outcomes](#)  
**Principal Investigator:** Sanjeev Arora, M.D.
- **Project:** [Valuation of Primary Care-Integrated Telehealth](#)  
**Principal Investigator:** Ken McConnochie, M.D., M.P.H.
- **Project:** [Enhancing Quality in Patient Care \(EQUIP\) Project](#)  
**Principal Investigator:** Fred Rachman, M.D.
- **Project:** [Holomua Project Improving Transitional Care in Hawai'i](#)  
**Principal Investigator:** Christine Maii Sakuda, M.B.A.

#### Liability Insurance Report

This report summarizes key findings from the AHRQ-funded State and Regional Demonstration projects and other Regional Health Information Organizations (HIOs). The report contains information about considerations, issues, and challenges associated with liability insurance for Regional Health Information Organizations, as well as recommendations from HIO representatives, lawyers, and insurance agents about the future handling of liability problems. Although released in 2009, the majority of the research for this report was developed in 2008.

#### e-Prescribing Program Brief

A program brief was developed in 2008 on e-Prescribing. It describes AHRQ's role in supporting e-Prescribing and provides information about the various e-Prescribing projects that AHRQ has funded.

## [e-Prescribing Expert Panel Report](#)

AHRQ convened a group of experts to discuss standards for e-Prescribing, building on the set of standards created by previous AHRQ and CMS funded projects. The report contains a summary of the discussion about the technical work, research, and testing needed for the standards to be recommended for widespread adoption.

## Lessons Learned Topics

The NRC completed content around a number of “lessons learned” topics in 2008. These included Ambulatory Computerized Provider Entry (ACPOE), Barcoded Medication Administration (BCMA), Telehealth, and Inpatient Computerized Physician Order Entry (CPOE). In 2008, this content was developed into three AHRQ-approved deliverable formats for the dissemination of “lessons learned” to the public. The three deliverable formats were:

- **Emerging Lessons:** Content geared toward Web publication on the AHRQ NRC Web site, with a section devoted to lessons from the AHRQ grantee programs.
- **Decisionmaker Briefs:** Two-page descriptions of lessons learned intended for organizational leaders and novice audiences.
- **Issue Papers:** In-depth, detailed reports of grantee findings and lessons learned.

Links to each of these documents are below:

### Ambulatory CPOE

- [Emerging Lessons](#) - Computerized Provider Order Entry - Ambulatory
- [Decisionmaker Brief](#) - Computerized Provider Order Entry
- [Issue Paper](#) - Ambulatory Computerized Provider Order Entry (CPOE) Findings from the AHRQ Health It Portfolio

### Barcoded Medication Administration

- [Emerging Lessons](#) - Bar-Coded Medication Administration
- [Decisionmaker Brief](#) - Bar-Coded Medication Administration
- [Issue Paper](#) - Using Barcode Medication Administration To Improve Quality And Safety Findings From The AHRQ Health IT Portfolio

### Chronic Disease Management

- [Emerging Lessons](#) - Health IT for Improved Chronic Disease Management
- [Decisionmaker Brief](#) - Chronic Disease Management
- [Issue Paper](#) - Innovations in Using Health IT for Chronic Disease Management Findings from the AHRQ Health IT Portfolio

### Inpatient CPOE

- [Emerging Lessons](#) - Computerized Provider Order Entry - Inpatient
- [Decisionmaker Brief](#) - Computerized Provider Order Entry
- [Issue Paper](#) - Inpatient Computerized Provider Order Entry (CPOE) Findings from the AHRQ Health IT Portfolio

## Telehealth

- [Emerging Lessons](#) - Telehealth
- [Decisionmaker Brief](#) - Telehealth
- [Issue Paper](#) - Using Telehealth to Improve Quality and Safety Findings from the AHRQ Health IT Portfolio

## Presentations at National Meetings

Dissemination of NRC activities was partially conducted by submitting abstracts to national conferences and, when accepted, conducting AHRQ-sponsored in-person presentation. These presentations were as follows:

- Cusack CM, Sapna Shah S. Web-Based Tools from AHRQ's National Resource Center. 2008 AMIA Annual Symposium, Washington, D.C.
- Dixon BE, Zafar A, Whipple EC, Cravens GD, McGowan JJ. Facilitating Informatics Knowledge Dissemination: Targeted Implementation Resources for Health Care Providers. 2008 AMIA Annual Symposium, Washington, D.C.
- Dixon B, Dimitropoulos L. Privacy and Security Solutions to Reduce Variation, Confusion, and Complexity in Organization-level Business Practices, Policies, and State Laws Related to Interoperable Health Information Exchange. HIMSS 2008 Annual Meeting, Chicago, IL.
- Moiduddin A, Dullabh P, Woolley R. Advancing the ePrescribing Research Agenda. 2008 AMIA Annual Meeting, Washington, D.C.
- Shah S, Cusack C. Health IT Survey Compendium. 2008 Academy Health Annual Research Meeting, Washington, D.C.
- Zayas-Cabán T, Dixon BE. Consumer Health IT Design: Human factors considerations for devices and systems used in the home. Healthcare Systems Ergonomics and Patient Safety International Conference; June 25-27, 2008; Strasbourg, France.
- White PJ, Woolley R. The Federal Government's Evaluation of E-Prescribing Standards: Challenges and Recommendations for Improvement. HIMSS 2008 Annual Meeting, Chicago, IL.

<b>Project Title:</b>	Building an Implementation Toolset for E-Prescribing
<b>Principal Investigator:</b>	Bell, Douglas, M.D.
<b>Organization:</b>	RAND Corporation
<b>Contract Number:</b>	290-06-0017-4
<b>Project Period:</b>	08/08 – 01/10
<b>AHRQ Funding Amount:</b>	\$999,825
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

**Summary:** This project is developing and testing an e-prescribing toolset that will act as a “how-to” guide for implementing e-prescribing across various ambulatory organizational settings. The project, still in its early stages of progress, includes: 1) an environmental scan of current e-prescribing implementation programs, both nationally and internationally; 2) detailed analysis of successful e-prescribing implementations in several organizational configurations, including large and small practice and safety net settings; 3) development of an implementation toolset based on these findings; and 4) pilot testing of e-prescribing implementation using the toolset. The toolset will include guidance on the complete life cycle of activities expected to contribute to successful implementation, covering technology requirements, workflow analysis tools, governance agreement templates, etc. The focus of the pilot implementation is not on the implementation itself, but on the completeness and usability of the toolset.

### Specific Aims

- Catalogue publicly announced, ongoing e-prescribing initiatives both in the United States and abroad, and describe their major features, including the participating organizations, the range of practice sizes and settings involved, the e-prescribing technologies used, the degree of successful adoption and use, and the degree to which stated goals have been achieved. **(Ongoing)**
- Analyze the experiences of several successful e-prescribing initiatives, assessing the extent to which implementation success is attributable to key practices or features, such as governance agreements, organizational characteristics, individual attitudes and motivations, prescription-related work processes, specific e-prescribing technologies and standards used, distinctive implementation practices, and estimated costs (versus savings) for each participating organization. **(Ongoing)**
- Create a draft E-Prescribing Implementation Toolset that provides organizations with guidance and customizable aids to help them follow the practices or develop characteristics that contribute to implementation success. The guidance would include sample governance agreements, workflow patterns and feasible work process transitions, and direction on other key organizational factors that support adoption of innovations such as leadership, organizational culture, employee involvement, training, and performance evaluation and incentives. **(Ongoing)**
- Evaluate the draft Toolset’s usability and usefulness in helping provider organizations representing a broad range of practices to implement e-prescribing. Changes in provider performance in generic prescribing and in other available quality measures will also be assessed based on results before and after implementation. **(Upcoming)**

- Create a final E-Prescribing Implementation Toolset based on findings from the pilot evaluation that organizations and communities can use to guide decisionmaking about and implementation of e-prescribing, and disseminate this Toolset nationally through AHRQ's Health IT Portal, presentations at live and online conferences, and peer-reviewed publications. **(Upcoming)**

**2008 Activities:** In 2008, data gathering, integration, and analysis of data for the United States environmental scan were completed. The interviews and initial draft of report on European e-prescribing implementation methods were also completed. The project completed instruments and Institutional Review Board (IRB) applications for site visits to collect data on successful e-prescribing implementations and analysis of existing tools for possible inclusion in the Toolset. Finally, we completed an outline of chapters for the final Toolset document that will integrate and provide a guide to using the best tools in e-prescribing implementation.

**Preliminary Impact and Findings:** Project is ongoing; preliminary findings not yet available.

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### **Selected Outputs**

None Available.

<b>Project Title:</b>	Colorado Connecting Communities – Health Information Collaborative State and Regional Demonstration Project (currently known as CORHIO)
<b>Principal Investigator:</b>	Davidson, Arthur, M.D., M.S.P.H.
<b>Organization:</b>	Colorado Regional Health Information Organization (CORHIO) and University of Colorado Health Sciences Center
<b>Contract Number:</b>	290-04-0014
<b>Project Period:</b>	10/04 – 06/10
<b>AHRQ Funding Amount:</b>	\$5,000,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The Colorado Regional Health Information Organization (CORHIO) is one of six AHRQ-sponsored State and regional demonstration (SRD) projects begun in late 2004 and early 2005 to create a non-profit health information exchange (HIE). Each of the SRDs is developed using a variety of approaches (e.g., technical, business, and governance models) in order to support data sharing and interoperability on a State or regional level; conduct analyses of the role of the Medicaid program; provide an evaluation of their project; and develop a sustainability model. The CORHIO SRD aims to build a prototype data exchange among four providers that will serve as a learning laboratory for identifying the architecture and policy issues that the community needs to address in order to establish a sustainable model. The four partners for the demonstration include Denver Health and Hospital Authority, Kaiser Permanente Colorado, the Children’s Hospital, and University of Colorado Hospital. The demonstration project does not contain a central repository. Instead, it holds a robust electronic Master Patient Index from which records can be matched and shared at the point of care. CORHIO and its partners “went live” with the demonstration on December 1, 2008. This system offers authorized emergency room practitioners at the four sites access to radiology reports (for the top 25 Logical Observation Identifiers Names and Codes [LOINC]-encoded), laboratory results (for the top 100 LOINC-encoded), prescribed and dispensed medication information, electrocardiogram (EKG) images and reports, registration information, and problem lists aggregated from all sites. Wherever Healthcare Information Technology Standards Panel standards existed, they were incorporated into the architecture.

### Specific Aims

- Develop a novel exchange of lab and prescription drug data among four unrelated entities. **(Achieved)**
- Conduct an analysis of the role of the Medicaid program. **(Ongoing)**
- Conduct an evaluation to determine clinical impact. **(Upcoming)**
- Develop a sustainability model. **(Ongoing)**

**2008 Activities:** For the point-of-care demonstration project, 2008 activities included extensive development and testing of systems architecture across sites, development of a Health Insurance Portability and Accountability Act (HIPAA)-compliant security and audit framework using National Institute of Standards and Technology standards, development of protocols and procedures at the four

sites, and completion of the Master Data Sharing Agreement in collaboration with the four sites. Those four sites consisted of three hospital emergency rooms and one health plan call center accessing secure information.

The CORHIO SRD HIE went live December 1, 2008 for these four sites. Nearly 370 users were identified across these initial data-sharing partners.

Other CORHIO projects have included working with the State health department to provide a secure Web portal for bio-surveillance reports. This program, funded by the Centers for Disease Control and Prevention (CDC), will demonstrate Health Level 7 (HL7, a protocol that allows health care computer applications to share clinical data) connectivity with the State's electronic immunization registry. CORHIO participated in the Health Information Security and Privacy Collaboration (HISPC), focusing on consumer education and engagement, as well as adoption of standard policies, working with many other States. In 2008, CORHIO successfully secured funding to support Governor Ritter's Building Blocks for Health Care Reform as well as support from the Colorado Health Foundation and private funders to expand CORHIO activities across the State.

In both January and July 2008, this SRD joined fellow AHRQ-sponsored SRDs at two in-person meetings in order to share lessons learned and general information, to and discuss each SRD's upcoming project-specific deliverables, such as preparing evaluation and sustainability plans.

This SRD contributed to the Summer 2009 AHRQ-sponsored manuscript entitled, *Liability for Regional Health Information Organizations: Lessons from the AHRQ-Funded State and Regional Demonstration Projects and Other Community Efforts*, which will be available at [www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov).

**Preliminary Impact and Findings:** CORHIO is conducting a formal evaluation of the demonstration project that will review user experience, clinical outcomes, and system use. This evaluation will be completed in 2009, after approval from AHRQ and OMB.

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## Selected Outputs

In January and July 2008, this HIE participated in two in-person meetings with fellow AHRQ-sponsored SRDs to share lessons learned, share general information, and plan for upcoming project-specific deliverables, such as conducting evaluations and developing sustainability plans. Available at: Colorado Regional Health Information Organization, <http://www.corhio.org>. Accessed May 2009.

In late 2008 and onward, this HIE contributed to the AHRQ-sponsored manuscript entitled, *Liability for Regional Health Information Organizations: Lessons from the AHRQ-Funded State and Regional Demonstration Projects and Other Community Efforts*, [available online](#).

- Principal Investigator, Art Davidson, was appointed to the National eHealth Collaborative (AHIC Successor) & ONC HIT Policy Committee.
- CORHIO Executive Director, Phyllis Albritton, co-chaired two ongoing HISPC committees related to standards adoption and consumer engagement and education; Dr. Davidson also served on these committees.
- Ms. Albritton gave a presentation to the Colorado Health Information Management Association (CHIMA), May 15, 2008.
- Dr. Davidson gave a presentation to the National Association of State Medicaid Directors, December 17, 2008.
- Dr. Davidson gave a presentation to the National eHealth Collaborative – CORHIO Challenges, March 27, 2009.

**Project Title:** State and Regional Demonstrations in Health Information Technology (currently known as Mid-South eHealth Alliance – MSeHA)

**Principal Investigator:** Frisse, Mark, M.D., M.S., M.B.A.

**Organization:** Vanderbilt Center for Better Health

**Contract Number:** 290-04-0006

**Project Period:** 09/04 – 09/09

**AHRQ Funding Amount:** \$5,000,000

**Summary Status as of:** December 2008

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The MidSouth eHealth Alliance (MSeHA) is one of six AHRQ-sponsored State and regional demonstration (SRD) projects begun in late 2004 and early 2005 to create a non-profit health information exchange (HIE). Each of the SRDs is developed using a variety of approaches (e.g., technical, business, and governance models) in order to support data sharing and interoperability on a State or regional level; conduct analyses of the role of the Medicaid program; provide an evaluation of their project; and develop a sustainability model. The MSeHA’s goal is to implement and evaluate regional data-sharing and interoperability service interconnecting health care entities in the Greater Memphis area, which includes three counties in southwest Tennessee as well as northern portions of Mississippi and northeastern Arkansas. The lessons learned and applicable work products are to be applied across these States. The MSeHA is a nonprofit that works in close conjunction with Vanderbilt University. The stakeholders include patients, primary care providers, specialty care providers, inpatient and emergency room care teams, health systems, safety net clinics, public health department, and State and local government.

The MSeHA began exchanging data on May 23, 2006. At that time, inpatient, outpatient and emergency department data from all 13 participating hospitals were available in the emergency department setting. As of December 2008, data from 14 hospitals (inpatient, outpatient, and emergency departments) as well as 14 primary care safety net clinics and the University of Tennessee Medical Group (UTMG), representing over 400 providers, were available to 14 emergency rooms (including one in Southaven, Mississippi), 14 primary care clinics, and hospitalists. The data include lab results, diagnostic imaging reports, cardiac study reports, discharge summaries, dictated emergency department notes, operative notes, history and physical exams, diagnostic codes, patient demographics and other identification, and encounter data. The MSeHA has been working on a medication hub project with Indianapolis to provide a patient medication history from RxHub and SureScripts and has worked with allergy information in a test environment.

Initially, Vanderbilt “donated” the use of its proprietary technology (software, hardware, etc.). As part of the plan for sustainability, the MSeHA system is converting from the Vanderbilt system to a commercially available system hosted by Informatics Corporation of America (ICA; <http://www.icainformatics.com/>). The conversion was to be completed by January 9, 2009. Through a partnership and licensing agreement with Vanderbilt, ICA retains the exclusive right to sell a commercial version of the Vanderbilt system.

The MSeHA began with a focus on improving the quality of patient care while maintaining or, hopefully, decreasing the cost of care delivery. As part of the AHRQ contract, an extensive evaluation began in 2006 and will continue through the end of the contract period. The evaluation expands the initial focus by

evaluating use/adoption, usability, measuring avoidable duplicate tests, complaint specific impact (e.g. chest pain), workflow assessment, and financial impact. Based on a literature review and discussions with Memphis clinical leadership, the evaluation team has focused on high-stability tests, which are defined as those tests whose results are unlikely to change rapidly within a defined time frame (i.e., 14 – 42 days). Adoption in the emergency departments varies between 1 percent and 14 percent, with an average rate of 3.5 percent in December 2008. In the ambulatory setting the adoption rate is closer to 7 percent. The evaluation team hopes to report the impact on duplicate high-stability tests and specific complaints soon.

The MidSouth eHealth Alliance has gained State and national recognition for its approach to privacy, security, and confidentiality. Its data-sharing agreements, policies, and operating committee infrastructure have been adopted and adapted by over 30 organizations and States.

### Specific Aims

- Exchange of clinical data elements among providers in a three-county region with a population of about 1 million. **(Achieved)**
- Leverage the Vanderbilt technical architecture to start the exchange, but transition to an independent platform. **(Ongoing)**
- Expand the number of participating organizations to remaining safety net providers and primary care ambulatory providers. **(Ongoing)**
- Develop a business model for sustainability. **(Ongoing)**

**2008 Activities:** In October 2007, the MSeHA successfully demonstrated the ability to exchange 100 percent of core data elements between core and extended facilities. Not all core elements are in production, however, as allergies and medication claims are still in test mode. In 2008, the MSeHA continued to maintain and work with 20 plus live data feeds from its various sites. In addition, we sought to engage with new partners. An agreement was signed with Informed, a local application service provider (ASP) vendor for a number of ambulatory practices in the community, including two MSeHA participants, to develop the interface between the NextGen system and MSeHA system. This interface essentially will be replicated as other providers that use Informed’s service become participants.

The MSeHA’s focus has been to “roll-out access” to its system to 14 emergency department practices and 15 health centers (larger numbers than originally anticipated). The MSeHA is available in emergency departments in the three counties in southwest Tennessee, as well as an emergency department across the State line in Southaven, Mississippi. In addition, the MSeHA has added new functionality to the exchange. For example, a partner requested special access to data of its patients who visit other hospitals. Along with this partner’s clinicians and IT personnel, MSeHA is designing a prototype for this functionality. MSeHA has been continuing the logical observation identifiers names and codes (LOINC) mapping of additional lab results, which has strengthened its ties with participating providers. Early in 2008, MSeHA mapped an estimated 50 labs, including panels, which represents 50 to 60 percent of the total ordered labs.

MSeHA recently signed a contract with a new vendor, ICA. MSeHA will work through the end of the year to ready the system to move the technical infrastructure from behind the Vanderbilt firewalls outward, to the ICA platform in early January 2009.

In addition, the MSeHA successfully engaged one of the largest pediatric practices in its community and by the end of 2008 was in discussion with the next-largest pediatric practice, as well as the two remaining safety net providers in the community. The MSeHA Board elected its third set of officers in May 2008. The focus for the Board is developing a business model/plan for sustainability. Discussions with Fed Ex and Cigna as potential partners took place in 2008, but no terms were negotiated.

The MSeHA was involved at the State level in developing an approach to measuring quality using clinical data and in developing business models for sustainability. The Vanderbilt team, in conjunction with the Regenstrief team in Indiana, developed a prototype for a medication hub. The pilot project progressed more slowly than planned due to the SureScripts/RxHub merger. By the end of 2008, test messages were successfully sent between MSeHA and Regenstrief and RxHub.

**Preliminary Impact and Findings:** As part of its evaluation, the MSeHA is conducting usability surveys, with prize incentives, and qualitative data collection that aims to identify workflow issues in emergency department and ambulatory settings. Overall, providers commented that the data were valuable and useful in caring for patients. Suggestions for improvement were forwarded to the development team. As of December 2008, duplicate testing analyses are underway for the following: head MRI, head CT, abdomen CT, HbA1c (a test that measures the amount of glycated hemoglobin in the blood), and ankle x-rays. The MSeHA tracks the number of patients who are queried and whether the data were found on the patient. All patients are “looked up” through an automated process; up to 13 percent of the time, a more detailed query is made by the provider. Approximately one-third to one-half of patients who have a detailed query have some information available for the clinician.

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## Selected Outputs

The Vanderbilt Regional Informatics team has made many of the documents, including legal agreements, operations committee structure, original technical proposal for the project, and the evaluation plan, available at [http://www.regionalinformatics.org/docs/task\\_cat\\_view/gid,30/](http://www.regionalinformatics.org/docs/task_cat_view/gid,30/).

In January and July 2008, this HIE participated in two in-person meetings with fellow AHRQ-sponsored SRDs to share lessons learned, share general information, and plan for upcoming project-specific deliverables such as conducting evaluations and developing sustainability plans.

In late 2008 and onward, this HIE contributed to the AHRQ-sponsored manuscript entitled, *Liability for Regional Health Information Organizations: Lessons from the AHRQ-Funded State and Regional Demonstration Projects and Other Community Efforts*, [available online](#).

The fact sheet is available at <http://www.midsoutheha.org/>, as well as links to all participating organizations.

## Presentations/Publications/Dissemination:

- Principal Investigator, Mark Frisse, together with project team leaders, Vicki Estrin and Janet King, has been facilitating meetings with key stakeholders in middle Tennessee to develop a data exchange in that community building on the work of the MSeHA in Memphis.
- Webinar (AHRQ/CHI), July 10, 2008
- Institute of Medicine, Comparative Effectiveness, July 30, 2008
- Redwood MedNET Annual Conference (Ukiah, CA), Janet King, July 2008
- Owen School of Business (sponsored HIT meeting), Janet King, Fall 2008
- AHIMA Regional Keynote (Chicago), August 18, 2008
- Owen School of Business (lecture), October 31, 2008
- Vanderbilt Seminar, September 1, 2008
- National Medicaid MMIS Keynote (for Governor Bredesen), September 15, 2008
- DBMI Course, Public Health Informatics, November 18, 2008
- California Privacy and Security Meeting (Sacramento), October 28, 2008
- Emdeon November Institute, November 6, 2008
- Cumberland Pediatrics, Annual Meeting (Keynote), December 9, 2008
- State of Pennsylvania eHealth Meeting (Keynote), May 4, 2009

- New York Academy of Medicine (Invited Lecture), May 21, 2009
- Vicki Estrin participated in a number of NHIN DURSA work group calls regarding the production level DURSA.
- Mark Frisse, Kevin Johnson, and Vicki Estrin presented different aspects of the Memphis project at AMIA in Washington, DC, November 10–12, 2008. (Note: with permission obtained in advance, up to \$3,000 of AHRQ funds were spent to fund the travel.)
- Mark Frisse and Vicki Estrin participated in the Governor’s statewide ePrescribing Summit on December 11, 2008.

**Conference papers and journal articles:**

1. Coffman T, Porter JP, Frisse ME. Reducing HIE Costs through Real-Time Data Feed Visualizations. AMIA Annual Symposium proceedings. Washington, DC, 2008:913.
2. Frisse ME, King JK, Rice WB, et al. A Regional Health Information Exchange: Architecture and Implementation. AMIA Annual Symposium proceedings. Washington, DC, 2008:212-6.
3. Johnson KB, Gadd C, Aronsky D, et al. The MidSouth eHealth Alliance: Use and Impact in the First Year. AMIA Annual Symposium proceedings. Washington, DC, 2008:333-7.
4. Frisse ME. Perspective: Health Information Technology: One Step at a Time. Health affairs (Project Hope). 2009;28(2):w379–w84.
5. Frisse ME. Information Technology Platform Requirements for a Learning Healthcare System. Washington Institute of Medicine; 2009.
6. Penfield SL, Anderson KM, Edmund M, Belanger M. Toward Health Information Liquidity: Realization of Better, More Efficient Care from the Free Flow of Health Information. Washington: Booz Allen Hamilton; January 2009. (MSeH leaders served as major contributors.)

<b>Project Title:</b>	An Evolving Statewide Indiana Information Infrastructure State and Regional Demonstration Project (currently known as Indiana Network for Patient Care – INPC)
<b>Principal Investigator:</b>	Overhage, J. Marc, M.D., Ph.D.
<b>Organization:</b>	Regenstrief Institute
<b>Contract Number:</b>	290-04-0015
<b>Project Period:</b>	09/04 – 09/09
<b>AHRQ Funding Amount:</b>	\$5,000,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** Indiana is working to build upon established local and regional health information infrastructure initiatives, including the Indiana Network for Patient Care (INPC), an operational health information exchange (HIE) in central Indiana (Indianapolis), and then develop the electronic infrastructure across the entire State. The INPC is one of six AHRQ-sponsored State and regional demonstration (SRD) projects begun in late 2004 and early 2005 to create non-profit health information exchange (HIE). Each of the SRDs is developed using a variety of approaches (e.g., technical, business, and governance models) in order to support data sharing and interoperability on a State or regional level; conduct analyses of the role of the Medicaid program; provide an evaluation of their project; and, develop a sustainability model. The INPC HIE includes a broad array of participants and members, including physicians, hospitals, ambulatory practices, laboratories, radiology centers, health plans, State and county health departments, and immunization registries. The Regenstrief Institute, acting on behalf of the participants, created and operates the exchange and helped create the Indiana Health Information Exchange (IHIE) to establish a sustainable business model to support the HIE.

The INPC is a robust HIE that has operated since 1995 and provides population-based, longitudinal, and consistently structured coded and text patient data for citizens of Indiana. The INPC is most complete for the Indianapolis Metropolitan Statistical Area (MSA), a 3,200-square-mile region in central Indiana with 1.7 million residents, but continues to expand across the State of Indiana, which has a population of 6.4 million. The INPC currently stores data for 17 million unique patient registrations representing 9,666,439 unique individuals. The system contains clinical data for nearly the entire population of the Indianapolis MSA, patients throughout Indiana, and patients outside the State.

The INPC captures data from many sources, including hospitals, physician practices, public health departments, laboratories, radiology centers, pharmacies, pharmacy benefit managers (via SureScripts), and payers. Sources like hospitals and physician practices provide many types of data, including laboratory test results, radiology test results, cardiology diagnostic results, pulmonary function test results, gastroenterology study results, procedures performed, diagnoses assigned, transcribed reports (admission, operative, discharge), and inpatient, outpatient, and emergency department encounters.

## Current INPC Participants

Organization	Number of participating locations
Hospitals	39
Laboratories	3
Imaging Centers	11
Physician Practice Groups	196
Payers	5
Public Health Departments	2

## Specific Aims

- Assess the actual and/or perceived effects of HIE on productivity, service utilization, patient quality, safety, satisfaction, and ongoing marginal costs. **(Ongoing)**
- Create a sustainable business and funding model to assure the HIE's long-term survival by providing services built on top of the HIE, such as clinical messaging, quality improvement, and public health services. **(Achieved)**

**2008 Activities:** The INPC spent Fiscal Year 2008 (FY08) expanding its activities by bringing on new partners (laboratories, imaging centers, suburban health hospitals, emergency departments, long-term care facilities, and rehabilitation centers) and seeking to resolve several challenges related to this expansion. The INPC worked on providing additional interfaces for lab and pathology centers in hospitals that recently joined the exchange. By the end of FY08, the INPC finalized its additional interfaces with all of its new data sources.

In total, INPC has achieved data sharing with 39 hospitals, 2 national laboratories, 2 radiology centers, 3 health plans, 3 physician practice groups, immunization registries, select ambulatory practices, and others who are participating in the INPC. The INPC has expanded its activities outside Indianapolis to other surrounding geographic areas, including Evansville, Terre Haute, and Northwest Indiana. In addition, we have continued our work to develop an entirely new software platform to support the exchange.

Regenstrief Institute and the INPC play a central role in the medication hub pilot project with MidSouth eHealth Alliance (MSeHA). MSeHA and INPC are contracted to interface with multiple sources of medication information, including SureScripts-RxHub, and hospital data systems. In addition, the INPC was asked to continue its participation in phase II of the Department of Health and Human Services, Office of the National Coordinator-funded National Health Information Network (NHIN) project.

As part of its evaluation in FY09, INPC is conducting a series pilot study on physician quality reporting that includes almost 1,000 physicians. Quality measures range from use of appropriate medication for patients with asthma to cholesterol management. The INPC prompts participating physicians with patient-specific reminders such as “adjustment of medication needed.” The INPC started delivering these reminders in July 2008 and will perform an analysis to test whether the intervention increases compliance to quality indicators at the patient level.

Additionally, Regenstrief is using INPC data to: 1) define community associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) cases, and 2) learn what happened to these patients before hospitalization in order to identify key community factors for developing and testing the efficacy of interventions to prevent community CA-MRSA infection in persons who experience repeated infections or who have close contacts with infected persons.

Also, Regenstrief Institute will develop and field a questionnaire and survey process to identify barriers to participation in HIE, and solicit feedback on how to overcome those barriers.

**Preliminary Impact and Findings:** Our previous research has demonstrated that the economic impact of making longitudinal patient data available in emergency departments is a savings of at least \$10 per visit, so expanding the INPC across the State should translate directly to lower costs of care. In addition, the evolving infrastructure has begun to enable a variety of services such as a paper-based medication history that includes clinical decision support and notification of a payer-based care manager when patients receive care in an emergency department or hospital setting.

Finally, almost 1,000 primary care providers across the Indianapolis MSA have received monthly feedback on over 20 quality measures based on INPC data. Although we have not yet formally assessed the impact of this information, we have observed the attention that practices have focused on quality improvement, as well as anecdotes about additional mammographic screening and colorectal cancers diagnosed at early stages.

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## Selected Outputs

We have presented on Indiana's efforts extensively nationally, giving over 100 presentations over the lifetime of the project that describe our technological, operational, and business approaches. We have also shared our learning with a variety of groups, including RAND, the Brookings Institution and National Opinion Research Center (NORC); government agencies such as the Office of Management and Budget and the Office of the National Coordinator for Health Information Technology; and Federal advisory groups such as the National Committee on Vital and Health Statistics.

In January and July 2008, this HIE participated in two in-person meetings with fellow AHRQ-sponsored SRDs to share lessons learned, share general information, and plan for upcoming project-specific deliverables, such as conducting evaluations and developing sustainability plans.

In late 2008 and onward, this HIE contributed to the AHRQ-sponsored manuscript entitled, *Liability for Regional Health Information Organizations: Lessons from the AHRQ-Funded State and Regional Demonstration Projects and Other Community Efforts*, [available online](http://www.healthit.ahrq.gov) at <http://www.healthit.ahrq.gov>.

Please see the INPC website, <http://www.regenstrief.org/medinformatics/inpc/hie-services-available>.

<b>Project Title:</b>	Delaware Health Information Network (DHIN) State and Regional Demonstration Project
<b>Principal Investigator:</b>	Perez, Gina B., M.P.A.
<b>Organization:</b>	Delaware Health Information Network (DHIN)
<b>Contract Number:</b>	290-05-0012
<b>Project Period:</b>	09/05 – 09/10
<b>AHRQ Funding Amount:</b>	\$5,000,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The Delaware Health Information Network (DHIN) is one of six AHRQ-sponsored State and regional demonstration (SRD) projects begun in late 2004 early 2005 to create non-profit health information exchange (HIE). Each of the SRDs is developed using a variety of approaches (e.g., technical, business, and governance models) in order to support data sharing and interoperability on a State or regional level; conduct analyses of the role of the Medicaid program; provide an evaluation of their project; and develop a sustainability model. The DHIN's goal is to implement a real-time, electronic method for health care providers to receive and query appropriate health-related information for their patients. The DHIN is a statewide public/private partnership that received AHRQ funding in October 2005. Partners include consumers, physicians, hospitals, businesses, payers, and reference labs. The DHIN exchanges data among hospitals, reference laboratories, and physicians practices statewide.

The DHIN's Public-Private Board of Directors comprises diverse organizations all representing the primary stakeholders of HIE. They include the Delaware Healthcare Association; the Medical Society of Delaware; Blue Cross Blue Shield of Delaware; Delaware Physicians Care, Inc.; Delaware State agencies such as the Delaware Health Care Commission, the Department of Insurance, the Department of Technology and Information, the Division of Public Health, and the Office of Management and Budget; the Delaware State Chamber of Commerce; large employers; and the University of Delaware.

The DHIN went live on May 1, 2007, becoming the first operational statewide clinical health information exchange.

### Specific Aims

- Improve the care received by patients served by Delaware's health care system, and reduce medical errors associated with the inaccurate and incomplete information available to providers of medical care. **(Ongoing)**
- Reduce the time and financial costs of HIE among providers and payers (necessary for patient care), by reducing the complexity of current distribution methods and drastically increasing use of electronic means. **(Ongoing)**
- Improve communication among health care providers and their patients to provide the right care at the right time based on the best available information. **(Ongoing)**
- Reduce the number of duplicative tests to afford specialists a better understanding of the patient upon referral from his/her primary physician and to expedite the reporting of consultant opinions and tests/treatments between specialists and the referring physicians. **(Ongoing)**

- Improve the efficiency and value of electronic health record (EHR) systems in the physician office and to assist physicians without an EHR in better organizing and retrieving test results. **(Ongoing)**

**2008 Activities:** Physician practices receive clinical results via two options: electronic inbox (which can be set to auto print) or interface to an EHR system. The DHIN is connected to six EHR vendors. By May 2008, the DHIN had achieved 100 percent interoperability among its core data receivers (55 core practices), 80 percent interoperability among its core data senders, and 25 percent interoperability of its core data elements. The DHIN plans to reach 100 percent by June 2009.

Other activities have included negotiating discounted interface contracts with EMR vendors to connect to the DHIN. Currently, six EMR vendors are connected to the DHIN or are in test, serving 158 physicians at 38 locations. The DHIN is beta testing its patient record search capability, including community master patient index (CMPI) and record locator service (RLS). Authorized users are able to query a patient's reports and results available in the DHIN.

The DHIN also provides for the electronic reporting of biosurveillance and reportable disease data from the connected hospital systems to the Division of Public Health's electronic reporting and surveillance system.

The DHIN was asked to continue its participation in Phase II of the Department of Health and Human Services (DHHS) Office of the National Coordinator (ONC)-funded National Health Information Network (NHIN) project. Having received funding a year after the other SRDs, the DHIN recently submitted its final evaluation plan to AHRQ and is working on its sustainability plan.

As of December 2008, the DHIN had 93 physician practices connected to the system (593 physicians and over 1,500 total users). The three DHIN participating hospital systems and LabCorp contribute more than 85 percent of laboratory tests and 81 percent of hospital admissions performed in the State of Delaware. Doctors Pathology Services, Quest Diagnostics, and St. Francis Hospital joined the DHIN in 2008 and are in varying stages of implementation.

DHIN expects to reach 50 percent of the State's practicing physicians by July 2009.

In 2009, the DHIN will offer fulfilled medication history query, transcribed reports (discharge summary, history and physicals, operative notes, etc.), electronic laboratory and radiology order capabilities, radiology image viewing, and bi-directional exchange with EHRs for lab order entry. In a future phase, the network will empower patients by introducing a patient portal that will enable consumers to access their health information and manage their care.

**Preliminary Impact and Findings:** An evaluation will begin in July 2009 to understand the value and benefit of the DHIN for each stakeholder group, including physician practices, hospitals, laboratories, payers, consumers, and State agencies. The evaluation will look at how the DHIN impacts efficiency, patient safety, and health care costs. To date, participating hospitals have determined that public health reporting through the DHIN saves time and resources. Anecdotally, the DHIN has been credited with improving workflow efficiencies in doctors' offices—in some cases reducing FTEs and redirecting personnel from administrative functions to patient care services.

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## Selected Outputs

In January and July 2008, this HIE participated in two in-person meetings with fellow AHRQ-sponsored SRDs to share lessons learned, share general information, and plan for upcoming project-specific deliverables such as plans for evaluation and developing a sustainability plan.

In late 2008 and onward, this HIE contributed to the AHRQ-sponsored manuscript entitled, *Liability for Regional Health Information Organizations: Lessons from the AHRQ-Funded State and Regional Demonstration Projects and Other Community Efforts*, [available online at http://www.healthit.ahrq.gov](http://www.healthit.ahrq.gov).

Please see DHIN's Web site, <http://www.dhin.org/>.

<b>Project Title:</b>	Improving Communications Between Health Care Providers via a Statewide Infrastructure: Utah Health Information Network (UHIN) Clinical State and Regional Demonstration Project (currently known as UHIN)
<b>Principal Investigator:</b>	Root, Jan, Ph.D.
<b>Organization:</b>	Utah Health Information Network
<b>Contract Number:</b>	290-04-0002
<b>Project Period:</b>	09/04 – 09/09
<b>ARHQ Funding Amount:</b>	\$5,000,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The Utah Health Information Network (UHIN) is one of six AHRQ-sponsored State and regional demonstration (SRD) projects begun in late 2004 or early 2005 to create a non-profit health information exchange (HIE). Each of the SRDs is developed using a variety of approaches (e.g., technical, business, and governance models) in order to support data sharing and interoperability on a State or regional level. Like the other SRDs, UHIN is tasked with the development of clinical (e.g., laboratory results and prescriptions) data sharing and interoperability capacity, the analysis of the role of the Medicaid program vis-à-vis electronic exchange of information, the evaluation of the SRD, and the development of a sustainability model. UHIN seeks to create and provide statewide capacity for administrative and clinical information to be exchanged between disparate health care information systems, physicians, hospitals, laboratories, payers, local health departments, and health care centers without compromising the integrity of the information exchanged. UHIN leveraged existing administrative exchange infrastructure and contracts to build the infrastructure of a statewide easy-to-use, low-cost HIE of clinical and administrative data whereby information is exchanged through an evolutionary electronic data interchange (EDI) path that allows paper but encourages users to migrate to electronic files. UHIN is supporting the use of a modest electronic medical record (EMR), commonly referred to as “EMR lite,” a Master Patient Index (MPI), and virtual health records query functionality. UHIN seeks to create provider-to-provider, provider-to-public health agencies, and provider-to-payer messaging through a hub model with a central server. Given the breadth of institutions, types of data, personnel, and health IT systems involved, the first 4 years of UHIN were dedicated to the challenging and exciting tasks of coalition building, infrastructure development, identifying and engaging in dialogue amongst disparate statewide partners including physicians, hospitals, laboratories, payers, local health departments, and health centers; development of UHIN self-governance policies and procedures; and determination of technological and administrative requirement to support the UHIN.

### Specific Aims

- Develop a novel exchange of laboratory and prescription drug data among unrelated entities. **(Achieved)**
- Conduct analyses of the role of the Medicaid program. **(Ongoing)**
- Provide for an evaluation of the project. **(Ongoing)**
- Develop a sustainability model. **(Upcoming)**

**2008 Activities:** UHIN’s Clinical Health Information Exchange (cHIE) task force (a subcommittee of the UHIN Board of Directors) conducted a formal and extensive search for an appropriate strategic partner to provide the technical infrastructure for new clinical data exchange and virtual health records query functionalities. A decision was made in December 2008 to partner with Axolotl. UHIN is in the process of updating its electronic commerce agreement (ECA) and creating a cHIE Addendum so that the responsibility will be on members to comply with liability requirements and use clinical data properly. UHIN has selected the initial roll out site and is enrolling the key data sources and building support among health care providers for participation in the cHIE. In 2007, Utah passed a law giving the Utah Department of Health the authority to adopt standards to exchange clinical data. The Utah Department of Health will leverage UHIN’s experience developing and adopting administrative data exchange standards to determine which standards to develop and adopt to exchange clinical data. UHIN also made progress creating a connection with the Utah Department of Health to exchange electronic death certificate data. UHIN continues to work with the Department of Health to connect to the Child Health Advanced Records Management (CHARM) database to permit user query of this database through the UHIN exchange.

In late 2008 and onward, UHIN contributed to the forthcoming (Summer 2009) AHRQ-sponsored manuscript entitled, *Liability for Regional Health Information Organizations: Lessons from the AHRQ-Funded State and Regional Demonstration Projects and Other Community Efforts*, which will be available at [www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov).

**Preliminary Impact and Findings:** In a State with relatively high (30 to 50 percent) EMR penetration, cost—in the form of connection fees EMR vendors want to charge—is a significant challenge. EMR vendors are seeking \$10,000 to \$50,000 to create these connections, even though UHIN uses a standard secure Web-services interface.

In addition, EMR systems are not currently designed to handle information exchange. They do not have the functionality to: 1) query for a virtual health record, 2) identify and resolve multiple identities efficiently, 3) manage the HIE patient consent parameters, 4) maintain the metadata on imported HIE data to record data origins, or 5) indicate which HIE data have been validated. In short, UHIN anticipates that most clinicians, whether they have an EMR or not, will be forced to use some or all of the cHIE tools—EMR-lite, virtual health records, and the registry and report tool—in parallel with their existing EMRs.

Other emerging legal issues that the community will need to address include the following:

- 5) Consent: How is consent handled across the State? How is it integrated with the consent gathered that is internal to an organization? What if the HIE consent conflicts with an existing internal consent?
- 6) Identification and Authentication: How will user identification and authentication be accomplished efficiently? UHIN hopes to piggy-back on existing user identification and authentication practices used by payers, hospitals, and State licensing efforts.
- 7) Auditing: How will UHIN assist members in complying with HIPAA privacy use and disclosure requirements—in particular, the more stringent rules included in the American Recovery and Reinvestment Act (ARRA) legislation?

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## Selected Outputs

In January and July 2008, UHIN participated in two in-person meetings with fellow AHRQ-sponsored SRDs to share lessons learned, share general information, and plan for upcoming project-specific deliverables such as plans for evaluation and developing a sustainability plan.

Developed plan for sustainability of the clinical and administrative data exchange.

Developed plan for evaluation of the HIE.

<b>Project Title:</b>	Rhode Island Statewide Health Information Exchange (HIE) State and Regional Demonstration Project (currently known as <i>currentcare</i> )
<b>Principal Investigator:</b>	Zimmerman, Amy, M.P.H.
<b>Organization:</b>	Rhode Island Department of Health
<b>Contract Number:</b>	290-04-0007
<b>Project Period:</b>	09/04 – 08/10
<b>AHRQ Funding Amount:</b>	\$5,000,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** The Rhode Island Information Exchange Project, *currentcare*, is one of six AHRQ-sponsored State and regional demonstration (SRD) projects begun in late 2004 and early 2005 to create non-profit health information exchanges (HIEs). Each of the SRDs is developed using a variety of approaches (e.g., technical, business, and governance models) in order to support data sharing and interoperability on a State or regional level; conduct analyses of the role of the Medicaid program; provide an evaluation of their project; and develop a sustainability model.

The Rhode Island Department of Health (HEALTH) is collaborating with the Rhode Island Quality Institute (RIQI) and stakeholders across the State to develop, implement, and evaluate an interconnected statewide health information system that uses a master patient index (MPI) to help put the right information into the hands of clinicians and their patients when and where it is needed. The RI HIE system, known as *currentcare*, is intended to evolve into a broadly interconnected statewide health information network to improve the quality, safety, and value of health care services and to support critical public health needs to improve the health of the broader Rhode Island population.

The project includes activities to design, develop, test, deploy, and evaluate the initial phase of a secure and reliable HIE governed by RIQI, the State-designated regional health information organization (RHIO). EDS is the lead technical vendor providing integration services for *currentcare*, which uses a customized version of HealthShare, an off-the-shelf proprietary HIE application that links longitudinal patient-level information from source data systems and provides a Web-accessible viewer to authorized users in any setting. *Currentcare* is in development, with system testing scheduled to begin in first quarter 2009 and implementation targeted for fall 2009. Initial types of data to be exchanged during the project period include laboratory results and medication history, with others to be added as rapidly as is feasible. Eventually, *currentcare* will include interfaces with electronic medical record (EMR) systems.

*Currentcare* is being implemented in accordance with the RI HIE Act of 2008, which stipulates privacy and confidentiality protections for the RI HIE that are stricter than other State and Federal health information privacy laws. Both the policy and technology decisions in the project have been profoundly influenced by community guidance and, as such, the rationale, impact, and results of this guidance will be a major focus of the project evaluation.

## Specific Aims

- Improve the quality, safety and value of health care in the State of Rhode Island through the ongoing use and growth of a sustainable statewide health information exchange system. **(Ongoing)**
- Incorporate an MPI into the HIE to locate longitudinal patient health information from numerous data-submitting partners statewide. Design the HIE so that consumers will be allowed to control access to their data. **(Achieved)**
- Implement the capability to present data from various sources in an integrated, patient-centric manner using a common user interface. **(Upcoming)**
- Successfully transition all operating, management, and governance responsibility of the HIE to a community-based RHIO. **(Upcoming)**

**2008 Activities:** In 2008, project stakeholders worked with the technical vendor team at EDS to finalize all system requirements, infrastructure, architecture plans, and the detailed design specifications for *currentcare*. Technical development focused largely on the incorporation of a two-phased patient consent approach and patient enrollment capabilities prompted by privacy and security policy developments. RIQI began efforts to obtain consumer permissions (enrollment) in fall 2008 using various strategies, including community outreach and education, training and development among providers, and paper-based and electronic marketing strategies. Enrollment efforts also targeted Medicaid beneficiaries. Efforts to connect initial data submitting partners and develop contractual agreements are ongoing.

In May 2008, RIQI was designated as the State's RHIO following an open bid process and entered into a transitional contract with HEALTH, which set forth a timeline for RIQI to assume management and operation of *currentcare*. HEALTH continues to work extensively with RIQI in support of its efforts to assume all responsibilities for the HIE as an operational RHIO by fall 2010. Approximately 60 percent of *currentcare* policies have been developed, refined, and approved through a stakeholder-driven process; all initial policies are on schedule to be completed by summer 2009.

**Preliminary Impact and Findings:** None as of yet.

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## Selected Outputs

HEALTH has submitted a series of required planning documents to AHRQ pertaining to implementation, evaluation, and sustainability of *currentcare*. Consent policy development activities and related delays in system acquisition and implementation have pushed out the schedule for demonstration of live data exchange. To allow for completion of the technical solution, including full installation and testing of the consent management application that has been custom developed for the project by EDS and InterSystems, the ability to demonstrate data sharing capability in a production environment will occur in fall 2009.

Enrollment of consumers and contractual engagement of community enrollment partners is fully underway. In anticipation of full implementation, to date, there are approximately 1,500 persons who have provided permission to include their health information in *currentcare*. Information about the *currentcare* system and its policies may be found on the Web at [www.currentcareri.com](http://www.currentcareri.com). Accessed May 2008.

- Attended National HISPC meeting, April 2008
- Presented "Financing the Rhode Island HIE" to the National Governor's Association in Washington, D.C., June 12, 2008.

- Presented at the SRD Meeting in Delaware, July 29-30, 2008. Topics included an overview of the RI Evaluation Plan, status of 100 percent data exchange deliverable, and an overview of the approach to sustainability.
- Presented at the National Governors Association State e-Health Alliance regarding Rhode Island's HIE legislation and consent model for *currentcare*.
- Attended HISPC Consent Collaborative Meeting, December 2008  
Presented at RI Health Information Management Association (State AHIMA Chapter) to increase awareness of the RI HIE and provide an opportunity for medical records professionals to discuss the implications of the HIE on their work, April 9, 2008.
- Presented to RI Council of Community Mental Health Organizations, May 16, 2008.
- In January and July 2008, this HIE participated in two in-person meetings with fellow AHRQ-sponsored SRDs to share lessons learned, share general information, and plan for upcoming project-specific deliverables, such as plans for evaluation and developing a sustainability plan.
- In late 2008 and onward, this HIE contributed to the AHRQ-sponsored manuscript entitled, *Liability for Regional Health Information Organizations: Lessons from the AHRQ-Funded State and Regional Demonstration Projects and Other Community Efforts*, [available online](http://www.healthit.ahrq.gov) at <http://www.healthit.ahrq.gov>.

<b>Project Title:</b>	Improving Lab Follow-Up by Delivering an Enhanced Medication List to Outpatient Physician Practices
<b>Principal Investigator:</b>	Simonaitis, Linas, M.D., M.S.
<b>Organization:</b>	Indiana University
<b>Contract Number:</b>	290-06-0013-2
<b>Project Period:</b>	09/07 – 07/09
<b>AHRQ Funding Amount:</b>	\$400,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

**Summary:** In this project, outpatient primary care clinicians receive a medication history based on pharmacy dispensing records immediately prior to each patient’s visit. The goal is to use this document to prompt discussion between the clinician and patient regarding the patient’s medications. The document is designed to support medication management; it contains decision support reminders specifically related to the patient and includes clinical decision support on drug-drug interactions, drug-lab interactions, and drugs to be avoided in the elderly. The document contains dispensing data from multiple pharmacy sources, as opposed to prescribing data currently stored in the patient’s chart.

The intervention will be piloted, fully implemented, and evaluated for its impact on quality and safety.

### Specific Aims

- Aggregate medication histories from multiple sources into a single document. **(Achieved)**
- Add decision support rules to medication history documents in four areas: inadequate lab monitoring, drugs with abnormal labs, drugs to avoid in the elderly, and drug-drug interactions. **(Achieved)**
- Deliver enhanced medication history documents to clinics. **(Achieved)**
- Examine instances of decision support rule use. **(Ongoing)**
- Examine quality and safety improvements. **(Ongoing)**

**2008 Activities:** We are about mid-way through this study. The year 2008 involved substantial labor-intensive programming and development work necessary to begin delivering the enhanced medication history document. First, we helped the clinic registration system create a trigger message each time that a patient arrived to register, and then send the trigger message to the Indiana Network for Patient Care. Second, we used the patient identifiers in the trigger message to collect dispensing records from three sources: RxHub commercial pharmacy benefit managers, Medicaid, and the Wishard County health services outpatient pharmacy. Third, we used the patient identifiers to collect laboratory test results. Because patients have different identifiers at different institutions, we had to match patient identifiers to aggregate the pharmacy and lab data. Fourth, decision support rules were written to recognize combinations of medications, labs, and age, and the resulting reminders were added to the summary file. Fifth, the data were formatted to produce a final readable report. Sixth, we developed a process to deliver the report to the correct printer at the correct clinic within a minute or two of the patient’s registration. When the report is printed, nurses or clinic staff place the document in the patient chart in preparation for the physician-patient visit.

We spent approximately 2 months testing the system with the clinics to ensure that the trigger messages worked properly and that the system responded promptly. Once testing was successful, we asked the nurses/clinic staff to begin delivering the documents to the charts. Initially, we went live at two clinics. One clinic has been very responsive; the physicians report that they like the document and appreciate its value. At the other clinic, we discovered that the data were not as thorough as what the clinic's current in-house system supplied. We are conducting a chart review to verify what data are missing and determine how to fix this.

We will be adding an additional clinic in early 2009.

**Preliminary Impact and Findings:** There are no preliminary findings available at this time.

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### **Selected Outputs**

None available.

**Table 12: Contract-Specific Summaries (PCC HIE)**

**HEALTH IT PORTFOLIO STRATEGIC GOAL:**

Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care (PCC), the coordination of care across transitions in care settings, and the use of electronic exchange of health information (HIE) to improve quality of care (PCC HIE).

<b>AHRQ BUSINESS GOALS: IMPLEMENTATION AND USE, KNOWLEDGE CREATION, SYNTHESIS AND DISSEMINATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Gaylin, Dan, MPA	National Resource Center for Health Information Technology (NRC)	290-04-0016	<a href="#">Page 396</a>
<b>AHRQ BUSINESS GOAL: IMPLEMENTATION AND USE</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Bell, Douglas, MD	Use of Electronic Referral System to Improve the Outpatient Primary Care-Specialty Care Interface	290-06-0017-3	<a href="#">Page 404</a>
No	Brottman, Gail, MD	Improving Asthma Care in an Integrated Safety Net through a Commercially Available Electronic Medical Record	290-06-0020-5	<a href="#">Page 406</a>
<b>AHRQ BUSINESS GOAL: KNOWLEDGE CREATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Kerwin, Jeffrey, PhD	Consumer Engagement in Developing Electronic Health Information Systems	PSC TO#07R000131	<a href="#">Page 408</a>
No	Spranca, Mark, PhD	Conducting Measurement Activities for Health Information Technology Initiative	PSC TO#07R000150	<a href="#">Page 410</a>
<b>AHRQ BUSINESS GOAL: SYNTHESIS AND DISSEMINATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Fontaine, Pat, MD	Participation by Primary Care Practices in Health Information Exchange in Minnesota	290-07-10010-2	<a href="#">Page 412</a>
No	Jimison, Holly B., PhD	Barriers and Drivers of Health Information Technology Use for the Elderly, Chronically Ill and Underserved	290-02-0024-9	<a href="#">Page 414</a>
No	West, David, PhD	Participation by Primary Care Practices in Health Information Exchange in Colorado	290-07-10008-3	<a href="#">Page 416</a>

<b>Project Title:</b>	National Resource Center for Health Information Technology (NRC)
<b>Principal Investigator:</b>	Gaylin, Dan, M.P.A.
<b>Organization:</b>	National Opinion Research Center at the University of Chicago (NORC)
<b>Contract Number:</b>	290-04-0016
<b>Project Period:</b>	10/04 – 09/09
<b>AHRQ Funding Amount:</b>	\$22,374,134
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** The National Resource Center for Health IT crosses all of the AHRQ Strategic Goals:

- Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.
- Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.
- Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** The National Resource Center for Health IT crosses all of the AHRQ Business Goals:

- Knowledge Creation
- Synthesis and Dissemination
- Implementation and Use

**Summary:** The National Opinion Research Center (NORC) serves as the master contractor for the AHRQ National Resource Center for Health IT (NRC), 2004-2009. The NRC plays a pivotal role in supporting AHRQ's monitoring of all grants and many AHRQ-sponsored health IT portfolio contracts. The NRC was created in 2004 initially to provide direct support to AHRQ-funded health IT grants and some contracts, and to provide an open-access, easy-to-use platform for disseminating findings from those research projects. In 2005, the public NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)) was created to serve as the primary dissemination vehicle of information and tools in health IT to the wider health IT community. Under the direction of AHRQ, the NRC is instrumental in categorizing the health IT portfolio, synthesizing results, generating new tools, and engaging experts on important health IT initiatives, challenges, and opportunities. The NRC provides a number of important functions, including:

- Maintaining the NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)).
- Providing direct technical and evaluation assistance to grantees, contractors, and would-be contractors through a variety of media, e-mail, telephone, Web-based conferencing, and in-person meetings.
- Collecting and disseminating lessons learned from AHRQ health IT projects via Implementation Stories, Podcasts, Issue Papers, Decisionmaker Briefs, and Emerging Lessons.
- Creating new resources, tools, and best practices to support those in implementing and evaluating health IT.
- Gathering and categorizing existing health IT resources for dissemination via the NRC Knowledge Repository.
- Supporting the AHRQ Annual Meeting, including logistics, preparation, and hosting of grantee networking activities.

NORC at the University of Chicago is the prime contractor for the NRC with a number of partners, including Regenstrief Institute; the Vanderbilt Center for Better Health (VCBH); the Center for IT Leadership (CITL); and John Snow, Incorporated. The NRC has a number of teams that support a set of core activities involving the grantees and contractors, as well as teams that build and maintain the infrastructure and content of the NRC Web site. These teams include the Value and Evaluation Team, the Technical Assistance Team, the Knowledge Repository Team, and the Dissemination Team. In addition, the NRC supports AHRQ in their administration of specific contract initiatives, including the State Regional Demonstration Projects and the Clinical Decision Support Projects. Frequently, the NRC will support additional specific targeted initiatives, such as the e-Prescribing work done in 2008.

This contract has also supported some trans-Federal health IT initiatives through AHRQ's work with the Office of the National Coordinator for Health Information Technology (ONC).

**2008 Activities:** Below are brief summaries of activities of the core NRC teams in 2008. Several of the example products mentioned below are identified in the Output section of the summary, where Web links are provided.

#### Value and Evaluation Team

In 2008, the Value and Evaluation Team (E&V) consisted of individuals from Indiana University/Regenstrief Institute; CITL; VCBH; John Snow, Inc.; and NORC. During the year, the E&V team provided ongoing direct evaluation support to AHRQ-funded health IT projects in the form of teleconferences, written and verbal feedback around evaluation plans, and in-person site visits to assist in the revision of evaluation plans. The team developed, released, and populated a compendium of surveys in order to provide the health IT community access to publicly available surveys involving health IT evaluation. A set of pediatric reminders and templates were packaged and made available on the Web site so that implementers of decision support might have a starting point when creating similar tools. The previously written evaluation toolkits underwent revisions in order to expand and refine sections on project design, evaluation measures, evaluation resources and statistical support. Some of the toolkits' measures were expanded to build Quick Reference Guides to provide additional guidance to those wanting to evaluate particular measures. The team prepared two summary reports for AHRQ and hosted a national teleconference on evaluation, entitled "The Importance of Evaluation in Health IT Implementation: Practical Advice for Providers and Health," on May 15, 2008.

#### Technical Assistance Team

In 2008, the Technical Assistance Team (TA) consisted of individuals from Astech Consulting; Booz Allen Hamilton; Indiana University/Regenstrief Institute; CITL; VCBH; John Snow, Inc.; and NORC. The TA team continued to provide direct technical assistance to AHRQ health IT projects throughout 2008. This technical assistance took the form of one-on-one calls and e-mail support, grantee open-forums, facilitation of grantee interaction, and organization of teleconferences around a variety of topics. The team continued to provide points of contact (POCs) for each of the grantees and conducted regular touch-base calls. The team continued to build and refine a taxonomy to categorize grantees and their technologies of focus and care settings. Throughout 2008, the TA team was largely focused on "knowledge capture" and "tool development," developing a series of publications on lessons learned from the AHRQ Health IT portfolio; these areas included Telehealth, Chronic Disease Management, Barcoded Medication Administration, and Inpatient and Ambulatory Computerized Order Entry. The results of this research were released to the NRC Web site as part of the Emerging Lessons section, short Decisionmaker Brief summaries, and longer Issue Papers. Two additional areas of focus were begun in 2008, including Rural and Underserved Populations, and Long-Term Care. Finally, the TA team planned, scheduled, and hosted eight national teleconferences on key health IT topics. The transcripts and

PowerPoint Presentations are available for all of these teleconferences in the Events section of the NRC Web site, [www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov). The documents noted are listed in the Outputs section, below.

### Knowledge Repository Team

The Knowledge Repository (KR) Team continued its efforts to expand and improve the use of a knowledge repository containing health IT best practices in 2008. Efforts to maintain and improve this knowledge repository involved a broad team of content experts and knowledge assistants, including individuals from CITL, Indiana University/Regenstrief Institute, NORC, and VCBH. In 2008, over 50 expert-reviewed documents were added to the central Knowledge Library Repository (KL), and over 1,100 documents were aggregated from external sources and added to the KL. The content of the NRC Web site was maintained by the KR team, including updating the Health IT Events calendar, as well as adding regular content to the Emerging Lessons, Health IT Tools, and Funding Opportunities sections. Grantee profiles and the grantee map were updated in 2008. Peer-reviewed publications by AHRQ-funded grantees were added to grantee profiles, as well as to the News and Publications page. In 2008, focus groups were held with targeted groups to elicit feedback around the NRC Web site in order to determine future initiatives. In 2008, 45 new portal communities were added to the vibrant NRC Extranet portal community. These communities support collaboration, social networking, and Web conferences within and among each other. The NRC portal itself provides the necessary Web 2.0 tools to share documents and links, host discussion forums, support Web pages, and provide RSS feeds, as well as integrated search functionality to find resources and administration modules to manage users within a community. There are currently more than 200 communities actively collaborating and participating with more than 6,000 users.

### Dissemination Team

In 2008, the Dissemination Team consisted of individuals from Burness Communications, Indiana University/Regenstrief Institute, CITL, and NORC. Dissemination activities included writing implementation stories and podcast scripts, producing the grantee e-mail newsletter, editing Web content, and participating in national conferences.

### State Regional Demonstration and Clinical Decision Support Project Support

Throughout 2008, the NRC provided support to both the State Regional Demonstration (SRD) and Clinical Decision Support (CDS) projects. This support included organizing and facilitating 11 meetings between all 6 SRD projects and AHRQ, 9 of which were held by teleconference and 2 as in-person meetings. Evaluation support was provided to the SRDs throughout the year. The NRC tracked the SRD contracts' monthly progress reports and deliverables. A framework for SRD sustainability plans was developed by the NRC and a Liability Insurance report was written.

The NRC facilitated bi-weekly calls with ARHQ project officers for project planning and oversight of the CDS projects. Project and work plans of both CDS contracts were reviewed, and feedback was presented to ARHQ. The NRC formed a 15-member technical expert panel to conduct key activities for CDS projects. In addition, the NRC organized and facilitated four technical expert panel meetings, two of which were in-person meetings. The NRC contracted and oversaw the development of three white papers on CDS topics. The NRC made the preparations for a CDS Town Hall meeting with AMIA and a CDS DesignShop meeting with VCBH.

### Support of e-Prescribing Activities

In 2006, the NRC hosted an e-prescribing standards expert meeting. In addition, they organized and hosted three national teleconferences on findings from the evaluation of e-prescribing pilot sites, managed

the electronic prior authorization (e-PA) subcontract, and produced a program brief focused on e-prescribing.

The AHRQ NRC Steering Committee held their annual meeting on June 5, 2008. The Steering Committee includes a diverse group of leaders in the field of health IT, and representatives from AHRQ and HRSA attended the meeting. The agenda for this year's meeting was divided into three segments: 1) a retrospective overview of NRC activities to date; 2) a group discussion of recommended activities in the near future, including recommendations about how to best disseminate outputs and activities of the NRC; and 3) a group discussion of a broader long-term vision for the NRC. The Steering Committee was asked to consider specific recommendations and next steps for the NRC.

The members of this group are as follows:

- **Cheryl Austein-Casnoff, M.P.H.** Associate Administrator for Health Information Technology, Health Resources and Services Administration, U.S. Department of Health and Human Services
- **Michael S. Barr, M.D., M.B.A., F.A.C.P.** Vice President, Practice Advocacy and Improvement for the American College of Physicians
- **Meryl Bloomrosen, M.B.A.** (representing Don Detmer, M.D., M.A., American Medical Informatics Association) Associate Vice President, American Medical Informatics Association
- **Pascale Carayon, Ph.D.** Procter & Gamble Bascom Professor and Director of the Center for Quality and Productivity Improvement, University of Wisconsin-Madison
- **Karen C. Fox, Ph.D.** Chief Operating Officer, Delta Health Alliance
- **Mark Frisse, M.D., M.B.A., M.Sc.** Accenture Professor and Director, Vanderbilt University
- **Betsy L. Humphreys, B.A., M.L.S.** Deputy Director, U.S. National Library of Medicine
- **Charles D. Kennedy, M.D.** Vice President of Health Information Technology, WellPoint, Inc.
- **Carmen B. Lozzio, M.D., F.A.C.M.G.** Professor, University of Tennessee
- **Blackford Middleton, M.D., M.P.H., M.Sc.** Corporate Director, Clinical Informatics Research & Development; Chairman, Center for Information Technology Leadership at Partners Healthcare System; Assistant Professor, Brigham and Women's Hospital
- **J. Marc Overhage, M.D., Ph.D.** President and CEO, Indiana Health Information Exchange; Director of Medical Informatics, Regenstrief Institute, Inc.; Professor, Indiana University School of Medicine
- **David D. Parker, R.N., M.H.S.** (For Theresa Cullen, M.D., M.S., I.T.S.C.) Indian Health Service, Office of Information Technology

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## Selected Outputs

### [Health IT Tools Landing Page](#)

The Health IT Tools landing page was a new addition to the Web site in 2008. This page provides direct links to tools developed or obtained by the NRC to assist health care organizations as they implement health IT into their practices. A sample of these tools is summarized below:

- [Compendium of Surveys](#)  
A searchable database of publicly available surveys focused on the evaluation of health IT projects. The surveys are categorized by survey type, technology, care setting, and respondent type. Each of the survey authors have given their permission for unrestricted use of the surveys so that organizations may download them and use them as is, or modify them for their own use.
- [Evaluation Toolkits](#)  
The evaluation toolkits provide guidance for health IT project teams to assist them in their development of evaluation plans and choosing measures for those plans. One toolkit is focused on health IT projects in general, the other focused on Health Information Exchange projects.
- [Quick Reference Guides](#)  
The quick reference guides provide detailed information about specific measures that can be incorporated into an evaluation plan. Each guide includes a brief description of the measure, summary of current literature on the measure, measurement methodology, and study design and analysis considerations.
- [Pediatric Rules, Reminders](#)  
This tool provides pediatricians with information about the use of rules and reminders in an electronic health record to improve adherence to clinical guidelines. A set of pediatric rules and reminders developed at Partner's Healthcare in Boston are available for download.
- [Pediatric Templates](#)  
These templates for acute and chronic pediatric conditions serve as an efficient way for clinicians to document a visit in an electronic health record and enhance adherence to clinical guidelines for those conditions. The templates were developed at Partner's Healthcare in Boston and are available for download.
- [Health IT Bibliography](#)  
The health IT bibliography compiles high quality resources to provide a wealth of information for individuals interested in health IT. The items in the health IT bibliography come from both peer reviewed journals and Web-based resources from reputable health care organizations.

### [The Clinical Decision Support \(CDS\) Initiative](#)

AHRQ has funded a variety of projects to further the use and development of CDS systems, which include demonstrations, white papers, and guides for implementing CDS. A dedicated portion of the NRC Web site was developed in 2008 to house materials developed under these projects.

### [Implementation Stories](#)

These stories feature AHRQ-funded projects where investigators successfully implemented health IT into everyday clinical practice and greatly improved patient care. The following implementation stories were developed in 2008:

- **Project:** [ECHO Extension for Community Healthcare Outcomes](#)  
**Principal Investigator:** Sanjeev Arora, M.D.
- **Project:** [Holomua Project Improving Transitional Care in Hawai'i](#)  
**Principal Investigator:** Christine Maii Sakuda, M.B.A.
- **Project:** [New Studies on Return on Investment for Health Information Technology Adoption](#)  
**Principal Investigator:** Mark Frisse, M.D.
- **Project:** [Enhancing Quality in Patient Care \(EQUIP\) Project](#)  
**Principal Investigator:** Fred Rachman, M.D.
- **Project:** [Improving Care in a Rural Region with Consolidated Imaging](#)  
**Principal Investigator:** Robert Coleman
- **Project:** [Creating an Evidence Base for Vision Rehabilitation](#)  
**Principal Investigator:** Cynthia Stuen, Ph.D.
- **Project:** [Implementing an Ambulatory Electronic Medical Record and Improving Shared Access](#)  
**Principal Investigator:** Michael Deluca, M.B.A., M.S.

#### Podcasts

Podcasts feature interviews with several principal investigators of AHRQ-funded Health IT projects who have had great success implementing health IT into their practice. The following Podcasts were released in 2008:

- **Project:** [ECHO Extension for Community Healthcare Outcomes](#)  
**Principal Investigator:** Sanjeev Arora, M.D.
- **Project:** [Valuation of Primary Care-Integrated Telehealth](#)  
**Principal Investigator:** Ken McConnochie, M.D., M.P.H.
- **Project:** [Enhancing Quality in Patient Care \(EQUIP\) Project](#)  
**Principal Investigator:** Fred Rachman, M.D.
- **Project:** [Holomua Project Improving Transitional Care in Hawai'i](#)  
**Principal Investigator:** Christine Maii Sakuda, M.B.A.

#### Liability Insurance Report

This report summarizes key findings from the AHRQ-funded State and Regional Demonstration projects and other Regional Health Information Organizations (HIOs). The report contains information about considerations, issues, and challenges associated with liability insurance for Regional Health Information Organizations, as well as recommendations from HIO representatives, lawyers, and insurance agents about the future handling of liability problems. Although released in 2009, the majority of the research for this report was developed in 2008.

#### e-Prescribing Program Brief

A program brief was developed in 2008 on e-Prescribing. It describes AHRQ's role in supporting e-Prescribing and provides information about the various e-Prescribing projects that AHRQ has funded.

## [e-Prescribing Expert Panel Report](#)

AHRQ convened a group of experts to discuss standards for e-Prescribing, building on the set of standards created by previous AHRQ and CMS funded projects. The report contains a summary of the discussion about the technical work, research, and testing needed for the standards to be recommended for widespread adoption.

## Lessons Learned Topics

The NRC completed content around a number of “lessons learned” topics in 2008. These included Ambulatory Computerized Provider Entry (ACPOE), Barcoded Medication Administration (BCMA), Telehealth, and Inpatient Computerized Physician Order Entry (CPOE). In 2008, this content was developed into three AHRQ-approved deliverable formats for the dissemination of “lessons learned” to the public. The three deliverable formats were:

- Emerging Lessons: Content geared toward Web publication on the AHRQ NRC Web site, with a section devoted to lessons from the AHRQ grantee programs.
- Decisionmaker Briefs: Two-page descriptions of lessons learned intended for organizational leaders and novice audiences.
- Issue Papers: In-depth, detailed reports of grantee findings and lessons learned.

Links to each of these documents are below:

### Ambulatory CPOE

- [Emerging Lessons](#) - Computerized Provider Order Entry - Ambulatory
- [Decisionmaker Brief](#) - Computerized Provider Order Entry
- [Issue Paper](#) - Ambulatory Computerized Provider Order Entry (CPOE) Findings from the AHRQ Health It Portfolio

### Barcoded Medication Administration

- [Emerging Lessons](#) - Bar-Coded Medication Administration
- [Decisionmaker Brief](#) - Bar-Coded Medication Administration
- [Issue Paper](#) - Using Barcode Medication Administration To Improve Quality And Safety Findings From The AHRQ Health IT Portfolio

### Chronic Disease Management

- [Emerging Lessons](#) - Health IT for Improved Chronic Disease Management
- [Decisionmaker Brief](#) - Chronic Disease Management
- [Issue Paper](#) - Innovations in Using Health IT for Chronic Disease Management Findings from the AHRQ Health IT Portfolio

### Inpatient CPOE

- [Emerging Lessons](#) - Computerized Provider Order Entry - Inpatient
- [Decisionmaker Brief](#) - Computerized Provider Order Entry
- [Issue Paper](#) - Inpatient Computerized Provider Order Entry (CPOE) Findings from the AHRQ Health IT Portfolio

## Telehealth

- [Emerging Lessons](#) - Telehealth
- [Decisionmaker Brief](#) - Telehealth
- [Issue Paper](#) - Using Telehealth to Improve Quality and Safety Findings from the AHRQ Health IT Portfolio

## Presentations at National Meetings

Dissemination of NRC activities was partially conducted by submitting abstracts to national conferences and, when accepted, conducting AHRQ-sponsored in-person presentation. These presentations were as follows:

- Cusack CM, Sapna Shah S. Web-Based Tools from AHRQ's National Resource Center. 2008 AMIA Annual Symposium, Washington, D.C.
- Dixon BE, Zafar A, Whipple EC, Cravens GD, McGowan JJ. Facilitating Informatics Knowledge Dissemination: Targeted Implementation Resources for Health Care Providers. 2008 AMIA Annual Symposium, Washington, D.C.
- Dixon B, Dimitropoulos L. Privacy and Security Solutions to Reduce Variation, Confusion, and Complexity in Organization-level Business Practices, Policies, and State Laws Related to Interoperable Health Information Exchange. HIMSS 2008 Annual Meeting, Chicago, IL.
- Moiduddin A, Dullabh P, Woolley R. Advancing the ePrescribing Research Agenda. 2008 AMIA Annual Meeting, Washington, D.C.
- Shah S, Cusack C. Health IT Survey Compendium. 2008 Academy Health Annual Research Meeting, Washington, D.C.
- Zayas-Cabán T, Dixon BE. Consumer Health IT Design: Human factors considerations for devices and systems used in the home. Healthcare Systems Ergonomics and Patient Safety International Conference; June 25-27, 2008; Strasbourg, France.
- White PJ, Woolley R. The Federal Government's Evaluation of E-Prescribing Standards: Challenges and Recommendations for Improvement. HIMSS 2008 Annual Meeting, Chicago, IL.

<b>Project Title:</b>	Use of Electronic Referral System to Improve the Outpatient Primary Care-Specialty Care Interface
<b>Principal Investigator:</b>	Bell, Douglas, M.D.
<b>Organization:</b>	RAND Corporation
<b>Contract Number:</b>	290-06-0017-3
<b>Project Period:</b>	09/07 – 09/09
<b>AHRQ Funding Amount:</b>	\$999,825
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project evaluates the implementation of a Web-based eReferral system developed by the University of California San Francisco (UCSF) and San Francisco General Hospital (SFGH). The project extends use of the system beyond the five clinics in which it is currently used to an additional specialty clinic, and it includes an intervention to expand use of the system by recruiting primary care providers at affiliated federally qualified health centers. The evaluation of this system centers on changes in the quality, efficiency, accessibility, and patient-centeredness of outpatient specialty care. The study will yield an implementation handbook, cost tool, and summaries of findings for dissemination to other care settings. The project is currently mid-way through and entering its final phases of post-intervention data collection and analysis.

### Specific Aims

- Compare changes among specialty clinics on indicators of the quality, efficiency, accessibility, and patient-centeredness of outpatient specialty care before and after use of eReferral. **(Ongoing)**
- Assess distinctive eReferral implementation practices among specialty and primary care sites and explore how these practices might influence the system’s success or failure in achieving business and health care goals. **(Ongoing)**
- Estimate the net costs (versus savings) from implementing eReferral for specialty and primary care sites and document the business case for the system’s adoption and use. **(Ongoing)**

**2008 Activities:** In 2008, the specialty intervention component in the SFGH Renal Clinic was launched and collection of pre-intervention cost-related tracking data in the Renal Clinic was completed. After SFGH management rejected the proposed intervention to develop an “Extranet” interface for eReferral with affiliated primary care clinics, we explored multiple alternative interventions with the clinics. At the end of 2008, these negotiations were ongoing.

In addition, the contractor completed analysis of preliminary before and after data on quantitative outcomes (quality, efficiency, accessibility, and patient-centeredness) in control versus intervention specialty clinics, before and after use of eReferral. Also completed were pre-intervention user interviews, development of a coding scheme for qualitative analysis of interview transcripts, and application of the coding scheme to mark up the transcripts using ATLAS.ti software.

Finally, the interim implementation and impact report was drafted and a draft “implementation handbook” was completed. Work also began on the final version. Preliminary results were presented to local stakeholders, including leaders at the San Francisco Health Plan.

**Preliminary Impact and Findings:** As of December 2008, preliminary findings were being summarized in an interim report to be submitted in early 2009.

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**Selected Outputs**

None available.

**Project Title:** Improving Asthma Care in an Integrated Safety Net through a Commercially Available Electronic Medical Record

**Principal Investigator:** Brottman, Gail, M.D.

**Organization:** Denver Health

**Contract Number:** 290-06-0020-5

**Project Period:** 09/07 - 12/09

**AHRQ Funding Amount:** \$484,760

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

**Summary:** This project seeks to improve the quality and patient-centeredness of asthmatic ambulatory care for children and adults. We will link a computerized decision support software application (electronic asthma action plan, or e-AAP) and a commercially available electronic health record [EHR] (Epic), two widely used applications that currently do not “talk” to each other. Providers then will be able to call up the e-AAP from Epic to help determine asthma severity, develop the best treatment plan, and print a one-page asthma action plan for the patient to take home. The intervention will be evaluated for its impact on the quality of asthma care. The development site is Hennepin County Medical Center (HCMC) in Minneapolis, Minnesota.

#### **Specific Aims**

- Develop the electronic decision support tool, with content based on the recommendations presented in the National Asthma Education and Prevention Program (NAEPP) 2007 Guidelines for the Diagnosis and Management of Asthma. **(Ongoing)**
- Create a mechanism that enables a user to call up the e-AAP while logged into a patient’s EHR. **(Ongoing)**
- Introduce the e-AAP to providers at eight HCMC primary care clinics, emphasizing how the e-AAP supports quality asthma care. **(Upcoming)**
- Create an asthma registry populated by data generated by the e-AAP and merged with asthma-relevant data generated by patient EHRs, and use the registry as the data source for regular reports showing clinic-by-clinic measures of asthma care quality. **(Upcoming)**

**2008 Activities:** We completed the model for the e-AAP, and the software developers began coding in December 2008. Technical development during 2008 also involved articulating the vision for the mechanism that would enable users to access the e-AAP from Epic.

**Preliminary Impact and Findings:** Preliminary findings to date concern the magnitude of effort required to convert recommendations for disease management expressed in a 450-page natural language narrative into executable computer code. The project extensively documents the issues encountered. Upon release in 2009, this documentation likely will have an impact on the processes by which clinical guidelines are developed and disseminated.

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**Selected Outputs**

The primary output to date is the model for the e-AAP, which is represented using the Microsoft product Visio as provided to AHRQ.

**Project Title:** Consumer Engagement in Developing Electronic Health Information Systems  
**Principal Investigator:** Kerwin, Jeffrey, Ph.D.  
**Organization:** Westat  
**Contract Number:** PSC TO#07R000131, IAA Number 06-443R-06  
**Project Period:** 09/07 – 06/09  
**AHRQ Funding Amount:** \$251,114  
**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** One important way that health information technology (IT) can improve the safety, quality, efficiency, and effectiveness of health care is through better supporting consumer engagement. This can be through directly providing a consumer interface into a health IT system, or through giving information to health care providers to assist in their patient interactions. As interest increases in reaching consumers and patients directly through information systems, it is important to understand what consumers want and how to get their feedback.

AHRQ has been funding research for novel patient safety and health IT projects, including projects in health information exchange (HIE). The value of IT investment in improving quality and safety depends a great deal on participation by the ultimate beneficiary: the patient/consumer. Health IT has the potential to reduce disparities and increase consumer participation in their self-care, as well as coordinate care for a patient-centered experience, but consumers have expressed a distrust of some health IT efforts. The utility of any health IT or HIE system will be greatly enhanced if a system designed to benefit the patient actually involves the patient in the planning, development, and implementation. Therefore, it behooves us to understand how to best engage patients and consumers. This contract will be used to fund an exploratory research study to gain insight into consumers' understanding, misunderstandings, fears, mistrusts, and concerns related to health IT and HIE in order to devise strategies to better engage consumers in the development of electronic health information systems.

We will conduct 20 focus groups with health care consumers in selected cities around the United States. In general, the groups will be homogenous with respect to the presence or absence of either of the following characteristics: 1) managing a chronic health condition (or the condition of a close family member), or 2) having visited at least three health care providers in the past 2 years. Consumers with a relatively "heavy" dependence on health care might be expected to have a very different frame of reference in considering health IT, as compared to persons with a lighter use of health care. We would expect that both the potential benefits and risks of health IT will be more immediately clear to those more dependent on health care, relative to the latter group. We will also construct several groups that are homogenous with respect to whether or not participants are covered by an HMO. Approximately two-thirds of physicians who practice within an HMO are using electronic medical records (at least partially), as compared to only about one-fifth of those in practices owned by the physicians themselves. Consumers who avoid HMOs often do so at least partly because they want maximum choice and independence with respect to the health care providers they visit, and this characteristic may be related to their perceptions of certain aspects of health IT (e.g., sharing of information among providers). Finally, it should be noted that four of the focus groups will be conducted with Spanish-speaking patients.

The project is expected to be completed by June 2009. AHRQ will receive the results in the form of intermittent summaries and a final report.

### **Specific Aims**

- Conduct 20 focus groups with health care consumers. **(Ongoing)**
- Prepare detailed report of study findings. **(Upcoming)**

**2008 Activities:** After obtaining OMB approval for the study in late summer, we first conducted two pretest focus groups, as a test of the moderator's discussion guide. The pretest groups provided valuable feedback for improving the discussion guide. We then conducted focus groups in Ohio (Columbus, as well as a medically underserved rural county); Denver, CO; and Providence, RI. Findings for each region were summarized in written reports.

**Preliminary Impact and Findings:** Findings thus far suggest that health care consumers do want to be engaged in at least one health IT issue: the sharing of their personal medical information (with other doctors, researchers, etc.). They would like to communicate directly with their health provider about who will have access to their medical information.

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### **Selected Outputs**

None Available.

<b>Project Title:</b>	Conducting Measurement Activities for Health Information Technology Initiative
<b>Principal Investigator:</b>	Spranca, Mark D., Ph.D.
<b>Organization:</b>	Abt Associates, Inc.
<b>Contract Number:</b>	PSC 23302008, TO#HHSP233200700008T
<b>Project Period:</b>	09/07 – 09/09
<b>AHRQ Funding Amount:</b>	\$710,109
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

**Summary:** Over the past 35 years, the Agency for Healthcare Research and Quality (AHRQ) and its predecessor agencies have made development of informatics an agency priority. In addition, AHRQ-supported research has played a central role in identifying the need for improvements where health information technology (IT) was applicable.

Given the significant investment by this initiative, there is a growing need to assess adoption and performance of health IT overall and to try to set benchmarks on which to gauge future performance.

The overarching goal of this ongoing project is to identify appropriate program performance measures that reflect the current focus of the health IT initiative at AHRQ and identify data sources to track those measures. The specific aims are to: support the work of the AHRQ health IT portfolio by providing suitable data, provide information on key questions related to health IT in order to inform activities of the initiative, and inform the health IT field.

### Specific Aims

- Develop reliable, valid, useful, timely, and cost-efficient measures and national estimates for four key measures of health IT progress:
  - Reduction in medication errors due to adoption of computerized provider order entry (CPOE) systems. **(Ongoing)**
  - The number of patients who can electronically access information on medication therapy. **(Upcoming)**
  - The number of clinicians who can electronically access evidence-based prevention or treatment information. **(Ongoing)**
  - The number of clinician organizations who have adopted evidence-based decision support technologies. **(Ongoing)**

AHRQ will use these measures to inform the activities of the AHRQ Health IT portfolio and to gauge national progress toward health IT adoption goals. Additionally, AHRQ will use this project as a model for future measure development efforts.

**2008 Activities:**

- Identified and defined work plans for each of the four Measurement Areas (delineated in Specific Aims)
- Developed analysis plans for all Measurement Areas
- Completed data collection on Measurement Areas 1, 3, and 4
- Developed and cognitively tested a new English- and Spanish-language survey instrument for Measurement Area 2
- Submitted survey for Measurement Area 2 to Office of Management and Budget for approval

**Preliminary Impact and Findings:** None available.

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**Selected Outputs**

None available.

<b>Project Title:</b>	Participation by Primary Care Practices in Health Information Exchange in Minnesota
<b>Principal Investigator:</b>	Fontaine, Pat, M.D.
<b>Organization:</b>	University of Minnesota
<b>Contract Number:</b>	290-07-10010-2
<b>Project Period:</b>	08/08 – 07/09
<b>AHRQ Funding Amount:</b>	\$254,423
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

**Summary:** This contract seeks to assess factors that influence small- and medium-sized primary care practices in Minnesota to participate in community-wide electronic health information exchange (HIE), defined as the exchange of electronic health information among multiple stakeholders such as hospitals, laboratories, ambulatory practices, and quality organizations. Assessments will focus on both the perceived benefits and barriers to HIE participation.

#### Specific Aims

- Conduct a systematic literature review of HIE, with emphasis on application to primary care practices. **(Achieved)**
- Determine the motivation and barriers to primary care practice participation in HIE. **(Ongoing)**
- Create a report that integrates the factors that affect participation in a community-based electronic HIE. **(Upcoming)**

**2008 Activities:** In 2008, the project completed a literature review of HIE and primary care clinics. We identified and secured agreements to participate from nine primary care practices in Northeastern Minnesota, West-central Minnesota, and the Twin Cities metropolitan area. By the end of 2008, eight of the nine practices had completed the survey and we had completed four site visits. Key informants for the site visits included clinic administrators, medical directors, and information technology staff.

#### Preliminary Impact and Findings:

##### *Extent of EMR and HIE implementation*

Most sites reported using electronic practice management systems for patient scheduling and registration. In most cases, this system was also used for referrals. Prescription-writing and -refills and laboratory communications were often electronic as well. Electronic methods to order radiology tests and obtain results were less common. Several data partners—including patient health records administrators, pharmacy benefit managers, and physicians outside the clinic—were not reported by any clinics. Sharing laboratory information was more common than sharing radiology and pharmacy information. Several clinics shared immunization records with the public health department. Also less common was data sharing with local hospitals and with payers.

### *Benefits*

At this point, we cannot make a list of broad themes relating to benefits based on formal qualitative analysis of the data, but we can provide a representative selection of themes based on investigator impressions from the site interviews. These themes are related to efficiency, cost savings, and quality.

### *Barriers*

Not one interviewee denied that the cost of buying an electronic medical record (EMR) system can impede adoption of electronic HIE. Some practices found ways to reduce the cost burden; for example: through Federal and State funding mechanisms related to EMR/HIE or with budgeting strategies that kept all costs from being funded entirely out of operating capital. In other words, cost is a problem in some practices, but in others it is a lower-level problem because the practices have figured out ways to manage them.

Lack of interoperability is an issue, not just among different commercial EMRs, but even between EMRs provided by the same vendor. Contrary to common belief, lack of appropriate technologies doesn't seem to be a major problem. It is technically possible to write programs to bridge different electronic systems. The issue is: who stands to benefit from the connection and, therefore, has a vested interest in providing leadership and resources to bring this about?

### *Security/privacy concerns*

The importance of security and data privacy was acknowledged, yet there was confusion about how HIPAA regulation should be applied to electronic HIE and some skepticism that HIPAA regulations were being applied fairly.

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### **Selected Outputs**

None Available.

**Project Title:** Barriers and Drivers of Health Information Technology Use for the Elderly, Chronically Ill and Underserved

**Principal Investigator:** Jimison, Holly B., Ph.D.

**Organization:** Oregon Health and Science University

**Contract Number:** 290-02-0024-9

**Project Period:** 07/07 – 08/08

**AHRQ Funding Amount:** \$250,000

**Summary Status as of:** August 2008, Conclusion of Contract

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

**Summary:** Oregon Health and Science University reviewed and synthesized available literature on the barriers and drivers of health information technology (IT) use for the elderly, chronically ill, and underserved. The review focused on the following key issues as they relate to these populations: the current usage of specific forms of consumer health IT, whether consumer health IT is effective in improving outcomes, what barriers hinder the use of consumer health IT, and what drivers or facilitators may stimulate or enable the use of consumer health IT. The final report also identifies gaps in the literature, suggests how barriers for health IT use for these populations may be overcome, and outlines the areas that could benefit from future research endeavors in order to better assess the health information needs of these populations.

The project team searched the MEDLINE®, CINHAHL®, PsycINFO®, the Cochrane Controlled Trials Register and Database of Systematic Reviews, ERIC, and the American Association of Retired Persons (AARP) AgeLine® databases for literature published since 1990 on the barriers and drivers to the use of interactive consumer health IT by the target populations listed above. Overall, the project reviewed 563 full-text articles and included 129 articles for abstraction. Through the review process, the team found distinct technology types that needed to be assessed separately: in-home monitoring, disease management, and self-management systems; online forums on health topics; patient access to their electronic health records (EHRs) and patient/physician e-mail; single or sporadic use of an interactive educational system; interactive training systems that monitor patient signals and provide immediate feedback; and interactive and tailored reminding systems.

#### **Specific Aims**

- Survey types of health IT that require interaction from the patient. **(Achieved)**
- Identify key drivers of interactive health IT use among key populations. **(Achieved)**
- Identify barriers to the use of these technologies. **(Achieved)**

**2008 Activities:** The final report was prepared for publication.

**Preliminary Impact and Findings:** The team found that several types of interactive consumer health IT were usable and effective in many settings and with all of the study's populations of interest. Convenience and ease-of-use were important drivers of system use, especially if the interventions could be delivered on technologies that users already had and interacted with on a daily basis. It was critical that data entry not be cumbersome and that the intervention fit into the user's daily routine. Perceived benefit,

system trust, anonymity for sensitive health conditions, and rapid clinician feedback were also important factors influencing the successful use of interactive consumer health IT.

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### **Selected Outputs**

Jimison H, Gorman P, Woods S, et al. Barriers and Drivers of Health Information Technology Use for the Elderly, Chronically Ill, and Underserved. Evidence Report/Technology Assessment No. 175 (Prepared by the Oregon Evidence-based Practice Center under Contract No. 290-02-0024). AHRQ Publication No. 09-E004. Rockville, MD: Agency for Healthcare Research and Quality. November 2008. Available at: <http://www.ahrq.gov/downloads/pub/evidence/pdf/hitbarriers/hitbar.pdf>. Accessed August 2009.

<b>Project Title:</b>	Participation by Primary Care Practices in Health Information Exchange (HIE) in Colorado
<b>Principal Investigator:</b>	West, David, Ph.D.
<b>Organization:</b>	University of Colorado, Denver
<b>Contract Number:</b>	290-07-10008-3
<b>Project Period:</b>	08/08 - 07/09
<b>AHRQ Funding Amount:</b>	\$249,992
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

**Summary:** Although the majority of health care encounters take place in small- to medium-sized ambulatory practices, little is known about what factors influence adoption of community-wide health information exchange (HIE) in these settings. This project aims to assess the perceived benefits and barriers that influence participation in community-wide electronic HIE initiatives, and to evaluate the potential effects of incentives for adoption. For this project, a community-wide electronic HIE initiative is defined as the exchange of electronic health information that includes more than one type of clinical data among multiple stakeholders in a community. A small- to medium-sized primary care practice is defined as a community-based medical practice that provides a full range of primary care services and involves 20 or fewer full-time clinicians. The project is employing a case study approach to collect and analyze qualitative and quantitative data from nine practice sites to evaluate current methods of HIE, motivations for adopting HIE-related functions, barriers to adoption, and the appeal of potential incentives. Three of the practice sites employ no electronic medical records (NO-EMR); two sites employ only electronic medical records (EMR-ONLY); and four sites are involved in the community-wide health information exchange (CW-HIE) program.

### Specific Aims

- Develop a report, using published research and commentary, on factors influencing stakeholder participation in community-wide HIE. **(Achieved)**
- Collect and analyze qualitative and quantitative data from nine primary care practices in three categories (“NO-EMR,” “EMR-ONLY,” and “CW-HIE”) to assess perceived benefits of, readiness to engage in, and barriers to HIE participation. **(Ongoing)**
- Based on this analysis, determine the relative strengths and weaknesses of different strategies for encouraging small- to medium-sized practices to participate in HIE. **(Upcoming)**

**2008 Activities:** The Colorado team conducted a review of the grey literature (reports, conference proceedings, etc.) addressing key issues in the value of HIE, particularly from the perspective of small- to medium-sized primary care practices. The findings are summarized in a report to AHRQ and will be combined with those from a complementary report from the University of Minnesota (based on analysis of peer-reviewed literature) to create a manuscript for publication.

In addition, the Colorado team enlisted nine primary care sites across the State to participate in case studies: three in the NO-EMR group, two in the EMR-ONLY group, and four in the CW-HIE group.

Data collection instruments were developed and refined based on literature review. Telephone interviews were conducted to prepare for on-site data collection in 2009.

**Preliminary Impact and Findings:** Key issues to be explored have been identified. From the perspective of small- to medium-size practices, potential motivators for adoption include reduced staff time in processing clinical notes and test results, improved timeliness and accessibility of results and reports (resulting in higher-quality, better coordinated care), less office space needed for paper charts, and faster claims processing. Potential barriers included the cost of implementing and maintaining health information technology associated with HIE (including the cost of hardware and software, the need for technical assistance, training costs, and potential loss of productivity during implementation), concerns about privacy and security, and concerns about use of HIE-derived data by other parties (such as health plans). Potential incentives to be explored include providing technical assistance and various monetary incentives.

Because the concept of HIE was new to several practices, it was useful in discussions to categorize several key functions of HIE: clinical messaging (delivery of test results), result lookup (ability to look up test results and reports ad hoc), electronic prescribing, electronic ordering of tests and referrals, and quality reporting.

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### **Selected Outputs**

The report “Key Issues in Health Information Exchange in Smaller Practices: Review of the Grey Literature” was submitted to AHRQ.

Materials to be used for telephone and onsite data collection were submitted to AHRQ for review.

A manuscript is in development as a collaborative effort with the University of Minnesota to summarize the findings of both the peer-reviewed and grey literature reviews.

A Final Report and manuscript for peer review are currently under development to disseminate the key findings of the Task Order.

**Table 13: Contract-Specific Summaries (Improved Decisionmaking)**

**HEALTH IT PORTFOLIO STRATEGIC GOAL:**

Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management (Improved Decisionmaking).

<b>AHRQ BUSINESS GOALS: IMPLEMENTATION AND USE, KNOWLEDGE CREATION, SYNTHESIS AND DISSEMINATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Gaylin, Dan, MPA	National Resource Center for Health Information Technology (NRC)	290-04-0016	<a href="#">Page 419</a>
<b>AHRQ BUSINESS GOAL: IMPLEMENTATION AND USE</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Doebbeling, Bradley, MD, MSc, FACP	Implementing and Improving the Integration of Decision Support into Outpatient Clinical Workflow	290-06-0013-3	<a href="#">Page 427</a>
No	Hsiao, Allen, MD, FAAP	Secure Messaging in a Pediatric Respiratory Medicine Setting	290-06-0015-2	<a href="#">Page 430</a>
No	McDonnell, Cheryl J, PhD	Use of Dense Display of Data and Information Design Principles in Primary Care Healthcare Information Technology Systems	290-07-10073-1	<a href="#">Page 432</a>
No	Nemeth, Lynne, PhD, RN	Implementation and Evaluation of Standing Orders Using Health Information Technology	290-07-10015-2	<a href="#">Page 434</a>
<b>AHRQ BUSINESS GOAL: KNOWLEDGE CREATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
No	Middleton, Blackford, MD, MPH, MSc	Clinical Decision Support Consortium	290-08-10010	<a href="#">Page 436</a>
No	Shiffman, Rick, MD, MCIS	Guidelines into Decision Support (GLIDES)	290-08-10011	<a href="#">Page 439</a>
<b>AHRQ BUSINESS GOAL: SYNTHESIS AND DISSEMINATION</b>				
<b>Completed in 2008</b>	<b>Principal Investigator</b>	<b>Project Title</b>	<b>Contract Number</b>	<b>Summary</b>
Yes	Black, Shirley	Patient Safety Electronic Health Records Meeting	290-08-10019	<a href="#">Page 442</a>
No	Fischer, Henry, MD	Assessing the Impact of a Dynamic Chronic Care Registry on Quality of Care	290-06-0020-6	<a href="#">Page 444</a>
No	Hasnain-Wynia, Romana, PhD	Improving Quality through Health Information Technology: Testing the Feasibility and Assessing the Impact of Using Existing Health Information Technology Infrastructure for Better Care Delivery	290-06-0022-3	<a href="#">Page 446</a>
No	Rosenthal, Daniel	Health Information Technology Enablement of Quality Measurement: Health Information Technology Expert Panel	290-07-10017-3	<a href="#">Page 448</a>

<b>Project Title:</b>	National Resource Center for Health Information Technology (NRC)
<b>Principal Investigator:</b>	Gaylin, Dan, M.P.A.
<b>Organization:</b>	National Opinion Research Center at the University of Chicago (NORC)
<b>Contract Number:</b>	290-04-0016
<b>Project Period:</b>	10/04 – 09/09
<b>AHRQ Funding Amount:</b>	\$22,374,134
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** The National Resource Center for Health IT crosses all of the AHRQ Strategic Goals:

- Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.
- Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.
- Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** The National Resource Center for Health IT crosses all of the AHRQ Business Goals:

- Knowledge Creation
- Synthesis and Dissemination
- Implementation and Use

**Summary:** The National Opinion Research Center (NORC) serves as the master contractor for the AHRQ National Resource Center for Health IT (NRC), 2004-2009. The NRC plays a pivotal role in supporting AHRQ's monitoring of all grants and many AHRQ-sponsored health IT portfolio contracts. The NRC was created in 2004 initially to provide direct support to AHRQ-funded health IT grants and some contracts, and to provide an open-access, easy-to-use platform for disseminating findings from those research projects. In 2005, the public NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)) was created to serve as the primary dissemination vehicle of information and tools in health IT to the wider health IT community. Under the direction of AHRQ, the NRC is instrumental in categorizing the health IT portfolio, synthesizing results, generating new tools, and engaging experts on important health IT initiatives, challenges, and opportunities. The NRC provides a number of important functions, including:

- Maintaining the NRC Web site ([www.healthit.ahrq.gov](http://www.healthit.ahrq.gov)).
- Providing direct technical and evaluation assistance to grantees, contractors, and would-be contractors through a variety of media, e-mail, telephone, Web-based conferencing, and in-person meetings.
- Collecting and disseminating lessons learned from AHRQ health IT projects via Implementation Stories, Podcasts, Issue Papers, Decisionmaker Briefs, and Emerging Lessons.
- Creating new resources, tools, and best practices to support those in implementing and evaluating health IT.
- Gathering and categorizing existing health IT resources for dissemination via the NRC Knowledge Repository.
- Supporting the AHRQ Annual Meeting, including logistics, preparation, and hosting of grantee networking activities.

NORC at the University of Chicago is the prime contractor for the NRC with a number of partners, including Regenstrief Institute; the Vanderbilt Center for Better Health (VCBH); the Center for IT Leadership (CITL); and John Snow, Incorporated. The NRC has a number of teams that support a set of core activities involving the grantees and contractors, as well as teams that build and maintain the infrastructure and content of the NRC Web site. These teams include the Value and Evaluation Team, the Technical Assistance Team, the Knowledge Repository Team, and the Dissemination Team. In addition, the NRC supports AHRQ in their administration of specific contract initiatives, including the State Regional Demonstration Projects and the Clinical Decision Support Projects. Frequently, the NRC will support additional specific targeted initiatives, such as the e-Prescribing work done in 2008.

This contract has also supported some trans-Federal health IT initiatives through AHRQ's work with the Office of the National Coordinator for Health Information Technology (ONC).

**2008 Activities:** Below are brief summaries of activities of the core NRC teams in 2008. Several of the example products mentioned below are identified in the Output section of the summary, where Web links are provided.

#### Value and Evaluation Team

In 2008, the Value and Evaluation Team (E&V) consisted of individuals from Indiana University/Regenstrief Institute; CITL; VCBH; John Snow, Inc.; and NORC. During the year, the E&V team provided ongoing direct evaluation support to AHRQ-funded health IT projects in the form of teleconferences, written and verbal feedback around evaluation plans, and in-person site visits to assist in the revision of evaluation plans. The team developed, released, and populated a compendium of surveys in order to provide the health IT community access to publicly available surveys involving health IT evaluation. A set of pediatric reminders and templates were packaged and made available on the Web site so that implementers of decision support might have a starting point when creating similar tools. The previously written evaluation toolkits underwent revisions in order to expand and refine sections on project design, evaluation measures, evaluation resources and statistical support. Some of the toolkits' measures were expanded to build Quick Reference Guides to provide additional guidance to those wanting to evaluate particular measures. The team prepared two summary reports for AHRQ and hosted a national teleconference on evaluation, entitled "The Importance of Evaluation in Health IT Implementation: Practical Advice for Providers and Health," on May 15, 2008.

#### Technical Assistance Team

In 2008, the Technical Assistance Team (TA) consisted of individuals from Astech Consulting; Booz Allen Hamilton; Indiana University/Regenstrief Institute; CITL; VCBH; John Snow, Inc.; and NORC. The TA team continued to provide direct technical assistance to AHRQ health IT projects throughout 2008. This technical assistance took the form of one-on-one calls and e-mail support, grantee open-forums, facilitation of grantee interaction, and organization of teleconferences around a variety of topics. The team continued to provide points of contact (POCs) for each of the grantees and conducted regular touch-base calls. The team continued to build and refine a taxonomy to categorize grantees and their technologies of focus and care settings. Throughout 2008, the TA team was largely focused on "knowledge capture" and "tool development," developing a series of publications on lessons learned from the AHRQ Health IT portfolio; these areas included Telehealth, Chronic Disease Management, Barcoded Medication Administration, and Inpatient and Ambulatory Computerized Order Entry. The results of this research were released to the NRC Web site as part of the Emerging Lessons section, short Decisionmaker Brief summaries, and longer Issue Papers. Two additional areas of focus were begun in 2008, including Rural and Underserved Populations, and Long-Term Care. Finally, the TA team planned, scheduled, and hosted eight national teleconferences on key health IT topics. The transcripts and

PowerPoint Presentations are available for all of these teleconferences in the Events section of the NRC Web site, [www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov). The documents noted are listed in the Outputs section, below.

### Knowledge Repository Team

The Knowledge Repository (KR) Team continued its efforts to expand and improve the use of a knowledge repository containing health IT best practices in 2008. Efforts to maintain and improve this knowledge repository involved a broad team of content experts and knowledge assistants, including individuals from CITL, Indiana University/Regenstrief Institute, NORC, and VCBH. In 2008, over 50 expert-reviewed documents were added to the central Knowledge Library Repository (KL), and over 1,100 documents were aggregated from external sources and added to the KL. The content of the NRC Web site was maintained by the KR team, including updating the Health IT Events calendar, as well as adding regular content to the Emerging Lessons, Health IT Tools, and Funding Opportunities sections. Grantee profiles and the grantee map were updated in 2008. Peer-reviewed publications by AHRQ-funded grantees were added to grantee profiles, as well as to the News and Publications page. In 2008, focus groups were held with targeted groups to elicit feedback around the NRC Web site in order to determine future initiatives. In 2008, 45 new portal communities were added to the vibrant NRC Extranet portal community. These communities support collaboration, social networking, and Web conferences within and among each other. The NRC portal itself provides the necessary Web 2.0 tools to share documents and links, host discussion forums, support Web pages, and provide RSS feeds, as well as integrated search functionality to find resources and administration modules to manage users within a community. There are currently more than 200 communities actively collaborating and participating with more than 6,000 users.

### Dissemination Team

In 2008, the Dissemination Team consisted of individuals from Burness Communications, Indiana University/Regenstrief Institute, CITL, and NORC. Dissemination activities included writing implementation stories and podcast scripts, producing the grantee e-mail newsletter, editing Web content, and participating in national conferences.

### State Regional Demonstration and Clinical Decision Support Project Support

Throughout 2008, the NRC provided support to both the State Regional Demonstration (SRD) and Clinical Decision Support (CDS) projects. This support included organizing and facilitating 11 meetings between all 6 SRD projects and AHRQ, 9 of which were held by teleconference and 2 as in-person meetings. Evaluation support was provided to the SRDs throughout the year. The NRC tracked the SRD contracts' monthly progress reports and deliverables. A framework for SRD sustainability plans was developed by the NRC and a Liability Insurance report was written.

The NRC facilitated bi-weekly calls with ARHQ project officers for project planning and oversight of the CDS projects. Project and work plans of both CDS contracts were reviewed, and feedback was presented to ARHQ. The NRC formed a 15-member technical expert panel to conduct key activities for CDS projects. In addition, the NRC organized and facilitated four technical expert panel meetings, two of which were in-person meetings. The NRC contracted and oversaw the development of three white papers on CDS topics. The NRC made the preparations for a CDS Town Hall meeting with AMIA and a CDS DesignShop meeting with VCBH.

### Support of e-Prescribing Activities

In 2006, the NRC hosted an e-prescribing standards expert meeting. In addition, they organized and hosted three national teleconferences on findings from the evaluation of e-prescribing pilot sites, managed

the electronic prior authorization (e-PA) subcontract, and produced a program brief focused on e-prescribing.

The AHRQ NRC Steering Committee held their annual meeting on June 5, 2008. The Steering Committee includes a diverse group of leaders in the field of health IT, and representatives from AHRQ and HRSA attended the meeting. The agenda for this year's meeting was divided into three segments: 1) a retrospective overview of NRC activities to date; 2) a group discussion of recommended activities in the near future, including recommendations about how to best disseminate outputs and activities of the NRC; and 3) a group discussion of a broader long-term vision for the NRC. The Steering Committee was asked to consider specific recommendations and next steps for the NRC.

The members of this group are as follows:

- **Cheryl Austein-Casnoff, M.P.H.** Associate Administrator for Health Information Technology, Health Resources and Services Administration, U.S. Department of Health and Human Services
- **Michael S. Barr, M.D., M.B.A., F.A.C.P.** Vice President, Practice Advocacy and Improvement for the American College of Physicians
- **Meryl Bloomrosen, M.B.A.** (representing Don Detmer, M.D., M.A., American Medical Informatics Association) Associate Vice President, American Medical Informatics Association
- **Pascale Carayon, Ph.D.** Procter & Gamble Bascom Professor and Director of the Center for Quality and Productivity Improvement, University of Wisconsin-Madison
- **Karen C. Fox, Ph.D.** Chief Operating Officer, Delta Health Alliance
- **Mark Frisse, M.D., M.B.A., M.Sc.** Accenture Professor and Director, Vanderbilt University
- **Betsy L. Humphreys, B.A., M.L.S.** Deputy Director, U.S. National Library of Medicine
- **Charles D. Kennedy, M.D.** Vice President of Health Information Technology, WellPoint, Inc.
- **Carmen B. Lozzio, M.D., F.A.C.M.G.** Professor, University of Tennessee
- **Blackford Middleton, M.D., M.P.H., M.Sc.** Corporate Director, Clinical Informatics Research & Development; Chairman, Center for Information Technology Leadership at Partners Healthcare System; Assistant Professor, Brigham and Women's Hospital
- **J. Marc Overhage, M.D., Ph.D.** President and CEO, Indiana Health Information Exchange; Director of Medical Informatics, Regenstrief Institute, Inc.; Professor, Indiana University School of Medicine
- **David D. Parker, R.N., M.H.S.** (For Theresa Cullen, M.D., M.S., I.T.S.C.) Indian Health Service, Office of Information Technology

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## Selected Outputs

### [Health IT Tools Landing Page](#)

The Health IT Tools landing page was a new addition to the Web site in 2008. This page provides direct links to tools developed or obtained by the NRC to assist health care organizations as they implement health IT into their practices. A sample of these tools is summarized below:

- [Compendium of Surveys](#)  
A searchable database of publicly available surveys focused on the evaluation of health IT projects. The surveys are categorized by survey type, technology, care setting, and respondent type. Each of the survey authors have given their permission for unrestricted use of the surveys so that organizations may download them and use them as is, or modify them for their own use.
- [Evaluation Toolkits](#)  
The evaluation toolkits provide guidance for health IT project teams to assist them in their development of evaluation plans and choosing measures for those plans. One toolkit is focused on health IT projects in general, the other focused on Health Information Exchange projects.
- [Quick Reference Guides](#)  
The quick reference guides provide detailed information about specific measures that can be incorporated into an evaluation plan. Each guide includes a brief description of the measure, summary of current literature on the measure, measurement methodology, and study design and analysis considerations.
- [Pediatric Rules, Reminders](#)  
This tool provides pediatricians with information about the use of rules and reminders in an electronic health record to improve adherence to clinical guidelines. A set of pediatric rules and reminders developed at Partner's Healthcare in Boston are available for download.
- [Pediatric Templates](#)  
These templates for acute and chronic pediatric conditions serve as an efficient way for clinicians to document a visit in an electronic health record and enhance adherence to clinical guidelines for those conditions. The templates were developed at Partner's Healthcare in Boston and are available for download.
- [Health IT Bibliography](#)  
The health IT bibliography compiles high quality resources to provide a wealth of information for individuals interested in health IT. The items in the health IT bibliography come from both peer reviewed journals and Web-based resources from reputable health care organizations.

### [The Clinical Decision Support \(CDS\) Initiative](#)

AHRQ has funded a variety of projects to further the use and development of CDS systems, which include demonstrations, white papers, and guides for implementing CDS. A dedicated portion of the NRC Web site was developed in 2008 to house materials developed under these projects.

### [Implementation Stories](#)

These stories feature AHRQ-funded projects where investigators successfully implemented health IT into everyday clinical practice and greatly improved patient care. The following implementation stories were developed in 2008:

- **Project:** [ECHO Extension for Community Healthcare Outcomes](#)  
**Principal Investigator:** Sanjeev Arora, M.D.
- **Project:** [Holomua Project Improving Transitional Care in Hawai'i](#)  
**Principal Investigator:** Christine Maii Sakuda, M.B.A.
- **Project:** [New Studies on Return on Investment for Health Information Technology Adoption](#)  
**Principal Investigator:** Mark Frisse, M.D.
- **Project:** [Enhancing Quality in Patient Care \(EQUIP\) Project](#)  
**Principal Investigator:** Fred Rachman, M.D.
- **Project:** [Improving Care in a Rural Region with Consolidated Imaging](#)  
**Principal Investigator:** Robert Coleman
- **Project:** [Creating an Evidence Base for Vision Rehabilitation](#)  
**Principal Investigator:** Cynthia Stuen, Ph.D.
- **Project:** [Implementing an Ambulatory Electronic Medical Record and Improving Shared Access](#)  
**Principal Investigator:** Michael Deluca, M.B.A., M.S.

#### Podcasts

Podcasts feature interviews with several principal investigators of AHRQ-funded Health IT projects who have had great success implementing health IT into their practice. The following Podcasts were released in 2008:

- **Project:** [ECHO Extension for Community Healthcare Outcomes](#)  
**Principal Investigator:** Sanjeev Arora, M.D.
- **Project:** [Valuation of Primary Care-Integrated Telehealth](#)  
**Principal Investigator:** Ken McConnochie, M.D., M.P.H.
- **Project:** [Enhancing Quality in Patient Care \(EQUIP\) Project](#)  
**Principal Investigator:** Fred Rachman, M.D.
- **Project:** [Holomua Project Improving Transitional Care in Hawai'i](#)  
**Principal Investigator:** Christine Maii Sakuda, M.B.A.

#### Liability Insurance Report

This report summarizes key findings from the AHRQ-funded State and Regional Demonstration projects and other Regional Health Information Organizations (HIOs). The report contains information about considerations, issues, and challenges associated with liability insurance for Regional Health Information Organizations, as well as recommendations from HIO representatives, lawyers, and insurance agents about the future handling of liability problems. Although released in 2009, the majority of the research for this report was developed in 2008.

#### e-Prescribing Program Brief

A program brief was developed in 2008 on e-Prescribing. It describes AHRQ's role in supporting e-Prescribing and provides information about the various e-Prescribing projects that AHRQ has funded.

## [e-Prescribing Expert Panel Report](#)

AHRQ convened a group of experts to discuss standards for e-Prescribing, building on the set of standards created by previous AHRQ and CMS funded projects. The report contains a summary of the discussion about the technical work, research, and testing needed for the standards to be recommended for widespread adoption.

## Lessons Learned Topics

The NRC completed content around a number of “lessons learned” topics in 2008. These included Ambulatory Computerized Provider Entry (ACPOE), Barcoded Medication Administration (BCMA), Telehealth, and Inpatient Computerized Physician Order Entry (CPOE). In 2008, this content was developed into three AHRQ-approved deliverable formats for the dissemination of “lessons learned” to the public. The three deliverable formats were:

- Emerging Lessons: Content geared toward Web publication on the AHRQ NRC Web site, with a section devoted to lessons from the AHRQ grantee programs.
- Decisionmaker Briefs: Two-page descriptions of lessons learned intended for organizational leaders and novice audiences.
- Issue Papers: In-depth, detailed reports of grantee findings and lessons learned.

Links to each of these documents are below:

### Ambulatory CPOE

- [Emerging Lessons](#) - Computerized Provider Order Entry - Ambulatory
- [Decisionmaker Brief](#) - Computerized Provider Order Entry
- [Issue Paper](#) - Ambulatory Computerized Provider Order Entry (CPOE) Findings from the AHRQ Health It Portfolio

### Barcoded Medication Administration

- [Emerging Lessons](#) - Bar-Coded Medication Administration
- [Decisionmaker Brief](#) - Bar-Coded Medication Administration
- [Issue Paper](#) - Using Barcode Medication Administration To Improve Quality And Safety Findings From The AHRQ Health IT Portfolio

### Chronic Disease Management

- [Emerging Lessons](#) - Health IT for Improved Chronic Disease Management
- [Decisionmaker Brief](#) - Chronic Disease Management
- [Issue Paper](#) - Innovations in Using Health IT for Chronic Disease Management Findings from the AHRQ Health IT Portfolio

### Inpatient CPOE

- [Emerging Lessons](#) - Computerized Provider Order Entry - Inpatient
- [Decisionmaker Brief](#) - Computerized Provider Order Entry
- [Issue Paper](#) - Inpatient Computerized Provider Order Entry (CPOE) Findings from the AHRQ Health IT Portfolio

## Telehealth

- [Emerging Lessons](#) - Telehealth
- [Decisionmaker Brief](#) - Telehealth
- [Issue Paper](#) - Using Telehealth to Improve Quality and Safety Findings from the AHRQ Health IT Portfolio

## Presentations at National Meetings

Dissemination of NRC activities was partially conducted by submitting abstracts to national conferences and, when accepted, conducting AHRQ-sponsored in-person presentation. These presentations were as follows:

- Cusack CM, Sapna Shah S. Web-Based Tools from AHRQ's National Resource Center. 2008 AMIA Annual Symposium, Washington, D.C.
- Dixon BE, Zafar A, Whipple EC, Cravens GD, McGowan JJ. Facilitating Informatics Knowledge Dissemination: Targeted Implementation Resources for Health Care Providers. 2008 AMIA Annual Symposium, Washington, D.C.
- Dixon B, Dimitropoulos L. Privacy and Security Solutions to Reduce Variation, Confusion, and Complexity in Organization-level Business Practices, Policies, and State Laws Related to Interoperable Health Information Exchange. HIMSS 2008 Annual Meeting, Chicago, IL.
- Moiduddin A, Dullabh P, Woolley R. Advancing the ePrescribing Research Agenda. 2008 AMIA Annual Meeting, Washington, D.C.
- Shah S, Cusack C. Health IT Survey Compendium. 2008 Academy Health Annual Research Meeting, Washington, D.C.
- Zayas-Cabán T, Dixon BE. Consumer Health IT Design: Human factors considerations for devices and systems used in the home. Healthcare Systems Ergonomics and Patient Safety International Conference; June 25-27, 2008; Strasbourg, France.
- White PJ, Woolley R. The Federal Government's Evaluation of E-Prescribing Standards: Challenges and Recommendations for Improvement. HIMSS 2008 Annual Meeting, Chicago, IL.

<b>Project Title:</b>	Implementing and Improving the Integration of Decision Support into Outpatient Clinical Workflow
<b>Principal Investigator:</b>	Doebbeling, Bradley, M.D., M.S.
<b>Organization:</b>	Indiana University
<b>Contract Number:</b>	290-06-0013-3
<b>Project Period:</b>	09/07 - 09/09
<b>AHRQ Funding Amount:</b>	\$394,622
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project encompasses a field study and controlled simulation analysis to integrate colorectal cancer screening clinical decision support (CDS) into outpatient clinical workflow. The study includes key informant interviews on site-specific best practices; direct observation of colorectal cancer screening CDS to identify barriers and facilitators to workflow integration; rapid prototyping of design alternatives based on those findings; controlled simulation to test the impact of design on efficiency, usability, and workload; and implementation of the refined CDS in local clinics to assess usability and impact. The implementation plan involves institutions that have demonstrated improved quality and efficiency using CDS: the Regenstrief Institute, the Department of Veterans Affairs (VA), and Partners Healthcare System.

**Key measures:** The first phase of the project, including the site visits, employs qualitative methods to understand factors related to effective integration of CDS into clinical workflow. Since this phase is qualitative in nature, there are not specific measures associated with the first study phase. The team intends to use rich qualitative observational data to understand key barriers to CDS workflow integration in the use of different electronic medical records (EMRs). Measurable “attributes” associated in the second project phase include efficiency, usability, and workload to demonstrate improved clinical workflow integration in both a simulated setting and actual implementation into clinical practice.

### Specific Aims

- Identify key approaches to CDS development for colorectal cancer screening at two Veterans Affairs Medical Center (VAMC) sites and two nationally recognized non-VA sites, for effective CDS integration into clinical workflow. **(Ongoing)**
  - Hypothesis 1: Effective colorectal cancer screening CDS integration into workflow requires system redesign, human factors assessment, pilot testing, use at the bedside or patient room, and provider training and support.
- Develop and test CDS design alternatives for improved integration into clinical workflow through a controlled simulation study and subsequent implementation. **(Ongoing)**
  - Hypothesis 2: Providers will experience improved efficiency and usability, and decreased workload when using design alternatives for colorectal cancer screening CDS compared to current CDS.

**2008 Activities:** In 2008, the project team finished its visits to all four nationally recognized sites. As coding and collating phase one observation data began, including direct observation of provider interaction with clinical reminders, key informant interviews, and focus groups of providers, it was

recognized that there was a greater volume and richness in the data than had been anticipated. The project was and continues to be pleasantly surprised by the findings that could be drawn from observations and discussions during the four site visits.

**Preliminary Impact and Findings:** As the project collated data and developed common themes, it was discovered that, despite the differences among the sites visited, they had several issues and barriers in common. A rough list of common themes discovered from our data follows:

- **Coordination of outside results** (which includes):
  - Reducing reliance on patient memory
  - Holes in colorectal cancer screening (CRCS) clinical reminders (CR) that are not satisfied or resolved
  - Outside exam results that are received in paper form do not get into electronic form
  - Documenting and tracking outside colonoscopy results in the computerized CDS
- **Data organization and presentation** (which includes):
  - No way to see if a colonoscopy has been ordered or scheduled
  - Prioritization of issues
  - Frustration that the provider can enter information into a GI consult, but then an error message is returned stating that the provider must enter the same information into the CRCS CR
  - No way to determine where the patient is in the CRCS process
- **Provider and patient education** (which includes):
  - Providers not knowing what the CR is for and how to satisfy it
  - Providers are not aware of the current best practices and guidelines for CRCS
  - Poor understanding of fecal occult blood test (FOBT) process
  - Inability to print educational information and literature for the patient from the exam room
  - Patient reluctance toward colonoscopy
  - Inability to print a reminder for the patient to complete followup
- **Navigation**
  - Need better navigation
  - Hard to navigate interface
  - Rigid and inflexible interface
  - Need to add navigation tools
- **Technological enhancements**
  - Inability to draw a lesion
  - Cleaning up inapplicable and/or inaccurate CR for CRCS
- **Form of decision support and connecting it to quality reporting**
- **Workflow/role assignments**
  - Unclear as to who captures necessary information for screening
- **Organizational issues**
  - Configuration of the exam room and placement of the computer
  - Not always an available computer for provider to use
  - Not enough time to satisfy reminders
- **Coordination between gastrointestinal (GI) and primary care**
  - Resolving CR—primary care providers have to locate the results and satisfy the reminder
  - Coordination between GI and primary care

Looking forward, we are exploring facets of redesign that could eliminate or reduce the barriers and facilitate a more seamless interaction among provider, clinical reminders, and patients.

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**Selected Outputs**

As of 2008, manuscripts had been drafted but none had yet been published. We anticipate submitting up to four publications to AMIA in 2009.

<b>Project Title:</b>	Secure Messaging in a Pediatric Respiratory Medicine Setting
<b>Principal Investigator:</b>	Hsiao, Allen, M.D., F.A.A.P.
<b>Organization:</b>	Yale New Haven Health Services Corporation
<b>Contract Number:</b>	290-06-0015-2
<b>Project Period:</b>	09/07 – 09/09
<b>AHRQ Funding Amount:</b>	\$399,970
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** This project aims to evaluate how implementation of a secure e-mail messaging (e-messaging) system between clinicians and patients and/or guardians affects provider time, emergency department (ED) use for medication refills, and qualitative satisfaction with care of patients in a pediatric respiratory medicine setting. Currently the project is mid-way through, having completed 5 months of in-person recruitment of patients receiving care at the Yale Pediatric Respiratory Medicine Clinic, a subspecialty clinic within a tertiary care hospital serving diverse patients. A total of 176 patients expressed interest in using the system, with 117 of them agreeing to and completing a study survey of demographic information and experience with technology; 57 patients have enrolled to use the system, 54 of them on-site with the assistance of a research assistant. Two rounds of electronic reminders have been sent to patients who have expressed interest but have not yet signed up for the system.

Before enrolling patients, a time-motion study was conducted of clinic providers answering numerous phone calls from patients requesting appointments, refills, and information. The goal was to be able to determine whether this work took more or less time after implementation of the project. In addition, the project reviewed and abstracted logs of phone notes, categorizing the reasons for clinic contact.

Because of the low number of users, substantive comparisons cannot yet be made. It is unclear why interest in this new service has not been stronger. The few people who have used the system appear to be patients and families who are relatively new to the practice. The project began qualitative interviews to explore patients' thoughts and possible reasons for not signing up or for signing up and not using the system. Input is sought from those who have used the system to assess their satisfaction. Patient enrollment is continuing, but the project is now targeting new patients.

Despite these challenges, the team is optimistic that the project will yield a great deal of useful information. In particular, it is hoped that our qualitative interviews with patients will uncover information about unanticipated barriers to adopting the service. Such barriers may include patient belief that secure messaging is more cumbersome and difficult to use than traditional e-mail, user preference for direct e-mail with their providers over e-mail with "the clinic," and patient perception that a well-run phone system offers faster service than a secure messaging system. This may prove to be a case in which the technology is currently ahead of its target users (patients and families). So far, patients appear to prefer more traditional methods of contact at this clinic.

### Specific Aims

- Evaluate the impact of secure messaging with regard to provider time, ED use for medication refills, and qualitative satisfaction by patients and clinicians. **(Ongoing)**

- Understand the content of what children, adolescents, and their parents will send as a secure message to their provider. **(Ongoing)**

**2008 Activities:** In 2008, the time-motion study of providers fielding patient inquiries was conducted, establishing a baseline prior to starting enrollment. In addition, inquiries were abstracted into different categories, in anticipation of secure health messaging content once patients enrolled.

**Preliminary Impact and Findings:** There are none to report at this time.

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### **Selected Outputs**

None available.

<b>Project Title:</b>	Use of Dense Display of Data and Information Design Principles in Primary Care Healthcare Information Technology Systems
<b>Principal Investigator:</b>	McDonnell, Cheryl J., Ph.D.
<b>Organization:</b>	James Bell Associates
<b>Contract Number:</b>	290-07-10073-1
<b>Project Period:</b>	05/08 – 05/09
<b>AHRQ Funding Amount:</b>	\$249,955
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** As of December 2008, the Use of Dense Display of Data and Information Design Principles in Primary Care Healthcare Information Technology (IT) Systems project (Dense Data Project) was 7 months into a 12-month contract. The Dense Data Project builds upon best practices to deliver innovative designs to clearly express the volume of data necessary to improve the quality of clinical care. The goal of the project is to establish a foundation and action agenda for the use of dense display of data and other innovative information design principles in primary care health IT applications. Project activities include reviewing existing research and evidence; identifying and convening a multi-disciplinary expert panel to establish design principles and evaluation criteria; and producing a synthesis of the information into a final report, use cases, and recommendations for ongoing research, implementation, and policy work in this field.

### Specific Aims

- Establish a foundation and an action agenda in the area of dense display of data and information design to provide insights into designing better primary care electronic health records (EHRs). **(Ongoing)**
- Complete a detailed background report, which contains a comprehensive summary of the literature and will serve as the basis for the final report. **(Achieved)**
- Conduct an Innovation Meeting comprising a group of experts in diverse areas related to the EHR and its design. The innovation group will be able to define what would be ideal user interfaces, primarily from the point of view of a primary care physician. This involves indicating how EHRs both are and are not being used optimally. Additional considerations include patient safety and risk, efficiency, and the impact of having scattered information. **(Ongoing)**
- Compile a set of recommendations on principles and policy and a research agenda. **(Ongoing)**
- Compile a set of use cases. **(Ongoing)**
- Complete a final report that integrates the background report and the output from the Innovation Meeting. **(Ongoing)**

**2008 Activities:** During 2008, the literature review on existing research and evidence related to dense display of data and information design principles in primary care health care IT systems was completed.

**Preliminary Impact and Findings:** Project is ongoing, preliminary findings not yet available.

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## **Selected Outputs**

A final report will integrate the background report and the output from the Innovation Meeting to provide a set of use cases and recommendations for research, implementation, and policy activities for AHRQ.

<b>Project Title:</b>	Implementation and Evaluation of Standing Orders Using Health Information Technology
<b>Principal Investigator:</b>	Nemeth, Lynne, Ph.D., R.N.
<b>Organization:</b>	Medical University of South Carolina
<b>Contract Number:</b>	290-07-10015-2
<b>Project Period:</b>	06/08 – 07/10
<b>AHRQ Funding Amount:</b>	\$500,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

**Summary:** A standing order (SO) in primary care practice authorizes nurses and other staff to carry out a medical order (test, vaccination, etc.) according to a practice-approved protocol without a provider's exam. Previous research shows SOs are effective for immunizations within practices not using electronic medical records (EMRs). The potential advantage of reminder systems within EMRs provides an opportunity to improve additional preventive and chronic care measures. The goals of this project are: 1) to incorporate a variety of SOs into daily workflow of eight PPRNet (Practice Partner Research Network) primary care practices using their EMRs (Practice Partner, McKesson, Inc. Seattle, WA); 2) to identify methods and strategies used by practices and barriers/facilitators to the uptake and sustained use of SOs; and 3) to measure change in 15 quality indicators resulting from use of SOs. The study design is a mixed methods quality improvement intervention. Quantitative data measures are calculated from EMR extracts quarterly; qualitative data are obtained through observation in practice site visits, interviews during these visits and network meetings, e-mail, and phone correspondence. The sample includes eight PPRNet primary care practices with 2-15 providers not previously involved in PPRNet interventions or using SOs.

This study uses the PPRNet-TRIP (Translating Research Into Practice) Quality Improvement (QI) models, an intervention model, an improvement model, and practice development model to evaluate the use of standing orders over 18 months. Practices experiment using these models to adopt changes into practice.

The outcome measures for this study include:

- Four screening measures (cholesterol, HDL-cholesterol, mammograms, osteoporosis).
- Six adult immunization measures (influenza, pneumonia, tetanus, zoster).
- Five diabetes measures (HgA1C, urinary microalbumin, HDL, LDL-cholesterol, triglycerides).

The project will develop a compendium of strategies for implementation of electronic SOs as one of its' main deliverables. Barriers to the process of implementing these SOs and success factors that lead to successful facilitation of this effort will be synthesized. This study began during the last half of 2008.

### Specific Aims

- Facilitate the initiation of an electronic SO system and its incorporation into daily workflow in eight primary care practices, identifying best methods and strategies. **(Ongoing)**
- Determine barriers and facilitators to the uptake and sustained use of electronic SOs in these practices. **(Ongoing)**

- Document changes in quality-of-care indicators and practice time management resulting from the use of electronic SOs. **(Ongoing)**
- Disseminate findings to the rest of the research network and to publish results in a peer-reviewed medical journal. **(Upcoming)**

**2008 Activities:** We recruited and enrolled eight primary care practices within PPRNet that had not previously participated in any PPRNet interventions. A network introductory meeting was held in October 2008, in Nashville, TN. PPRNet research team members and consultants met with physician and staff liaisons of each of the participating practices to provide an overview of the study. The first site visits to each practice to introduce the study, observe clinical practice settings and workflow, and assist the practices with planning for project implementation and monitoring. Qualitative and quantitative data were collected to assess the project at baseline and subsequent stages.

**Preliminary Impact and Findings:** None available.

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### **Selected Outputs**

None available.

<b>Project Title:</b>	Clinical Decision Support Consortium
<b>Principal Investigator:</b>	Middleton, Blackford, M.D., M.P.H., M.Sc.
<b>Organization:</b>	Brigham and Women's Hospital
<b>Contract Number:</b>	290-08-10010
<b>Project Period:</b>	03/08 –03/10
<b>AHRQ Funding Amount:</b>	\$5,000,000
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** Despite the overwhelming evidence of clinical decision support (CDS) effectiveness, CDS use and adoption are limited, and a small number of academic medical centers and integrated delivery networks account for the bulk of CDS research and development. Wider CDS adoption has been held back by a variety of social, economic, and technical issues, including, but not limited to: lack of widely adopted standards for representing and sharing clinical knowledge in a computable form; difficulty developing clinical practice guidelines that can be readily and unambiguously translated into a computable form; absence of a central repository or knowledge resource where computable guidelines can be shared and stored; challenges in integrating CDS into the clinical workflow; and limited understanding of organizational and social issues relating to CDS.

These barriers are surmountable, as evidenced by a small number of sites where CDS is pervasive. We believe that the biggest challenge to fostering widespread CDS adoption is in documenting, generalizing, and finally translating the experience from these advanced sites to broader community settings. To address this challenge, investigators from Brigham and Women's Hospital, Harvard Medical School, and Partners HealthCare Information Systems (PHIS), have formed the Clinical Decision Support Consortium (CDSC) in collaboration with the Regenstrief Institute, Kaiser Permanente Northwest Research Group, the Veterans Health Administration, Masspro, GE Healthcare, and Siemens Medical Solutions.

The goal of the CDSC is to assess, define, demonstrate, and evaluate best practices for knowledge management and CDS in health information technology (IT) at scale—across multiple ambulatory care settings and electronic health record (EHR) technology platforms. The CDS Consortium is confident that working together, with Agency for Healthcare Research and Quality (AHRQ) support, significant progress toward widespread adoption of CDS can be made quickly.

The CDSC project is mid-way through its initial 2-year period. Our full interim report was submitted to AHRQ on March 4, 2009. The initial clinical focus points of the Consortium are diabetes, coronary artery disease, and hypertension screening within ambulatory care sites in Massachusetts. This project pursues knowledge management as the primary health IT strategic goal.

We plan to implement CDS in ambulatory EHR systems. In the first 2 years, we will perform our demonstration in the Partners HealthCare Longitudinal Medical Record System, which is certified by the Certification Commission for Healthcare Information Technology (CCHIT). In future years, we will implement the demonstrations in General Electric's (GE) Centricity system and NextGen's EMR, both of which are also CCHIT-certified, as well as the Veteran Administration's (VA) VistA system and the Regenstrief Institute's Regenstrief Medical Record System (RMRS). VistA and RMRS are proprietary, non-CCHIT-certified systems. VistA is available as open source, and RMRS is related to OpenMRS which is also open source.

We are using a variety of analytical methods to address our specific aims. We have conducted a series of qualitative evaluations consisting of interviews and ethnography carried out by qualified qualitative researchers. We will also evaluate the effectiveness and performance of the decision support interventions we are developing using quantitative methods.

If successful, we anticipate that we will build decision support systems that will be useful for improving quality and patient safety across multiple disparate EHR systems. We anticipate that these methods will be effective compared to other decision support methods, but that our innovations in collaborative knowledge engineering and service-oriented delivery of decision support will allow them to be developed, maintained, and implemented much more efficiently, and employed much more widely, than conventional decision support resident in individual medical record systems.

### Specific Aims

- Assess and define best practices for knowledge management and CDS in ambulatory care. **(Ongoing)**
- Define a novel, practical knowledge representation scheme that allows users to access knowledge in the manner most useful to them to facilitate translation of knowledge into CDS within EMRs. **(Ongoing)**
- Build a prototype national knowledge repository to support access and use of knowledge artifacts, and collaborative knowledge engineering. **(Ongoing)**
- Build publicly available Web services to provide remote CDS. **(Ongoing)**
- Build end-user CDS dashboards depicting user compliance with CDS, and provide feedback to knowledge engineers building the CDS knowledge artifacts and Web services on the efficacy of the CDS. **(Ongoing)**
- Coordinate overall CDSC evaluation activities. **(Ongoing)**
- Demonstrate the feasibility of this approach through multi-site, multi-vendor demonstration projects. **(Upcoming)**
- Disseminate our results through a variety of traditional channels. Traditional channels include journal publications and conference presentations, while less traditional channels include the AHRQ Web site; white papers; education modules for physicians; and reports to trade associations, standards bodies, and certifying authorities. **(Upcoming)**

**2008 Activities:** The Consortium's Knowledge Management (KM) Lifecycle Assessment Team completed its KM and CDS-reviewed consortium sites' CDS activities and practices. The team also completed a site visit to Partners HealthCare System. The Knowledge Translation and Specification team completed its work on the semi-structured and structured representations. The KM Portal team delivered eRoom as a collaborative environment for the Consortium's activities, developed a self-service training module for the facilitator and participants, completed the conceptual and physical architecture for the knowledge portal architecture, and finalized the hardware.

During this same period, the Vendor Generalization and CCHIT Team developed guidelines for IP sharing among Consortium members, notified CCHIT and the Healthcare Information Technology Standards Panel (HITSP) about the CDSC project, reviewed the current CCHIT and HITSP requirements and standards for CDS and KM, and completed capability reviews of nine EHR systems' decision support features through customer interviews. The CDS Services Development team completed a CDS literature review on current service-oriented architectures and made the decision to use the PHS Enterprise Clinical Rules Services. Finally, the Joint Information Modeling Work Group selected standard terminologies and a decision support model, and recommended use of the Continuity of Care Document (CCD) as the core data exchange framework. All teams have completed preliminary evaluation plans and are working with the CDS Evaluation team to finalize these plans.

**Preliminary Impact and Findings:** We aim to disseminate our findings and work products widely, through the AHRQ National Resource Center for Health IT.

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### **Selected Outputs**

Wright A, Bates DW, Middleton B, et al. Creating and sharing clinical decision support content with Web 2.0: issues and examples. *J Biomed Inform* 2009 Apr; 42(2):334-46

Sittig D. Clinical decision support: What is it? Why is it so hard? What can we do about it? Grand Rounds at University of Texas; December 2008; Austin, TX.

Middleton B, Sittig D. Why is CDS so hard? Office National Coordinator; September 2008; Washington, DC.

Middleton B. AHRQ Clinical Decision Support Consortium; September 2008. AHRQ National Teleconference. Available at: Partners Healthcare. Clinical Decision Support Consortium. <http://www.partners.org/cird/cdsc>. Accessed May 2009.

AHRQ 2008 Annual Conference presentation: Clinical Decision Support Consortium ([PowerPoint® File](#), 2.2 MB; [Web Version](#)) Blackford Middleton, Harvard Medical School CDS contract.

**Project Title:** Guidelines Into Decision Support (GLIDES)  
**Principal Investigator:** Shiffman, Richard N., M.D., M.C.I.S.  
**Organization:** Yale University  
**Contract Number:** 290-08-10011  
**Project Period:** 03/08 – 02/10  
**AHRQ Funding Amount:** \$5,000,000  
**Summary Status as of:** December 2008

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

**Summary:** The Guidelines Into Decision Support (GLIDES) project supports the development, implementation, and evaluation of demonstrations that advance understanding of how best to incorporate computerized clinical decision support (CDS) into health care delivery at ambulatory care sites. The project’s main focus is knowledge management and implementation. Its principal goals are to define a systematic and replicable approach to transforming knowledge derived from clinical practice guidelines into actionable decision support systems; identify and implement preferred methods for integrating CDS tools into electronic health records (EHR) systems; improve CDS tools for measuring and improving quality of care and providing performance feedback; and evaluate the benefits and weaknesses of creating, storing, and replicating CDS across multiple clinical sites.

The GLIDES Project is led by staff from the Yale School of Medicine’s Department of Pediatrics and the Center for Medical Informatics, and is assisted by clinical and information technology (IT) staff from Nemours and Yale New Haven Hospital. The project is approximately 60 percent complete, and is now beginning to capture, categorize, and disseminate lessons learned and recommendations.

GLIDES CDS demonstration tools have been integrated into two Certification Commission for Healthcare Information Technology (CCHIT) compliant EHR systems: GE’s Centricity at Yale and Epic Systems’ EpicCare at Nemours. A combination of quantitative and qualitative evaluation methods are being used to determine the project’s results and major findings. The overall outcome of the contract is to recommend methods to assist clinical organizations with the efficient and effective implementation of CDS across the country.

For 2009, we are focusing on these activities:

Phase II requires implementation of CDS systems for two guidelines (asthma and obesity prevention) in five locations operated by Yale and Nemours, using two leading EHR systems. The intent of this more complex implementation is to identify and propose solutions to the challenges of implementing common guidelines in varied practice locations. Development work started in January 2009, and roll-out is now beginning at the following locations:

<i>Guideline</i>	<i>Site</i>	<i>EHR System</i>
Obesity	Yale Primary Care	GE Centricity
	Nemours Delaware PC	EpicCare
Asthma	Nemours Orlando	EpicCare
	Nemours Jacksonville	EpicCare
	Nemours Pensacola	EpicCare

A thorough and rigorous evaluation program is underway, addressing:

- Transformation of text guidelines into decision support
- Clinical decision support development and evaluation
- Clinician use and usability of CDS
- Effect of CDS on guideline-directed care
- Patient outcomes

### Specific Aims

- Implement evidence-based guideline recommendations that address prevention of pediatric obesity and chronic management of asthma. **(Ongoing)**
- Apply the Guideline Elements Model (GEM) and associated tools to systematically and replicably transform the knowledge contained in these guidelines into a computable format. **(Ongoing)**
- Deliver the knowledge via CDS at ambulatory sites that employ Centricity EMR at Yale and EpicCare at Nemours. **(Ongoing)**
- Evaluate the fulfillment of these goals and the effectiveness of the decision support tools in improving the quality of health care. **(Ongoing)**
- Disseminate the findings. **(Upcoming)**

**2008 Activities:** In 2008, GLIDES completed three of seven main phases of work:

1. A comprehensive project plan and timeline were prepared and reviewed with AHRQ, specifying the required tactics, staffing, and organizational arrangements necessary to accomplish the project's goals and aims. GLIDES also organized project staff and partners to proceed with the demonstration.
2. Narrative guidelines for asthma and obesity prevention were thoroughly analyzed and converted into structured information that can be computerized for delivery at the various practice sites. A key focus of this phase involved transforming this information from narrative language to structured logic at a central location (Yale) and into a format that could be used effectively by all practice sites as a foundation for subsequent implementation. The GLIDES team selected guidelines and recommendations, marked up selected guidelines using GEM Cutter II, performed guideline quality appraisal with GEM-COGS, applied EXTRACTOR to GEM files, restated recommendations in human-readable statement logic, categorized action-types, mapped concepts in recommendations to SNOMED codes, added critical terms to recommendation glossary, classified recommendations by clinical objective, and identified obstacles to implementation with GuideLine Implementability (GLIA).
3. In July 2008, GLIDES began Phase I implementation of the National Heart, Lung, and Blood Institute (NHLBI) asthma guideline in the Yale Specialty Clinic. During this phase, clinical workflow design for the asthma specialty clinic was completed, and integration of the new guideline's decision support with existing clinical workflow and systems began. A baseline survey was also started to assess specialist/primary care physician attitudes to current asthma support systems. In addition, GLIDES identified and addressed several potential barriers, including limitations of local workflow, Centricity system capabilities, and differences in the needs of primary vs. specialty physicians. Delivery of CDS systems for asthma was completed in 2008, and support and assessment of the systems and their results are continuing into 2009.

**Preliminary Impact and Findings:** Preliminary findings are not available yet.

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### **Selected Outputs**

CCHIT recommendations for certification of information systems in support of CDS.

Interim and final recommendations to the general guideline development community, and to the developers of the specific guidelines used by the project, on best practices in guideline development regarding CDS translation and implementation.

Available at: Yale Center for Medical Informatics. GLIDES Project.  
<http://gem.med.yale.edu/glides/default.htm>. Accessed 11 May 2009.

<b>Project Title:</b>	Patient Safety Electronic Health Records Meeting
<b>Principal Investigator:</b>	Black, Shirley
<b>Organization:</b>	Team PSA contractors
<b>Contract Number:</b>	290-08-10019
<b>Project Period:</b>	05/08 – 12/08
<b>AHRQ Funding Amount:</b>	\$268,394
<b>Summary Status as of:</b>	December 2008, Conclusion of Contract

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**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** With the Electronic Health Record (EHR) Safety Institute, the Agency for Healthcare Research and Quality (AHRQ) convened a meeting on October 21-22, 2008, regarding EHRs and the benefits and risks involved in implementing them. Two hundred representatives of stakeholders across American health care—learned societies and educators, patients and consumers, payers, policymakers, providers, regulators and accreditors, researchers and funders, and vendors—were invited to a 2-day educational and consensus-building conference. Group discussions produced primary recommendations and stakeholder-specific recommendations regarding the following: 1) aspects of EHR safety the stakeholder group could address effectively, 2) resources the group possesses currently, 3) resources the group would need to address EHR safety most effectively, 4) barriers the group would have to overcome, 5) current best practices, and 6) feasible first steps for the stakeholder group to take. The meeting brought together nationally-recognized experts in various areas related to patient safety and EHRs to move toward the goal of making EHRs available to most Americans by 2014 and to accelerate the adoption and use of an electronic health information infrastructure in the United States.

As is the case with other health care interventions, the safety and effectiveness of EHRs need validation and continuous improvement. While there has been some documentation of the potential for EHRs to contribute to patient harm or adverse events, other reports suggest that implementation can help a practice focus on patient safety-centered practices. Because of the mixed record in relevant literature, and because EHR implementation requires a complex set of changes to clinical practice—including care workflows, communications, and staff roles in the general work environment—demonstrating and improving their effects on patient safety is critically important.

### Specific Aims

- Identify the scope of EHR safety. **(Achieved)**
- Define research needs and benchmarks. **(Achieved)**
- Establish what individual health care institutions can do to make EHRs as safe and effective as possible. **(Achieved)**

**2008 Activities:** The contract was conducted entirely during calendar year 2008.

**Preliminary Impact and Findings:** The meeting’s breakout sessions and larger group discussion resulted in delineation of recommendations related to a wide variety of stakeholder groups. Many recommendations were general in scope, including:

- Quality-focused national policies are needed to guide EHR development, implementation, use, and optimization.
- EHRs must be designed for security and patient safety from the beginning, starting with system hazard analysis during the development, implementation, and optimization phases of EHR use (as long as possible) before they lead to near misses or adverse events.
- An anonymous, secure system for reporting EHR-related safety hazards and learning from others' experiences is urgently needed.
- EHR adoption should not be mandated until safety and effectiveness in real-world settings have been demonstrated. Organizations capable of doing the demanding work of developing and maintaining safe and effective EHRs should be encouraged to do so and studied rigorously by teams, including safety and human-factors engineers.
- America's 160,000 smaller practices and hospitals do not have the capability to do the extensive modifications necessary to implement and maintain safe and effective EHRs. They will need special help, perhaps in the form of remotely hosted and managed EHRs.
- Caution regarding one-stage ("big-bang") implementation is appropriate; some vendors recommend it, but research and experience suggest it may compromise safety.
- Vendors need to share responsibility for EHR safety and effectiveness with implementers and users.
- Stakeholder-specific recommendations were made for groups including funders, researchers, educators, payers, policymakers, providers, regulators and accreditors, standards developers, and vendors.

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### **Selected Outputs**

None available.

<b>Project Title:</b>	Assessing the Impact of a Dynamic Chronic Care Registry on Quality of Care
<b>Principal Investigator:</b>	Fischer, Henry, M.D.
<b>Organization:</b>	Denver Health
<b>Contract Number:</b>	290-06-0020-6
<b>Project Period:</b>	09/07 - 05/09
<b>AHRQ Funding Amount:</b>	\$357,543
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** This contract sought to improve the quality of care provided to adult diabetic patients within an urban safety net system through an integrated diabetes registry. We used the registry to perform the following tasks: 1) distribute quarterly patient report cards to patients' homes and to participating providers in eight community health centers, as well as quarterly provider performance report cards with patient-level clinical quality data; 2) develop and use a point-of-care interface to improve adherence to guideline-based care; and 3) evaluate the effects of these interventions on process, quality, cost, and satisfaction with care. Ultimately, we hope that this approach can be applied to other chronic diseases and health care systems.

Diabetes registry data, including patient-level demographics, laboratory data, scheduling information, and pharmacy data, were transferred into a data warehouse using a Siemens Medical System. No applications were implemented or evaluated for this project. Methods for quantitative analyses included pre/post intervention-control multivariate regressions. All analyses were performed using SAS Enterprise Guide software version 9.1 (Cary, NC). The study period analyses accounted for differences in age, race/ethnicity, gender, degree of illness, and baseline levels for each outcome variable, and included generalized estimated equations to account for the within-subject correlation of repeated measures by individual patients. Qualitative analyses were performed through provider interviews at each clinic and patient surveys.

The intervention has been completed, and qualitative and quantitative analyses have generated preliminary findings.

### Specific Aims

- Assess the effect of patient report card mailings on a quarterly basis on process outcomes, such as the checking of diabetes labs or blood pressure. **(Achieved)**
- Assess the effect of point-of-care automated delivery of patient report cards at the time of patient check-in on intermediate outcomes, such as expert-recommended glycemic index, blood pressure, and lipid outcomes. **(Achieved)**
- Assess the impact of electronically delivered provider performance feedback, including patient-level data, on intermediate outcomes. **(Achieved)**
- Pilot a point-of-care interface for providers at one clinic site to improve guideline-based care. **(Achieved)**

**2008 Activities:** During the first quarter of 2008, we transferred diabetes registry data to the data warehouse and completed a user interface with the warehouse to generate reports and query data. The

patient report card and provider performance report card arms of the intervention, launched in December 2007, were completed in January 2009. The pilot for the point-of-care interface began in September 2008 and was completed in January 2009.

### **Preliminary Impact and Findings:**

#### *Process outcomes*

We found that mailed patient report cards did not improve process outcomes.

#### *Clinical outcomes*

Point-of-care delivery of patient report cards had a significant impact on lipid performance (the target being LDL < 100mg./dL) but not on glycemic or blood pressure control. Provider performance feedback with patient-level data significantly improved lipid control (LDL < 100 mg/dL), glycemic control (HbA1c < 7.0), and blood pressure control (BP < 130/80 mm Hg). Patients who received point-of-care report cards and who also were listed on provider performance report cards performed significantly better on lipid and glycemic measures.

#### *Provider feedback*

Providers rarely used the point-of-care interface at the pilot site. They cited the many competing demands during a 20-minute visit and the time it took to access the report as significant barriers.

Providers felt performance feedback provided motivation but created a competitive environment. They felt unable to effect change in their patient panel because of lack of time and resources, such as nurses to facilitate between-visit case management.

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### **Selected Outputs**

Poster Presentation. National Society of General Internal Medicine Meeting; 2009 May 15; Miami, FL.

Panel Discussion. Academy of Health Conference; 2009 June 29; Chicago, IL.

<b>Project Title:</b>	Improving Quality through Health Information Technology: Testing the Feasibility and Assessing the Impact of Using Existing Health Information Technology Infrastructure for Better Care Delivery
<b>Principal Investigator:</b>	Hasnain-Wynia, Romana, Ph.D.
<b>Organization:</b>	Health Research and Educational Trust; Northwestern University, Feinberg School of Medicine
<b>Contract Number:</b>	290-06-0022-3
<b>Project Period:</b>	09/07 - 07/09
<b>AHRQ Funding Amount:</b>	\$393,457
<b>Summary Status as of:</b>	December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** This contract seeks to understand how health information technology (IT) can improve access to and management of laboratory information for patients with HIV and/or in need of cervical cancer screening. The team will illustrate how health IT tools can improve compliance, efficiency, and quality of care by reducing duplicate tests and lost results, and increasing adherence to treatment follow-up guidelines. The project is developing a set of best practices to disseminate to community health centers and physician practices.

### Specific Aims

- Understand how health IT can improve access to and management of lab information for patients with HIV and patients in need of cervical cancer screening. **(Ongoing)**
- Illustrate how health IT tools can improve compliance with evidence-based lab test guidelines and improve both the efficiency and quality of care by reducing the numbers of duplicate lab tests, “lost” results, and lab results without follow-up. **(Ongoing)**
- Identify how health IT can aid various types of health care practitioners in lab-related tasks. **(Ongoing)**
- Develop a set of best practices focused on how a specific set of health IT tools can be used to improve both treatment and screening (i.e., HIV treatment; cervical cancer screening and follow-up) that can be disseminated to other community health centers and physician practices. **(Ongoing)**

**2008 Activities:** These included getting OMB approval, collecting data, conducting a time and motion study, developing qualitative interview protocols, conducting key informant interviews with clinic staff and Alliance leadership, and analyzing data.

### Preliminary Impact and Findings:

#### *Low follow-up rates for abnormal Pap smears*

Post-implementation data showed that the rate of follow-up for abnormal Pap smears is very low at both centers (<10 percent). This could be because patients go elsewhere to receive follow-up care. It would be helpful if we could quantify (at least hypothetically) how many patients go elsewhere to receive follow-up. However, documenting that follow-up rates for abnormal Paps are low is an important finding: Although we can't say that the health IT made a difference in the rate pre and post, we can say

strategically that health IT can be used to help centers identify areas for improvement. In addition, we found that decision support at the point of care needs modification (e.g., a prompt) to follow up for abnormal Pap smears.

#### *Rate of duplicate viral load tests*

The rate of duplicate tests at each center was low both pre and post implementation (<1 percent). When interpreting these results, it is important to consider that the patients seeking HIV care at these centers tend to be very aware of their status, such as when lab tests were last performed, or when they are due. Thus, ordering duplicate tests is not likely to be an issue for these centers, or one that will be notably affected by health IT implementation. Overall, these results speak to the fact that not everything requires a system prompt (and we now have data to support this). Resources are better spent on decision support for abnormal Paps than for HIV viral load testing.

#### *Cost-effectiveness*

There is variation in time spent without quantifying by staff type.

The ability to implement depends on staffing—the impact of health IT on workload productivity will vary by provider due to variability in adaptation time and other factors yet to be explored. The lesson for implementation is that the cost estimate must take staffing into account.

At the point of implementation, the burden will be heterogeneous. The team is encouraging providers to shift their focus from the “burden” of implementation to time savings that could be realized once the system is mastered by all staff.

#### *Qualitative component*

We completed 33 interviews (11 from HHO, 16 from HB, and 6 from Alliance).

Preliminary findings suggest that lab interface issues have a notable impact downstream—they affect provider satisfaction with the system. Despite staff members’ frustration, no one reported that they would rather go back to paper charts.

What staff like best about the system: they don’t have to search for charts anymore; the system facilitates communication between different providers through “flagging”; and the system facilitates communication with patients.

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### **Selected Outputs**

Manuscripts are under development, as well as an implementation handbook.

**Project Title:** Health Information Technology Enablement of Quality Measurement: Health Information Technology Expert Panel

**Principal Investigator:** Rosenthal, Daniel

**Organization:** National Quality Foundation

**Contract Number:** 290-07-10017-3

**Project Period:** 6/08 - 6/10

**AHRQ Funding Amount:** \$526,927

**Summary Status as of:** December 2008

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination

**Summary:** This project consists of two primary workgroups. The Quality Data Set Workgroup has convened an expert panel to help guide the development of recommendations to further quality measurement using health information technology (IT) and uses the panel's expertise to develop materials concerning health IT standards, capabilities, and quality measurement. The project builds on prior work at the National Quality Forum (NQF) completed under direction of the Health IT Expert Panel (HITEP). The NQF has organized the HITEP for a meeting in February 2009 to gather, synthesize, and refine clinical workflow maps, focusing on care processes related to the previously prioritized set of measures. In addition, the NQF is conducting an environmental scan; drafting a set of quality measures that are automated, patient-centered, and longitudinal; and developing recommendations to the Healthcare Information Technology Standards Panel on data standards.

The Workflow Workgroup will define the workflow to manage electronic health information to enable expected patient care while decreasing the information seeking and documentation burden for individual clinicians. The work product will define the qualitative and quantitative aspects of data by examining quality data flow maps. Such quality data management will address three requirements for data: the authoritative source, the methods for attribution of accountability at the source of the data, and the method of transit.

#### **Specific Aims**

- Represent quality data requirements (concepts, data types, data elements, code sets) unambiguously and specifically. **(Ongoing)**
- Determine mechanisms and opportunities within quality data management workflows for identifying patients who are eligible for inclusion in measure populations, gathering performance measurement data, and providing clinical decision support to optimize performance in targeted areas. **(Ongoing)**

**2008 Activities:** The Quality Dataset Workgroup built on the work of a prior HITEP project that developed data categories and types to be studied. Under this contract, the HITEP explored the relevant medical concepts and test value thresholds relevant to these data types with the intention of exploring collaborative design session (CDS) design. The Workflow Workgroup developed a framework for measuring workflow performance to encourage new measure development that enables comparison of performance among multiple sites.

**Preliminary Impact and Findings:** None available.

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**Selected Outputs**

None available.

## IX. References

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Available at: United States Department of Health and Human Services. HHS Grants Policy Statement. [http://www.hhs.gov/grantsnet/docs/HHSGPS\\_107.doc](http://www.hhs.gov/grantsnet/docs/HHSGPS_107.doc). Accessed September 8, 2009.

## Appendix A: Index of Principal Investigators' Projects

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Arora, Sanjeev, MD	Project ECHO: Extension for Community Healthcare Outcomes	<a href="#">Page 82</a>
Baker, David, MD	Using Precision Performance Measurement to Conduct Focused Quality Improvement	<a href="#">Page 284</a>
Baker, Wende M, MEd	Chronic Mental Health: Improving Outcomes through Ambulatory Care Coordination	<a href="#">Page 150</a>
Bates, David W, MD, MSc	Statewide Implementation of Electronic Health Records	<a href="#">Page 85</a>
Bell, Douglas, MD	Building an Implementation Toolset for E-Prescribing	<a href="#">Page 373</a>
Bell, Douglas, MD	Use of Electronic Referral System to Improve the Outpatient Primary Care-Specialty Care Interface	<a href="#">Page 404</a>
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Black, Shirley	Patient Safety Electronic Health Records Meeting	<a href="#">Page 442</a>
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Bove, Alfred, MD	Using a Telemedicine System to Promote Patient Care Among Underserved Individuals	<a href="#">Page 154</a>
Brottman, Gail, MD	Improving Asthma Care in an Integrated Safety Net through a Commercially Available Electronic Medical Record	<a href="#">Page 406</a>
Brown, C Andrew, MD, MPH	Detecting Med (Medication) Errors in Rural Hospitals Using Technology	<a href="#">Page 45</a>
Bryant, Charles A, MD	INTEGRIS Telewoundcare network	<a href="#">Page 313</a>
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Carayon, Pascale, PhD	Computer-Based Provider Order Entry (CPOE) Implementation in Intensive Care Units (ICUs)	<a href="#">Page 113</a>
Carrow, Grant, PhD	Enabling Electronic Prescribing and Enhanced Management of Controlled Medications	<a href="#">Page 57</a>
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Chrischilles, Elizabeth, PhD	Personal Health Records and Elder Medication Use Quality	<a href="#">Page 159</a>
Chueh, Henry, MD	Ambulatory Care Compact to Organize Risk and Decision-making (ACCORD)	<a href="#">Page 161</a>
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Davidson, Arthur, MD, MSPH	Colorado Connecting Communities – Health Information Collaborative State and Regional Demonstration Project (currently known as CORHIO)	<a href="#">Page 375</a>
Davison, Rod	Tulare District Hospital Rural Health Electronic Medical Record Consortium	<a href="#">Page 48</a>
Deluca, Michael, MBA, MS	Ambulatory Electronic Medical Record and Shared Access	<a href="#">Page 247</a>
Doebbeling, Bradley, MD, MS	Implementing and Improving the Integration of Decision Support into Outpatient Clinical Workflow	<a href="#">Page 427</a>
Dorr, David, MD, MS	Enhancing Complex Care through an Integrated Care Coordination Information System	<a href="#">Page 289</a>
Druss, Benjamin, MD, MPH	An Electronic Personal Health Record for Mental Health Consumers	<a href="#">Page 165</a>
Feldman, Penny, PhD	Improving Medication Management Practices and Care Transitions through Technology	<a href="#">Page 167</a>
Ferranti, Jeffrey, MD, MS	Automated Adverse Drug Event Detection and Intervention	<a href="#">Page 87</a>
Ferris, Timothy G, MD, MPH	Improving Pediatric Safety and Quality with Healthcare Information Technology	<a href="#">Page 317</a>
Field, Terry, DSc	Using Health Information Technology to Improve Transitions of Complex Elderly Patients from Skilled Nursing Facilities (SNF) to Home	<a href="#">Page 169</a>
Fischer, Henry, MD	Assessing the Impact of a Dynamic Chronic Care Registry on Quality of Care	<a href="#">Page 444</a>
Fischer, Michael, MD	Impact of Office-Based e-Prescribing on Prescribing Processes and Outcomes	<a href="#">Page 119</a>
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Forrest, Christopher, MD	Improving Otitis Media Care with Electronic Health Record (EHR)-based Clinical Decision Support and Feedback	<a href="#">Page 171</a>
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Frisse, Mark, MD, MS, MBA	State and Regional Demonstrations in Health Information Technology (currently known as Mid-South eHealth Alliance – MSeHA)	<a href="#">Page 377</a>
Gandhi, Tejal K, MD, MPH	Improving Safety and Quality with Outpatient Order Entry	<a href="#">Page 90</a>
Garber, Lawrence D, MD	Secure Architecture For Exchanging Health Information (SAFEHealth)	<a href="#">Page 175</a>
Gardner, William, PhD	Pharmaceutical Safety Tracking (PhaST): Managing Medications for Patient Safety	<a href="#">Page 61</a>
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Gorman, Paul, MD	Using Information Technology (IT) to Improve Medication Safety for Rural Elders	<a href="#">Page 116</a>
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Guise, Jeanne-Marie M, MD	Improving Safety and Quality with Integrated Technology	<a href="#">Page 268</a>
Gunter, Margaret J, PhD	New Mexico Health Information Collaborative	<a href="#">Page 264</a>
Gurwitz, Jerry, MD	Health Information Technology in the Nursing Home	<a href="#">Page 51</a>
Gurwitz, Jerry, MD	Improving Post-Hospital Medication Management of Older Adults with Health Information Technology	<a href="#">Page 65</a>
Hahn, Elizabeth, MA	Implementing a Low-Literacy, Multimedia Information Technology (IT) System to Enhance Patient-Centered Cancer Care	<a href="#">Page 177</a>
Hasnain-Wynia, Romana, PhD	Improving Quality through Health Information Technology: Testing the Feasibility and Assessing the Impact of Using Existing Health It Infrastructure for Better Care Delivery	<a href="#">Page 446</a>
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Huck, Jacqueline, RN, MPH	A Rural Healthcare Information Technology Cooperative to Promote Clinical Improvement	<a href="#">Page 135</a>
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Jones, Mark H, MS, MBA	Implementation of Health Improvement Collaboration in Cherokee County, Oklahoma	<a href="#">Page 138</a>
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Kerwin, Jeffrey, PhD	Consumer Engagement in Developing Electronic Health Information Systems	<a href="#">Page 408</a>
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Kopal, Helene, MPH, MPA	Evaluation of a Computerized Clinical Decision Support System and Electronic Health Record (EHR)-Linked Registry to Improve Management of Hypertension in Community-Based Health Centers	<a href="#">Page 297</a>
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Pohl, Joanne, PhD	A Partnership for Clinician Electronic Health Record (EHR) Use and Quality of Care	<a href="#">Page 305</a>
Rachal, Valerie, RN, PhD	Creating Online Newborn Intensive Care Unit (NICU) Networks to Educate, Consult & Team	<a href="#">Page 257</a>
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Samore, Matthew, MD	Rural Trial of Clinic Order Entry with Decision Support	<a href="#">Page 144</a>
Samore, Matthew, MD	Patient-Centered Informatics System to Enhance Health Care in Rural Communities	<a href="#">Page 209</a>
Schadow, Gunther, MD, PhD	Value of New Drug Labeling Knowledge for e-Prescribing	<a href="#">Page 104</a>
Schillinger, Dean, MD	Harnessing Health Information Technology for Self-Management Support and Medication Activation in a Medicaid Health Plan	<a href="#">Page 212</a>
Schneider, Eric, MD	Massachusetts Quality E-Measure Validation Study	<a href="#">Page 342</a>
Schwarz, Eleanor, MD	Harnessing Health Information Technology to Prevent Medication-Induced Birth Defects	<a href="#">Page 125</a>
Selby, Joe, MD	Feedback of Treatment Intensification Data to Reduce Cardiovascular Disease Risk	<a href="#">Page 361</a>
Sequist, Thomas, MD, MPH	Can Risk Score Alerts Improve Office Care for Chest Pain?	<a href="#">Page 215</a>
Shank, Nancy C, MBA	Health Information Exchange: A Frontier Model	<a href="#">Page 218</a>
Shiffman, Rick, MD, MCIS	Guidelines into Decision Support (GLIDES)	<a href="#">Page 439</a>
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Spranca, Mark, PhD	Conducting Measurement Activities for Health IT Initiative	<a href="#">Page 410</a>
Stepnowsky, Carl, PhD	Enabling Sleep Apnea Patient-Centered Care Via an Internet Intervention	<a href="#">Page 225</a>
Stuen, Cynthia, PhD, DSW	Creating an Evidence Base for Vision Rehabilitation	<a href="#">Page 325</a>
Tang, Paul, MD	Patient-Centered Online Disease Management Using a Personal Health Record System	<a href="#">Page 228</a>
Thomas, Eric, MD, MPH	Measuring the Value of Remote Intensive Care Unit (ICU) Monitoring	<a href="#">Page 107</a>
Thomas, Eric, MD, MPH	Using Electronic Records to Detect and Learn from Ambulatory Diagnostic Errors	<a href="#">Page 344</a>

**Table 14: Grants and Contracts by Principal Investigator Last Name, First Name**

Principal Investigator	Project Title	Summary
Trivedi, Madhukar, MD	Using Information Technology to Provide Measurement Based Care for Chronic Illness	<a href="#">Page 79</a>
Turchin, Alexander, MD	Monitoring Intensification of Treatment for Hyperglycemia and Hyperlipidemia	<a href="#">Page 346</a>
Veline, James, MS, MA	Electronic Prescribing and Decision Support to Improve Rural Primary Care Quality	<a href="#">Page 231</a>
Vogt, Thomas, MD	Using Information Technology to Improve the Quality of Cardiovascular Disease (CVD) Prevention & Management	<a href="#">Page 349</a>
Ward, Marcia M, PhD	Health Information Technology Value in Rural Hospitals	<a href="#">Page 110</a>
Waters, Teresa, PhD	Technology Exchange for Cancer Health Network (TECH-Net)	<a href="#">Page 282</a>
Weiner, Mark, MD	Crossing the Quality Assessment Chasm: Aligning Measured and True Quality of Care	<a href="#">Page 352</a>
West, David, PhD	Participation by Primary Care Practices in Health Information Exchange (HIE) in Colorado	<a href="#">Page 416</a>
Wheeler, Donald A, MHA, FACHE	Critical Access Hospital Partnership Health Information Technology Implementation	<a href="#">Page 310</a>
Wolf, Michael, PhD	Using Information Technology for Patient-Centered Communication and Decision Making about Medications	<a href="#">Page 234</a>
Zimmerman, Amy, MPH	Rhode Island Statewide Health Information Exchange (HIE) State and Regional Demonstration Project (currently known as currentcare)	<a href="#">Page 390</a>

## Appendix B. Process for Preparing Grantee-Specific Summary

1. **List of Grantees:** From January-February 2009, the Health IT Portfolio staff and NRC synchronized lists of grants, PIs, institutions, duration of grant, total AHRQ budget for grant, active status of grant, and whether or not grant received a no-cost extension, for those grants sponsored by Health IT Portfolio that were active during at least part of CY 2008. Discrepancies were resolved. The final list served as both the data set and list of 124 grants that were active for some part of 2008.
2. **Grantee-Specific Template:** In January 2009, the initial structure, a template, for grantee-specific summaries was developed by AHRQ staff in cooperation with NRC. The template was modestly enhanced by Health IT Portfolio staff in February and March. In April and May, AHRQ's OCKT staff provided further refinements to the format of the grantee-specific summaries to assure compliance with DHHS format requirements and to enhance readability of the documents. The summaries were to contain the following information:
  - a. **Demographics** (information completed by NRC)
    - i. Protect Title
    - ii. Principal Investigator: name and degrees
    - iii. Organization (receiving contract)
    - iv. Mechanism: FOA: HS-##-####: Title of FOA
    - v. Grant Number: R## HS##### (R##, may be replaced by UC1 or P20)
    - vi. Project Period: mm/yyyy – mm/yyyy (indicated if a no-cost extension was granted, and if so, used the extended ending date)
    - vii. AHRQ Funding Amount
    - viii. Summary Status as of: (December 2008 or month grant concluded)
  - b. **Health IT Strategic and AHRQ Business Goals** (information completed by NRC)
  - c. **Summary** (drafted by NRC)
  - d. **Specific Aims** (based on grant proposal and status of aims as reported in ARRS)
  - e. **2008 Activities** (information provided by contractor)
  - f. **Preliminary Impact and Findings** (as applicable for ongoing projects, information provided by PI)
  - g. **Selected Outputs** (as applicable for ongoing projects, information provided by PI)
3. **Preliminary Sources of Information:** There were up to five primary sources for NRC to prepare its initial draft of grantee-specific summaries:
  - a. **Grant Proposal**
  - b. **Final Reports for Completed Grants**
    - i. 38 THQIT grants ended during 2008.

- ii. Health IT Portfolio staff solicited the Final Reports from the PIs and forwarded them to NRC. All were received from PIs and shared with NRC.
- c. **Quarterly Reports Submitted through the Agency for Healthcare Research and Quality Research Reporting System (ARRS)**
  - i. These were critical sources of information for all 124 grantees.
  - ii. ARRS reports provided the grantees' self-reported status regarding overall progress on milestones for the project and spending to date. The aggregate results of these variables were reported to the Office of Management and Budget pursuant to the 2008 then-active Performance Assistant Rating Tool (PART) measures for the Health IT Portfolio.
  - iii. Other information was gleaned from the ARRS reports including the status of specific aims (i.e., milestones):
    - 1. Upcoming,
    - 2. Ongoing,
    - 3. Achieved, or
    - 4. \*Ongoing\* or \*Upcoming\* (indicating that AHRQ's funding for that grant had concluded but that the grantee was pursuing completion of that specific aim through other means).
- d. **NRC Quarterly Calls.** As part of its grantee programmatic activities, the NRC conducts quarterly calls with all grantees who are currently funded through any of the four Ambulatory Safety and Quality (ASQ) Funding Opportunity Announcements (FOAs) (HS-08-002, HS-07-002, HS-07-006, HS-07-000), known as ASQ grantees. Sixty-nine of the Health IT Portfolio's active grants.
  - i. During spring 2009 (February-April) regularly scheduled quarterly calls with the ASQ grantees, additional information was collected about the project, including the vendor and version of the health IT application used in the research grant and whether or not those health IT applications had received certification via the Certification Commission for Health Information Technology (CCHIT). This information was collected in a narrative fashion.
- e. **Redacted Elements of Non-Competing Continuation Reports.** For those grantees with poor quality reporting (at least 20 grantees), Health IT Portfolio staff vetted their annual non-competing continuation reports and abstracted information regarding milestones. However, the type of information that is expected in those documents is generally quite distinct from the programmatic information regarding challenges, barriers, mitigating factors, and preliminary findings and outputs sought for a grant-specific calendar-year report.

#### 4. Identifying Missing or Incomplete Information

- a. From January through March, NRC staff prepared and reviewed initial hardcopies of the quarterly ARRS report. NRC provided Health IT Portfolio staff a list of those grantees for which ARRS quarterly reports were either not submitted or were incomplete. This was a serious source of delay in the drafting of scores of grantee-specific summaries, both in terms of the number of grantees who had not been providing informative quarterly reports on a regular basis and the poor

quality of some grantees' reporting. The ARRS system requires sequential reporting, whereby one cannot post a third-quarter report until the reports for earlier quarters have been posted.

**5. Tracking the Development and Finalization of Grant-Specific Summaries**

- a. Health IT Portfolio staff in cooperation with NRC staff developed a Microsoft Excel® spreadsheet for tracking development, distribution, review and approval of each grant-specific summary, from NRC development of the summaries to OCKT approval of the summaries, and NRC posting of the summaries on the NRC Web site ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)).
- b. NRC staff maintained the Excel spreadsheet.

**6. Stimulating ARRS Reporting**

- a. AHRQ staff and NRC representatives notified all grantees that a summary of their grant's progress as of the end of 2008 or the conclusion of their grant, if it ended in 2008, would be generated based on the information reported in the ARRS system as of April 15, 2009.
- b. In February 2009, Health IT Portfolio staff contacted Project Officers for those grants with incomplete reporting and advised them to instruct their grantees on the importance of submitting complete and timely quarterly reports through ARRS.
- c. ARRS reports for 2008 available as of April 15 were used to develop summaries.

**7. Principal Investigator (PI) Review of Grant-Specific Summary**

- a. NRC sent each grantee the draft grant-specific summary and welcomed additional information that the PI could provide.
- b. PIs were generally given 2 weeks to provide approval or comments on the grant-specific summary.
- c. For non-responders, additional reminders for approval or comments on the grant-specific summaries were sent to PIs.
- d. Health IT Portfolio staff prompted non-responders.
- e. When PIs failed to respond to either NRC or Health IT Portfolio staff, unedited drafts of grant-specific summaries were considered implicitly accepted by the PI, since no concerns or objections were raised by the PI. For 2008 grant-specific summaries, 81 percent (101/124) of the grant PIs provided explicit approval of their summaries.

**8. Health IT Portfolio Staff Review**

- a. Each of the draft grant-specific summaries was reviewed for content, tone, format, and completeness.
- b. These were returned to NRC.

**9. NRC Prepared Final Drafts of Grant-Specific Summaries**

- a. NRC consulted grantee documents or consulted grantees to address AHRQ-sought clarity, as appropriate.
- b. NRC conducted format editing of grant-specific summary and reformatted the document to be ready for posting to the Web site.

10. **AHRQ Staff from the Office of Communications and Knowledge Transfer (OCKT) Conducted Final Format and Content Edit of Grant-Specific Summaries**
  - a. Using the Quality Assurance Check list developed by AHRQ Health IT Portfolio staff, and the spreadsheet of grantee information, OCKT editors conducted quality assurance of descriptors of each grant with particular care regarding the grantees' most recent self-reported quarterly status regarding milestones and budget.
  - b. OCKT editors also conducted a careful edit check for compliance with OCKT format requirements and a logic check of content. OCKT made final changes to the grant-specific summaries and returned the documents to NRC.
  
11. **Posting to the NRC Web Site:** Grantee-specific summaries are available through the NRC Web site ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)) by clicking on the map displayed on the NRC landing page.
  - a. NRC prepared 508-compliant HTML and PDF versions of the grant-specific summaries.
  - b. These summaries are identified by grantee through the prompt: **View Calendar Year Update, 2008** ([PDF](#), [HTML](#)).

## Appendix C. Process for Preparing Contract-Specific Summary

1. **List of contracts:** In March 2009, the Health IT Portfolio staff generated a list of 26 Health IT Portfolio contracts and points of contact that were active for some or all of CY 2008. The Health IT Portfolio staff provided NRC with a list of contracts active during that year that specified PIs, institutions, duration of contract, total AHRQ budget for the contract, and paragraph summary of the contract.
2. **Contract-Specific Template:** In March 2009, a template for contract-specific summaries was developed by Health IT Portfolio staff, which was informed by the content of the grant-specific template, yet omitted information that was not applicable to contractors.
  - a. **Demographics** (information completed by NRC)
    - i. Protect Title
    - ii. Principal Investigator: name and degrees
    - iii. Organization (receiving contract)
    - iv. Project Period
    - v. AHRQ Funding Amount
    - vi. Summary Status as of: (December 2008 or month contract concluded)
  - b. **Health IT Strategic and AHRQ Business Goals** (information completed by NRC)
  - c. **Summary** (drafted by NRC based on summary information provided by Task Order Officer)
  - d. **Specific Aims** (delineated by NRC if information was provided)
  - e. **2008 Activities** (information provided by contractor)
  - f. **Preliminary Impact and Findings** (as applicable for ongoing contracts, information provided by PI)
  - g. **Outputs** (as applicable for ongoing contracts, information provided by PI)
3. **Preliminary Sources of Information:** There were up to two primary sources for NRC to prepare its initial draft of contract-specific summaries:
  - a. Synopses of contracts provided by Health IT Portfolio staff to NRC.
  - b. Synopses from final reports when available.
4. **Tracking the Development and Finalization of Contract-Specific Summaries**
  - a. Health IT Portfolio staff, in cooperation with NRC staff, developed an Excel spreadsheet for tracking development, distribution, review, and approval of each contract-specific summary, from development by NRC to approval by OCKT, and NRC's posting of the summaries on the NRC Web site ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)).
  - b. NRC staff maintained the Excel spreadsheet.
5. **Principal Investigator's (PI) Review of Contract-Specific Summary**
  - a. Health IT Portfolio staff notified contractors via e-mail of this initiative and respectfully requested that they participate in the development of contract-specific summaries.

- b. NRC sent each contractor the draft contract-specific summary and welcomed additional information that the PI could provide.
  - c. PIs were generally given 2 weeks to provide approval or comments on the contract-specific summary.
  - d. For non-responders, additional reminders for approval or comments on the contract-specific summaries were sent to PIs.
  - e. Health IT Portfolio staff prompted non-responders.
  - f. When PIs failed to respond to either NRC or Health IT Portfolio staff, unedited drafts of contract-specific summaries were considered implicitly accepted by the PI, since no concerns or objections were raised. For 2008 contract summaries, 88 percent (23/26) of the contract PIs approved their summaries.
6. **Health IT Portfolio Staff Review**
- a. Each of the draft contract-specific summaries was reviewed for content, tone, format, and completeness.
  - b. These were returned to NRC.
7. **NRC Prepared Final Drafts of Contract-Specific Summaries**
- a. NRC consulted contract documents and/or consulted contractors to address AHRQ-sought clarity, as appropriate.
  - b. NRC conducted format editing of contract-specific summary and reformatted the document to be ready for posting to the Web site.
8. **AHRQ Staff from the Office of Communications and Knowledge Transfer (OCKT) Conduct Final Format and Content Edit of Contract-Specific Summaries**
- a. Using the quality assurance checklist developed by AHRQ Health IT Portfolio staff and the spreadsheet of contract information, OCKT staff reviewed the content of the summaries..
  - b. OCKT also conducted careful edit checks for compliance with OCKT format requirements and a logic check of content. OCKT made final changes to the contract-specific summaries and returned the documents to NRC.
9. **Posting to the NRC Web Site:** Contract-specific summaries are available through the NRC Web site ([www.healthIT.ahrq.gov](http://www.healthIT.ahrq.gov)) by clicking on the map displayed on the NRC landing page.
- a. NRC prepared 508-compliant HTML and PDF versions of the contract-specific summaries.
  - b. These summaries are identified by project through the prompt: **View Calendar Year Update, 2008** ([PDF](#), [HTML](#)).