

Grant Final Report

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**Metro DC Health Information Exchange (MeDHIX):
Strategies for Successful Planning and Implementation of
HIE Solutions in Safety Net Clinic Communities**

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Abstract

Purpose: The goal of the project is to improve medical care, particularly transitions among providers, for medically underserved populations through implementation of a multi-jurisdictional health information exchange (HIE) linking safety-net clinics, hospital emergency departments, and specialists.

Scope: Safety net providers (EHR users/non-users), patients, hospitals, local government, and community organizations focused on the underserved and health disparities.

Methods: Initial evaluative information used interviews and group discussions to document perceived benefits, barriers, willingness to participate, current EHR use, and desired HIE content and features. Focus groups of underserved individuals elicited opinions on risks and benefits of HIE. Provider feedback on actual HIE utility was planned post implementation. A model was designed to measure cost and sustainability from potential reductions in ED visits using medical homes and open source HIE.

Results: The open source HIE links data from 14 safety-net clinics; 40 care sites; 3 jurisdictions, (110,000 patients/560,000 clinic visits), incorporating differing privacy and confidentiality standards. Only minimal deployment was achieved by the end of year 4, adversely affecting the HIE evaluation. Factors included legal concerns, shifting hospital priorities, and dwindling support for a regional approach, favoring local initiatives as more funding became available.

Key Words: safety-net, open source, Health Information Exchange, eChart, photo ID, multi-jurisdictional

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Final Report

Purpose

The goal of the Metro DC Health Information Exchange (MeDHIX) project is to improve medical care, particularly transitions among providers, for medically underserved populations in three jurisdictions (the District of Columbia; Montgomery County, Maryland; and Northern Virginia) through the implementation of a safety net focused, multi-jurisdictional regional health information exchange (HIE).

Aim 1. Implement a sustainable health information exchange linking the electronic health record systems of the region's safety net clinics with mainstream healthcare providers to improve patient care quality, safety, and efficiency for the region's most vulnerable populations, focused on the specific and unique needs of the uninsured population and safety net environment.

Aim 2. Work with safety net clinic providers, hospital emergency departments, and specialists that are a major source of care for safety net patients to identify specific data, applications, and use cases that are of the most benefit to them.

Aim 3. Broadly involve health care organizations, community groups, philanthropies, and governments across the region, focusing on education and outreach about the benefits, risks, opportunities, priorities, implementation strategies, national successes and failures, and the potential for HIE to help bring better, more cost effective healthcare to their constituencies.

Aim 4. Engage ethnically, racially, and economically disadvantaged individuals and their representative organizations to better understand the factors that inhibit or promote their acceptance of HIE and the steps that must be taken to maximize trust, acceptance, and mutual benefits.

Aim 5. Assist safety net clinics in the implementation, enhancement, and use of EHRs, as a prerequisite for achieving significant HIE benefits.

Aim 6. Reduce unnecessary visits to hospital emergency departments.

Aim 7. Provide data for public health planning, epidemiological surveillance and targeting of services to the low income uninsured.

Scope

Background

This study focused on HIE, EHRs, and safety net providers for several reasons. Organizations in the DC metropolitan area representing the specific interests of the uninsured population believed that a single “Community of Interest” should be formed across the region, as: (1) the population is mobile across jurisdictions, warranting a regional view of health care for the uninsured; (2) individual safety-net providers and political jurisdictions face similar challenges; (3) funding from foundations and all levels of government is limited and must be maximally leveraged; and (4) the uninsured population and the safety-net clinic environments have significant differences from the insured, warranting a focus on the uninsured for a regional health information exchange.

Of particular interest are differing privacy and confidentiality laws and regulations, differing priorities and funding for health care for low-income, uninsured populations, differing philosophies, and differing views on the benefits and potential for regional collaboration versus independent projects. These differences are particularly interesting in light of a highly mobile and diverse indigent population that seeks health care across the region regardless of political or jurisdictional boundaries.

For example, the D.C. Health Alliance, the city’s safety net program for low-income uninsured patients provides comprehensive primary care benefits through multiple providers.

The Montgomery County model is quite different. Among the wealthiest counties in the nation, it is also the most ethnically diverse county in Maryland with a low income uninsured population in excess of 100,000 people (~10% of the population).^{1,2,3}

The Montgomery Cares program provides primary health care to medically uninsured, low-income adult residents of Montgomery County. This program is funded in part by Montgomery County and administered by the Primary Care Coalition (PCC) to help support the network of independent nonprofit clinics known as the Community HealthLink Clinics. These clinics are staffed by medical professionals, and are operated by their own staffs, boards, and traditions.

Safety net clinics can deliver excellent primary care, but are dependent on outside resources for specialty consultations, emergency care, and hospitalization. The PCC, through its program administration role and participation in regional activities, recognized the potential benefits of an HIE that could connect safety net clinic patients to mainstream health care providers regionally and assembled a coalition of community organizations to bring the benefits of HIE to underserved individuals and their providers.

At the time this project began, there was little exposure to EHRs and virtually none to HIE in this region. Even by 2009, EHR adoption in Montgomery County for all providers was less than 19% (Dr. David Sharp, Maryland Health Care Commission). The organizational focus was to involve as many health care related organizations and interested parties as possible. For these participants, education about the benefits, risks, opportunities, priorities, implementation strategies, national successes and failures, and the potential for HIE to help bring better, more cost effective health to their constituencies were critical success factors in building support for the MeDHIX safety net oriented HIE project.

Earlier work focused on implementing EHRs in non-Federally Qualified Health Center (FQHC) safety net clinics found that low acquisition and operational cost and ease of use were

essential ingredients for successful adoption and use, as the free clinics in Montgomery County are far more constrained financially and technically than FQHCs. Commercial EHRs were simply not affordable. Given the costs of commercial EHRs, the clinics would invariably choose to spend their resources on direct patient care, precluding the benefits of EHRs and HIE.

The evolutionary solution for the free clinics was the successful implementation of a modular, web based, open source solution (CHLCare) that provided basic capabilities with the ability to add features of particular importance to free clinics. This system is now used by 14 clinics across the region, has brought tangible benefits, built a substantial database for HIE sharing, and helped them envision the benefits of more comprehensive EHRs in the future.

Building a sustainable safety net HIE involves the same considerations of low operational cost, ease of use, and flexibility for growth. As such, an evaluation of open source alternatives was an integral component of the MeDHIX HIE research project.

This research was performed at free clinics, FQHC safety net providers, hospitals, local governments, and community organizations in the Washington, D.C. metropolitan area, including participating organizations in Montgomery County, MD, Washington, D.C., Northern Virginia, and Prince Georges County, MD.

Settings

In year one, the primary focus of this project was the Washington Hospital Center and safety net clinics in Washington, D.C. In years 2, 3, and 4 the primary focus was on eight safety net clinics and five community hospitals in Montgomery County, MD, and one safety net clinic in Washington, D.C. For the Montgomery County clinics, annual patient volume grew from 8,521 patients (26,055 encounters) in 2005 to 21,077 (56,597) by 2009.

The free clinics constitute an especially important group as they are the most financially and technology constrained class of providers, falling well below the Federally Qualified Health Centers in terms of resources and support. In one of the jurisdictions (Montgomery County), free clinics are the predominant source of medical care, as federal regulations inhibit the formation of FQHCs.

Project Participants

Five categories of organizations participated in the MeDHIX HIE research and implementation project, with differing responsibilities and perspectives on the challenges of providing care for low income, uninsured diverse populations. These categories of organizations include the following and are further described below:

1. Systems Integrators and Advocacy Organizations
2. Primary Care Providers
3. Hospitals
4. Safety Net Clinics
5. Local and State Governments, Philanthropic, and Community Advocacy Organizations

1. Systems Integrators and Advocacy Organizations. The Primary Care Coalition of Montgomery County (PCC) is a private, non-profit, charitable organization working with public/private partners to provide high-quality, accessible, equitable, efficient, and outcome-driven health care services for low-income, uninsured county residents. In January, 2000, Montgomery County asked PCC to develop a system of care for low income uninsured and underinsured county residents. This program has grown from 4 clinics serving two thousand people to 12 clinic organizations seeing over 21, 000 patients (56,000 visits) annually. The PCC was the AHRQ grant recipient and overall project coordinator.

The District of Columbia Primary Care Association (DCPCA) works with primary care clinics and the DC Department of Health to facilitate the development and sustainability of an effective integrated health care system in the District of Columbia with a goal of guaranteeing access to primary health care. The main focus of DCPCA was helping a pilot group of DC safety net clinics adopt EHRs in preparation for HIE and promoting HIE activities in DC.

The Regional Primary Care Coalition (RPCC) is an active collaboration of existing and emerging coalitions of primary care providers and health philanthropies serving the region's low income residents in Washington, D.C., Northern Virginia, and Suburban Maryland. Their focus is advancing health equity, improving the health status of the region's residents, and fostering the creation of coordinated, patient-centered systems of community-based primary care that make excellent, affordable, linguistically and culturally appropriate health services available to all across the region. Member organizations are located in Washington, D.C., Montgomery and Prince Georges counties in Maryland, and Arlington, Fairfax, Prince William, and Loudoun counties and the city of Alexandria in Virginia. Their role was to bring disparate groups together to share ideas and accomplishments.

2. Primary Care Providers. Primary care providers in Montgomery County included the pan Asian Volunteer Health Clinic, Community Clinics, Inc., Holy Cross Hospital Health Center, Mary's Center, Mercy Health Center, Mobile Medical Care, Muslim Community Center Clinic, Proyecto Salud, Spanish Catholic Center, People's Community Wellness Center, and Under One Roof. District of Columbia clinics included Bread for the City; Family and Medical Counseling Service, Inc.; La Clínica del Pueblo; Mary's Center for Maternal and Child Care; SOME (So Others Might Eat); and Whitman-Walker Clinic. Virginia clinics included Arlington Free Clinic and Jeanie Schmidt Free Clinic.

3. Hospitals. Six area hospitals participated actively in the project: Washington Hospital Center in DC, a major tertiary care teaching hospital, and five community hospitals located in Montgomery County: Holy Cross Hospital, Montgomery General Hospital, Shady Grove Adventist Hospital, Suburban Hospital, and Washington Adventist Hospital.

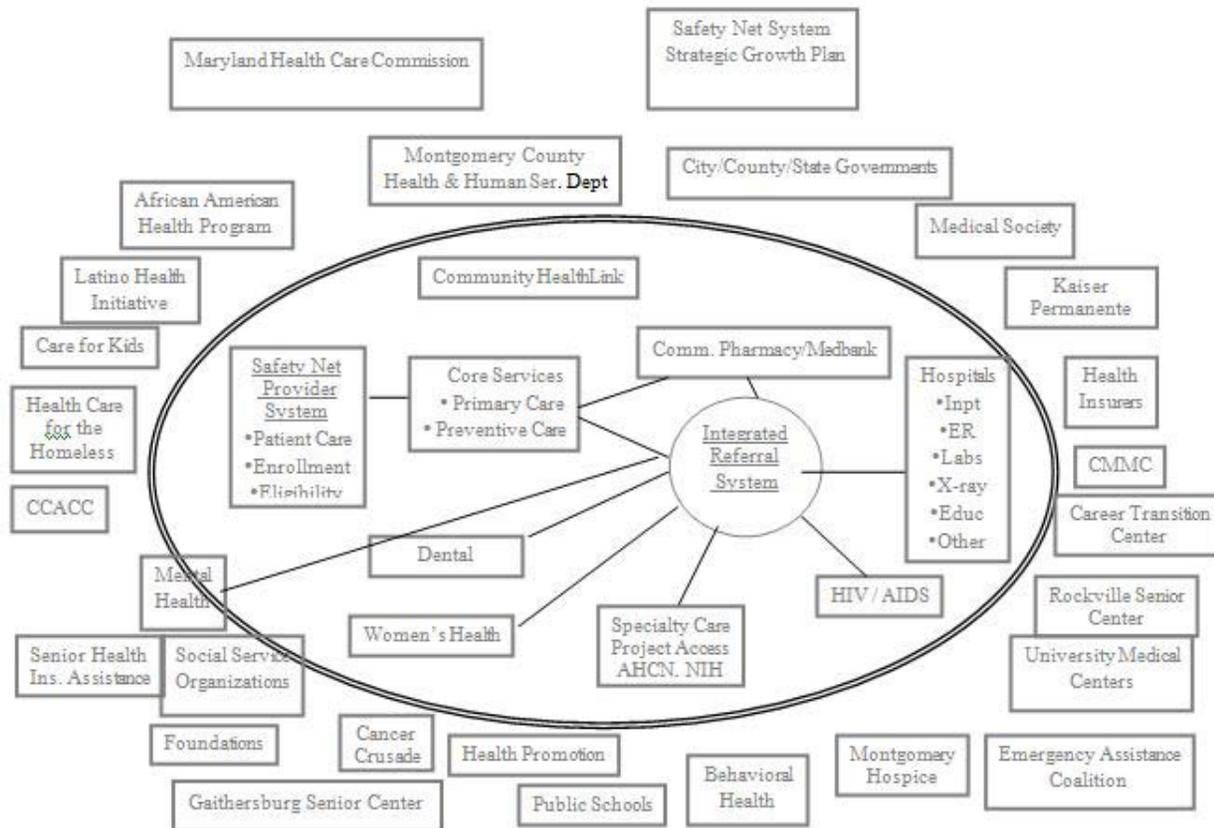
4. Safety Net Clinic Patients. The patient population included in the study is low income, uninsured or underinsured, ethnically and racially diverse.

5. Local and State Governments, Philanthropic, and Community Advocacy Organizations. Numerous organizations are involved in health care at the community level. Given their limited knowledge of EHRs and HIE at the start of this project, community outreach and education were integral to our work. For these participants, education about the benefits, risks, opportunities, priorities, implementation strategies, national successes and failures, and the

potential for HIE to help bring better, more cost effective health to their constituencies were critical success factors in building support for the MeDHIX safety net oriented HIE project.

Figure 1 illustrates only a subset of the entities that were part of the HIE communication and assessment activity: those involved in health care for low income uninsured patients in Montgomery County alone. Surrounding jurisdictions have still more. We worked with a substantial number, though not all, of the organizations shown in Figure 1, as well as those in other jurisdictions, with differing degrees of intensity.

Figure 1. A subset of the entities involved with the HIE communication and assessment activity



Conceptual Framework

The conceptual framework for safety net clinic EHR adoption and effective use is a 3 tier model. The bottom tier is focused on improving the operational and clinical effectiveness of each individual safety net clinic; the middle tier is focused on helping a group of clinics function as an integrated safety net system of care; and the top tier is focused on connecting the safety net system of care to mainstream health care providers and services.

At the bottom tier safety net level, project work was considerably more broad-based than simply EHR assessment or adoption. An essential component of our methodology is to train clinic staff in the fundamentals of workflow and process redesign in accordance with models developed by the Institute for Healthcare Improvement. The goals are to develop local clinic

skills in process improvement, achieve measurable improvements in productivity and quality, and redesign clinic practices for more effective use of existing and future EHRs.

At the middle tier, building an effective safety net system of care across multiple clinics, projects focused on sharing ideas, effective processes, and data. One group of 14 safety net clinics already used a shared, web based, open source, safety net clinic oriented basic EHR called CHLCare. Since these clinics were already sharing demographic and clinical data, they could quickly move to shared standards and models for cross-clinic quality improvement metrics, Community Pharmacy formulary; and to share services such as stress testing, diabetes education, and outpatient surgery among members based on special capabilities within a specific clinic.

The top tier focused on connecting the shared safety net clinic EHR to community hospital emergency departments. Later, this work was extended to include creating photo ID cards for safety net patients to facilitate patient identify management and HIPAA compliance, an automated electronic link between a commercial laboratory service and the shared CHLCare EHR, remote eligibility verification for safety net patients at community hospitals when patients were referred for specialty care services, and a fax to PDF capability for specialists to use to send consultative reports back to the clinics for incorporation into the HER, or for hospital emergency departments to use to notify clinics that a patient of theirs has been treated.

Methods

This project focused on the practical challenges of building a sustainable, useful safety net oriented HIE. The goal was not to conduct a formal assessment of patient outcomes for providers with HIE access vs. those without, to quantify HIE benefits, or to measure before and after levels of knowledge of health information exchanges by patients, physicians, or community organizations. We had hoped to be able to demonstrate a reduction in ED visits through the use of an HIE connecting safety net clinics and hospital emergency departments. We did develop a quantitative model, but were unable to obtain actual use data by the end of the grant period because of delayed implementation of the HIE. We are currently implementing that program.

The sections below describe the methods used by the project team to complete each of the project aims. The methods emphasize building collaborative relationships and focused information gathering closely tied to the themes of provider priorities for data content and access, community education on the benefits, risks, and strategies for effective HIE implementation, and exploration of safety net patient perspectives on the value, fears, and risks that they see in making their data more widely available to those who provide care.

Aim 1

Implement a sustainable health information exchange linking the electronic health record systems of the region's safety net clinics with mainstream healthcare providers to improve patient care quality, safety, and efficiency for the region's most vulnerable populations, focused on the specific needs of the uninsured population and safety net environment.

Implementation. The implementation strategy for MeDHIX consisted of three phases:

- Leveraging existing technology, Azyxxi, the Washington Hospital Center's sophisticated data aggregation and display system (now Microsoft Amalga), to rapidly deploy a significant subset of capabilities to provider participants to address the issues of cross-jurisdictional, cross-enterprise health information exchange and help participants understand the value and activities associated with HIE deployment in the safety net environment (year 1).
- Tracking the expected issuance of federal standards, protocols and operating guidelines necessary for Community of Interest HIE's, such as MeDHIX, to interoperate within the evolving regional health information exchange and National Health Information Network environment, adapting phase 1 work for compatibility with those standards (year 2).
- Refining HIE capabilities as user requirements and technical standards evolved and extending the HIE to additional regional participants (years 3 and 4).

Open Source Considerations. Two characteristics of safety net clinics led us to consider open source technology for health information exchange. Safety net clinics, in particular the free clinics that are the predominant providers in one of the jurisdictions, are quite resource poor. For them to participate in HIE and EHRs, costs must be low, with minimal technical and operational complexity, or financial requirement. These organizations also are heavily reliant on volunteers for patient care and support services. Low cost of acquisition, implementation, ongoing operations, customization, and staff training are critical and often determine whether a free clinic can adopt and effectively use an EHR or stays with traditional paper records.

Open source platforms more readily lend themselves to local modifications and enhancements to meet unusual needs of safety net clinics, typically not met by commercial systems, in a cost effective fashion. Examples from our own work range from the simple to the quite complex. One clinic has 200 volunteer providers with variable schedules, ranging from once a week to once a quarter. The clinic may not know the names of the providers until the day of the clinic, thus requiring special features in the appointment component of the EHR to make appointments in advance for anonymous providers and then quickly and easily assign patients to the proper providers. A complex example is the creation of a specialty referral management system that is fully integrated with the EHR to provide seamless connectivity among the individuals in the clinics requesting the referrals and two separate charitable community organizations that manage the recruitment and assignment of specialists, make the appointments, and notify the clinics of the match. This system also manages the return of consultative reports to the EHR.

Sustainability. Sustainability, a critical factor for project success, was evaluated by reviewing the operational costs, capabilities, flexibility, complexity, and support requirements of the relatively few successful HIEs. Commercial, one-of-a-kind, and open source solutions were reviewed. Exploring the use of open source software to minimize acquisition, implementation, operational, and customization costs was of particular interest given our positive experience with open source safety net EHR solutions.

MeDHIX Data Disclosure Legal Considerations. The regulations governing data exchange are especially complex for MeDHIX, as the Community HealthLink consortium has member clinics in Virginia, Maryland and the District of Columbia. Varying state statutes must be evaluated and business processes adapted to address data sharing limitations. To address privacy and data sharing concerns, we engaged a Washington, D.C., law firm that had participated in the Markle Connecting for Health Common Framework project to research and reconcile the laws and regulations of three jurisdictions, with a focus on HIE for vulnerable populations.

Aim 2

Work with safety net clinic providers, hospital emergency departments, and specialists that are a major source of care for safety net patients to identify specific data, applications, and use cases that are of the most benefit to them.

The objective was eliciting information from those who provide care to safety net patients about what data and features would be most useful to them in an HIE. The method was an extensive set of meetings and interviews, both individual and small groups, with safety net clinic staff, community hospital ED staff, and senior ED physicians at Washington Hospital Center representing the views of a tertiary hospital ED.

Aim 3

Broadly involve health care organizations, community groups, philanthropies, and governments across the region, focusing on education and outreach about the benefits, risks, opportunities, priorities, implementation strategies, national successes and failures, and the potential for HIE to help bring better, more cost effective healthcare to their constituencies.

PCC, DCPCA, and RPCC by design are well connected to numerous community organizations focused on health care for disadvantaged populations within the DC metropolitan area. Formal and informal sessions, working groups, and individual interviews were used to explore the benefits of HIE regionally, disseminate information about the evolving concepts of HIE, and gain perspectives from a remarkably diverse group of organizations.

Surveys were conducted with key stakeholders, primarily in Montgomery County, through an open-ended survey to assess the level of knowledge, interest, and perceived benefits and risks of HIE. The survey was administered in an interview format by phone or in person to allow participants the opportunity to share more liberally and ask questions if necessary. These participants were primarily partners and collaborators with the PCC, and the various groups interviewed are listed in the section 2.3.5. The rest of the surveys (primarily those from the Montgomery County Medical Society), were completed by participants in written format and sent to them by e-mail. To analyze these surveys, responses were categorized by question and then gleaned for salient themes. Quotations and comments were then grouped by theme and weighted according to how often participants mentioned a particular theme.

Aim 4

Engage ethnically, racially, and economically disadvantaged individuals and their representative organizations to better understand the factors that inhibit or promote their acceptance of HIE and the steps that must be taken to maximize trust, acceptance, and mutual benefits.

Clinic patients participated from two perspectives. The first was through an educational process explaining the benefits and risks of sharing health information, one to one with each patient by staff at each clinic followed by the patient agreeing or not agreeing to share data. The second form of participation involved formal, moderated focus groups. The goal was to elicit detailed information about perceptions, fears, risks, confidentiality concerns, and personal experiences related to access or lack of access to medical data by providers at the time of care and the challenges that patients had in assembling their medical data.

Aim 5

Assist safety net clinics in the implementation, enhancement, and use of EHRs, as a prerequisite for achieving significant HIE benefits.

Activities included the identification of a pilot group of clinics interested in EHR adoption, a formal acquisition process, staff training, and implementation. Two distinct collaborative projects were undertaken in two different jurisdictions within the region.

The goal of the first collaborative project, led by the District of Columbia Primary Care Association, was to accelerate the adoption of EHRs by Washington, D.C. safety net clinics. Phase 1 was an assessment of the “current state” of readiness of the clinics to adopt EHRs. Phase 2 was a detailed requirements analysis, harmonization of needs across the clinics, RFP development, and acquisition. Phase 3 was the selection and implementation of an EHR at six pilot clinics.

The second collaborative project was the extension of the CHLCare web based, open source shared EHR to additional safety net clinics in the metro DC region. These clinics tend to be small, unable to acquire or install EHRs, and are part of a network of free clinics providing care to low income, uninsured individuals. Clinic sponsors include religious organizations, cultural associations, and community groups. Examples include the Arlington Free Clinic in Arlington, VA; the Muslim Community Clinic in Montgomery County; L’Ami Clinic for French speakers, a Pan Asian clinic; and the Jeanie Schmidt Free Clinic in Herndon, VA.

Aim 6

Reduce unnecessary visits to hospital emergency departments (ED).

This section describes the goal and approach of a work in progress, as delayed implementation of the HIE has prevented completion of this task.

In fiscal year 2009 ED charges for the five hospitals in Montgomery County exceeded \$13 million for “self-pay and charity” patients, most of whom are in the low income, safety net category. Of this total, \$5.7 million is in the “avoidable” category based on the Billings⁴ algorithm for classifying ED visit as “primary care treatable or preventable conditions.” Communication between safety net clinics and hospital emergency departments is often

incomplete and fragmented. The ED often does not know that a safety net patient is receiving care from a specific clinic and the clinic typically does not know on a timely basis that an ED visit has occurred. Lack of communication prevents both parties from instituting appropriate interventions to minimize unnecessary ED visits. We hoped to address deficits in this communication process through the use of the HIE.

This collaborative program includes all five Montgomery County hospitals, each paired with one or more of six safety net clinics. The method to achieve this aim is to identify patients eligible for care at one of the safety net clinics at the time of an ED visit, enroll them in an appropriate safety net medical home clinic, and compare pre and post ED utilization using data from the Maryland Health Services Cost Review Commission.⁵ In addition to simple counts of appropriate vs. primary care preventable ED visits, we also plan to compare hospital-clinic pairings and the potential influence of demographic factors such as education level, language, proximity to a clinic, and hours of operation of the medical home clinic.

The key elements for this analysis include:

- Picture ID card to identify the patient and the patient's clinic to the ED.
- ED access to the patient's demographic and clinical data through the HIE.
- Timely access for safety net clinic staff to the ED discharge summary.
- Classification of an ED visit as "primary care treatable or preventable" (Billings algorithm).
- ED usage history by patient before bi-directional HIE data sharing.
- ED usage history by patient after bi-directional HIE data sharing.

This first three requirements are associated with this project. The remaining three components are part of a complimentary project in collaboration with the Department of Health and Mental Hygiene and the Maryland Health Services Cost Review Commission.

Aim 7

Provide data for public health planning, epidemiological surveillance and targeting of services to the low income uninsured.

Three activities were defined to meet this aim:

1. Show local public health authorities the power of data aggregation and analysis tools for public health using the Washington Hospital Azyxxi system (now Microsoft Amalga).
2. Understand the priorities of local public health officers with respect to assessing demographic, disease state, and treatment data for safety net populations.
3. Explore the potential for contributing de-identified encounter, diagnostic, and medication data on safety net patients to ESSENCE, the Maryland state bio-surveillance system⁶,

designed for the early detection of disease outbreaks, suspicious patterns of illness, and public health emergencies. Data from safety net providers is not currently part of ESSENCE and would complement data submitted daily by hospital emergency departments and chain pharmacies.

Results

The primary goal of the MeDHIX project was to create and deploy a multi-jurisdictional regional safety net clinic oriented health information exchange to link safety net clinics to one another and to mainstream providers, with initial emphasis on hospital emergency departments and specialist referrals. We were able to create the MeDHIX HIE to link 14 safety net clinics at 40 care sites across 3 jurisdictions that can be accessed by 5 community hospitals, the Montgomery County Department of Health and Human Services, and medical specialists treating safety net patients, while incorporating differing multi-jurisdictional privacy and confidentiality standards. Deployment on a pilot basis did not begin until the end of year 4.

The remainder of this section describes results associated with each of the seven aims.

Aim 1

Implement a sustainable health information exchange linking the electronic health record systems of the region's safety net clinics with mainstream healthcare.

Year 1. The technical goal for year 1 was to use existing technology, the Washington Hospital Center Azyxxi system (now Microsoft Amalga) data aggregation, display, and analysis system, to demonstrate the feasibility and benefit of exchanging data between Washington Hospital Center and at least one safety net clinic to gain experience and confidence in exchanging medical data without major upfront costs or delays.

A uni-directional link was established between the Azyxxi system at Washington Hospital Center and Bread for the City, a DC safety net provider. Clinic staff could enter demographic data remotely into Azyxxi's master patient index/record locator system. When a match was found, that patient's data was made available to the clinic. This was successfully used to look up diagnostic and treatment data on a patient who had been treated at the Washington Hospital Center but could not remember her diagnosis or how she was treated.

The patient matching algorithm for safety net patients uses social security number and home address as important matching factors. Social security number was often not available or reliable and patients moved frequently leading to less certainty than expected. The thick client Azyxxi implementation was complex and expensive to install and support in safety net clinics, in contrast to a web based application that could be integrated without special equipment at low marginal cost.

Year 2. Formal National Health Information Network (NHIN) standards were not yet well defined and our technical approach had to be completely rethought when the Azyxxi team left

the Washington Hospital Center to become part of Microsoft, changing their focus from a safety net clinic HIE collaboration to the university medical center and large hospital market.

We reviewed the small number of operational HIE's then extant for functionality, applicability to the safety net and community hospital setting, flexibility for enhancement, and costs for implementation and ongoing operations. The Regenstrief work was impressive, but costly and not readily transferable; the Utah Health Information Network was more financially focused; and the Cincinnati Health Bridge work depended on a revenue model that was not realistic for safety net clinics. After reviewing the approach taken by the OpenHRE team as one of the original NHIN participants, we elected to employ a similar open source solution, tailored to safety net clinics and community hospitals to get the project back on track.

The latter half of year 2 and the first half of year 3 were devoted to the design, development, and testing of the MeDHIX HIE infrastructure and eChart user application. The MeDHIX open source message exchange architecture and related management functions used emerging standard tools from the open source community. The eChart user views and tools were based on extensive discussions with safety net clinic physicians and staff, hospital ED physicians, senior hospital administrative and IT staff, building on the experience of similar projects.

eChart capabilities include:

- “eChart” clinical summary viewable from a web browser for ER and specialists based on data from the CHLCare open source shared EHR used by the clinics.
- Picture ID card creation for safety net clinic patients to meet patient identification and HIPAA requirements for hospital emergency departments and specialists.
- Quest Laboratories electronic results reporting.
- Community wide referral management module.
- Accept faxed reports from specialists and ERs for incorporation into the clinic EHR.
- Eligibility verification for safety net patients at point of care.
- Conform to multi-jurisdictional privacy regulations.
- Embedded privacy and confidentiality requirements in the “eChart”.
- Ability to print the “eChart” for non-repudiation and workflow convenience.
- Emergency Department Discharge Summary (when available from hospitals).
- Mirth interoperability exchange platform to manage data transfer, connectivity, authentication, audit, and related functions.

The eChart employs a three step “keep it simple” philosophy. The eChart does not display medications, labs, and problem lists associated with Mental Health, HIV or Drug Rehab in the initial eChart view, with an appropriate disclaimer. To balance patient care and confidentiality

protections, Step 2 permits a medically authorized user to view protected health information, after obtaining consent from the patient and documenting in MeDHIX that consent has been obtained. Should the patient not be able to give informed consent, Step 3 allows the provider to document that they have complied with the policies of their institution and then view the restricted data

Year 3. With the departure of the Azyxxi team and the DCPCA focusing on implementing a common EHR in six pilot clinics in the District of Columbia, we shifted our emphasis to the safety net clinics and community hospitals in Montgomery County and one clinic with branches in both Washington, D.C. and Maryland.

Montgomery General Hospital had recently provided space on its campus for a new branch of the Proyecto Salud clinic and was especially interested in using the eChart to access data on their safety net patients, as well as patients from other safety net clinics. A demonstration attended by their Vice President for Medical Affairs, the ED Director, senior nursing staff, and ED personnel was highly positive. The ED Director was pleased at the content, suggested that we should consider adding EKG tracing if the clinics were able to provide them, and observed that “I’ll have easier access to better data on safety net patients than I do on our insured patients.” We also learned that ED physicians were not always aware of the existence of many of the safety net clinics, with the result that patients are often instructed to return to the ED when they could be referred to an appropriate safety net clinic for follow up and continuing care. The hospital also started the process of approving the data sharing agreements.

Year 4. The intent for year 4 was to implement the eChart at all five Montgomery County hospital emergency departments. The reality was quite different and illustrated the importance of shifting priorities in collaborative ventures. We demonstrated the eChart to ED staff at the remaining four hospitals. All were quite positive, with staff confirming our earlier findings that the eChart HIE would not only help them provide better acute care, but improve their safety net clinic referrals and minimize ED “bounce back”. ED staff asked for sign-on codes and training and were eager to start.

However, the reality was that implementation was delayed at each hospital, but for different reasons. In one case, it took nearly a year to obtain clearance for shared data access. In another case, the hospital was in the midst of installing a comprehensive hospital information system on a time schedule set by a parent organization. Another was in the evaluation phase for replacing their hospital information system and did not have resources to spare.

While discouraging, we used this delay as an opportunity to work with the safety net clinics to help them increase EHR utilization and data entry. We assisted in the opening of two new safety net clinics, increasing the number of patients who could participate in the exchange. Montgomery General registration staff began using the eChart to verify safety net patient eligibility and demographic information. We also implemented the MeDHIX fax capability for specialists to fax consultative reports for inclusion in the EHR.

We began a new collaborative program in Year 4 with all 5 Montgomery County hospitals and six safety net clinics. The goal of this program is to identify patients with primary care preventable ED visits, enroll them in a medical home, and compare pre and post ED utilization and the influencing factors. The MeDHIX eChart is an essential component of this project for identifying safety net clinic patients in the ED and communicating with their clinic. Without it, the project could not have gone forward.

HIE Sustainability. The resource constraints of the safety net world make financial sustainability for an HIE especially challenging. The resources required for annual operations for MeDHIX are quite modest:

- Commercial server hosting (Linux, MySQL, Apache, monitoring, etc.): \$10,000
- User training and “help desk” support (0.25 – 0.5 FTE): \$25,000 - \$50,000
- Reserve fund for unexpected modifications, trouble shooting, etc.: \$10,000 - \$20,000
- Total estimated annual cost: \$45,000 - \$80,000

Aim 2

Work with safety net clinic providers, hospital emergency departments, and specialists that are a major source of care for safety net patients to identify specific data, applications, and use cases that are of the most benefit to them.

Initial discussions were held with physicians from 6 safety net clinics and 5 hospitals, other care providers, ED staff, and hospital IT and executive staff to determine the degree of interest in HIE and perceived benefits. There was a general consensus that a safety net oriented HIE linking clinics and EDs had the potential for significantly improving care, minimizing the risks associated with duplicative diagnostic studies, and, reducing costs. We also gathered information on what data would be most valuable in the ED setting and how it should be presented.

After the eChart software was tested, we demonstrated it to ED staff at 5 hospitals. In all cases they felt it would be easy to use for rapid access to relevant clinical data and to identify the safety net patient’s medical home clinic. Not only would this allow ED physicians to contact the patient’s physician if needed, but would minimize the risk of ED “bounce back” by ensuring that the clinic was made aware of the ED visit and received appropriate follow up information. The concept that “a little data goes a long way” was confirmed, with the most useful health data being diagnoses, allergies, current medications, visit history and the ability to identify the patient’s primary care provider and medical home. The data most frequently asked for, but not yet available from the safety net clinics, are EKGs. Safety net clinic physicians saw considerable value in receiving an electronic notification and ED discharge summary for patient follow up, particularly for “avoidable” ED visits. This will be implemented as hospitals develop the capability for electronic transfer, or perhaps using the MeDHIX fax-to-PDF capability. This latter step will involve operational changes at each hospital.

Aim 3

Broadly involve health care organizations, community groups, philanthropies, and governments across the region, focusing on education and outreach about the benefits, risks, opportunities, priorities, implementation strategies, national successes and failures, and the potential for HIE to help bring better, more cost effective healthcare to their constituencies.

In addition to numerous individual and group discussions with community groups, 54 people responded to the open ended interview survey described in the method section.

Table 1.

	Yes	Yes, with conditions	No	Unsure	Total
Community-based organizations	8	0	1	0	9
Montgomery Cares (safety-net) clinics	5	8	0	1	14
Montgomery County DHHS	2	2	0	3	7
Physician members of medical society	7	2	5	1	15
Others*	7	0	0	2	9
Total	29 (54%)	12 (22%)	6 (11%)	7 (13%)	54

* "Others" include: leaders of area foundations, a president of a chamber of commerce, a hospital CIO, a representative from the Office of Minority Health

Those in the “Yes” category cite better coordination and continuity of care and increased efficiency and cost-effectiveness. For those in the “yes, with conditions” category, the concerns were predominantly confidentiality. Community leaders who work with immigrant communities said that patients may not opt-in to HIE if they fear that certain information may be released beyond a particular provider. This concern was most strongly expressed by leaders who work with immigrant groups from Africa, where stigma for particular diseases or conditions is particularly strong. The “No” group (mostly physicians) were not convinced of significant positive impact or thought it likely that providers would bear an inordinate burden to implement.

Aim 4

Engage ethnically, racially, and economically disadvantaged individuals and their representative organizations to better understand the factors that inhibit or promote their acceptance of HIE and the steps that must be taken to maximize trust, acceptance, and mutual benefits.

Focus group methodology was used to gather the perspectives of uninsured or underinsured patients primarily living in Montgomery and Prince George’s Counties. A total of 8 focus groups were conducted with 61 participants. Focus group size ranged from 5 to 12 individuals. All groups used a trained facilitator. Two groups were conducted entirely in Spanish. Participants were a mix of native born and recent immigrants and had little or no knowledge of HIE before attending the session.

The primary concerns related to the confidentiality of patient data and the security of the system. Latino patients were concerned that information might be used for non-medical purposes such as Immigration or Customs investigations. The Tuskegee experiments were referenced by African Americans as an improper use of personal medical data that could result from HIE. Some individuals were especially sensitive to the risks of inadvertent data sharing in cultures where having certain disease can lead to social ostracism.

Most participants indicated that they would support sharing personal health information if they could be assured of the “absolute security and confidentiality” of their information, and if their information were not at risk of release to peers, family members, employers or commercial entities (e.g. pharmaceutical companies). Suggestions included requiring patient consent before his/her information would be shared and a system that could track access to medical records.

Those who opposed sharing their health information were not convinced that it would improve their healthcare or that confidentiality could not be protected.

Examples of limits that patients would place on sharing data include: “I don't want doctors or anyone else being able to view it at will. Information such as gynecology and cosmetology wouldn't be pertinent to a doctor treating me for high blood pressure. Some information should be private.”

Regardless of willingness to share data through an HIE, all focus group participants emphasized the value of increased access to their own health information, describing the difficulties they faced, such as having to take unpaid time from work to collect medical records when sent to a specialist.

Aim 5

Assist safety net clinics in the implementation, enhancement, and use of EHRs, as a prerequisite for achieving significant HIE benefits.

Under the primary sponsorship of DCPCA, six safety net clinics in Washington, D.C. volunteered to be pilot sites for implementation of a common EHR: Bread for the City; Family and Medical Counseling Service, Inc.; La Clínica del Pueblo; Mary's Center for Maternal and Child Care; So Others Might Eat; and Whitman-Walker Clinic. eClinicalWorks was selected as the vendor, with implementation activities starting in June 2007.

CHLCare, the web based, open source shared EHR, was installed in additional safety net clinics in the metro DC region. These clinics tend to be small, unable to acquire or install EHRs, and are part of a network of free clinics providing care to low income, uninsured individuals. Clinic sponsors include religious organizations, cultural associations, and community groups. Clinics include the Arlington Free Clinic in Arlington, VA; the Muslim Community Clinic in Montgomery County; L'Ami Clinic for French speakers, a Pan Asian clinic; and the Jeanie Schmidt Free Clinic in Herndon, VA. CHLCare is now used by 14 safety-net clinics; at 40 care sites; across 3 jurisdictions.

During the course of this project, the number of patients seen annually by clinics using the CHLCare shared EHR has increased from about 8,000 to over 24,000. Over 39,000 different patients were seen in the last 2 years, accounting for ~190,000 visits. The database now contains nearly ~560,000 clinic visit records on over ~110,000 culturally, racially, ethnically, and linguistically diverse patients. This information is available through the MeDHIX eChart.

Aim 6

Reduce unnecessary visits to hospital emergency departments.

The goal of this program is to identify patients with primary care preventable ED visits, enroll them in a medical home, and compare pre and post ED utilization and the influencing factors. While it is disappointing that we have not yet been able to achieve sufficient usage to evaluate the efficacy and utility of the MeDHIX eChart project in reducing ED usage, we expect significant usage as part of the ED diversion project and plan to conduct an evaluation even though the formal grant period has ended.

Aim 7

Provide data for public health planning, epidemiological surveillance and targeting of services to the low income uninsured.

The exploration of Azyxxi for public health data analysis did not continue beyond the transfer of the Azyxxi system to Microsoft. However, Montgomery County public health staff has had a long interest in better data and tools to analyze disease patterns in the safety net community for allocating scarce resources most effectively. Geomapping of MeDHIX HIE data began in year 4, is increasingly used, and has stimulated more requests for data and an analytical, data driven focus.

Lessons Learned and Challenges to EHR and HIE Implementation

There was general consensus among hospitals that the cost/benefit for safety-net patients is likely to be substantial in improving health and controlling costs. However, there was a prevalent belief that the confidentiality risks outweighed the benefits for insured patients, who typically have existing relationships with providers who know them well and already have access to all or most of the necessary medical data. Hence the risk of unauthorized or accidental release of personal health data, even if low, outweighs the benefit. Emergency room (ER) physicians, who see both uninsured and insured patients, did not share this belief, instead observing that they would have more data on safety net patients, with the potential for safer more timely care, than for insured patients.

Barriers to Implementation and Use of and HIE. Barriers to effective HIE among safety net clinics and mainstream health care providers include: more pressing safety net clinic medical priorities, limited paid staff, a heavy volunteer component, lack of technology skills in the clinics, technical complexity and cost of data interchange systems, privacy concerns, and organizational priorities by both clinics and mainstream health care providers that are considered to be much more important for access to quality care than HIE.

Environmental Constraints. Environmental constraints define the boundaries of HIE as determined by each hospital, introducing additional hospital centric evaluation criteria beyond those technical factors originally anticipated. Some hospitals are reluctant to share data unless it is already being shared through traditional methods. Some prefer to be silent partners in the day-to-day operations of MeDHIX, not wanting responsibility for managing inquiries or unexpected access to their databases. Others may be reluctant to absorb the costs of deploying a separate server outside the firewall, preferring to delegate to MeDHIX the responsibility for hosting the databases that receive health data. Even browser choice may be controlled or prohibited, along with contract limitations imposed by HIS software vendors.

Safety Net Patient ID Cards. As part of our use work with the hospitals, we unexpectedly encountered a new set of procedural, legal, and liability concerns as we as we attempted to complete the technical discussions on the details of the message exchange. Hospitals required assurance in two areas before they were willing to share data. First, positive identification of the patient; second, evidence that a patient was being seen in one of the safety net clinics, a surrogate

for assuring that the patient had been informed of the clinic's data sharing policies and received proper HIPAA counseling. Without this ability, the project could not proceed.

To meet these requirements, we implemented safety net patient photo ID cards as part of the MeDHIX project. An ID card supports the process of identifying a medical home for the patient and assists in discharge planning in the ED. The ID card also identifies the patient as agreeing to the data exchange. The ID card also addressed the concerns that some physicians and hospitals had expressed about the risks or added time associated with probabilistic matching of patient records between health systems. The hospitals did not want data to be provided if there was any question that the data might not belong to the specific patient. In addition, hospital staff did not want to take the time or responsibility for reviewing potential matches and selecting records based on their individual assessment of what patient entries or data belong to the patient being seen. This process is time consuming and increases risk and liability for the hospital.

HIE Governance and Operations. The transfer of Azyxxi to Microsoft was a powerful demonstration that the technical service provider should not be the governing entity. Member hospitals stressed the importance of a neutral party managing the MeDHIX infrastructure, concerned that a competitor managing the HIE infrastructure would be an obstacle to participation because of how shared data might be used. Also, there was concern that priorities for system features and operational rules would be determined by the HIE service provider, with little say by partner institutions.

Differences in the Perceived Value of Data. The value placed on different kinds of data varied considerably among providers and clinical care sites. Azyxxi used an expensive high performance workstation with a large high resolution monitor to test the value of viewing medical imaging studies remotely in a safety net setting. While remote image viewing is technically impressive, there was considerable difference of opinion as to its value and cost effectiveness in safety net clinics, where physicians placed a lower priority on seeing imaging studies given their heavy patient loads and busy safety net clinics, often preferring the radiologist's report.

Community hospitals and safety net clinics viewed exchanging basic patient data as a significant benefit for both clinics and ED physicians. EDs value a patient's "eChart summary" as a quick guide to potential problems and the information to contact the provider if needed. Clinics value an electronic discharge summary, as they often are not aware that their patient has been seen until much later, if at all. Hospitals value the ability to refer a patient back to the primary provider to ensure effective follow up and to arrange for a medical home for those patients who do not yet have one. The information that seems to be most highly valued is care provider, visit history, problem list, allergies, and medications from the ER perspective, with the addition of lab results and ER discharge summaries for the safety net clinics.

Importance of Public Education in Building Support for HIE. Discussions and interviews with community groups and focus group findings from safety net patients suggest that training and education focus on patient rights and responsibilities with regard to their medical information. Efforts would need to be supported by policy, resources, and incentives; confidentiality and security would need to be clearly demonstrated; HIE implementation would need to be accompanied by standards for recording and classifying medical information in the

system; and specific goals should be delineated regarding what HIE is intended to accomplish and for whom.

Safety Net Patient Benefits from HIE. While our data is limited, focus group results and discussions with safety net patients and providers suggest that safety net patients will benefit even more than insured patients from an effective health information exchange. Insured patients typically have one or a small set of providers who already communicate effectively with one another for most medical problems. In contrast, safety net patients typically are seen by multiple providers at multiple sites, records are less complete, information is more diffusely scattered, and patients often must visit multiple providers to physically collect and assemble their own medical records. The challenges of providing high quality, cost effective, timely preventive and therapeutic interventions are correspondingly greater and outcomes less certain.

Legal Issues and Concerns. Legal issues concerning patient privacy and access to personal health information continue to be costly in terms of delayed implementation, cost, and fear or reluctance to participate, constituting the single largest impediment to planning and implementing HIE. In spite of a growing national consensus on guidelines for sharing health information, each new organization - and individuals new to current member organizations - regularly revisit concerns that had been previously resolved. Differing interpretations are sincerely held, reflecting the complexity of the underlying statutes and regulations. For the MeDHIX project, privacy and data sharing policies were especially interesting because the project spanned three distinct jurisdictions: Maryland, Virginia, and the District of Columbia.

Collaboration Challenges.

- Project planning is challenging when tasks cross multiple organizations even for organizations enthusiastically committed to target completion dates. External and internal business and clinical priorities may preempt HIE work, slowing implementation. Causes include apprehension concerning legal liabilities, policy and business process changes, and competition between providers. These common business related delays are complicated by the fact that potential benefits from HIE are future oriented and speculative, whereas the preempting projects are either essential now or have clear near term benefits. These factors delay implementation, making project plan target dates less predictable.
- Well defined expectations among participants are paramount to avoid confusion and subsequent crucial amendments to technology and business processes. This was demonstrated when the organization providing an established record locator, data aggregation and display tool changed from a web-based to a dedicated high-performance personal computer paradigm for linking the safety-net clinics to the HIE.
- If the HIE operator, instead of the data providers and recipients, controls the project plan, policies, and processes, considerable effort may be required to align the needs of all users.

- Measuring the impact of HIE on safety, quality, and efficiency of medical care continues to be a challenge for us. We hope to get some quantitative data through our post grant ED diversion-medical home project.

Related Activities and Future Projects Integral to the MeDHIX HIE

Future plans include data exchange with the DC RHIO and inclusion in CRISP, the newly established Maryland statewide HIE project. Further information on the DC RHIO project is available at <http://dcpc.org/index.php/Health-Information-and-Technology-Initiative-8-2007.html>. Detailed information on current activities and future plans for CRISP is available at the Maryland Health Care Commission web site, <http://mhcc.maryland.gov/electronichealth/hie.html>.

MeDHIX/AHRQ Facilitated Resources to Expand and Enhance Safety Net EHRs and HIE.

- Montgomery Cares – a Montgomery County, MD, program to expand the safety net clinics to provide high quality care to more uninsured. The ability to acquire, use, and share health data electronically was integral to program expansion and assessment.
- Kaiser Permanente grant to enhance the medication management function of the CHLCare shared EHR to meet unusual needs of safety net clinics.
- Care First Blue Cross Blue Shield grant to add disease management and planned care extensions to CHLCare and MeDHIX.
- Funding to integrate behavioral and oral health care into safety net clinics.
- Komen grant for breast cancer outreach regional expansion.
- Expanded health care for the homeless funding.
- County support for diabetes standards of care assessment project.
- Meyer Foundation support.

MeDHIX Related Regional Activities and Participation.

- Maryland Governor's Health Information Technology Task Force to Study Electronic Medical Records.
- DC RHIO (formerly National Capital Area RHIO). Advisory Board.
- Regional Primary Care Coalition.

- Montgomery County Health Information Exchange Project (MCHIE) report and recommendations for a statewide HIE.
- “Emergency Department-Primary Care” (ED-PC Connect) reduction of avoidable ED use funded under a Maryland Dept. of Health and Mental Hygiene grant.

References

1. <http://raceandhealth.hhs.gov/templates/content.aspx?ID=4949&lvl=2&lvlID=113>
2. http://en.wikipedia.org/wiki/Montgomery_County,_Maryland
3. <http://www.montgomerycountymd.gov/rectmpl.asp?url=/content/rec/gccd/index.asp>
4. Billings J. Software for Use of the Emergency Department Classification Algorithm. In *Tools for Monitoring the Health Care Safety Net*. (Ed. R. Weinick, J. Billings; AHRQ Publication No. 03-0027, September 2003. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.ahrq.gov/data/safetynet/tools.htm>.
5. See: <http://www.hsrc.state.md.us/>.
6. For more information see: <http://www.marylandfluwatch.org/essence-surveillance> and <http://bioterrorism.dhmd.state.md.us>.

List of Publications and Products

Montgomery County Health Information Exchange Collaborative, “Strategies for a Person -Centric, Inclusive Maryland Health Information Exchange” http://mhcc.maryland.gov/electronichealth/MCHIE_Final_Report.pdf

“Metro DC Health Information Exchange (MeDHIX) Characteristics, Challenges, Lessons Learned” AHRQ 2008 Annual Conference; Thomas L. Lewis and Leta Kajut, Center for Community Based Health Informatics

“Partnering To Assist Montgomery County Maryland's Uninsured into Becoming the Healthiest Community in America”, OpenHRE Conference; Lewis, TL and Kajut, L, Dec. 12, 2006 www.openhre.org/local/UG06/PCC.pdf

“Health Information Technology, Health Information Exchange, and Community Perspectives”. The Rockville Institute and Universities of Shady Grove; Contemporary Issues Seminar Series, Lewis, TL, Watson, MR, May 5, 2009, <https://www.rockvilleinstitute.org/seminar/spring2009hit.asp?q=lewis>