Nursing Home IT: Optimal Medication and Care Delivery

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Principal Investigator:
Susan D. Horn, PhD

Team Members:
Siobhan Sharkey, MBA
Sandra Hudak, MS, RN
Julie Gassaway, MS, RN
Roberta James, MStat
Randall Smout, MS

Performing Organization:
International Severity Information Systems, Inc. (ISIS)

Project Officer:
William Spector, PhD

Abstract

Purpose: Objectives were to implement a health information technology (HIT) system with added best-practices decision support modules in 15 participating nursing homes and evaluate impact on care processes, resident health outcomes including pressure ulcers (PrUs), and staff efficiency and satisfaction.

Scope: Fifteen nursing homes from 8 states participated, selected based on their willingness to participate. Fourteen were not-for-profit; facility size averaged 100 beds, range from 50-250 beds.

Methods: Project work spanned three years: one year for planning, one year for initial implementation, and one year for continued implementation and sustainability strategies. Facilities implemented HIT incrementally, focusing implementation in one or more areas: (1) CNA daily documentation; (2) 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 CMS Nursing Home Compare and staff feedback on workflow.

Results: 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% in the CMS high-risk PrU and weight loss quality measures in 18 months.

Key Words: pressure ulcer prevention, nursing home quality improvement, nursing home HIT

Final Report

Purpose

The objectives of the project, Nursing Home IT: Optimal Medication and Care Delivery, were to implement a health information technology (HIT) system with added best-practices decision support modules in 7 long term care (LTC) organizations with 15 participating nursing home facilities and evaluate the impact on care processes, resident health outcomes including pressure ulcers (PrUs), and staff efficiency and satisfaction.

Critical components of the HIT implementation strategy adopted by each nursing home included developing standardized data elements, redesigning workflow, and using timely feedback reports in daily practice to monitor resident status and adjust care plans for improved resident care, including prevention of PrUs and unintended weight loss. We worked with each nursing home to facilitate implementation of HIT with the goal of accelerating quality improvement efforts, integrating evidence-based findings into daily practice, and redesigning clinical processes.

To optimize the value of HIT in nursing homes the project team collaborated with participating nursing homes to:

- Implement an HIT solution that will improve clinical practices and health outcomes through:

  - Electronic clinical documentation for CNAs, RN/LPNs, and members of the multidisciplinary care team

  - Clinical decision support focused on incontinence care, nutrition management, skin assessment, behavior management, and restorative care best practices

  - Electronic medication administration record.

- Identify HIT implementation best practices in use of technology in LTC

- Conduct an evaluation of the role of HIT in changing clinical practices and improving resident safety, quality of care, and health outcomes.

Short Term Goals

- Establish facility implementation teams

- Finalize initial facility HIT implementation strategy

- Establish baseline assessment

- Redesign clinical workflow to use HIT optimally in nursing home facilities

- HIT installation and training

Long Term Goals

- Refine clinical workflow design to meet targeted outcomes: clinical practice and health outcomes

- Refine implementation strategy

- Evaluate HIT impact: improve resident quality of care outcomes in nutrition, incontinence care, behavior management, restorative care, and PrUs

- Identify significant lessons learned in wide range of nursing home facilities that have implemented HIT solutions for care delivery and medication administration record.

Scope

Background

There is widespread agreement that technology offers great opportunity to accelerate and sustain quality improvement; however, the healthcare community needs to know how to use HIT to change clinical practice and improve patient safety and quality of healthcare, how to implement HIT to achieve these results, and how to develop strategies that will sustain results. There are many examples of how adoption of HIT in acute and ambulatory settings has improved operational and quality performance, but the same cannot be said of the LTC setting. Long term care managers have been criticized for being slow adopters of HIT. Even though financial and clinical software modules have been available for the better part of two decades, critics say the field has been slow to upgrade its HIT systems and services, wary of innovative platforms, such as application service providers (ASPs), and unwilling to move past hardware purchased circa 1992, if then. More than 95% of all LTC facilities have at least one computer because they must submit MDS data electronically. However, fewer than 4% of all LTC facilities have electronic documentation systems. This indicates a large opportunity for information to be sourced electronically.

HIT offers decision support capabilities to guide best practices at the point of care, including real-time automatic alerts for optimal nutrition, incontinence, behavior, and restorative care. Just as in the acute and ambulatory care settings, strategic investments in information technology in nursing homes will be essential for process improvements, evidence-based practice, and other quality enhancements to take place. Although technology can accelerate and sustain quality improvement, what is the best way to implement an effective and sustainable quality improvement effort using HIT? If technology is applied to an ineffective manual process, the process will remain ineffective.

Context

ISIS facilitators identified initial workflow findings with facility implementation teams. The initial workflow assessment was used in HIT roll-out discussions with the facility's HIT Vendor. A summary of initial facility workflow challenges and how HIT could address them were:

Care Planning Practices.

- Multi-disciplinary team communication: Opportunity to improve CNA communication with RNs and care team.

- Skin/Wound rounds: Opportunity to improve team's response to a decrease in resident weight. Currently, each RN manager, dietary, and Wound RN round weekly using reports summarized manually by the Wound RN. Typically weights are done monthly on all residents and there is often a delay in response to a significant change in weight.

- Care planning practices: Increase use of timely reports as part of clinical decision making in care planning.

- End of shift reporting: Opportunity to reduce RN time spent on end-of-shift reporting and improve accuracy of information reported to nursing by CNA staff. This was accomplished by implementing a feature that provided CNAs an option to "send notice to Charge Nurse" while documenting any component of resident care (e.g., if CNA documented "refused am care" an option was available to send this documentation response to the charge nurse) during the documentation process.

CNA Documentation and Care Planning Processes.

- Communication delays: CNAs experienced delays associated with communication with other staff members, i.e., tracking down staff who are on break, coordination at shift change, etc. CNA communication to nursing often was haphazard and not based on formal triggers from resident observations.

- Care planning practices: Care planning meetings were led by the head nurse and included the social worker, activity personnel, dietician, and LPN. CNAs were not involved in care planning meetings. Social work prepared summary information for care planning by obtaining the majority of information from CNAs.

- Culture: Hierarchical versus team oriented.

- Standard documentation: Lacked behavior report, bowel and bladder tracking, and restorative care forms.

Medication Administration.

- Medication management: Error in transcribing medication orders was identified as a major area for improvement. The goal was to reduce time spent on monthly change-over (redoing the MAR every month) and time spent verifying MD orders prior to faxing orders to the pharmacy. RNs spent time double-checking and verifying medication orders and re-writing the MAR for each resident each month.

- MedPass: Opportunity to improve accuracy of medication distribution (bar-coding). Automated tracking would enable the team to assess whether medications were given on time and how often they are dispensed outside of the target 1 hour timeframe for administration (one hour before or after the time medication was scheduled to be dispensed).

- Accurate and complete documentation of pain and behavior assessments: Opportunity to improve consistent documentation of pain and behavior assessments for residents receiving medications. Opportunity to incorporate CNA behavior observations into RN behavior documentation to increase accuracy and completeness of documentation requirement.

- Standard alerts and prompts to caregivers: Opportunity to improve upon existing process of alerts. For example, if PRN medication is not used for 30 days, then discontinue order.

Settings and Participants

Fifteen nursing homes participated in the project from 8 states: Wisconsin (1), South Dakota (1), North Dakota (1), Nebraska (2), Minnesota (1), Ohio (7), Washington DC (1), Arizona (1). They were selected based on their willingness to participate. Fourteen out of fifteen facilities were not-for-profit. Facility size ranged from 50-250 beds, with an average of 100 beds.

- Hennis Care Centre of Dover (Dover, OH) is a 158 bed long-term care facility that serves a rural Ohio community located in the Appalachian region and has a high percentage of Hispanic residents. Seventy percent of the clients served are low income and most are elderly with only about 6% under age 65. The latter have either a terminal illness or a chronic debilitating disease with functional disabilities.

- Carroll Manor Nursing and Rehabilitation Center (Washington, DC) has 250 elderly and Alzheimer residents; 85 - 90% are Medicaid dependent and greater than 95% are African-American. The ancillary departments of Providence Hospital provide HIT support to Carroll Manor.

- Mercy Franciscan at Schroder; Mercy St. Theresa Center; Mercy Franciscan at West Park; and Mercy Franciscan Terrace are all in or near Cincinnati, OH, and are part of Mercy Health Partners, which is part of Catholic Health Partners. These four nursing homes each have between 83 and 108 beds, and have Medicaid, Medicare, and private pay residents. The general population is chronically ill older adults requiring nursing care

and support for multiple ADLs. Also, many residents have cognitive deficits from Alzheimer's disease or other dementias. Quality of end of life care is a major consideration for this population.

- Christian Home and Rehab (Waupon, WI) is a 74 bed long-term care facility comprised of Medicare, Medicaid, and private pay residents.

- The Evangelical Lutheran Good Samaritan Society (ELGSS) (National Campus located in Sioux Falls, SD): As the nation's largest not-for-profit long-term care organization, the ELGSS owns or manages Christian Communities of Care in 25 states, employs 24,000 staff members, and serves more than 28,000 residents. They provide healthcare services for the elderly and others in need including skilled nursing, subacute care, assisted living, home health care, and outpatient therapies (physical, occupational, speech, respiratory, and intravenous). Other special services include adult day care, Alzheimer's special care units, respite care, and hospice care. All Society centers are organized to provide spiritual ministry to residents, families, and the surrounding communities. There were 5 ELGSS skilled nursing facilities participating in this project located in 4 states – SD (1), MN (1), NE (2), ND (1).

  - Good Samaritan Society – Sioux Falls Village, (Sioux Falls, SD): 184 beds

  - Good Samaritan Society - Pelican Rapids (Pelican Rapids, MN): 52 beds

  - Good Samaritan Society - Mott (Mott, ND): 55 beds

  - Good Samaritan Society - Wood River (Wood River, NE): 59 beds

  - Good Samaritan Society - Hastings Village (Hastings, NE): 204 beds

- Glencroft Care Center (Glendale, AZ): Glencroft is a continuing retirement community, sponsored by Mennonite Health Services with cooperation of local churches, and is situated on a 40-acre site in Glendale, AZ. The campus includes 552 apartments (102 HUD, 51 assisted living, and 399 independent living apartments) and the Care Center, a 225-bed skilled nursing facility with a sub-acute unit. Glencroft provides a continuum of care for older adults. The organization's goal is to target processes where HIT can impact operational and clinical outcomes.

- National Church Residences – Traditions at Stygler Road (Gahanna, OH) and Traditions Chillocothe (Chillicothe, OH) 100-bed and 50-bed nursing facilities, and both are part of National Church Residences.

Incidence and Prevalence

The combined facility average CMS prevalence of PrU for high risk residents was 10.8% in Q1 2005, prior to HIT implementation. There were 2 facilities that did not report quality measure data. There were 3 facilities with high risk PrU quality measures of 3%, 4%, and 5%; 10 facilities had quality measures $\geq$ 8%, ranging from 8% to 21%.

Methods

Study Design

The Nursing Home HIT project was designed to integrate HIT implementation and quality improvement activities and to assess impact on staff experiences, operational efficiencies, and clinical outcomes. The main components included:

1. Implement an HIT solution in LTC, including

   - Electronic CNA documentation

   - Clinical decision support focused on incontinence care, nutrition management, skin assessment, behavior management, and restorative care best practices

   - Medication administration record (MAR)

2. Identify HIT implementation best practices in use of technology in LTC

3. Conduct an evaluation of the impact of HIT on the following measures:

   - Health Outcomes: CMS PrU quality measure (high risk residents) and unintended weight loss quality measure

   - Staff Experiences: Staff feedback

   - Provider adoption: barriers to adoption and promoters of adoption

   - Workflow: time spent documenting, practice changes related to CNA and RN documentation processes, PrU prevention, and medication administration.

Data Sources/Collection

The data collection plan was part of the implementation plan at each site. To the extent possible, existing information was used. For the impact assessment, data were collected from (i) the CMS Nursing Home Compare website, (ii) standardized forms for facility reporting of PrU incidence, and (iii) quality improvement teams at each facility gathering staff feedback on

workflow as part of the intervention. Post-implementation measurement, starting 6 months after implementation and for each 6-month period thereafter, re-measured the areas assessed at baseline in order to evaluate change over time.

Interventions

Project work spanned three years: one year for planning, one year for initial implementation, and one year for continued implementation efforts and sustainability strategies. Participating facilities implemented HIT in an incremental fashion. Each facility established HIT priority(ies) and focused implementation efforts in one or more area (see Confirm HIT Scope). Each facility sequenced implementation according to their specific requirements, goals, and resources.

Study facilities completed the following milestones:

Step 1: Confirm HIT Scope. Each facility confirmed a sequence of implementation steps according to their specific HIT priorities, goals, and resources in one or more of the following areas:

i. Clinical documentation and reporting for restorative care and CNA daily flow sheets (ADLs, weights, bathing, BM, voiding, incontinence, nutrition, behavior, and skin observations)

ii. Clinical decision making reports.

iii. Medication administration / Treatment administration: HIT point of care solution, Electronic Medication Administration Record (*eMAR)* during medication administration and/or treatment administration record (eTAR).

iv. Clinical documentation for Nursing/clinical team care delivery and care planning. (Note: several facilities decided to expand automated documentation beyond CNA and restorative care to nurse documentation).

Table 1. HIT vendors and scope

Organization / Facility	HIT Vendors	HIT Implementation Scope
MHP Schroder West Park Terrace St Theresa	1. Resource Systems – CareTracker for CNA documentation	Clinical documentation, including PrU charting (CNA and wound nurse)
Providence / Carroll Manor	1. Resource Systems – CareTracker for CNA and RN documentation 2. eMAR –PharMerica in Year 3	Clinical documentation (CNA and RNs)
Glencroft Care Center	1. Digital Pen Systems 2. Point-Click-Care	Implement Digital Pen Systems – CNA documentation and 'Real-Time' reports
Hennis Care Center	1. Resource Systems – CareTracker used by Therapy Dept., Activities, CNAs, and RNs for charting. 2. MDI – e-charting for RN and care team documentation and eMAR	Clinical documentation: RNs and LPNs e-charting all clinical assessments; CNA documentation Implemented the MDI eMAR product in July 2006

Table 1. HIT vendors and scope (continued)

Organization / Facility	HIT Vendors	HIT Implementation Scope
The Evangelical Lutheran Good Samaritan Society Sioux Falls Village Mott Pelican Rapids Hastings Wood River	Hands On application developed by Good Samaritan Society that includes: 1) Handheld application for clinical documentation of resident daily care. Used by CNA, Nurse, Social Services, Dietary, and Activities personnel. 2) NetPC application for clinical reports and viewing of records. 3) Interface system to upload/download data between the handheld and the NetPC applications.	Handheld application: Implement clinical documentation of ADLs, Bathing, BM & Voided, Care Plan approaches, Dining, Mood/Behavior, Skin, Vitals/Weights/Height. NetPC application: Implement using reports and viewing of clinical documentation sent from the handheld.
Christian Home and Rehab	Digital Pen Systems	Implement clinical documentation (CNA and Wound RN)
National Church Residence - Stygler Rd - Chillicothe	Optimus EMR	Implement EMR starting with CNA and RN documentation Integrate 'Real-Time' reports into Optimus system

Step 2: Determine Internal Implementation Team. Each facility identified key members to coordinate the customization and review of the software and serve as the internal implementation team.

Step 3: Install HIT Hardware and System Set-Up. Each facility worked with their HIT vendor and internal IT support to install hardware and set-up the system.

Step 4: Customize Software. Each facility established a customization plan with their HIT vendor. One component of the customization was to include standardized data elements and reports to support prevention of PrUs.

Step 5: Training. Each facility established an initial training session schedule for staff. The 'go-live' date to begin implementation directly followed the training. A project facilitator worked with each facility project manager to customize materials for staff in-services, to facilitate development of new policies and procedures, roles and responsibilities, and to establish an ongoing education schedule.

Step 6: Workflow Redesign. Each facility team identified workflow changes related to HIT implementation and confirmed new processes for staff. The project team conducted on-site visits to observe clinical processes, conduct workflow analysis, and develop initial plans with the care teams to redesign workflow to incorporate technology into processes to gain efficiencies and improve accuracy of data capture.
The primary objective for workflow redesign using information technology was to identify areas to integrate technology capabilities into workflow where it was most appropriate (e.g., build technology into the workflow versus changing clinical processes to accommodate technology features and design).

Target areas of workflow redesign and process improvement were the following:

- CNA Daily Workflow

    - Documenting resident daily flow

    - Communication with clinical team

- Nursing Daily Workflow

    - Wound Nurse documentation and reporting

    - Nursing care plan documentation and communication

- Care Planning Processes

    - Identification of residents at risk for PrU development

    - Composition of care team

    - Reports used in clinical decision making

    - Monitoring resident outcomes

- Medication Administration

    - Process to manage monthly change-over of MAR

    - Process to review, transcribe, and verify MD orders

    - Timeliness of medication administration

    - Documentation of pain and behavior assessments

Step 7: Confirm Documentation Completeness and Accuracy. Each facility team established processes to confirm completeness of documentation, provide on-going feedback to the clinical staff, and target inservices in areas requiring additional training.

Step 8: Use of Clinical Reports. A project facilitator had on-going project management conference calls with each facility implementation team. Each facility implementation team focused on how reports are used in resident care planning processes, how reports are used for end of shift or end of day review, and how reports are linked directly to prevention of PrUs, including management of unintended weight loss.

Measures

Key outcome measures included:

- Health Outcomes: CMS PrU quality measure (high risk residents) and unintended weight loss quality measure

- Staff Experiences: staff feedback

- Provider Adoption: barriers to adoption and promoters of adoption

- Workflow: time spent documenting, practice changes related to CNA and RN documentation processes, PrU prevention, and medication administration.

We identified factors critical for successful implementation of HIT in nursing homes and the facilitators of and barriers to HIT adoption. As part of our evaluation we captured lessons learned about factors that lead to successful implementation of HIT solutions, including financial, technical, organizational, personnel, cultural, and procedural barriers.

Limitations

There were some limitations to the project. Facility participation on a volunteer basis biased the selection to those nursing homes with an interest in implementing HIT and improving care. Many of the participating facilities had experience in quality improvement and working on process changes with a multi-disciplinary team approach. Several of the facilities also participated in the development of the tools (model CNA documentation forms and report design) and in the implementation process.

Results

Each facility team monitored outcomes and processes pre and post-implementation as part of the project to identify promoters and/or challenges to implementation and assess the impact. We assessed impact in four major areas:

- Workflow: How does HIT implementation impact daily workflow for providers?

- Provider Adoption and Attitudes: How does HIT implementation impact staff satisfaction?

- Health Outcomes: How are changes in clinical practice using HIT associated with improved health outcomes for LTC residents?

- Lessons Learned: How can lessons learned from the project impact future implementation efforts and dissemination of HIT into nursing homes?

Principal Findings: Implementation Progress

All 15 nursing homes implemented HIT for CNA documentation and clinical reports to summarize CNA information into meaningful trends, i.e., weight loss, meal intake, and other indicators for high risk of pressure ulcer development. All 15 nursing homes implemented HIT for various components of nursing documentation. Also, 5 facilities implemented HIT for eMAR / eTAR, but because of vendor delays the implementation did not occur fully until the last year of the project.

MHP.

- Progress Year 1: CareTracker installed and implemented in four facilities. All CNAs trained and documenting in the CareTracker system.

- Progress Year 2: The main emphasis was on 1) reviewing completeness rates at all four facilities, 2) installing 20 new kiosks across the 4 facilities, 3) developing the restorative care series in CareTracker including data elements for CNA and restorative team members, and 4) developing a 'skin observation' module in CareTracker for CNAs.

- Progress Year 3: All facilities used the Restorative module, ADL documentation, and Behaviors documentation built in CareTracker to support RN and CNA documentation. The main focus was to sustain consistent documentation completeness and ADL documentation accuracy and increase use of reports in daily work with front-line clinicians. The therapy department used CareTracker to document ADLs and mood information. Each facility standardized policies related to the use of CareTracker. The next step is to add the weekly wound assessment to CareTracker.

Providence Carroll Manor.

- Progress Year 1: CareTracker installed and implemented on 2 units. The CNAs documented entire daily flow charting and RNs documented behavioral symptoms and skin assessments. Prior to implementing the CareTracker system, the CNAs redesigned documentation forms using standardized data elements, implemented new paper forms, and received reports from ISIS.

- Progress Year 2: The CNAs and RNs on all nursing units documented in the CareTracker system.

- Progress Year 3: The team worked to 1) support on-going use of CareTracker and integrate the reports into daily workflow, and 2) implement the PharMerica eMAR module. Carroll Manor continued to focus on using CareTracker system facility-wide. Use of reports from CareTracker continued to be a high priority. The RN managers used

reports on a regular basis, however, the RN team leaders on each unit who work directly with CNAs were not consistent users of reports.

Glencroft Care Center.

- Progress Year 1: Implemented MDI e-MAR. eMAR used on 2 long-term care units with plans to migrate to sub-acute. CNAs and Wound RNs incorporated Real-Time standardized documentation and implemented new redesigned forms as a pre-IT step.

- Progress Year 2: The project team finalized selection decision for a new EMR system, Point-Click-Care, to replace MDI. Glencroft planned to proceed with HIT implementation for RN eMAR and clinical documentation in Year 3 of HIT implementation (starting in October 2006). CNAs and Wound RN incorporated Real-Time standardized documentation forms as a pre-IT step and used Digital Pen Systems technology. Staff accessed Real-Time reports via a web portal provided by Digital Pen Systems. The lead CNA and CNA preceptors were responsible for training staff and implementation roll-out. CNA documentation completion rates continued to be high. MDS nurses focused on documentation accuracy, in particular the behavior and ADL documentation. MDS nurses, wound nurse, dietary, and management focused on use of clinical reports in weekly care planning activities.

- Progress Year 3: Glencroft continued to implement Point Click Care (PCC) for MDS documentation. PCC's AR [accounts receivable] module was implemented on August 1, 2007. The next step was to conduct training on a nursing documentation module in August and September 2007 with go-live nursing documentation module at the end of September 2007. Glencroft is still waiting for the vendor to provide the timeline to implement PCC's eMAR and eTAR solutions.

Hennis Care Center.

- Progress Year 1: Implemented MDI e-charting for RNs on all units. RNs completed entire admission packet in the system. The CareTracker system was used by the Therapy Dept., Activities, CNAs, and RNs for daily clinical charting.

- Progress Year 2: In preparation for the eMAR, Hennis worked with MDI to build libraries of all their medication lists and alerts. Hennis implemented the MDI eMAR product in July 2006.

- Progress Year 3: Social Services and Activities began putting their progress notes into e-Charting; this helped with reviewing notes over a period of time for continuity throughout departments. The next step was to interface several systems. For example: Lab results – Suburban Lab system was beta-tested to access lab results on-line and integrate into MDI. Rosie II – Life systems was beta-tested to capture vital signs.

The Evangelical Lutheran Good Samaritan Society.

- Progress Year 1: Completed programming/testing of Hands On software (developed by Good Samaritan Society) for handheld documentation and reports on the NetPC. The five new modules included ADLs, Bathing, BM & Voiding, Care Plan Approaches and Vitals/Weights/Height. Reports for each module were completed. One facility implemented.

- Progress Year 2: Completed implementation of the Hands On application at the remaining four centers. As of March 2006, all five centers were 'live' with handhelds and NetPCs using the 5 modules for documentation and reports; approximately 500 CNAs and nurses were involved. Additional modules (Mood/Behavior) and corresponding reports were implemented at all 5 centers. Every 2 weeks, the five Good Samaritan facilities in the grant along with the GSS National Campus team participated in a conference call with ISIS facilitator to review HIT implementation and use of clinical reports.

- Progress Year 3: Two additional modules (Dining and Skin) and corresponding reports were implemented at all 5 centers. Each facility team focused on increasing the use of reports by the front-line, including the 'end-of-shift' report and mood and behavior report. The National Campus team continued to receive feedback from users of the Hands On software and internal programmers and clinical IT staff prioritized requests and provided software updates on a regular basis. Internally the Good Samaritan Society made a decision to bring this project to scale, which included implementation of the application in nearly 200 skilled nursing centers across 24 states. Wireless technology was installed in all these centers to support timely uploads of data from hand-held devices.

Christian Home and Rehab.

- Progress Year 1: The Digital Pen Systems solution was implemented for CNA and Wound RN documentation. Standardized CNA form was used.

- Progress Year 2: The CNA and Wound RN continued to document using Digital Pen technology.   Project leaders accessed Real-Time reports on a regular basis. The wound nurse used the digitized Real-Time PrU Tracking Sheets and reviewed the PrU report data on-line or printed from computer.

- Progress Year 3: Reports were reviewed by Nursing Leadership, Dietician, and MDS nurse; results were discussed with front-line staff, as needed. Close monitoring of CNA documentation resulted in more accurate documentation; monitoring and documentation of red and open areas by CNAs improved.

National Church Residence – Traditions at Stygler Road and Chillicothe.

- Progress Year 2: National Church Residences implemented the Optimus EMR starting with Traditions at Stygler Road facility and Chillicothe in September 2006. The team

automated nursing documentation, care planning, and CNA documentation at the point-of-care using hand held devices. The CareTracker product, previously used for CNA documentation, was discontinued. The Traditions at Stygler Road team worked with ISIS facilitators to ensure Real-Time data elements and reports were incorporated into the Optimus product. Optimus guaranteed Real-Time report availability with 2 months of system implementation: Completeness, Nutrition, Behaviors, Trigger Summary, and Priority Reports.

- Progress Year 3: The team continued to access AHRQ Real-Time reports on a regular basis using Optimus. New tablet PCs were ordered. The team focused on implementation of MD orders in the system. Each facility updated policies and procedures related to the use of EMR. Next steps in HIT implementation were implementation of e-MAR/e-TAR at the end of September. Also, project coordinators worked with RNs, CNAs, and Dietary to determine a plan for how ISIS Real-Time reports could be used on a daily basis.

Outcomes

Baseline data collection was completed at all facilities and included: staff experiences, workflow, and clinical outcomes (PrU incidence rates). An ISIS facilitator worked with each facility implementation team to assess the impact on process and outcome measures post- HIT implementation. Post-implementation evaluation data collection occurred every 6 months after initial implementation. All sites established a plan and mechanisms to collect on-going evaluation data, including: data source, tool or collection guidelines, and on-going data collection schedule.

Table 2. Summary staff feedback comparing post-implementation (6, 12, and 18 months) to baseline

Area	Measure	Summary
CNA satisfaction	CNA feedback questions	CNAs reported that they do not want to go back to paper documentation process and that they are satisfied with automated documentation process. CNAs reported satisfaction with use of technology versus paper documentation. CNAs reported improvements in workflow including less redundancy in documentation.
CNA documentation completeness	Weekly trends monitored	All facilities reported that documentation completeness reports provided timely and valuable information to CNAs and RNs responsible for reviewing the HIT implementation and identifying areas needing improvement.
MDS RN time to gather information	MDS RN staff feedback questions – Likert scale	HIT improved MDS RN access to timely resident information for review and monitoring – MDS Assessment, QI monitoring, and Care Planning.
Adoption of HIT on daily basis by CNA, RN, MDS RN, Wound RN, and other members of care team	Observation, team focus groups, monitoring reports in use	CNAs took on leadership roles by teaching/guiding new staff. Many CNAs felt that their work was valued and people were reviewing and using their information.
Multi-disciplinary team communication processes	RN/LPN, Dietary, and CNA feedback questions – Likert scale	CNAs reported improved recognition that what they document every day was valued by nurses and other clinical team members. Nurses and Dietary reported improved access to information and team communications.

Details: CNA Staff Feedback Surveys. CNAs provided feedback from 13 of the participating facilities (2 facilities did not submit data: 1 submitted electronically making the data impossible to analyze and 1 submitted baseline data only because of late implementation): 336 CNAs at baseline; 336 CNAs at 6-months post-HIT; 326 CNAs at 12-months post-HIT; and 331 CNAs at 18-months post-HIT implementation. Based on combined feedback from all facilities, there was improvement in the following areas (combined facility survey data showed improvement from baseline (pre-HIT) compared to 18 months post-implementation).

- Q#1. I feel like I spend [the right amount of time] documenting resident information.

- Q#9. I feel like I receive enough information about the resident at the beginning of my shift to provide quality resident care. [Completely agree]

- Q#12. I feel that I understand [All] what needs to be done for the residents before I start my work.

- Q#16. I [Never] have to chart on two day's worth of documentation at the same time because I did not have time to do it the previous day.

There was no change in responses for the following questions:

- Q#7: I feel like an important part of the team on my unit. [Often]

- Q#8: I know the most important things to do in providing resident care that help prevent pressure ulcers. [Completely agree]

There was improvement in the following three areas from baseline (pre-HIT) compared to 12 months post-implementation. The 18-month feedback did not reflect improvement compared to baseline.

- Q#2. I have difficulty completing documentation before the end of my shift. [Never]

- Q#4. I document the same information in more than one place. [Never]

- Q#10. I feel that what I document each day is valued and used by the doctors, nurses, and other clinical staff. [Completely agree]

Figure 1. Combined CAN HIT staff feedback survey results
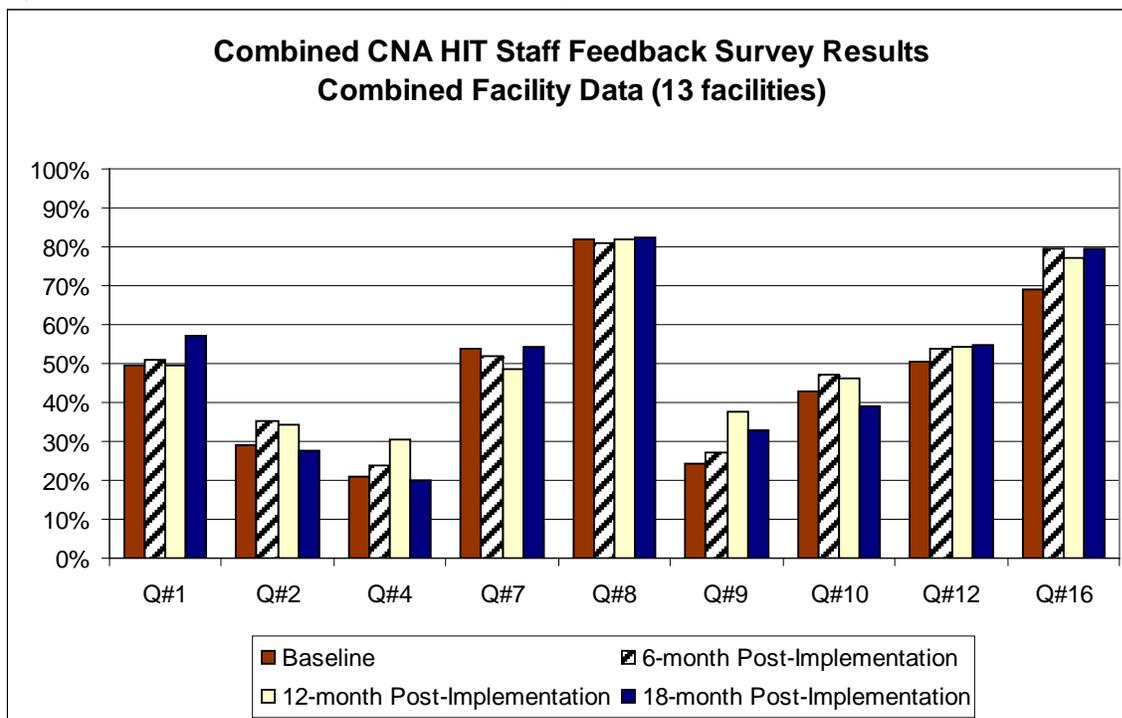
CNA feedback is summarized for two questions (Q#7 and Q#8) by facility using the same HIT vendor to show that there is variation across vendors and to help explain why there was little to no change overall.

Table 3. CNA feedback

	CNA Feedback	Overall	Vendor 1 N=5	Vendor 2 N=5	Vendor 3 N=2	Vendor 4 N=1
Q#7	I feel like an important part of the team on my unit. [Often]	Little or no change	Improved	Improved	Declined	Improved
Q#8	I know the most important things to do in providing resident care that help prevent PrUs. [Completely agree]	Little or no change	Little or no change	Declined	Improved	Declined

Details: Nursing Feedback. Nurses provided feedback from 10 of the 15 participating facilities(5 facilities did not provide feedback from nursing): 122 nurses at baseline; 189 nurses at 6-months post-HIT; 156 nurses at 12-months post-HIT; and 197 nurses at 18-months post-HIT implementation.

Based on feedback from all facilities, the following questions showed improvement of 5% points or more (combined facility survey data showed improvement from baseline to 12-month post-HIT implementation)

- Q#4. Before the end of my shift I have reviewed CNA documentation for completeness [Completely agree.].

- Q#10. CNAs understand care to be provided to the residents at the beginning of their shift. [Completely agree].

- Q#14. At my facility, we spend [the right amount of time] on shift report to communicate resident needs.

- Q#16 At the beginning of my shift, I am aware of all residents on my unit who have a pressure ulcer(s). [Completely agree].

- Q#18. I am made aware of residents who have significant weight loss [each shift].

- Q#19. At my facility, CNAs are made aware of residents with PrUs at the beginning of the shift. [Completely agree].

- Q#20. By the end of my shift I am aware of all residents on my unit who had decreased meal intake for the day. [Completely agree].

- Q#22. The frequency for weighing residents (without acute illness) at our facility is appropriate. [Completely agree].

- Q#23. At my facility, there is a standard definition of "significant weight loss"; all nurses use the same guidelines when identifying residents with significant weight loss. [Completely agree]

- Q#26. At present, it takes [Minimal] effort to assemble resident summaries for MDS nurse.

There was slight improvement (less than 5% points) from baseline to 12-month post implementation in these questions:

- Q#2: Before the end of my shift, I review the CNA documentation for resident findings that may require additional nursing assessment and/or intervention. [Completely agree].

- Q#13: Shift report at my facility is comprehensive and informative; the appropriate people attend shift report.[Completely agree].

- Q#15: At my facility, CNAs are made aware of residents with significant weight loss at the beginning of the shift. [Completely agree].

- Q#17: At the beginning of my shift, I am aware of residents who are at risk of developing a pressure ulcer. [Completely agree].

There was a slight decline in positive response for one question from baseline to 12-month post implementation:

- Q#9: At my facility, there is a breakdown or delay in communication of resident care needs among the care team? [Never].

Facility teams helped address the question, "Why does nurse feedback decline across the board at 18-months post-implementation?" Teams suggested that during the first year of implementation the staff was excited and enthusiastic about using the new technology and its promise to improve daily work compared to paper-based manual processes. By month 18, staff had experienced the realities that the HIT system needed modifications or enhancements to better meet their needs and became frustrated with the long timeline to program and test the changes. Another explanation for the 18-month decline that several facilities reported was that staff turned over after the first year. Also, the hardware used by the staff like kiosks and hand-helds often were outdated one year later and the staff started requesting newer models.

Details: MDS Feedback. Based on feedback from 26 MDS coordinators at 11 facilities the following areas of impact were assessed: time to gather MDS information and CNA documentation completeness. The MDS coordinators reported that the 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).

Figure 2. RN/LPN combined HIT feedback survey results

RN/LPN Combined HIT Feedback Survey Results
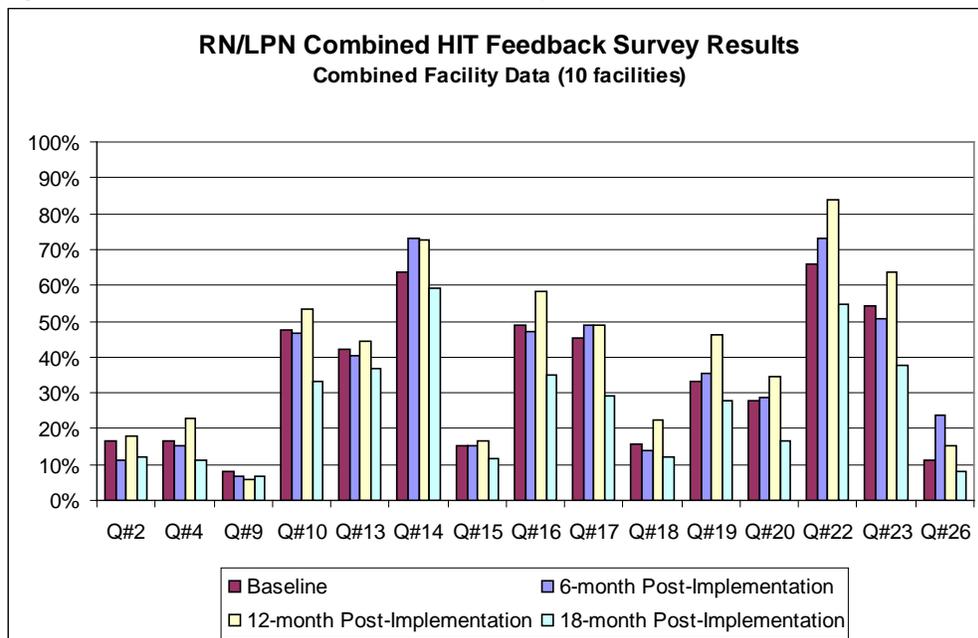**Combined Facility Data (10 facilities)**

Figure 3. Average time to gather information for MDS

MDS coordinators reported improved completeness and accuracy in several areas: behaviors, bathing, urinary continence, ADLs – toileting, and ADLs – eating.
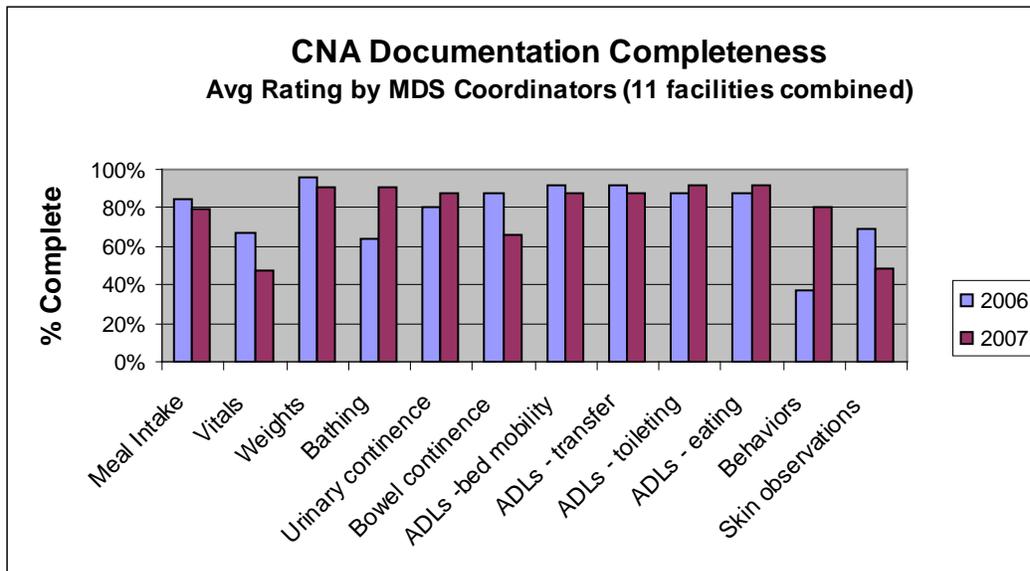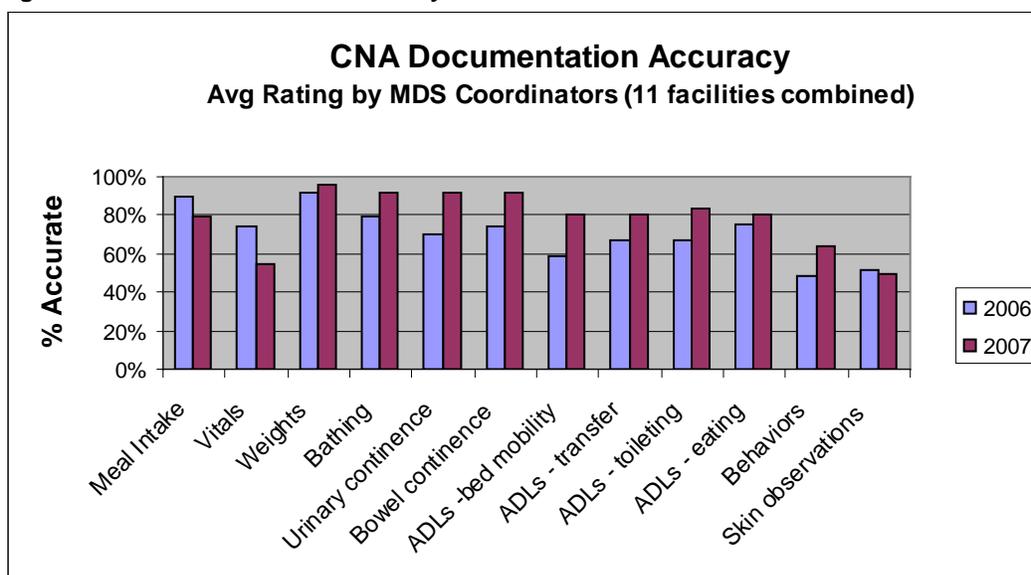
Figure 4. CAN documentation completeness

CNA Documentation Completeness
Avg Rating by MDS Coordinators (11 facilities combined)

Figure 5. CAN documentation accuracy

CNA Documentation Accuracy
Avg Rating by MDS Coordinators (11 facilities combined)

Details: Dietary Feedback. Based on feedback from 19 dietary staff in 11 facilities, the following questions showed improvement:

- How often is weight change calculated and/or assessed for each resident by dietary staff. (Baseline = 100% monthly or quarterly and 0% daily or weekly; Post-implementation = 40% daily or weekly).

- Dietary staff participate in care planning meetings (% increased from 70% to 84% participate).

- Nurses notify dietary staff when a resident has significant decreased meal intake (Baseline = 0% within one shift; Post-implementation = 25% within one shift).

- Information about resident behaviors is easy to find (% completely agree increased from 9% to 21%)

Clinical Outcomes. The pre- and post-HIT implementation data for two quality measures show promising trends. For 12 facilities combined (3 facilities did not have quality measure data) after 1.5 years of HIT implementation, the CMS quality measure (QM) for high risk residents with PrUs decreased overall from 10.8 to 8.9, a decline of 18%.

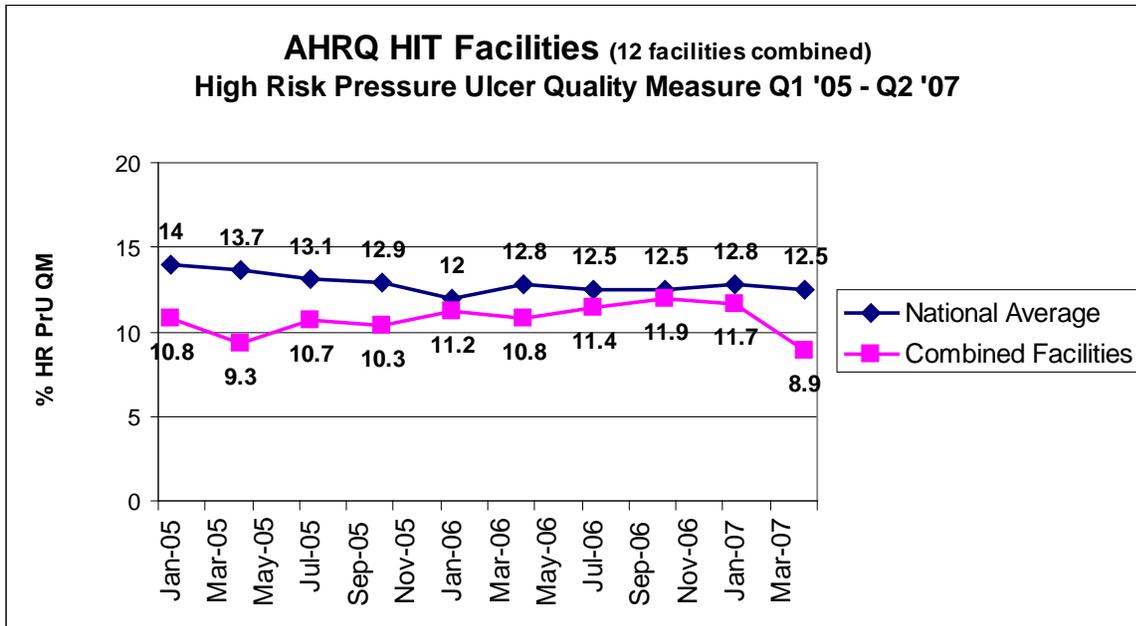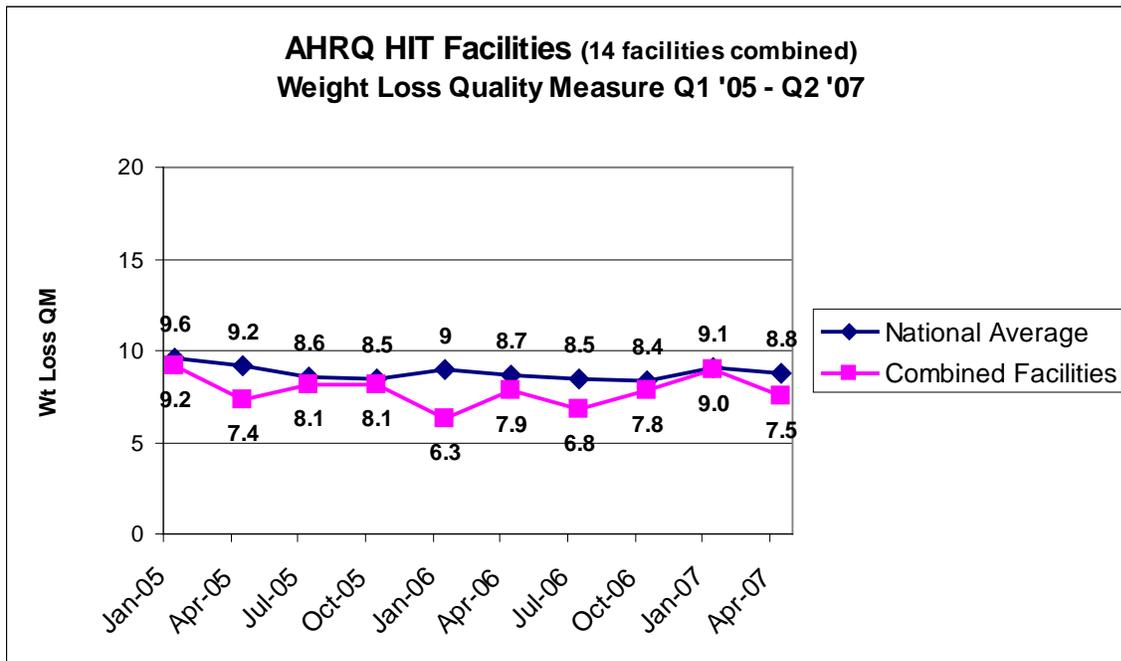**Figure 6. High-risk pressure ulcer quality measures**

AHRQ HIT Facilities (12 facilities combined)
High Risk Pressure Ulcer Quality Measure Q1 '05 - Q2 '07

National Average: 14, 13.7, 13.1, 12.9, 12, 12.8, 12.5, 12.5, 12.8, 12.5

Combined Facilities: 10.8, 9.3, 10.7, 10.3, 11.2, 10.8, 11.4, 11.9, 11.7, 8.9

Y-axis: % HR PrU QM

X-axis: Jan-05, Mar-05, May-05, Jul-05, Sep-05, Nov-05, Jan-06, Mar-06, May-06, Jul-06, Sep-06, Nov-06, Jan-07, Mar-07

Figure 7. AHRQ HIT facilities

AHRQ HIT Facilities (14 facilities combined)
Weight Loss Quality Measure Q1 '05 - Q2 '07

National Average: 9.6, 9.2, 8.6, 8.5, 9, 8.7, 8.5, 8.4, 9.1, 8.8

Combined Facilities: 9.2, 7.4, 8.1, 8.1, 6.3, 7.9, 6.8, 7.8, 9.0, 7.5

Y-axis: Wt Loss QM

X-axis: Jan-05, Apr-05, Jul-05, Oct-05, Jan-06, Apr-06, Jul-06, Oct-06, Jan-07, Apr-07

Discussion

Barriers Impacting HIT Implementation Timeline and Strategies to Address.

a. HIT systems require customization to meet LTC needs. The participating nursing homes reported that there was no one HIT system for LTC that fully met the needs of clinical documentation and/or clinical workflow.

b. Hardware needs were greater than anticipated. Staff needed greater access to computers to review and/or print reports, additional kiosks, or additional hand-helds. Pharmacy consultant or attending physician access to computers posed a challenge; they waited to have information printed for them because they did not have access logon/password to access reports.

c. Complexities and challenges of integrating multiple systems. Many of the facilities implemented multiple systems, because there was no one system that met all their needs. Facilities reported that it was much more challenging to interface two different software systems than they ever thought.

d. DON turnover. Unexpected turnover of the Director of Nursing impacted the HIT implementation roll-out at several facilities.

Lessons Learned Related to HIT Implementation. Based on formal feedback, workgroups reports, and participant informal feedback interviews, the nursing homes summarized lessons learned.

a. Overall Timeline for HIT implementation was longer than expected

- Pre-implementation phase: This phase typically lasted 1 year and included planning, workflow review and redesign, software customization, hardware and software installation, and training.

- Implementation phase: While there was a 'start-up' implementation phase that typically lasted 3-6 months depending on how the HIT was being implemented, on-going implementation support did not end. Participants all acknowledged that this was the phase that was under-estimated in initial planning.

- Customization: This phase involved review and customization of the vendor software to meet the needs of the facility. Participants noted that it required more work than vendor estimated to customize the system for LTC needs.

- Validation phase: This was the beginning phase of using reports or output from the HIT systems. All participants agreed that during this phase staff members confirmed that the data were complete and correct. Several facilities reported that before team members started using reports they had to believe that the data were accurate and

complete. As IT was implemented this was one of the first barriers of report use that was addressed by teams.

- Use of reports plus process improvement: This phase followed the 'Validation phase.' After there was trust that the system reports were accurate and complete, staff was able to take steps to integrate reports into existing meetings. Several facilities have taken steps to develop new processes with front-line team members using reports.

b. Start with automating CNA documentation. All facilities reported that HIT implementation for CNA documentation uncovered many issues related to lack of accuracy and inconsistencies in CNA documentation (e.g., incontinence, behaviors, skin observations). CNA documentation was not reviewed on a regular basis previously and was not used in reports that were used by the team until now. CNAs adapted immediately to HIT for daily documentation.

Table 4. Use of devices

Device	Reported benefits	Reported challenges
Hand-held	Support documentation at point-of-care. Mobile with caregiver.	Reports that palm pilots were not durable. Palm device maintenance/repair process was resource-intensive and costly. Challenges increased as additional facilities and devices were added to the project. CNAs not documenting at point-of-care. Report that hand-helds were cumbersome to carry around.
Kiosk	Support documentation in the hallways outside the resident's room. CNAs do not congregate at the nurse station or the break room to document. Out in the hallways near the residents.	Problem accessing kiosk if there were not enough to support the # of CNAs.
Digital Pen	Least amount of change to workflow. Uses digital pen and paper to capture information electronically.	Issues reported about the data upload process reliability. The vendor improved the interface and monitored the issue. Issues reported about capturing hand-writing. Data capture worked best with checkboxes.

c. Training needs are on-going. CNA staff required frequent instruction on how to document properly. Compliance required constant monitoring. If facility team members decreased frequency of monitoring compliance, then compliance percentages dropped. HIT implementation required on-going staff education and attention to work flow issues. Distance learning was helpful, but was not a substitute for a consultant being there on-site. Staff would not go through materials by themselves. Sites reported that many staff would have given up without on-site one-to-one time with RNs. RNs need to be educated more than once on how to logon to computer and access reports.

d. Monitoring compliance is on-going. Gaining staff compliance on system use required rigorous monitoring by leadership team early in the process. Maintaining staff compliance and completeness rates required constant monitoring. Routine review of reports helped staff development identify the need to focus inservices, e.g., how to document behaviors accurately and consistently and prompted development of reminders and/or cheat sheets.

e. Workflow issues require on-going attention. All participating nursing homes under-estimated the workflow changes that go hand-in-hand with HIT implementation. All facilities reported the need for on-going monitoring, feedback loops, and interactive status review sessions to integrate HIT into daily work, e.g., daily review of documentation completeness reports with staff to understand challenges and barriers. Another example was reviewing how RNs were using reports in care planning during RN meetings.

f. HIT by itself does not lead to QI. QI will not happen because IT is implemented. Incorporation of HIT into workflow was not a one-time event but rather a commitment to improved process. All facilities reported that HIT implementation itself was totally consuming and required more support than expected. In addition, there was more time spent on HIT implementation issues than QI and how to use reports to improve care of residents.

g. Need a plan for how information will be used by clinical team. Despite challenges with HIT implementation and workflow changes, there was no reason not to move forward with use of reports and developing the skills of the front-line teams in using information as part of their decision making and care planning processes. Use of reports by front-line team members took more time than expected. All facilities reported that RNs were slow to adopt reports into their daily practice. Several reasons based on facility feedback were: (i) how to use summary information for clinical decision making is not a standard part of RN training; (ii) RN mindset is if they did not document the information they cannot use it; (iii) RNs did not understand how the reports could improve their daily practice versus add another task to the day. Several strategies were employed to promote use of reports by nursing home front-line teams:

- Identify owner of report. Make specific assignments to staff members to use reports and provide feedback to DNS.

- Start small. Focus on 1-2 reports for team to use. Reports are reviewed and discussed by a group of clinical team members (not reviewed by just one person).

- Identify how report can eliminate manual work or make work easier for staff.

- On-going training and follow-up on reports. Show how to access, how to print, and when to use reports. Customize the homepage for key clinical users to show the 3-5 reports most often used.

- Identify the 'champions' who are using the reports on a daily or weekly basis. Support champions in communicating to their colleagues how the reports are useful and how the reports are accessed. For example, designate lead CNA who makes sure downloads are done and looks at completeness rates. Several facilities made an effort to delegate responsibilities to CNAs so that the tasks to implement the intervention did not all fall on staff development or nursing leadership. It was important to find a report 'super user' to be a champion on report use.

- Establish a process to review clinical reports each week. Each team member was responsible to review specific reports and/or specific sections of reports, e.g., unit trends (nursing leadership), behavior report results (MDS nurse), weight and meal intake trends (dietary). Nurse managers reviewed Nutrition and Priority reports with clinical teams each week to confirm care plan, next steps, and follow up.

h. HIT implementation needs dedicated internal project team resources and a consistent dedicated person to manage the HIT implementation.

All facilities reported the need to have a dedicated project management resource who understands clinical user needs and workflow to support HIT implementation. For facilities belonging to one system, it was important to have a dedicated person to coordinate the project across facilities, keep all team members informed, maintain schedules and deadlines, and serve as primary point of contact with HIT Vendor.

- The EMR Project Manager needs to be a fulltime person for training/retraining and maintaining all implementation processes once initiated.

- When responsibilities were delegated to an entire team there was more consistent HIT use and fewer disruptions to the process. When the HIT implementation was the responsibility of the DON or Administrator only, there was higher likelihood of disruption to the process, e.g., follow-up with vendor not done, questions not answered, and workflow issues not addressed resulting in staff confusion. If there was a team involved including lead CNAs, there was more stable HIT workflow on a daily basis.

- DON involvement was critical. Without the support of clinical leadership, HIT implementation plateaued. Why? HIT implementation requires workflow redesign and role changes. If clinical leadership was not actively involved, then changes to work flow did not occur and benefits of HIT were less than optimal.

Conclusions

The nursing homes identified several best practices related to HIT implementation:

- Involve front-line staff and multi-disciplinary team members. Facility teams should include front-line staff (CNAs) in early project activities, e.g., facility customization of standardized CNA forms and evaluation of CNA forms. CNA involvement promotes 'buy-in' of project activities and reduces resistance to change in daily practices. It also promotes a sense of empowerment within CNA teams. Multi-disciplinary team members must be included early in the project when defining data elements and reports and included in workflow analysis and redesign efforts.

- Pre-IT preparation is key to successful implementation of HIT. Preparation steps include: (1) establish clear business objective with measurable outcomes, (2) assess process of data flow and how and when information is used by each discipline in decision making, (3) standardize data elements, confirm definitions, and reduce redundancy across and within disciplines, and (4) design reports to support optimal clinical decision making and improve communication across disciplines.

- HIT implementation must provide immediate improvement for staff. For example, the Digital Pen technology eliminated the need to fax standardized documentation forms to database at ISIS office to generate reports. Staff had immediate access to reports on web portal. Staff satisfaction and excitement with new technology was high from the start.

- HIT vision is an EHR, however, it is possible to take an incremental approach to HIT implementation and achieve results in small steps.

- Value of Collaborating with Other Facilities. Partnering with other providers implementing HIT shortened the learning curve and provided a catalyst for creative thinking. Provider partnerships supported successful HIT implementation by providing a forum for shared learning, problem-solving, and collaboration.

Significance

Several facilities participating in this THQIT initiative were participants on the AHRQ-funded Real-Time Optimal Care Plans for Nursing Home QI project: MHP (4 facilities), Good Samaritan Village (1 facility), and Sugar Creek Rest (1 facility). The Real-Time project was successful in standardizing data elements, establishing a process to produce timely reports of resident specific information, and incorporating timely reports into redesigned processes of planning resident care. The results achieved in Real-Time prompted many facilities to determine how the redesigned processes could be sustained in on-going operations. The goal was to implement processes facility-wide, beyond initial pilot unit, or purchase HIT to automate the process fully. The Real-Time initiative provided the foundation for IT implementation by standardizing data elements, developing report templates, and redesigning care processes.

We used ISIS' experience in project management and product implementation to maximize success of implementation in this HIT project. Several factors related to successful implementation emerged:

- Redesign Workflow. We redesigned the nursing home process (rather than just improving existing processes) by implementing automated processes to transmit evidence-based best practice information and providing decision support for clinicians in nursing home practice. HIT enabled implementation of protocol-driven care: resident assessment, daily documentation including alerts or prompts for specific interventions based on resident needs, tracking specific interventions delivered based on best practice, and summarizing documented clinical information in a variety of formats previously requiring a chart pull and abstraction.

- Preliminary Steps to Prepare for HIT are Important. IT implementation after standardizing documentation and redesigning clinical workflow reduces waste, streamlines processes, and integrates best practices based on research.

- Involve Front-Line Staff. ISIS encouraged facility teams to include front-line staff (CNAs) in early project activities, e.g., facility customization of standardized CNA forms and evaluation of CNA forms. This involvement promoted 'buy-in' of project activities and reduced resistance to change in daily practices. It also promoted a sense of empowerment within CNA teams.

- Long Term Care Facilities are Eager to Proceed with HIT Implementation in conjunction with assistance in the following activities: standardize data elements to incorporate requirements for best practices and quality from multiple stakeholders, share information and learning across facilities, redesign processes to optimize use of HIT, and educate staff on use of timely feedback reports for care planning.

- Integrate Research Results with HIT Implementation to Improve Resident Outcomes. Our approach incorporated effects of HIT on clinical and administrative processes, and research-based optimal clinical practices on health outcomes.

Implications

Each facility established plans for long-term sustainability, mechanisms to support future HIT implementation activities, and ongoing evaluation. The plans included the following key components of success:

- Organizational priority and leadership commitment. The Implementation Team at each facility identified ways to determine ongoing needs and establish communication with executives.

- Ongoing operational strategies for education, policies and procedures, and staff recognition for excellence. Each facility developed plans to integrate findings into education strategic plans.

- Ongoing understanding of costs/benefits related to HIT.

- Formalize HIT implementation role and responsibility at each facility. Establish responsibility for maintaining issues log and assessing barriers.

- Participation in annual HIT vendors' user forums.

- Half-yearly evaluations based on the mechanisms established as part of this grant funding.

- Explore using HIT to meet goals of local QIO.

List of Publications and Products

Presentations

2005 Annual Patient Safety and Health IT Conference: June 6-10, 2005, in Washington, DC. Susan Horn presented about how standardized documentation and feedback reports were integrated into HIT for nursing homes.

AAHSA Annual Meeting, November 7–10, 2005, in San Antonio, TX. The Project Team, along with two representatives from a participating facility, Christian Home and Rehabilitation, presented a two-hour session entitled "Making Organizational Change for Quality Improvement: Getting Started and Moving Forward." Session objectives included: (1) learn how a freestanding nursing home and two multi-facility organizations (AAHSA members) started quality improvement initiatives involving organizational change, (2) share practical strategies these nursing homes used to implement organizational change and quality improvement, and (3) involve meeting participants in discussions of implementation of evidence-based organizational change efforts (question/answer).

Gerontological Society of America Symposium, November 20, 2005, in Orlando, FL. Susan Horn presented findings from the three AHRQ-funded projects related to nursing home care practice improvement to prevent PrUs. Included was information about the original National Pressure Ulcer Long-Term Care Study followed by a description of findings from the Real-Time Optimal Care Plans for Nursing Home QI project, which led to the Nursing Home IT project, which led to the QIO prevention of PrUs in nursing homes implementation project.

AAHSA Annual Meeting, April 4, 2006, in Washington DC. Siobhan Sharkey and Sandra Hudak presented in collaboration with a panel of 5 representatives from participating HIT facilities.

2006 Annual Translating Research Into Practice and Policy (TRIPP) conference: July 10, 2006, in Washington, DC. Susan Horn presented about how standardized documentation and feedback reports were integrated into HIT for nursing homes.

California Association of Health Facilities (CAHF) Annual Conference: November 15, 2006, in Palm Springs, CA. Siobhan Sharkey participated in a panel titled Pressure Ulcer Prevention and Treatment- Tried, True, and New. The purpose was to share practical strategies to incorporate evidence-based best practices for PrU prevention into everyday workflow in nursing homes.

Gerontological Society of America Annual Meeting, November 18, 2006, in Dallas, TX. Susan Horn participated in a panel chaired by Dr. William Spector titled Quality of Care Research in Long Term Care: Evidence from AHRQ and assisted Nancy Bergstrom, PhD, RN with a presentation titled "Healing Time of Stage 2 Pressure Ulcers".

AHIMA LTC HIT Summit, June 2007, in Chicago. Siobhan Sharkey attended the AHIMA LTC HIT Summit, submitted a case study of use of HIT in nursing homes, and presented a poster board on lessons learned.