



Evaluation of the Flexibility Critical Access Hospital Health Information Technology Network Implementation Program

Final Report

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I. Executive Summary

Nearly 60 million Americans live in rural areas¹ and face challenges in accessing high quality health care. This represents the vast majority of the approximately 62 million Americans that live in communities with shortages of primary care providers.² As policymakers, health care practitioners, and the public increasingly demand more widespread use of electronic medical records (EMRs) and health information technology (HIT) to increase efficiency, enhance patient safety, and improve coordination of care, studies that evaluate its implementation and effects are essential. This is of particular importance in rural settings where these challenges are amplified. To this end, the Health Resources and Services Administration (HRSA), Office of Rural Health Policy (ORHP) utilized \$25 million in one-time funding to support 16 rural grantees to develop and implement HIT pilot networks in an 18-month timeframe. This report describes an evaluation of these grantees that were charged with designing, creating, and implementing functional pilot networks to improve coordination of care in their communities, and provide lessons learned for future providers and networks in adopting HIT. The outcomes of this grant program are ideally timed to inform and impact the unprecedented HIT funding and programmatic supports funded as part of the American Recovery and Reinvestment Act of 2009 (ARRA, or the Stimulus Bill) which provides for a total of \$19.2 billion for HIT programs and incentives.

The application of HIT has the potential to transform the landscape of how health information is collected, managed, stored, used, and shared, and has special potential to affect the Nation's rural communities. HIT has the potential to help remote communities coordinate care, improve disease surveillance, target health education and compile regional data, all activities that can improve health care and health nationwide. At the same time, rural communities face particular challenges to implementing HIT, given the geographic dispersion of its population and the many resulting implications for the delivery of health care.

Challenges of Rural Communities and HIT

- Geographic dispersion of population
- Limited infrastructure, workforce, capital and other resources
- Service and provider mix
- Socioeconomic status of patient population

ORHP funded grantees through its Medicare Rural Hospital Flexibility (Flex) Critical Access Hospital (CAH) Health Information Technology (HIT) Network Implementation Program, which promotes the implementation of HIT in CAHs and their associated network of providers in States that are current Medicare Flex grantees. The grant program funded grantees to establish HIT systems, but allowed them to use

"HIT is not an IT project; it's a clinical project that's supported by IT."

—Flex CAH HIT grantee

these funds in a flexible way. As a result, some grantee hospital programs already had systems in place and were able to build upon and enhance them using grant dollars; absent the funding, some programs would never have been able to establish an HIT program. Each grantee was at a different level of maturity when the program began, and the grant program allowed each to establish a new system or build upon an existing one.

¹ U.S. Department of Health Human Services, Health Resources and Services Administration. (2009). *Office of Rural Health Policy 2008 Annual Report*. Retrieved from <http://ruralhealth.hrsa.gov/pub/2008annualreport/orhp2008annualreport.pdf>.

² Ruddy, G., Fryer, G., Phillips, R., Green, L., Dodoo, M., & McCann, J. (2005). The family physician workforce: the special case of rural populations. *American Family Physician* 72(1), 147. Retrieved from <http://www.graham-center.org/online/graham/home/publications/onepagars/2005/op31-rural-populations.html>

Grantees worked on a range of HIT projects, including systems for practice management, disease registry, care management, clinical messaging, personal health records, electronic health records, and health information exchanges. All shared the common goal of using HIT as a tool to improve the safety, quality, efficiency and effectiveness of health care delivery by ensuring that clinical information of patients served by the network is accessible to all providers across the continuum of care, from ambulatory care to acute delivery sites. It is too early in the process to measure the impact of the grant on patient outcomes; most grantees are in the

“Small hospitals support a culture of working together where people wear different hats [and] there’s a much more community-oriented environment and agreeable attitudes.”
—Flex CAH HIT grantee

implementation phase of the process. However, the ultimate desire and belief is that the use of HIT systems will ultimately lead to better health outcomes through improved quality of care—quality that improves as electronic management systems promote coordination of information and care treatment plans, offer clinicians real-time responses about their patients and national treatment standards, and reduce medical errors associated with paper records.

The Flex CAH HIT program concentrated funding within smaller service areas to increase the likelihood of creating sustainable pilot projects. Grant applicants were required to identify up to three CAHs and their associated network of providers that together provide a full continuum of care for rural residents in their service area. To build upon existing patterns of care, it was critical that the Flex applicant propose a network that followed common patient referral patterns. The network could include local partners for the CAH, including but not limited to tertiary / referral hospitals, private practice physicians, Medicare-certified Rural Health Clinics (RHCs), Community Health Centers (CHCs) / Federally Qualified Health Centers (FQHCs), nursing facilities, home health agencies, public health departments, and emergency medical service providers.

“By working together instead of trying to be separate all the time, we can show rural America that collaboration works and is sustainable.”
—Flex CAH HIT grantee

A. Evaluation Design

A multi-method evaluation approach was developed to achieve the following evaluation goals:

- Determine the extent to which grantees are able to successfully implement the activities proposed in their application;
- Describe the supports and barriers grantees faced in reaching their stated goals and objectives; and
- Describe the project characteristics, and the supportive elements necessary for projects to fulfill the goals of the Flex CAH HIT Program, in order to inform future grant funding cycles.

This evaluation utilized the data already collected by the grantees for administrative, monitoring, and evaluation purposes. It also collected additional data to support the goals of the evaluation, such as return on investment (ROI) and systems analysis. Data collected from each grantee through key informant telephone interviews conducted every 3 months supplemented these secondary data. The grant administrator participated in each of these quarterly calls which took place from September 2008 through July 2009.

In addition, 2-day site visits were conducted with four grantees (University of North Dakota Center for Rural Health, Oklahoma State University Center for Health Sciences, South Carolina Office of Rural Health, and Board of Regents of the University of Wisconsin System) to explore in-depth their administration of the Flex CAH HIT grant, analyze the HIT system implemented, understand the success

and challenges of implementation, and study initial outcomes. Data collection consisted of group interviews with staff involved in the implementation of the HIT system.

“You can’t really understate the [need for] leadership in working with neighbors in the region.”

—Flex CAH HIT grantee

B. Analysis and Results

Analysis of these data indicates that many factors contributed to supporting the various HIT networks, including leadership from health care administrators and clinicians, stakeholder buy-in, project design, IT expertise,

State and national interest in the projects, and supports specific to the CAH environment. At the same time, groups encountered common barriers to implementation, including technical issues (i.e., problems with interfaces and supports from vendors), unanticipated workforce issues, health system and CAH-level barriers, and challenges related to financing and administering programs. In addition, some grantees experienced barriers because of communication and leadership issues within the networks as well as with vendors for scope of work issues.

Grantees learned many common lessons from the process of creating and implementing their HIT networks. Chief among these is the importance of good project management that focuses on the process of change management and achieving the project’s primary goals. In addition, financial planning and fiscal management are essential; administrators must recognize the magnitude of costs associated with such a project and carefully manage its costs. Time management is another key element of project management; HIT projects can be much more time-consuming than planners anticipate, and budgeting time and resources adequately is critical. Grantees pointed to the importance of early planning, which can help a project advance and ensure that existing systems and workflows can be translated into digital records. Staff buy-in and training are essential to engaging staff, ensuring their ongoing participation and support while giving them the tools and information they need to use the HIT effectively. Finally, grantees noted that communication and coordination among partners is essential to managing such a large and complex project.

Grantees reported that that implementation of HIT networks had an effect on operations and data collection and utilization, including the increased availability of and access to patient data; increased provider collaboration; improved physician satisfaction with the ability to access data remotely; and improved patient outcomes stemming from better access to charts and improved care coordination.

The evaluation examined supports for and barriers to project sustainability. While some grantees reported that they had budgeted for sustainability, including recruiting new partners to the network for cost-sharing, others have encountered barriers to funding. Even so, many reported having sought additional funding from Federal, State, and private sources.

Grantees were asked to describe whether and how HRSA had been helpful to them throughout the process. Most reported that HRSA had been very helpful, particularly with monthly group calls, technical assistance, support to work with vendors, and national and regional meetings.

C. Recommendations

Several recommendations emerged from the results of this evaluation, particularly in terms of grant administration and technical support to grantees. Throughout the grant period, grantees experienced many challenges in simply administering the grant; future programs could be designed to limit or eliminate these challenges. In addition, grantees noted that although they often needed technical support or assistance, they were uncertain of how to find or access resources available to them. Collectively, these lessons learned and resulting recommendations are relevant for future grantees in implementing HIT – the facilities and staff involved in these projects have experience that can be useful

to future HIT projects within their singular facility and within their networks. This experience is critical in the post-ARRA world of many rapid HIT and HIT-related projects being funded. Additionally, these recommendations should serve as points of consideration and revision for future iterations of Flex CAH HIT or similar funding.

Grantees emphasized that they had experienced several challenges in administering the grant, including, the limited timeframe within which to complete the project, governance issues, unclear evaluation expectations, and issues sustaining the activities of the grant. Grantees also raised a series of technical support issues. Although many grantees are aware that technical assistance (TA) resources exist, knowledge of these resources and how to access them varied widely; access often depends on self-determination to uncover or utilize one-size-fits-all resources. Some grantees felt that rural grantees may have a difficult time articulating their needs or do not know all the relevant questions to ask. In addition, many have limited access to resources such as quality broadband services. Collectively, these and other grantee needs may best be served by an HIT Primer – a toolkit designed specifically for CAHs to aid them in adopting an HIT-based application or system. This HIT Primer should focus on rural health settings and in particular CAHs, and build upon other tools such as those encompassed in HRSA’s Health IT Adoption Toolbox and the Rural Assistance Center (RAC) guides. Such a Primer would include specific engagement and selection modules to address many of the TA needs described below in more detail.

In short, future HIT implementation programs should consider the following programmatic and resource recommendations to benefit CAHs in adopting HIT overall, and to specifically benefit the Flex CAH HIT program in future iterations.

Consider a longer grant funding period for future HIT planning and implementation grants. Many grantees stated that they needed more time to complete the project. Many found the combination of planning and implementation activities expected to be covered in an 18-month period of performance to have been unrealistic.

Acknowledge potential governance issues and facilitate resolution. Grantees reported having widely varied governance structures, within which real and perceived challenges existed. While many reported experience working with smaller CAHs in an existing collaborative, some found the addition of larger hospitals or health systems to their networks to be problematic. Future grantees must be more fully cognizant of these potential governance issues. HRSA must be ready to support meaningful mitigation of such issues throughout the grant process.

Emphasize the importance and value of ongoing evaluation and clearly state expectations. Grantee evaluation intent, methods and execution varied widely across sites. Many sites were conducting or planned to conduct staff (user) and/or patient satisfaction surveys. For evaluation to be meaningfully conducted by future Flex CAH HIT grantees, HRSA should clearly communicate expectations and intent of internal evaluation, and provide technical assistance (evaluation plan examples, selecting appropriate measures, data collection methods, etc.) where possible and appropriate. In turn, grantees must understand the importance of evaluation and commit to make it a central component of their project plans and execution.

Support broader sustainability planning. HIT implementation involves many unknowns that can be costly from a financial (and other resource) perspective. Some types of sustainability may be more of an acute issue for rural hospitals – where budgets are small and staff and infrastructure resources are also seriously constrained. HRSA can help grantees consider different types of sustainability issues – financial and other resource constraints, operational or workflow challenges, and ways to mitigate these challenges. HRSA should also encourage and support grantees considering the total cost of ownership (financial and other costs) for HIT systems, rather than focusing on initial purchase prices.

Expand vendor selection, procurement and implementation assistance. Grantees experienced a wide range of satisfaction with their selected vendors, and noted specific times and situations during the vendor engagement where additional help from HRSA would be extremely helpful. For vendor selection, grantees commented they were unsure of what and how to ask vendors meaningful questions tailored to the site's circumstances. Many grantees suggested that HRSA is ideally suited to actively engage with grantees to keep expectations between sites and vendors mutually reasonable, and to be an advocate for the collective grantees in navigating vendor interactions. They also suggested that HRSA could more readily provide or point grantees to resources to develop a site's needs assessment, RFQ/RFP development, vendor selection process, vendor evaluation /comparison tools and contract development tools.

Require key staff succession planning and adequate staff education/training. Grantees identified a number of workforce issues that affected project success – namely staff retention and turnover. While grantees acknowledged that staff shortages and recruitment challenges in a rural environment are inevitable, they also pointed to turnover training and knowledge retention as aspects of larger workforce issues that could be readily improved. Grantees need to consider what happens if there is turnover in a key position. This “succession planning” can help ensure that not one person wholly holds critical information, and that key staff can be effectively replaced. HRSA should provide grantees with succession planning tools for key staff, and explicitly encourage more staff education with specific tools and estimations for such training, tailored to rural environments.

Establish a mechanism for cross-grantee collaboration, best practices and networking. Throughout the evaluation, grantees were appreciative of the networking and collaboration opportunities facilitated by HRSA, but grantees consistently wanted additional ways to learn from each other, work together and share information. Also, grantees requested the ability to work with future grantees, in the event that additional rounds of Flex CAH HIT are funded. Whatever the collaboration mechanism is, grantees would benefit from building a stronger consortium across rural care facilities.

Additional supports for successful implementation. Grantees were aware that implementation consists of more than just buying a product and installing it, but often noted a lack of confidence in handling some of the larger issues inherent in large system implementations. HRSA can support “change management” procedures in future grants – to not only aid in a successful system implementation, but to uncover dysfunctional procedures and fix them.

The Flex Program itself helps to sustain the rural healthcare infrastructure, relying on the Critical Access Hospital as the hub of an organized system of care. To this end, the Flex Program fosters the growth of collaborative rural delivery systems across the continuum of care. Robust, useful and usable HIT systems that coordinate patient and treatment information while respecting privacy, and that enable inter-setting health care information exchange, are critical to building an infrastructure that supports patients and leads to the best possible outcomes for them. The remainder of this report chronicles this model effort to establish and sustain HIT systems in 16 rural communities. The report describes the performance of grantees as they designed, created, and implemented functioning CAH HIT pilot networks, and describes the experiences of partner organizations in this effort. In all, theirs is a remarkable story of success, one in which some organizations reported having been entirely paper-based—indeed, with some reporting that their clinicians could not even turn on or operate a computer—to moving toward an entirely electronic system of medical and health records accessible by providers throughout a rural region. Absent the commitment, funding, and support of HRSA, such successes would not have occurred. This successful pilot program will point the way for subsequent projects to promote HIT not only in rural networks, but in other systems that might be inspired by and learn from the stories told here.



II. Introduction

A. Background

The Office of the National Coordinator for Health Information Technology defines health information technology (HIT) as “the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making.”³

Department of Health and Human Services (DHHS) Secretary Kathleen Sebelius states that “expanding the use of electronic health records is fundamental to reforming our health care system...electronic health records can help reduce medical errors, make health care more efficient and improve the quality of medical care for all Americans.” DHHS has identified furthering the use of HIT as a key priority.⁴ This focus aligns with the President’s goal of universal adoption of electronic health records for all Americans within five years.⁵

The application of HIT has the potential to transform the landscape for how health information is collected, managed, stored, and shared, and has particular potential to affect the Nation’s rural communities. According to the National Advisory Committee on Rural Health and Human Services (NACRHHS), HIT can “help disparate rural providers from across the

spectrum of care to better coordinate care for their patients...help rural communities improve public health through disease surveillance and targeted health education... compile regional data that can be used to improve the health of rural Americans [and] improve the quality of health care not just in rural

Anatomy of a Critical Access Hospital (CAH)

- Medicare Rural Hospital Flexibility Program (Flex Program) was created by the Balanced Budget Act of 1997
- Flex Program provides grants to implement a state’s CAH program and to encourage the development of rural health networks
- Cost-based reimbursement from Medicare (cost plus 1%)
- CAHs are licensed acute care hospitals at least 35 miles from another hospital, or 15 miles from another hospital in mountainous terrain or areas with only secondary roads
- Maximum of 25 acute care inpatient beds
- 24-hour emergency services

³ The Office of the National Coordinator for Health Information Technology. (n.d.). In glossary of selected terms related to e-health. Retrieved from http://healthit.hhs.gov/portal/server.pt?open=512&objID=1256&parentname=CommunityPage&parentid=9&mode=2&in_hi_u_serid=10741&cached=true

⁴ Office of the Vice President, The White House. (2009, November 17). *Vice President announces availability of nearly \$1.2 billion in grants to help hospitals and doctors use electronic health records* [Press release]. Retrieved from http://www.whitehouse.gov/the_press_office/Vice-President-Biden-Announces-Availability-of-Nearly-12-Billion-in-Grants-to-Help-Hospitals-and-Doctors-Use-Electronic-Health-Records/

⁵ Goedert, J. (2009, January 8). Obama calls for all Americans to have EHRs within five years. *Health Data Management*. Retrieved from: <http://www.ihealthbeat.org/Articles/2009/1/9/Obama-Calls-for-All-Americans-To-Have-EHRs-Within-Five-Years.aspx>

communities, but also across America.”⁶ According to the 2008 American Hospital Association survey, 1,998 (40%) of the 5,010 community hospitals are rural hospitals.⁷ Well over half of these rural hospitals (1,305) have less than 25 beds and are designated as Critical Access Hospitals (CAH) that bill for services to Medicare beneficiaries on a cost basis.⁸

However, CAHs face challenges in adopting HIT, which lead to lower HIT adoption rates in rural communities.⁹ For example, only 20 percent of CAHs have some form of an electronic health record, while only 25 percent use electronic prescription order entry.¹⁰ Rural health care systems face particular challenges; their infrastructure, service and provider mix, health status, geographic dispersion of population and socioeconomic characteristics, are often different and unique to rural communities—rural health systems “are not just a small version of suburban and urban health systems.”¹¹ The NACRHHS notes that while “rural communities face many challenges in adopting HIT, including limited access to capital and infrastructure, lack of workforce expertise and difficulty in obtaining community buy-in” they “also have strengths that may facilitate HIT adoption, including the smaller size and less complex nature of rural health care systems.”¹²

The U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration’s (HRSA) Office of Rural Health Policy (ORHP) is charged with informing and advising DHHS on matters affecting rural hospitals and health care, coordinating activities within the department that relate to rural health care (with particular attention to the Centers for Medicare and Medicaid Services and its programs), and maintaining a national information clearinghouse. As part of its mission, and to further HIT adoption in rural communities, OHRP funded the Medicare Rural Hospital Flexibility (Flex) Critical Access Hospital (CAH) Health Information Technology (HIT) Network Implementation Program. The Flex CAH HIT Program promotes the implementation of HIT in CAHs and their associated network of providers in States that are current Medicare Flex grantees.¹³

⁶ The National Advisory Committee on Rural Health and Human Services. (2006). *The 2006 report to the Secretary: Rural health and human services issues*. Retrieved from <ftp://ftp.hrsa.gov/ruralhealth/NAC06forweb.pdf>

⁷ American Hospital Association. (2009). *Fast Facts on U.S. Hospitals* [Fact Sheet]. Retrieved from http://www.aha.org/aha/resource-center/Statistics-and-Studies/Fast_Facts_Nov_11_2009.pdf

⁸ A Critical Access Hospital is a hospital that is certified to receive cost-based reimbursement from Medicare. The reimbursement that CAHs receive is intended to improve their financial performance and thereby reduce hospital closures. Each hospital must review its own situation to determine if CAH status would be advantageous. CAHs are certified under a different set of Medicare Conditions of Participation (CoP) that are more flexible than the acute care hospital CoPs. See the following for more information: http://www.raonline.org/info_guides/hospitals/cahfaq.php#whatis.

⁹ The Rural Health Research Centers at the University of Minnesota, North Carolina-Chapel Hill, and Southern Maine constitute the Flex Monitoring Team. The Team is the recipient of a 5-year cooperative agreement award from the Federal Office of Rural Health Policy to continue to monitor and evaluate the Medicare Rural Hospital Flexibility Program (the Flex Program). The monitoring project is assessing the impact of the Flex Program on Critical Access Hospitals and their communities and the role of States in achieving overall program objectives. See the following for more information: <http://www.flexmonitoring.org/>

¹⁰ Flex Monitoring Team. (2006). *The current Status of health information technology use in CAHs* (Briefing Paper No. 11). Retrieved from http://www.flexmonitoring.org/documents/BriefingPaper11_HIT.pdf

¹¹ The National Advisory Committee on Rural Health and Human Services. (2006). *The 2006 report to the Secretary: Rural health and human services issues*. Retrieved from <ftp://ftp.hrsa.gov/ruralhealth/NAC06forweb.pdf>

¹² The National Advisory Committee on Rural Health and Human Services. (2008). *The 2008 report to the Secretary: Rural health and human services issues*. Retrieved from <ftp://ftp.hrsa.gov/ruralhealth/committee/NACreport2008.pdf>

¹³ The Medicare Rural Hospital Flexibility Program is a Federal initiative that provides funding to State governments to strengthen rural health by: licensing small hospitals as Critical Access Hospitals (CAH); offering cost-based Medicare reimbursement for acute inpatient and outpatient services; encouraging the development of rural-centric health networks; and offering grants to States to help implement a CAH program in the context of broader initiatives to strengthen rural health care infrastructure. (Source: <http://ruralhealth.hrsa.gov/funding/flex.htm>)

B. Program Purpose

The purpose of the FLEX CAH HIT Network grant was to provide funds to support the development of Flex CAH HIT Network pilot programs, sixteen in total, in States receiving the grant (one per State). For the purposes of the grant, examples of HIT include practice management systems, disease registry systems, care management systems, clinical messaging systems, personal health record systems, electronic health record systems, and health information exchanges. The common thread among all funded pilot projects is the use of HIT as a tool to improve the safety, quality, efficiency, and effectiveness of health care delivery. The Flex CAH HIT program aimed to ensure that clinical information of patients served by the CAH HIT network is accessible to providers across the continuum of care, from ambulatory care to acute service delivery sites.

The Flex CAH HIT program concentrated funding within smaller service areas to increase the likelihood of creating pilot projects that are sustainable. Grant applicants were required to identify up to three CAHs and their associated network of providers, which could include a common larger referral hospital, that together provide a full continuum of care for rural residents in their service area. To build upon existing patterns of care, it was critical that the Flex applicant propose a network that followed common patient referral patterns. The network could include local partners for the CAHs in the network, including but not limited to private practice physicians, Medicare-certified Rural Health Clinics (RHCs), Federally Qualified Health Centers (FQHCs), nursing facilities, home health agencies, public health departments, and emergency medical service providers. The CAH HIT Network proposed by the applicant was required to cover a service area that reflects the natural flow of patients served by the CAH and its associated providers. Applicants also were required to have past experience with the use of quality improvement programs (e.g., the Center for Medicare and Medicaid Services' Hospital Compare) and were asked to select least five performance outcome measures with national benchmarks, including the diabetes control and cardiovascular health performance indicators as required by HRSA.

The Flex CAH HIT grantees encompass a variety of HIT implementation projects. Grant projects differ in a number of key characteristics, including network structure (e.g., the number of CAHs involved, whether a tertiary facility is participating, and what types of ancillary facilities are included); type of HIT being implemented (e.g., electronic medical record; health information exchange, telemedicine, or a combination thereof); history of collaboration between the grant project partners; and whether the proposed project is new or had been planned prior to the Flex CAH HIT announcement. These projects might serve as a model to the Nation, particularly rural communities facing similar challenges in adopting HIT.

The remainder of this report describes the evaluation purpose, design and methodology. It features the analysis and results of the evaluation, particularly in terms of supports and barriers grantees encountered during their implementation process, as well as lessons learned in that process. The report includes detailed case studies from the four sites selected for extensive evaluation, including:

- Flex CAH HIT Network Implementation Grant, University of North Dakota Center for Rural Health
- Northeastern Oklahoma CAH EHR Network, Oklahoma State University Center for Health Sciences
- South Carolina Office of Rural Health, Lakelands Rural Health Network HIE
- Rural Wisconsin Health Cooperative Information Technology Network, Board of Regents of the University Wisconsin System

Results of a value-based return on investment (ROI) evaluation are discussed in detail. The report concludes with specific recommendations to HRSA, particularly in terms of administering future grants involving HIT expansion activities.



III. Methods

A. Purpose

This evaluation assessed the 16 Flex CAH HIT grantees' ability to design, create, and implement functioning CAH HIT pilot networks that help improve coordination of care for the rural population served by the participating CAH(s). The main objectives of the evaluation were to:

- Determine the extent to which grantees are able to successfully implement the activities proposed in their application;
- Describe the supports and barriers grantees faced in reaching their stated goals and objectives; and
- Describe the project characteristics, and the supportive elements necessary for projects to fulfill the goals of the Flex CAH HIT Program, in order to inform future grant funding cycles.

B. Evaluation Design

To thoroughly and objectively examine the implementation of the Flex CAH HIT program, the evaluation employed a multi-method design that incorporated several implementation evaluation strategies. Quantitative and qualitative data collection, analysis, and triangulation were necessary to obtain a complete picture of program implementation successes, challenges, and areas for improvement. The implementation of the Flex CAH HIT program was examined across the 18-month grant period using information collection from:

- Review of grant documentation background information, including grantee monthly reports, final reports, and grant applications
- Telephone interviews (quarterly and close-out)
- Case study of select grantees, including calculation of value-based return on investment

C. Evaluation Questions

The evaluation questions reflect project implementation from the grantees' perspective and address the critical aspects of planning and oversight, implementation, maintenance and sustainability planning, and return on investment. The evaluation questions are drawn from the stated purpose and intent of the Flex CAH HIT program and frame the evaluation in terms of the goals and strategies that are most important to the success and implementation of the program. Table 1 presents a summary of evaluation domains, questions, and data collection methods used to address each question.

Table 1. Summary of Evaluation Domains and Data Collection Methods

Domain	Evaluation Questions	Document Review (e.g., grant applications, monthly reports, other reports)	Quarterly Telephone Interview	Group Interview with Select Grantees	Value-Based Return on Investment
Network characteristics	<ul style="list-style-type: none"> Who are the members of each CAH HIT network? What is the governance structure of the network? How long has the network been operating? What other quality-related functions does the network perform in addition to this HIT project (e.g., joint quality improvement activities, collection and analysis of quality measure data)? 	X	X	X	
Project maturity	<ul style="list-style-type: none"> What types of HIT are already in place at each CAH and at each of their network members? What additional HIT investments are needed to meet the goals of the implementation project? 	X	X	X	
Planning and development	<ul style="list-style-type: none"> What types of planning approaches were used by the grantee and the network to determine the needs and focus of the HIT implementation project (e.g., readiness assessment, workflow analysis, business plan)? 	X	X	X	
Evaluation measures	<ul style="list-style-type: none"> To what extent did the technology that was implemented and planned for allow patient data to follow throughout the continuum of care? How did project implementation improve patient care and help providers throughout the network work together more efficiently to manage the health care needs of residents in the service area of the critical access hospitals that will form the core of the network? How will outcomes be measured on specific disease indicators (as chosen by grantees)? 		X	X	X
Assessment of project implementation	<ul style="list-style-type: none"> How is success defined by the CAH network? How successful was the implementation? How successful is the operation of the new HIT functionality? What was the ability of the grantee and the network partners to implement information technology in a seamless manner? 	X	X	X	X

Domain	Evaluation Questions	Document Review (e.g., grant applications, monthly reports, other reports)	Quarterly Telephone Interview	Group Interview with Select Grantees	Value-Based Return on Investment
Challenges experienced	<ul style="list-style-type: none"> What were the scope and impact of barriers encountered? What type of supports helped in the implementation of the project? 	X	X	X	
Lessons learned	<ul style="list-style-type: none"> What lessons have been learned about planning and implementing HIT in CAH networks? 	X	X	X	
Sustainability and maintenance	<ul style="list-style-type: none"> How will HIT be sustained and upgraded? 	X	X	X	
Return on Investment	<ul style="list-style-type: none"> What was the nature of the return on investment that resulted (anticipated to result) from the use of this health information technology? 			X	X

D. Methods

1. Document review

The following documentation were reviewed for the purposes of this evaluation:

- Applications for each grant award
- Grantee monthly reports
- Written reports

These documents were reviewed to obtain an accurate depiction of the project being implemented, network structure, network partners, vendors utilized, project maturity, and implementation successes and challenges.

2. Telephone interviews, quarterly and at close-out

Information obtained from the applications and reports were supplemented by telephone interviews with the grantees on a quarterly basis and at the end of the grant period. Grantees were asked to explain in greater detail information shared in monthly reports, in addition to the barriers experienced during project implementation, specific supports and elements that have contributed to the implementation of the project plan, lessons learned about HIT planning and implementation, and any differences observed between CAHs with regard to project implementation. The interview protocols are located in Appendix A.

3. Case study of select grantees

Site Visits

Group interviews were held with Grant Administrators and other representatives from select grantees to supplement the information obtained through the quarterly calls with all grantees and the secondary data analysis of grantee monthly reports and other background information. Grantees who participated in the site visits were selected based on a combination of several criteria in order to achieve a representative view of program implementation:

- **Type of project implemented.** Projects could have focused implementation on an electronic health record, health information exchange, telemedicine, or a combination of these projects.
- **Network structure.** This factor takes into account grantee network characteristics such as the number of community access hospitals (CAHs) involved in the implementation, the number and type of ancillary partners, and the presence of a tertiary hospital.
- **Relationship between network partners.** This factor indicates the extent to which network partners had an existing relationship or collaborated on other projects in the past.
- **Project maturity.** Some projects were developed upon the announcement of grant funding, while others were already under development.

Using these criteria, the following grantees were selected to participate in the site visits:

- University of North Dakota Center for Rural Health
- Oklahoma State University Center for Health Sciences
- South Carolina Office of Rural Health
- Board of Regents of the University of Wisconsin System

Site visits were conducted over a 5-month period near the end of the grant period from March to July 2009. In-depth group interviews were conducted on site with a range of staff, including the Grant Administrator, Principal Investigator, Director of Information Technology, Medical Director, Director of Nursing, and other clinical services and administrative staff. The interview protocol was designed to collect information about aspects of the grant implementation that could not be obtained from secondary data sources. The protocol was

administered in a uniform manner using a standard interview guide and protocol to support analysis across grantees. A copy of the interview protocol is located in Appendix B.

Value-based Return on Investment (ROI)

Adapting and implementing new information systems in live health care settings, and in particular in rural health settings, and demonstrating a clear value (e.g., through rates of use), has proven difficult. Because HIT is not introduced into a static environment, evaluation must consider the environment in which implementation occurs.¹⁴ In terms of evaluating return on investments (ROI) on HIT implementation, financial and disease outcome-based ROI can take years to accrue, although more value-based ROI measures can be good predictors of these factors. The ROI used for this implementation evaluation focused on how and where users (patients, clinicians, administrators, etc.) of an implemented HIT system derive and obtain value. For the grantees selected for case study, a suite of tools were adapted and designed to incorporate qualitative and quantitative value-based ROI measures to capture important information within the evaluation timeframe. The following section describes the steps and measures taken to study ROI of the HIT implementation, and discusses the results of that study in the four case-study states (North Dakota, Oklahoma, South Carolina and Wisconsin). The full suite of ROI tools is located in Appendix C.

Step 1: Functional Definition Tool

As a first step, the grantees that participated in the site visits used the Step 1 Functional Definition tool to parse out individual functions and participants involved in the project's scope, and to further define the specific relationships among data suppliers, data users, and the purpose of the information being shared. The tool provided lists of possible HIT functions as well as possible HIT participants; however individual CAHs had the opportunity to add or combine up to three user-defined functions and three user-defined participants. CAHs completed this tool using their information and then confirmed with the Altarum evaluation team the specific functions and participants affected by the Flex CAH HIT grant.

Step 2: Understanding Pre-Grant System(s) and Activities

In Step 2 of the ROI protocol, grantees used the Understanding Pre-Grant System(s) and Activities questionnaire to assess several measurement elements of the pre-grant system(s) and activities involved in the Flex CAH HIT project. This tool serves as a baseline or pre-test measure to understand where each CAH is (their "pre-grant processes") as a means to compare the impact of the grant activities (their "to be processes"). In other words, this tool serves to evaluate some of the limitations of paper-based information systems.

Step 3: Understanding Implemented System(s) and Activities

In Step 3 of the ROI protocol, grantees used the Understanding Implemented Grant System(s) and Activities questionnaire to assess several measurement elements of the implemented system(s) and activities involved in the Flex CAH HIT grant. This implementation information collection step then served as a comparison point against the baseline measurements taken in Step 2.

E. Data Analysis

Qualitative data, including interview responses and abstracted information, initially were stored and cleaned in Microsoft Word and subsequently imported to NVivo 7 software for content analysis. The data were analyzed for key themes and differences in response across grantees. Specific qualitative examples that illustrated grantee successes and challenges were stored in NVivo; some are included in this final evaluation report. Comparison of grantees' data by type of project implemented (e.g., EHR, HIE, etc.) did not yield significant differences in responses. Aggregate results of the analysis are presented in Section III of this report.

¹⁴ An Evaluation of Electronic Health Records in Indian Health Services

F. Limitations

1. Generalizability of findings due to variation in HIT systems.

The flexible nature of initiatives such as the Flex CAH HIT program poses an evaluation challenge. Each grantee designed a different HIT system and implemented that strategy differently in different environments, thereby making standardization of the evaluation methods and the Flex CAH HIT program a challenge. The time and resources available for the evaluation limited the number of case studies that could be conducted. Efforts were made during case study selection to ensure that general characteristics of the grantees were represented in the evaluation; however, the grantees that were selected for case study may not be representative of all grantees.

2. Non-experimental design.

An experimental evaluation design was not feasible within the timeframe of the study, in which a site that did not receive Flex CAH HIT funding was compared against a Flex grantee on selected indicators. The study does not separate out the effects of the Flex CAH HIT program from the myriad other environmental and contextual factors that may have influenced the implementation of the Flex CAH HIT grant and initial value-based return on investment. Thus, this evaluation also does not infer causality.

3. ROI measures of clinical outcomes and quality improvement.

Beyond the tools developed for Flex CAH HIT value-based ROI evaluation, additional ROI measures of specific clinical outcomes and quality improvement are extremely important to HIT implementation. However, because clinical and quality improvement measures require a significant observation period to appropriately assess implementation and ROI effects, these measures could not be used within the limited timeframe of this evaluation project. Given the abbreviated timeline of this grant, the baseline measures Flex CAH HIT grantees established in Steps 1 & 2 may be utilized in future ROI evaluations of clinical and quality improvement measures. Future evaluations may want to require CAHs to answer additional questions regarding specific disease outcomes, workflow, and staffing changes to be affected by the grant, including any relevant measurements (e.g. FTE changes, task time, functional or other direct costs).

4. Self-reported data.

The evaluation did not include an independent assessment and observation of the Flex CAH HIT grant implementation. All of the data collected for the evaluation were the self-reported perceptions and experiences of grantee representatives. Social desirability may have affected participant responses in which respondents may have replied in a manner that would be viewed favorably by others.



IV. Analysis and Results

The Flex CAH HIT grantees conducted a variety of HIT implementation projects. Grant projects differed in a number of key characteristics, including network structure; type of HIT being implemented; history of collaboration between the grant project partners; and project maturity. A summary of the grantees' projects is presented in Table 2 and a detailed profile of each grantee's project is located in Appendix D.

This chapter presents an analysis of the supports and barriers facing the grantees as they implemented their projects, their plans for sustainability and evaluation, the impact their project has had on CAH operations and outcomes, as well as a description of the lessons they have learned regarding HIT implementation. Data sources for this report are the monthly reports submitted by grantees, as well as the September and December 2008 grantee quarterly conference calls and the June 2009 close-out calls conducted with all grantees.¹⁵

Through the monthly reports and quarterly and close-out calls, grantees were asked to report on:

- The supportive elements or factors that were critical in completing the project tasks/activities
- Any barriers that were encountered in accomplishing the tasks/activities and steps taken to resolve them
- Technical assistance or additional resources needed to achieve the goals of the grant project
- Lessons learned about HIT planning and implementation
- Project impacts on operations and patient care
- Plans and resources needed for sustainability
- Plans for evaluation
- HRSA's role in the implementation

Inductive qualitative analysis was conducted on aggregated data to identify themes for each topic. Findings are presented first on the supports to project implementation, then the barriers to project implementation, followed by lessons learned by grantees about HIT implementation. Project impacts, plans for sustainability, evaluation, and HRSA's role in the implementation are also discussed.

¹⁵ The close-out call topics were covered with the four grantees that were visited in person during the site visit.

Table 2. Summary of Flex CAH HIT Implementation Grantees Projects

Grantee Name	Main Purpose (EHR, HIE, and/or telemedicine)	Project Description	Project History/Background	Network Structure	Vendor(s)
Alabama Department of Public Health	Electronic Health Record	Formalize a provider network to include a CAH, rural health center, tertiary hospital, and a seven-cardiologist physician group and bring the network together for shared information in order to identify more at-risk cardiovascular disease patients and to provide more coordinated care for those already identified.	Although independent, the partners have experience working together. The cardiologist group has a strong presence in the community. The participating tertiary center is the primary transfer partner, and it has a longstanding positive relationship with the cardiologists, who do most interventions there. While this was a new project, the CAH had recently invested in cardiac care equipment.	One CAH, one rural health center, one tertiary center and a physician group	Healthland (EHR) and Sci-Health (performance tracking)
Hawaii State Department of Health	Electronic Health Record	The goals of the project were to: establish a model CAH and clinic EHR capability based on the Indian Health Service Resource and Patient Management System (IHS RPMS), a derivative of the VA VistA system; implement the RPMS infrastructure with appropriate servers and end-user equipment in two CAHs (West Kaua'i Medical Center and Samuel Mahelona Memorial Hospital) and three associated clinics; implement security protocols and security software in RPMS to enable the HHSC Kaua'i Region CAHs and clinics with authorized access to patient records; develop application interfaces with patient management and billing systems to ensure adoption and improve the efficiency of the EHRs in Hawai'i; and evaluate the implementation and usability of the Kaua'i RPMS EHR to provide lessons learned for future RPMS implementations in Hawai'i CAHs and clinics.	This pilot FLEX program application was submitted by the State of Hawai'i Department of Health (DOH), as a partnership with the Kaua'i Region of the Hawai'i Health Systems Corporation (HHSC), and the Telecommunications and Information Policy Group (TIPG) of the University of Hawai'i (UH). The Partners have been rigorously working over the past two years to develop a strategy to implement EHRs in CAHs and clinics to improve patient safety and quality, and to improve efficiency and effectiveness for reasons well-documented in national studies, reports, and executive orders. The DOH has been working as a partner with the HHSC and the University of Hawai'i to ensure a cost-effective and sustainable EHR capability.	Two CAHs and three clinics	An EHR based on the Indian Health Service Resource and Patient Management System (IHS RPMS), a derivative of the VA VistA system
Illinois Department of Public Health	Electronic Health Record and Health Information Exchange	Project funds were used to implement electronic health records in the rural health clinics of two critical access hospitals; implement a picture archiving and communications system at one of the participating hospitals; implement health information exchange software; and identify the processes and activities that best supported technology implementation in the critical access hospital environment.	This project is the result of two years of planning. The CAHs have worked on previous cooperative projects, including evaluating HIT and processes to improve information sharing, and a joint pharmacy coverage project. The CAHs are members of the Illinois Critical Access Hospital Network. The other network stakeholders have also worked together in the past.	Two CAHs and their two clinics	NextGen (EHR and HIE)
Indiana State Department of Health	Electronic Health Record	St. Vincent Health implemented electronic health record (EHR) technology into the outpatient primary care setting (Rural Health Clinics and one Federally Qualified Health Clinic), and the inpatient Critical Access Hospital setting, and allows them to connect electronically for records and results transfer to the tertiary care setting. The demonstration project results were instrumental in illustrating how to connect and deliver patient care results into the Indiana Health Information Exchange (IHIE).	The project is the result of 12-18 months of planning, which resulted in St. Vincent's organization-wide Information Services and Technology Strategic Plan for 2006-2009. Most of the entities involved are owned and operated by St. Vincent Health, part of Ascension Health, the parent organization. All CAH sites report to the same Chief Operating Staff and Chief Medical Officer.	Three CAHs, connecting to three clinics (rural health centers) and an FQHC	Eclypsis (inpatient EHR) and AllScripts (outpatient EHR)

Grantee Name	Main Purpose (EHR, HIE, and/or telemedicine)	Project Description	Project History/Background	Network Structure	Vendor(s)
Louisiana Department of Health and Hospitals	Electronic Health Record and Health Information Exchange	The Pointe Coupee Parish health system has evolved without a strategic system design. The object of the project was to provide a system(s), which will allow access to patient data in a secure web enabled environment. The ultimate goal was the sharing of appropriate health information among all partner organizations. This will be accomplished by connecting all of the information systems and processes implemented in a secure, hosted environment. This will provide essential data, in an efficient manner, to the network's health care providers.	The network members have a long history of working collaboratively to improve the health care delivery system of Pointe Coupee Parish, and have proven to be innovators in rural network development. They have been engaged in collaborative sharing of information for several years.	The Pointe Coupee HIT Network includes Pointe Coupee General Hospital, a 25-bed CAH; the CAH's transfer tertiary hospital, Our Lady of the Lake Regional Medical Center (the Lake), a 740-bed community hospital located in Baton Rouge (approx 45 miles); and four local rural health clinics managed by the Lake--an FQHC with two sites in the parish (Innis Community Health Center); one local community clinic; two private practice primary care clinics; and one home health agency, Point Coupee Home Bound.	AHS, CNN, CPSI, Cerner (CareFx is being used statewide)
Michigan Department of Community Health	Electronic Health Record and Health Information Exchange	The primary purpose of Michigan's FLEX CAH-HIT Network project was to create an effective health data exchange between two Critical Access Hospitals and their tertiary referral center, in order to improve the safety, quality, efficiency, and effectiveness of health care delivery through a full continuum of care. The anticipated results will be measurable improvements on the health status of local communities including improvements in: (a) the safety and quality of care delivery and patient's care; (b) the effective delivery of health services and continuity of patient care; and (c) operating efficiencies in terms of time saved, increases in revenue, increased tracking and or reporting of patient's quality and health outcomes.	Participating sites are part of the Thumb Rural Health Network (TRHN). TRHN is a recently incorporated 15-member organization located in the rural counties of Huron, Sanilac, and Tuscola, typically referred to as MI's "Thumb." TRHN's membership includes seven CAHs and one sole-community provider; both county health departments; six tertiary hospitals surround the region; and one Multipurpose Collaborating Council. In 2006, the organization identified the need to develop a Health Network Exchange (HNE).	Three CAHs and a tertiary referral hospital	Techttime, CPSI, and Cerner (HER) and Covisent (HIE)

Grantee Name	Main Purpose (EHR, HIE, and/or telemedicine)	Project Description	Project History/Background	Network Structure	Vendor(s)
Minnesota Department of Health	Electronic Health Record and Health Information Exchange	The grantee successfully implemented an electronic health record system among its three facilities, Madison Lutheran Home, Johnson Memorial Health Services, and Appleton Area Health Services, in order to create an integrated community health information system to allow patients served to travel seamlessly through the continuum of care and permit reporting of quality measurement data.	The partners collectively make up the Lac qui Parle Health Network, created in 1998. In 2007, the LqPHN conducted an HIT strategic planning process that provided a comprehensive blueprint for the selection and implementation of a system-wide electronic health record (EHR) system. The three organizations identified a need for patients in the three communities to move seamlessly through the continuum of care from emergency services to acute hospital-based care to assisted living and/or nursing home and referral to Rice Memorial Hospital in Willmar or other referring hospitals, such as Avera McKennan in Sioux Falls, South Dakota, or Level I Trauma Hospitals in the Minneapolis-St. Paul metropolitan area. It also identified a need to continue improving patient quality of care and safety by integrating outcomes reporting into its EMR environment.	Three CAHs and their ancillaries	Dairyland, HMS, CPSI
University of North Dakota	Electronic Health Record and Health Information Exchange	The goals of the North Dakota project were: 1) to assist CAHs with the implementation of electronic medical records and the sharing of patient data with at least one ancillary facility within their respective communities; 2) facilitate the exchange of patient information (diabetes) between the CAH facility/ancillary and the regional tertiary center; and, 3) strengthen regional network to address HIT needs and issues.	The partners are part of a larger existing network, the North Region Health Alliance. There is a long and established relationship of collaboration among the members. At the time of the application, North Dakota had 31 critical access hospitals (CAHs), none of which was involved in a health information technology (HIT) network with its tertiary. Statewide data indicated that CAHs were supportive of the need and benefits of HIT; however, they struggled with available resources (e.g. financial and IT staff).	Three CAHs (part of an existing network) and their ancillary facilities, including a Rural Health Center, a Community Health Center, two long-term care facilities, as well as a tertiary referral hospital.	Healthland (2 CAHS used for their HER) and American HealthNet (1 CAH chose this for their EHR). Cincial Workstation was used as the portal to the tertiary facility.

Grantee Name	Main Purpose (EHR, HIE, and/or telemedicine)	Project Description	Project History/Background	Network Structure	Vendor(s)
Nebraska Department of Health and Human Services	Electronic Health Record	The main focus of the Nebraska Project was to share and exchange clinical health information along a continuum of care. This continuum involved the Thayer County Health Services (a Critical Access Hospital and physician's clinic), five additional rural health clinics, one assisted living facility, one nursing home, three EMS ambulance units, an independent pharmacy, a hospital-owned retail pharmacy, a home health agency, and the network hospital (St. Elizabeth Regional Medical Center in Lincoln). The desired outcome of the project was to improve the quality, safety, efficiency, and effectiveness of the Thayer County Health Care system.	This project was designed to meet the health needs of Thayer County and the surrounding communities in Nebraska and Kansas. The population of Thayer County is older and the mortality rates for many of the major health problems are considerably above the state average. There are also access to care issues. Developing an electronic health information exchange system was considered a critical tool that would facilitate an improvement in health outcomes for patients with diabetes, heart failure, and stroke. It would also lead to improvements in adult and childhood immunization rates, a sharp reduction in medication errors, and more timely and effective treatment of the patients who were transferred to the network hospital.	A CAH, five rural health clinics, a home health agency, a nursing home and an assisted living facility, several EMS units, a hospital owned retail pharmacy and an independent retail pharmacy, and a network tertiary hospital.	Medinotes and HMS
Oklahoma State University, Center for Health Sciences	Electronic Health Record and Health Information Exchange	The proposed project was designed to create a Critical Access Hospital (CAH) Electronic Health Record (EHR) Network in Northeastern Oklahoma (the "Network"). The Network members' vision for the EHR network was to ensure that patient clinical information would be easily accessible to providers within a healthcare organization and to other providers as patients migrate from ambulatory care to acute service delivery sites within the region. The improved access to patient information would be integrated into a coordinated system of care that would result in more effective and efficient health care delivery that would ultimately lead to improved safety and quality of care for patients.	The partners were not part of a pre-existing network, but they have created one (the "Northeastern Oklahoma CAH EHR Network") for the purposes of this project. The project was new at the time of the application.	Four CAHs and a tertiary center	Cerner, Meditech, and HMS (EHR) and Covisent (HIE)
South Carolina Office of Rural Health	Health Information Exchange	The purpose of this project was to acquire the necessary funding and technical resources to implement a regional health information exchange and quality improvement initiative in the Lakelands area of western South Carolina. The goals for this grant were: 1) To serve as the SC rural pilot site for an already developed health information exchange technology platform, that includes a personal health record; and 2) to establish a regional quality improvement program and reporting function within the health information exchange.	The Lakelands Rural Health Network (LRHN) is a nonprofit, multi-county vertical network that was developed in 2004 with the guidance and financial assistance of the South Carolina Office of Rural Health, the state FLEX grantee, to achieve efficiencies, expand access, coordinate and improve the quality of essential health care services, and strengthen the rural health care system as a whole. The network started a strategic planning process in 2004, during which time HIT was identified as a priority. The network completed a formal needs assessment process that included community and key informant interviews to make sure that the LRHN HIT projects are driven by the needs of area clinicians.	2 CAHs, an FQHC with 9 family practices, 2 rural health centers, 3 family practices, and a tertiary facility	Care Evolution

Grantee Name	Main Purpose (EHR, HIE, and/or telemedicine)	Project Description	Project History/Background	Network Structure	Vendor(s)
Tennessee Department of Health	Health Information Exchange	This project endeavored to facilitate enhanced collaboration among health care providers within the Middle Tennessee Rural Health Information Network (MTRHIN) to include three Critical Access Hospitals (CAHs), one Federally Qualified Health Center (FQHC) and their referral hospital by supporting the electronic exchange of health information. The purpose of this project was to support the use of health information technology (HIT) as a tool to improve the quality of patient care and minimize health access issues, which in turn improves patient outcomes, decreases medical costs and hospital admissions. The aims included the adoption and effective use of HIT; the creation of sustainable business models for deploying HIT in Medicare Rural Hospital Flexibility (Flex) CAH networks; enhancing the ability of safety net providers to leverage initiatives and resources as well as improving quality; and promoting performance improvement within the Flex program.	The selected CAHs had already developed a workplan and two of the three CAHs are within a larger hospital system and were in the midst of formalizing a network at the time of grant selection (they have now received 501(c)3 status).	Three CAHs, an FQHC, and a tertiary referral hospital, collectively the Community Health Network	NextGen
Texas Office of Rural Community Affairs	Electronic Health Record, Health Information Exchange, and telemedicine	The goal and primary need for this project has been to improve health care delivery and quality of life through Health Information Technology (HIT) implementation within two rural communities as a demonstration model for all rural Texas communities. The objectives are to improve the safety, quality, efficiency and effectiveness of healthcare delivery through implementation of health information technology.	There wasn't a formal network between the CAHs prior to this project. However, all the partners have signed MOUs among themselves. This project was their second collaborative effort.	Two CAHs, community partners, and a tertiary hospital	OPUS
Virginia Department of Health	Health Information Exchange and Telemedicine	Using the American Stroke Association's "Stroke Continuum of Care" as an organizing framework, the VA Critical Access Health HIT (VA CAH-HIT) Network served as a test bed for the implementation of HIT interventions across the full stroke continuum of care within CAH service areas of the Virginia Acute Stroke Telehealth (VAST) statewide network infrastructure. The CAH-HIT grant funding was utilized to set up the first regional network for VAST. The specific focus of the program was to implement, test and evaluate a variety of information and telecommunication technologies to determine how technology could be leveraged to address functional requirements--particularly at the critical access hospital (CAH) level in highly rural areas of the state. The outcome of the effort was intended to not only set up a network in this region, but to develop a model to be leveraged statewide.	In efforts to begin addressing the problem of fragmentation in stroke care, the Virginia Department of Health (VDH), Office of Minority Health and Public Health Policy (OMHPP) partnered with the Virginia Telehealth Network (VTN) and the Virginia Stroke Systems Collaborative (VSS – which has since transitioned to become the Virginia Stroke Systems Task Force) to design a model telestroke network for Virginia. The initiative was coined the Virginia Acute Stroke Telehealth (VAST) network.	One CAH, one community hospital, a tertiary center, and ancillary providers	CPSI and FastChart (EMR), InTouch Health (robotics), DR Systems and CareStream (PACS vendor) and Medweb (teleradiology)

Grantee Name	Main Purpose (EHR, HIE, and/or telemedicine)	Project Description	Project History/Background	Network Structure	Vendor(s)
Washington State Department of Health	Health Information Exchange	This project set out to connect three CAHs and their respective ancillary facilities, all with disparate information systems, to each other and to the tertiary referral hospital in Seattle, Harborview Hospital, which is the only Level 1 Trauma Center in the state, through a health information exchange. This HIT project aimed to develop a universal data exchange/interfacing capability on multiple levels, and has the potential to serve as the universal EHR exchange platform that can be integrated into the statewide telehealth pipeline, thus making the platform scalable to CAHs and other providers statewide.	The three CAHs are members of the HIT Implementation Network of Western Washington Rural Healthcare Collaborative (WWRHCC), and have a long history of collaboration, particularly in the areas of HIT and telemedicine. Since 2003, all WWRHCC hospitals have been members of the University of Washington's Telehealth Network, and have been working together to develop HIT systems to support the delivery of specific specialty services through telemedicine. In 2005, WWRHCC performed an internal business planning process developed to guide the Collaborative through the next 3 years in its evolution. Since then, the Collaborative has been actively pursuing a consistent set of goals as a cohesive group.	Three CAHs and their associated rural health centers, and a tertiary Level 1 trauma center	Orion
Board of Regents of the University of Wisconsin System	Electronic Health Record and Health Information Exchange	This project involves implementing a shared community EHR environment (with integrated hospital, physician clinic, and skilled nursing applications), which is intended to unify information from disparate continuum of care settings into a community electronic health record and provide contraindication checking and decision support tools that will reduce medication errors, facilitate the practice of evidence-based medicine, and improve care quality.	The RWHC ITN Project was designed to address a variety of critical access hospital (CAH) needs and problems. As has been discussed in several reports and studies, CAHs face a number of HIT adoption challenges, including lack of financing, lack of sufficient HIT professionals, and limited expertise to facilitate project management and workflow redesign. These challenges are especially pronounced for small-volume CAHs, since they generally have tighter margins and smaller proportions of staff to devote to HIT and EHR related activities. In many cases the result of these challenges is that CAHs are simply not structurally positioned to move forward with the technology implementations that can benefit their patients and that will be required to meet the demands of the changing healthcare landscape (including ARRA, value-based purchasing, and health reform).	4 CAHS and their affiliated physician clinics and skilled nursing facilities	HMS

A. Supports to Implementation

Grantees discussed several core supports to implementation, including components directly related to stakeholder buy-in, project design, and supports specific to the CAH environment.

A.1. Stakeholder Buy-in

Management leadership (10 grantees). Good leadership is necessary to bring both a regional and a national perspective to a project, to work with neighboring institutions, and to create an integrated system while avoiding territorial issues. As one grant administrator stated “You can’t really understate the [need for] leadership in working with neighbors in the region.” Executive leadership and involvement can positively contribute to moving a project plan forward. CEOs and CFOs intimately involved in the Flex CAH HIT project were instrumental in conveying a sense of urgency and priority to staff at all levels, and grant administrators saw this as critical to a smooth and timely implementation. Management buy-in was further strengthened by executive backgrounds in areas such as designing functional operational systems as well as close working relationships with IT experts.

Community partner support (7 grantees). The program must have a good relationship with providers; one grantee noted that providers “had ideas from years of experience on how to deal with some of the issues.” Community partner support can also lead to an expansion beyond hospitals and pharmacies to include care providers such as nurse educators, dietitians, clinical work stations, and, in one grantee’s case, a regional diabetes center. One grant administrator found that placing advertisements in the local newspaper about the project revitalized the small community: “Hospitals are big time employers in each community and [our HIT implementation] gets the staff and community pumped. Everyone gets all kinds of great publicity by being associated with the effort.”

Clinical leadership and support (6 grantees). Five grant administrators discussed the importance of physician buy-in to project success: “The physician champion is obviously critical.” Physician and other clinical staff champions can facilitate communication between clinicians and IT staff. One grantee administrator felt that the two participating hospitals with a physician and a physician assistant (PA) champion stood a better chance of success than those without. In another, clinical input drove vendor selection during the project planning stages.

IT Expertise (6 grantees). The knowledge and dedication of IT staff is an invaluable project support, especially when the IT staff recognize that there is much to be done with the project beyond what they are currently doing, which is important to the long-term success of the project. Having staff who understand the breadth and scope of what the project is trying to accomplish is important to its success.

State and national interest in HIT (5 grantees). General awareness of the national HIT environment, as well as State awareness of CAH capabilities to integrate HIT, improved grantees’ prospects for planning and implementing a successful project. One grant administrator stated that CAHs are “aware that the Flex CAH HIT grant is their best chance to get a tested and workable EHR” in the present environment. A supportive relationship with the State, including the ability to use its resources and guidance, is especially important for project sustainability. The relationship between the grantee and the State can be mutually beneficial, as in the case of one grantee whose project provided positive publicity to the State in rural newspapers. Another grantee cited the support of the Lieutenant Governor’s office and the creation of a Statewide eHealth Council as a support to innovation. State-level officials also have a stake in the success of innovative HIT implementation efforts because HIT is tied to other issues on the State agenda, such as veterans’ care, community mental health, and disaster preparedness.

A.2. Project Components

Vendor support (7 grantees). Seven grantees who had good vendor experiences described their vendors as supportive and quick to help with troubleshooting when hospital concerns were voiced. Vendor support included a willingness to collaborate to ensure success and sending very qualified people who were friendly and helpful to train staff. One grantee wrote that their vendor was “not afraid to hold your hand if you’re not good with computers.” Another vendor supported one grantee’s project by being knowledgeable about rural culture and communities. Grant administrators praised their vendors for attributes ranging from astute strategic planning, to interface capabilities, to willingness to provide software support and training. One grant administrator reported that the vendor’s strategic plan was the foundation for hospital staff buy-in because it designated templates and workforce processes that led staff to “stretch their skills to cross over from paper to electronic systems.”

Partner readiness (6 grantees). A number of grant administrators reported that selecting hospitals that already had the infrastructure and/ or network capabilities to implement the project was advantageous. One grantee involved all of the area hospitals rather than just the three initially part of the grant. This meant that when a few of the initial participating hospitals dropped out of the project, other hospitals were prepared to take their place. Another grantee found that its hospitals had already gained experience installing ambulatory EMRs and physician monitoring, meaning that the grant didn’t have to “re-invent the wheel.” One CAH had already gone through a strategic planning process that allowed the grant to take advantage of an existing skill set. Established relationships between partners and experts also helped facilitate the project implementation.

Software supports (6 grantees). Several grantees described how characteristics of the software or hardware provided by the vendors, including the ability to connect remotely, a bi-directional database, and open architecture solutions, supported project goals. Ease of use was also important: “If you’re in various departments in the hospital, you [use] the same program, so the look and feel, the tabs, the pull-down menus, the alarms, are all the same for each department. You don’t have to [re]-train employees if they switch departments.”

A.3. CAH-Level Supports

CAH structure and organization (6 grantees). Smaller CAH size can make implementation more manageable: “Small hospitals support a culture of working together where people wear different hats [and] there’s a much more community-oriented environment and agreeable attitude.” Having fewer staff to “get on board,” noted one grant administrator, contributed substantially to project success. Another stated that working with smaller facilities and organizations made it easier to generate interest, involvement, and buy-in to a new way of doing business. Smaller, less structured health care systems provide more flexibility for the exchange of information and quick decision-making. Being in one network environment was another support that facilitated networking. The willingness of one CAH to dedicate a portion of its budget to staff training had contributed immensely to the success of one grantee’s overall implementation and spoke to the value that the institution placed on project sustainability.

Collaboration among CAHs (6 grantees). Collaboration among participating CAHs has served as a significant project support. Grant administrators found that networking among CAHs and having an established CAH network facilitated decision-making, information exchange, and the inclusion of different constituencies. One grant administrator hoped that “this will have long-term effects beyond this grant in improving stroke systems of care.” Work group collaboration can create the necessary cohesion for a network of hospitals while also leaving them the flexibility to work independently on

issues most important to their facilities. Regular meetings and other forms of communication among CAHs helped to emphasize the joint effort required by the implementation.

CAH staff enthusiasm (6 grantees). CAHs that have dedicated and passionate staff willing to commit the time necessary to troubleshoot HIT issues have met with greater success than those CAHs that are reluctant to confront these challenges head on. For example, one grant administrator described “daily huddles” at a CAH where staff meet to discuss areas of frustration and solutions evolving from their EHR project. One CAH supported user groups developed from different department staff to facilitate staff input and buy-in. Buy-in and involvement from the administrative level to the clinical staff is important: “It really has to be a facility-wide buy-in process.” Staff can make an effort to reach out to other CAHs and to smaller communities. In particular, projects with champions stand a better chance of success.

B. Barriers to Project Implementation

Grantees identified a number of barriers and challenges they faced in the implementation of their projects. While technical issues comprise a large portion of the barriers facing grantees, other issues have also had substantial impact on the grantees’ project implementation. These issues included both anticipated and unforeseen issues of workforce, health system and CAH-level barriers, and challenges related to finances and administration. One grantee stated that “the whole project is by definition tough in the sense that you are introducing high-level technology to rural communities.” These barriers to implementation can be broadly grouped in the following manner:

B.1. Information Technology and Related Issues

Vendor/Network Disconnect (9 grantees). The process of implementing the projects was inhibited due to a disconnect between vendors and network members resulting in slow vendor negotiations, vendor selection, and contracting process delays. The contracting process can be difficult for some hospitals because of vendors “promising the moon” but giving hospitals “a huge gap in the contract.” Working with vendors who are used to large integrated systems in the context of small and rural systems is another difficulty. Many software and hardware applications developed for large medical centers can fail to address most or specific, critical needs of a rural setting.¹⁶ Vendors do not always understand CAHs and small facilities; vendors found it difficult to conceptualize how their products work in a small setting. Others found the initial selection process cumbersome: “It’s like putting together a 1500-piece puzzle.”

Furthermore, going into vendor negotiations and expectations for implementation, many CAHs lack overarching infrastructure, IT exposure and staff background, and limited resources for training and system maintenance – gaps that the CAH may be expecting the vendor to address or at least assist with, that are left unaddressed in contracts or worse, are specifically avoided by vendors. Multiple grantees were frustrated with trying to get vendors to make their systems interoperable with each other or with legacy systems. One grant administrator stated that “It’s one thing to deal with their sales reps; it’s another to deal with their programmers and make sure that the product you agreed to have in your institutions actually does what they say it can do.” Compounding these interoperability or expectation gaps is the contracting process where CAHs will be instructed that contracts are “standard” and certain terms may not be negotiated. One grantee thought that the process might be different for large States

¹⁶ Demiris, G., Courtney, K., & Meyer, W. (2007). Current status and perceived needs of information technology in Critical Access Hospitals: a survey study. *Informatics in Primary Care* 15(1), 45-51.

with a large IT investment because those States can leverage their size to get the full attention of the vendors.

Interfacing different systems (7 grantees). One of the main technology barriers involved the difficulty of integrating different systems, which was a “barrier to quick and efficient implementation.” Interfacing expenses, difficulty finding compatible software, and different vendor systems at different hospitals fell into this category. “Major programming issues” requiring time-consuming and costly “work arounds” for Patient Indexes and other essential pieces of the HIT system frustrated implementation. In at least one case, even hospitals that shared leadership chose different vendor systems.

Infrastructure (5 grantees). Both expected and unexpected infrastructure needs were barriers. In some cases smaller provider practices could not afford adapters to get onto the data network. The grant in some cases became the default for providing resources as simple as cabling in older facilities. One grantee found that the hospitals did not have the required interface they had claimed to have. Another grantee found it hard to find technical and IT personnel willing to support rural hospitals.

B.2. Partner and health system issues

Partner readiness (5 grantees). The ease of implementation may “boil back to readiness.” In some cases, the relationships between CAH HIT partners ended up not being as strong as anticipated. Some providers did not have a sense of urgency about their involvement and participation. One grantee found that the tertiary center in the project lacked a desire to be flexible with a “very closed and controlling system unwilling to engage in discussions about how to make the project work.” Another grantee experienced trouble with one specific partner who did not want to change. Finally, one grantee found that the biggest challenge was undertaking a project of this magnitude in a rural area where many hospitals do not have fully implemented EHRs.

Communications and leadership (4 grantees). Communication and leadership issues were also challenges. In one grantee’s CAHs, the IT manager and the CEO did not involve their staff, making staff more resistant to challenges. History between particular members in the network can cause communication problems when the partners are not supporting transparency, and when political strain prohibits some of the necessary networking and connecting. One grantee experienced problems with buy-in from the ancillary partners because grant administrators did not have the authority to push the smaller non-integrated partners, and the larger, authoritative partner paid little attention to the smaller partners. Another grantee experienced problems when the health network board members became “more concerned with doing their own thing” after a personnel departure left a leadership vacuum. Projects with “a lot of moving parts” like these require that partners communicate about the concept and ultimate goals.

Contract negotiations (4 grantees). Grantees experienced difficulties setting up final agreements and getting clinics and tertiary hospitals to commit to the project; one experienced a six-week delay in contract negotiation with some of the grant’s major partners. Another grantee found it difficult getting CAHs to agree to the specific software. Contracts require legal review, a step that may be difficult for rural partners who may “interact with their legal team only once a quarter.”

Governance (4 grantees). The complexity of large hospital systems also posed a problem for some grantees. One State has regional health boards as well as corporate hospital boards, creating confusion over who has the authority to make decisions and creating the potential for “Balkanized EHRs.” Another grantee found that the lack of understanding of all the legal barriers and bureaucracies involved in the project was the biggest barrier; governance issues with patient compliance, patient consent, and privacy officers held up the project timeframe. A final governance issue was the receptivity and involvement of the consumer and whether consumers have input into the shape of the system.

B.3. Workforce Issues

Culture (10 grantees). More than half of the grantees experienced some cultural issues: “You’re never prepared for the human reaction to the actual implementation.” One grantee found that physicians were not as receptive to the technology as had been hoped, and several found that one community or hospital was much easier to work with than another. Grantees referenced a lack of general IT exposure among many staff, which is a widely recognized challenge in HIT adoption that is more common in rural settings. Another grantee experienced pushback from physicians who wanted custom-designed templates and had little power to put pressure on the physicians because the hospital would have difficulty hiring more. One grantee called doctors “creatures of habit” and another said that physicians are “very strong willed.” Elderly, rural, or simply technology-adverse end users presented other cultural challenges. While culture is often a hurdle for HIT implementations, it has been noted that provider and community buy-in is more difficult to obtain in rural communities, and this particular challenge was highlighted in the National Advisory Committee on Rural Health and Human Services 2006 report to HHS.¹⁷

Shortages and turnover (5 grantees). Workforce issues included staff turnover in rural areas and an inability to hire the right person for the job due to a small pool of applicants. Grantees have to take into consideration what happens if there is turnover in a key position; one recommended “session management” where “somebody knows everything that I know. Not one person holds all the information, so if someone quits, the next person can replace that knowledge.” Rural and smaller hospitals had particular difficulty attracting and retaining IT knowledge.

B.4. Fiscal Issues

Lack of funding (8 grantees). Lack of funding was a concern for many of the grantees, ranging from unexpected costs to the realization that some sites lack the resources needed to successfully implement the project. The current financial climate and strained State budgets worry many of the grantees. Financial barriers include hefty maintenance fees for the HIE software, the cost of setting up a Helpdesk, needed funds to hire knowledgeable staff, unanticipated costs such as interfaces between records and billing systems, and pending bankruptcy of community partners. One grantee had to be “extra careful watching small budget items like conference calls and travel.”

Sustainability (7 grantees). Grantees were concerned about future funding. One grantee articulated the fiscal challenge as “how do you slow down the freight train?” They have several hundred people working on the project currently, and after the grant ends, they will still have 35 clinicians designing the in-patient EHR, and a similar number designing the outpatient EHR. They “just can’t stop that process.” One grantee is hoping that the hospital corporation will recognize the value of the HIT and ensure that the implementation is maintained, and others are searching for new State or Federal grant money to continue or expand their systems.

B.5. Administrative Issues

Timeframe (8 grantees). Many grantees had difficulty with the timeframe: “It became very clear to us doing these projects, that by the time the project was up and running, the time to do the assessments would not be there.” One grantee thought the timeline was too compressed during the initial assessment of the project, leading to inadequate due diligence. The inflexible, structured grant schedule was challenging and created extra work for administrators. Staff illness, the need to map and plan

¹⁷ The National Advisory Committee on Rural Health and Human Services. (2006). *The 2006 report to the secretary: Rural health and human services issues*. Retrieved from <ftp://ftp.hrsa.gov/ruralhealth/NAC06forweb.pdf>

workflows, and competing issues and projects all added to timeframe stresses. Implementing the grant is “extremely complicated” and if “you’re shoving it through a very aggressive timeline; you’re setting yourself up for problems.”

C. Lessons Learned

Grantees were asked to reflect on the lessons they have learned about HIT implementation. Their thoughts are summarized here, organized by theme, ranging from most to least frequently mentioned lessons.

C.1. Project Management (11 grantees)

Several grantees said that key lessons learned included flexibility, adaptability, and patience. Project managers must be conscious of change management issues and keep in mind their primary goals to ensure success: “A lot of times when you get a big grant, you just go out and think you can conquer the whole world.” Grant partners must have confidence in the project management. Partners need to think that their perspectives are important and that their needs will be addressed and heard. As such, programs must accommodate the needs of different partners, such as by arranging training sessions so that they are not disruptive to the clinical practices. Realism about the readiness of partners and the ability to ameliorate personality conflicts between partners are important aspects of project management. One grantee found that “there is a lot of sensitivity to how project management discusses and approaches things” and managing relationships, conflicts, and flagging motivation is important to keep a project on track.

C.2. Early Planning (10 grantees)

Grantees emphasized the need to plan early and plan well: “You can never plan enough. The meetings you have may seem trivial or a waste of time, but as we look back, we understand it was well worth our time.” Partners have different levels of knowledge and comfort with technology; a long planning process helps the project advance on a level with which all partners are comfortable. Methodical planning is required to ensure that existing systems and workflows can be translated to digital records in the most efficient and effective way possible; planners need to be “brutally honest” about how well existing methods function because “taking an inefficient process and having it run faster is not effective.” It is difficult to backtrack at the point of implementation if the team realizes that everyone has not been included or the process mapping was not ideal. Early and thorough planning is needed to ensure that the technology solutions selected perform as expected and, importantly, are compatible with existing legacy systems. Planners must “engage early and engage often.” Project managers and administrators must have a plan for the unpredictable.

C.3. Ensuring Staff Buy-in (10 grantees)

Grantees recognize that it is extremely important to have full buy-in and ongoing participating from all staff: “If the people who are going to be using the system don’t believe in it, it’s going to fail.” End users must be involved in the decision-making process to help create a level of comfort with and buy-in to the system. HIT is “not an IT project; it’s a clinical project that’s supported by IT.” Another grantee agreed that HIT is a clinical project and a quality of care project that requires buy-in from both the administrative and the Chief Medical Officer levels. Top-level buy-in is critical to ward off resistance from lower-level staff. Two grantees emphasized the need for a physician champion or “evangelist” at each organization to secure buy-in. One grantee felt that it would have been helpful to have a liaison or champion to go between the IT staff and the physicians to overcome terminology barriers. Program planners should not assume that some staff will resist the new technology: one grantee was surprised to find that the older nurses loved the new system.

C.4. Financial Planning and Fiscal Management (9 grantees)

Grantees emphasized the need to recognize the magnitude of expenses involved in a project of this nature and carefully manage the budget. One grantee learned that its grant writers should have allocated funding more carefully for a larger tertiary facility, and another learned that IT costs can drain even budget surpluses relatively quickly. One grantee was stymied by a delay getting legislative authority to spend funds and had to entirely rework the budget due to the delay. Unexpected expenses can cause stress, as one grantee that had to divert funding to infrastructure needs and to the development of interfaces between vendors found. HIT implementation involves many unknowns that can be costly from a financial perspective. One grantee found that fiscal management was a drain on resources, requiring several staff to track financial resources. Finally, planners must consider the financial resources of partners because rural hospitals may lack the money or resources to sustain HIT.

C.5. Time Management (5 grantees)

Five grantees noted that HIT projects can take more time than expected. The 18-month timeframe for this grant was difficult for some grantees. One felt that this process usually takes place over three or four years of negotiation and securing clinical involvement. The timeframe is especially challenging for small hospitals without extensive resources and staffing. Implementation in CAHs that have limited financial and personnel resources needs to be at a pace that the hospital can absorb. Additionally, the implementation can lead to a temporary reduction in operational efficiency as partners become used to the new workflow and processes. State processes can also create unexpected delays and grant administrators need to be more realistic about the timeframe, allot more time to the startup period of the grant, and “tread lightly before engaging fully.”

C.6. Communication and Coordination (5 grantees)

Ongoing communication is a necessity for a project with many different partners. First, obtaining input regarding participants’ wants and needs is important to ensuring that expectations are met. One grantee found that this process includes explaining to the community what a health information exchange (HIE) is. Planners need to recognize that articulating a clear message is critical to getting the point across. Second, several factors can make it difficult to get multiple CAHs working together and moving in the same direction. Communication is a critical success factor because there are a number of steps, such as coordinating downtime for system maintenance, which must be executed concurrently. Finally, communication between the technical side of the project and the clinicians can be difficult; one grantee administrator felt that this project taught her that she should not assume that clinicians know everything about HIE and that she will be sure to serve as a conduit between the technical side and the clinical side in the future.

C.7. Training (4 grantees)

Staff require adequate training; one grantee found that they had not budgeted enough for training. Another found that its vendors had underestimated the training needed and learned that it is important not only to purchase the applications but also to dedicate resources to ongoing support until the staff is comfortable using the resources. One facility whose staff lacked computer experience set up a classroom of computers and allocated time for staff to “fiddle around” with computers. This is a creative solution for supporting staff who may have a fear of new technology. Finally, ensuring that some internal staff can service and maintain the hardware and software can cut down on costs and ensure that the system is in the hands of people who are dedicated to patient safety: “It’s better to put money into staff education than rely on an outside vendor.”

Advice to Other CAHs

- “Don’t think that you have to solve everything yourself. The resources are available outside – having a knowledgeable consultant to advise [our project] with vendor selection was invaluable and saved money and grief in the long run.”
- “Identify [your] champions early on. Especially in the CAH environments where there is a shortage of physicians, identifying nurses that will be the clinical applications coordinators and giving them the time they need to spend on the project is very important.”
- “Make sure the entire team and hospital staff gives input at the very beginning of the process on what they feel like needs to be accomplished, so they feel like it’s their system also, rather than something that’s just been forced down their throat.”
- In terms of vendor selection, make sure that the RFQ/RFP has all the necessary information. “Don’t get drawn into some vendor salesperson giving you ‘everything’s great’ – make sure you do your vendor evaluation and selection in a very detailed way.”
- “The most important thing, especially when dealing with a short timeframe, is selecting the right community and ensuring that these communities are ready to deal with change and make the projects successful. Do an in-depth culture assessment to ensure that the full community, not just a few individuals, are ready for change.”

D. Impact on Operations and Outcomes

D.1. Availability of Data (9 grantees)

The most common impact on operations was the increased availability of and access to patient data. The ability of staff to see patient information quickly from any computer in the hospital is helpful, and replacing faxed information with real-time access to data has had an impact on operations. Some grantees have not yet fully implemented their systems but expect to see an increase in the availability of data. One grantee expects video conferencing, telemedicine, and electronic document transfers to greatly affect the availability of data. Another grantee anticipates having more ease of use, less time spent pulling patient records and making paper copies and a system that reduces duplicative tests between local and tertiary hospitals which will improve the continuum of care between the rural sites and the tertiary facilities. Finally, one grantee has observed that the quality of data is improving and becoming more reliable as the data fields become standardized between providers.

D.2. Provider collaboration (8 grantees)

Three grantees feel that provider collaboration has been improved by the project; one said that clinicians are especially satisfied with the ability to access information from external locations. Another grantee emphasized its “team development model” and noted that the way that the relationships developed have allowed for quicker decisions about transfers.

Five grantees feel that provider collaboration will be improved once their project has been fully implemented. One grantee said that between 20 and 30 percent of its clinics cannot exchange Continuity of Care Record (CCR), Continuity of Care Document (CCD) or Clinical Document Architecture (CCA) data formats currently, and another is trying to install a monitoring system. The clinicians will have access to information they did not have previously when a patient was referred from another clinician. Finally, one grantee has found that the implementation process had started for the first time a

discussion about how different entities chart and how they use EMR. This grantee feels that this will lead to more information-sharing and help providers work more efficiently.

D.3. Patient Outcomes (7 Grantees)

Seven grantees described the positive patient outcomes generated by the implementation. Positive impacts include constant access to patient charts for physicians, which lead to better care coordination and better outcomes. Grantees also noted marked improvements in point of care areas such as treatment plans, medical reconciliation, and medical errors. For some grantees, the implementation has led to improved staff development and relationships between the CAH and network hospitals, allowing quicker decisions about patient transfers.

D.4. Data tracking (5 grantees)

Three grantees felt that there was a positive impact on data tracking; the ability to share data between remote clinics is important. One grantee found that radiology results are returned much more quickly and that use of couriers has been reduced. Two grantees felt that it is too early in their projects to measure the impact on data tracking.

D.5. Data entry and management (3 grantees)

Two grantees believe that the electronic health records and other technological improvements will improve hospital reporting, data entry, and the flow of the patient record. The data entry will be streamlined and duplicative entries will be reduced. A third grantee feels that once providers and staff are used to the system, there will be more rapport between the nurses entering patient data and the patients.

D.6. Quality of Care (2 grantees)

One grantee feels that there will be a positive impact on quality of care because there will be less chance of miscommunication between medical staff. With the paper-based system, physicians never directly touched the patient record and instead gave verbal instructions to the staff which increased the likelihood of medical error. Another grantee's rural hospital has used the technological improvements as a marketing tool, advertising local state-of-the-art stroke treatment rather than having patients rely on a three-hour drive or air transport to a larger hospital for treatment. This project also used its system to make provider training available at any point in time, which will enhance the delivery of care in the rural area. In rural areas, "you basically had to go in physically to take a course, and spend a lot of time traveling a great distance. It makes perfect sense to use the technology to make stroke training more accessible and efficient for EMS providers in remote areas."

D.7. Efficiency (2 grantees)

Two grantees discussed the impact of the implementation on efficiency. Both discussed the upfront costs of such a change in processes that "a lot of people may not realize" such as a period of reduced productivity due to disruptive changes. However, one of the grantees notes that of its 18 providers all but 3 are back up to their baseline levels of productivity and the remaining three are nearly recovered. The project does not yet have good evidence that buy-ins are increasing above the baseline, but they are seeing the operational efficiency increase at the practice-level. For instance, all relevant information is documented in the chart, without the reliance on transcription and medical records that there was before the EMR/HIE implementation stage.

E. Evaluation

Grantees were required to conduct an evaluation of their individual Flex CAH HIT project, and also participate in the national evaluation of the Flex CAH HIT program.

Five grantees have conducted formal assessments of the HIT implementation:

- **Staff satisfaction.** Four grantees measured staff satisfaction. Two grantees took baseline satisfaction surveys. One posted that data to the AHRQ website to share with other projects. A third grantee also used a staff satisfaction survey and plans to survey each partner six months after the implementation date. One hospital found that satisfaction levels have increased dramatically in the year since implementation. Finally, the fourth grantee looked at the preliminary reactions of the physicians to the technology and is considering continuing the assessments. This assessment found that there were differences in satisfaction depending on the type of site: rural physicians were generally more satisfied because the smaller environment made it easier for physicians to access the system. At the large State hospital, doctors found it more challenging to use the system in a bigger and more hectic environment.
- **Patient satisfaction.** Two grantees are either using or will use a formal measure for patient satisfaction. One is currently collecting patient satisfaction data for comparison, and the other has measured patient satisfaction continuously. This grantee found that patient satisfaction, for a brief period of time, went down. However, it is now above the baseline level because patients are noticing the advantages of having technology in the practice, and they like that physicians have more access to their information. The doctors can even see information on patients who have had something done at another hospital within the county.
- **Other assessments.** One grantee had a vendor assessment and negotiated a week of training with the vendors as a result of that assessment.

Three grantees conducted informal assessments of their system. One grantee administrator is aware of some informal feedback from providers; most providers do see the value of the system, and the more resistant physicians are becoming more convinced that EMR are a positive. Another grantee agreed that most staff are coming around to the system, but that it is still new, especially for the older staff at more rural hospitals: "These people were used to doing things a certain way for the past 10 to 15 years." The informal feedback for the third grantee has also been generally positive. Four grantees do not have any kind of assessment.

How Grantees Define Success

Utilization (7 grantees). Utilization was the most commonly mentioned definition of success: a system that “does get used and handles people’s needs.” Success is “getting the system up and information flowing into the portal” but this is only the first step in a long process of expanding to all hospitals in the system. One grantee stated that the primary success will be when a clinician at the tertiary hospital sees a transfer patient and all of that patient’s records from the referring hospital are available. After the patient has been treated and returned to the local community, the attending physician will be able to access that patient’s updated records seamlessly.

Clinical outcomes (4 grantees). Clinical outcomes, including HRSA-specific measures, are a longer-term measurement of success, which may take months or even a year or two to demonstrate impact. Due to the small size of rural hospitals, there are not yet enough data for one grantee to draw clinically significant measures. The measures to track impact on patient care include medication errors, medication reconciliation, diabetes, stroke, congestive heart failure, and improved communication with EMT throughout the continuum of care.

User satisfaction (4 grantees). Physician and user satisfaction with the technology is a necessary measure of success: “Our measure of success is that we have a product implemented that is a valuable tool for our providers and that it qualifies us for our incentive payments.” One grantee would like to do a survey of this measure, and another has already developed user satisfaction surveys.

Patient satisfaction and care (3 grantees). Patient satisfaction and quality of care were important measures of success for three grantees: “Our success is first and foremost – that we can improve our patient care, and that the system will allow us to give better patient care.”

Interoperability (2 grantees). Standardization of various pieces of the implementation and getting critical interfaces between systems built are measures of success for two grantees.

Meaningful use (2 grantees). Two grantees specifically listed compliance with the provisions for meaningful use of an EHR in an inpatient setting as a goal.

F. Sustainability

Grantees discussed their plans for sustaining their implemented systems, including the barriers they face, the funding they have sought to complement or continue projects implemented with Flex CAH HIT funding, and other ways in which they have sought to sustain their projects.

F.1. Barriers to Sustainability

Funding (7 grantees). Grantees most commonly cited funding barriers. The lack of money and the expenses associated with maintenance and interfacing were common concerns. One grantee noted that the infrastructure for HIT is present and that all problems can be solved with the right funds: “It’s just going to come down to if they can afford it.”

Other (5 grantees). Other barriers included a prohibitive local environment and the need for discipline and “doggedness” on the part of project managers and partners. The problem of the maintenance of software upgrades over time was mentioned by two grantees. Finally, a few grantees had operational or workflow barriers, including problems with vendors’ abilities to follow through with service agreements and software upgrades.

F.2. Funding Sought

Six grantees have sought grant money to help with sustainability. Sources include Federal, State, and private funding, including the Medicare Flexibility Grant, grants from the Agency for Healthcare

Research and Quality, State funding to address annual maintenance fees for the installed software, and private funding to purchase additional infrastructure.

Four respondents either had not sought additional funding or were not aware if additional funding had been sought. One has had budgeting discussions but no grant seeking, and another was considering pursuing a grant for the development of a community report card that would compare data locally to national-level HIE data.

F.3. Planning and Support

Budgeting for sustainability (9 grantees). Most of the grantees discussed how they had incorporated sustainability into project or hospital budgets: “We knew we couldn’t go forward with this unless we could sustain it.” Hospitals in particular were said to “have budgeted for everything” and were expected to support their own EMRs. One grantee said that each of its partners understands and will be able to sustain their individual applications. The ability to sustain the grant was one of the hospital selection requirements for one grantee. Another’s community hospital board included one year of sustainability in their budget. Finally, one grantee included sustainability in their cost support and plans to reinvest their depreciation returns: “If you’re going to be sustainable, you’ve got to be disciplined.”

Expansion to new partners (5 grantees). Five grantees have sustainability plans that include bringing in new network members to spread expenses, hosting fees, maintenance fees, and upgrade fees across hospitals. Using a model and applying it statewide helps create a project that can be sustained within the State system. One grantee had plans to bring in other hospitals using Federal earmarks or stimulus funds. One grantee noted, “By working together instead of trying to be separate all the time we can show rural America that collaboration works and is sustainable. If each facility could find their niche and we could build off each other we could help sustain each other. Because, in these rural areas, if the hospitals and schools go away, the communities themselves dry up!”

G. HRSA’s Role in the Implementation

Twelve grantees discussed ways in which HRSA was helpful during their implementation:

Monthly group calls (8 grantees). Overall, the monthly group calls were the most commonly mentioned help provided by HRSA. Grantees appreciated the opportunity to share with other States and learn about their projects. One grantee would like to continue to network with other similar and dissimilar projects from around the country in the future, to get “in step” with how projects are progressing.

Providing technical assistance (5 grantees). Five grantees felt that the technical assistance provided by HRSA, including access to an evaluator and other resources, was helpful. HRSA provided language to use on an end-user agreement for the HIE and provided other information and resources as requested by the grantees.

Help with a vendor (3 grantees). Three grantees referenced an issue with one of the vendors that HRSA helped to resolve. The HRSA Project Officer “arbitrated” with some of the participants and HRSA was “willing to step in when some issues with a couple of the vendors occurred.”

In-person meetings (2 grantees). Two grantees felt that the national and regional meetings were helpful, providing them with “face time” and giving HRSA staff a chance to meet with the State staff involved in the project.

Other (4 grantees). Other ways that grantees described HRSA as being helpful include:

- “HRSA has been active, not intimidated by the scope of the program, and deserve a lot of credit, including for bringing objective evaluation folks on...”

- HRSA gave updates and communicated clearly. HRSA has provided “invaluable information and resources.”
- Having a personal project officer (PO) was helpful – “whereas with some of the other grants, they barely even knew who we were.” The POs were very responsive to the grantees.

Only two grantees described ways in which HRSA was not helpful. One grantee found it difficult to process the amount of information that HRSA provided: “I personally couldn’t juggle learning that website and all the tools that were out there in addition to all the additional things that were going on.” This grantee felt that HRSA needed to be more liberal on its timelines. The other grantee felt that CVD and diabetic measures were irrelevant to what its grant was trying to accomplish and thought that hospitals needed to use quality indicators that specific to them.

H. Suggestions from Grantees for Future Grant Programs

Grantees provided suggestions to HRSA for future grant programs of a similar nature:

More technical assistance (6 grantees). Many grantees had requests for specific TA that would have been useful in the project, including:

- Mechanism for allowing grantees to share resources and documentation, such as a knowledge center for HIT
- Ability to network with prior HIT grantees in the event that another round of Flex CAH HIT is funded
- Additional TA for rural areas—rural grantees have a difficult time articulating what they need, do not understand what questions to ask, and lack access to resources such as quality broadband services
- Help building a consortium among rural care facilities
- Development of a national privacy model as privacy and security are an issue that “we’re going to plow into in a big way”
- Model for and TA on sustainability and funding justification

More time (5 grantees). Many grantees felt constricted by the 18-month timeline and felt that more time allotted would have allowed the implementation to proceed “at a more orderly pace.” The tight timeline resulted in “a lot of corners that needed to be cut” because grantees did not have time to properly deal with unexpected personnel and change management issues.

Vendor help (3 grantees). Three grantees specifically suggested that HRSA develop issues and policies for dealing with vendor selection and contract development: “There is a lot of vendor activity promising the moon” but hospitals are not used to understanding vendor contracts, meaningful use rules, and other vendor-related issues. One grantee felt that HRSA has an opportunity to “push the vendors and keep them in check.”

Funding (3 grantees). Two grantees specifically requested increases in the travel budget so that grantee staff can travel to key national IT meetings and other valuable learning opportunities such as grantee meetings to share results and best practices, and tease out results that others around the country were having with their projects. The other funding related suggestion was simply more funding to cover the unexpected costs of interfacing.

The following sections describe in detail the case studies conducted in four select sites (University of North Dakota Center for Rural Health, Oklahoma State University Center for Health Sciences, South Carolina Office of Rural Health and Board of Regents of the University of Wisconsin System), as well as the results of a return on investment evaluation conducted at these sites.

Case Study 1: Flex CAH HIT Network Implementation Grant, University of North Dakota Center for Rural Health

A. Introduction

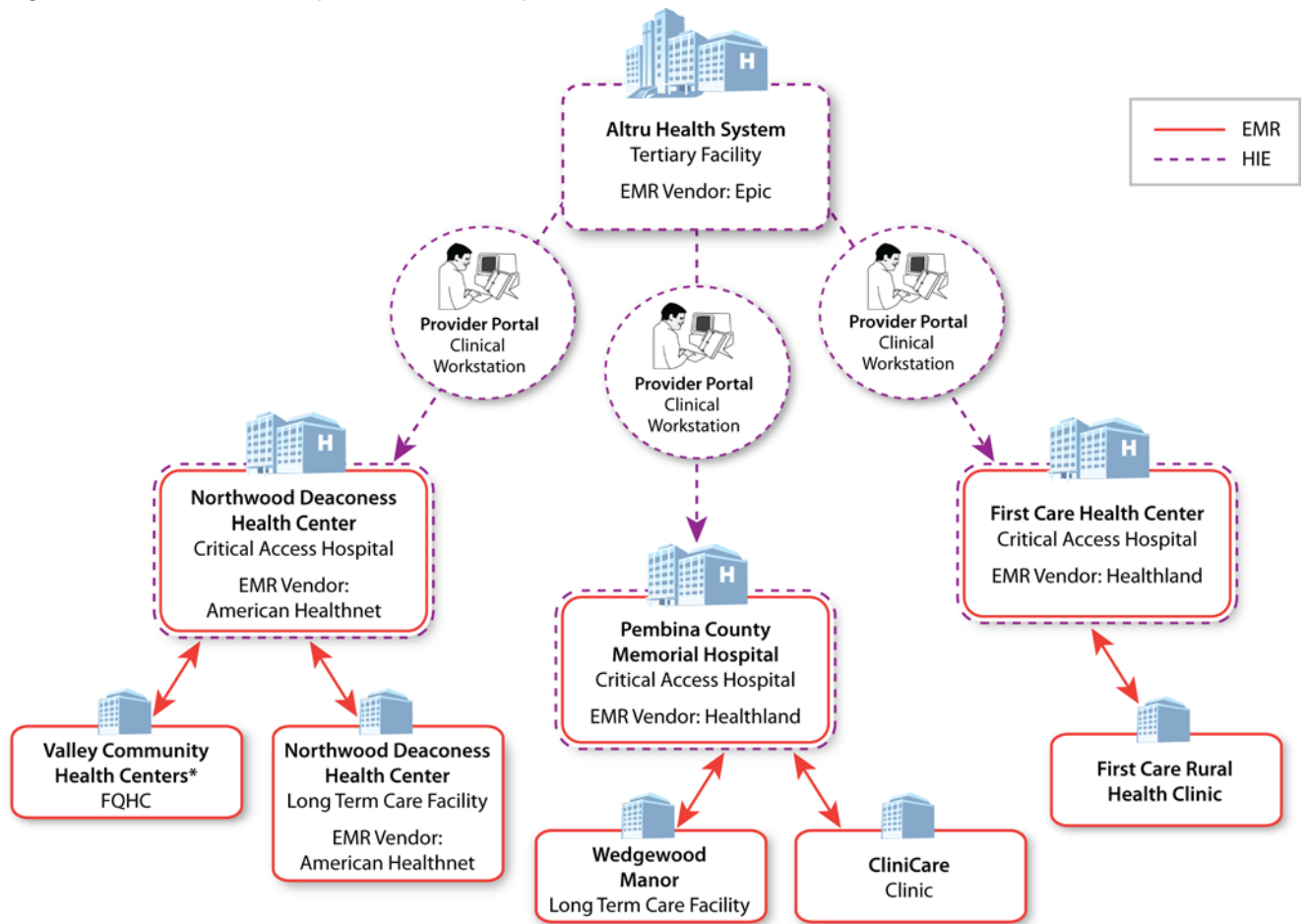
The goal of the North Dakota Flex CAH HIT Network Implementation Project was to facilitate the exchange of health information by implementing a patient-centered electronic medical record (EMR) along the continuum of care --facilitating patient safety, efficiency, and effectiveness of health care services. The objectives of the project were to:

- Assist CAHs with the implementation of EMRs and the sharing of patient data with at least one ancillary facility within their respective communities.
- Facilitate the exchange of patient information between the CAH, ancillary facility, and the regional tertiary center.
- Strengthen the regional network to address HIT needs and issues.

Three North Dakota CAHs, (Northwood Deaconess Health Center in Northwood; Pembina County Memorial in Cavalier; and First Care Health Center in Park River — all part of the North Regional Health Alliance), one tertiary referral hospital (Altru Health System in Grand Forks), and several ancillary providers associated with the selected CAHs (Valley Community Health Centers, Wedgewood Manor [long-term care facility], CliniCare, and First Care Rural Health Clinic) as the network in this pilot project. The participating CAHs did not all choose the same provider for their EMR, and therefore individually focused on the implementation of those different EMRs and in the implementation of Clinical Workstation – a one-way portal between the rural facilities and the tertiary facility, Altru Health System.

Figure 1 below depicts the three EMRs implemented within the three rural facility sites and the information-sharing relationships with those CAHs and their clinic and long-term care facility partners. Also depicted are the paths of the Network’s information exchange implementation of Clinical Workstation.

Figure 1. North Dakota Implementation Map



**Valley Community Health Centers does not have an EMR in place, but does have shared computers to facilitate lab and x-ray ordering.*

B. Background

The Flex CAH HIT grant opportunity was aptly timed for the North Dakota Network – the planning and implementation project would build upon previous and ongoing health IT projects statewide in North Dakota, and at the specific facilities themselves. Upon learning about the Flex CAH HIT grant opportunity, the State Flex program director and the State Office of Rural Health (SORH) program director, both of the North Dakota Center for Rural Health at the University of North Dakota, identified two networks within the State that they felt were working well together and would be best qualified to participate in the Flex CAH HIT grant. The Center for Rural Health pre-selected Northwood Deaconess Health Center, a CAH, to participate in the Flex grant, as it was believed the community health center associated with Northwood, Valley Community Health Centers, would help make North Dakota’s proposal to HRSA more competitive nationally. Additionally, Altru Health System, the tertiary facility, was willing to work with the rural providers in the North Regional Health Alliance. A competitive process was then used to select the two remaining hospitals; all eligible hospitals in the Network applied. Two hospitals were ultimately selected: First Care Health Center in Park River and Pembina County Memorial

Hospital in Cavalier. Based on their applications, both were deemed to be at an appropriate level of readiness and commitment for the Flex project.

C. Existing Infrastructure

Prior to the Flex CAH HIT-funded EMR implementation, each of three CAHs used an electronic system for financial purposes. Pembina had a PACS medical imaging system, which had not yet been integrated into the full EMR as of May 2009. First Care had software in its exam rooms that could be used to pull up the PACS system, as well. Both Pembina and First Care also had an electronic lab system. Northwood had a completely paper-based clinical system prior to the Flex grant activities.

In preparation for installing an EMR system, First Care Health Center had recently wired its new facility to support electronic health information processes. This IT infrastructure update began in 2005 concurrently with an addition and renovation of the hospital building and construction of a clinic, funded with a USDA loan, capital campaign, and local sales tax.

The providers at all the participating hospitals and clinics also had portal access to patient information through Altru's Clinical Workstation application prior to the Flex grant, but First Care and Pembina were not using it. The Community Health Center at Northwood was previously an Altru clinic, so Northwood staff were familiar with Clinical Workstation.

In addition to existing infrastructure in individual facilities, Blue Cross Blue Shield funded the North Regional Health Alliance with a networking grant of \$85,000 to collaborate on HIT. The Network is using these funds to build a larger regional HIE.

D. Planning Approaches

Pembina and First Care underwent markedly different planning processes. Pembina's process was informal and relied on the chosen vendors for design of the facility's EMR workflow. Pembina staff reported, however, that given the progress of the EMR implementation to date, it would have been advisable, during the planning stages of the implementation, to examine the workflow in detail; an updated workflow (adjusted for EMR use) should properly meet the needs of the facility's existing policies and procedures.

In contrast, First Care respondents felt that it would be difficult at best to be fully prepared for the changes in workflow resultant of an EMR implementation. First Care's CIO designed a readiness assessment for the facility and ultimately chose the EMR vendor. This decision was driven by the fact that the previous electronic system used for the financial portion of hospital operations did not have the ability to support a clinic EMR.

Involvement of clinical stakeholders in planning

Both Pembina and First Care involved clinical stakeholders, including physicians, specialists, and nurses, in planning, to various degrees. In terms of champions for HIT, the nursing staff (reported specifically at Pembina) were very supportive during the EMR planning phase. Various clinical stakeholders at both Pembina and First Care pushed for the incorporation of lab, radiology, medical records, and nursing paper-based records to the electronic system. At Pembina, all physicians and one PA were involved in planning, as well as several physicians at a competing, but interconnected, clinic. These providers were included in staff meetings in which plans for the EMR implementations were discussed. At First Care, a PA, family physician, and surgeon participated in the project planning phases. The CEO of First Care directly discussed the Flex grant opportunity with their providers, and requested input and support for

the implementation. First Care respondents added that all of the facility staff were involved to some degree with the application demonstrations before the vendor was selected.

While EMR planners sought out their perspectives and participation, the enthusiasm and level of participation in planning varied widely among clinical stakeholders. For instance, one provider at Pembina wrote a list of wants and needs for an EMR; several made time to watch the vendor presentations and were quite involved in terms of examining and comparing vendor workflows; while at least one provider wanted no involvement in the implementation. Similarly, at First Care, one provider was resistant to the idea of implementing an EMR. The sentiment expressed by this provider was

essentially, ‘if we are going to have to do it, we might as well do it now when the grant money is available.’

CAHs selecting different vendors for their EMR was “really not an issue” given that data interactions were to occur almost solely with the tertiary system rather than between CAH EMR systems.

Vendor selection

Originally, the North Regional Health Alliance anticipated that installing the same vendor system at each facility participating in the Flex CAH HIT grant would be easier and more sustainable, given the potential to use a shared-

staffing model. However, the facilities were unable to reach a consensus about a single vendor, in part because facilities had decided to move forward with selecting an EMR at different times and with consideration for the variety of legacy systems in place at those facilities. First Care and Pembina chose the same vendor; Northwood chose a different vendor. CAH respondents reported that this difference in vendor selection between hospitals was “really not an issue” given that data interactions were to occur almost solely with Altru through the HIE, rather than directly between hospital EMR systems.

Pembina CAH examined three vendors as candidates for the EMR implementation. The CEO and CFO, in addition to clinical stakeholders, contributed to the selection process. Ultimately, the final selection was chosen because this vendor already hosted the facility’s financial system, and CAH planners felt that it was important to integrate the existing system with the clinical EMR under a single vendor.

First Care staff developed a number of elements which planners agreed were vital to an EMR system. These included price, Certification Commission for Health Information Technology (CCHIT) certification, the ability to interface with systems already in place, and sustainability. One vendor was eliminated simply because the EMR came in well over the CAH’s budget of \$700,000 to \$800,000. Another vendor considered was also decided against because while it was an “impressive” system, according to respondents, it would have likely been hard to interface with other systems. Clinical stakeholders (including the PA, most nurses, and staff from both lab and radiology departments, as well as the business office), chose their vendor because it met all the basic criteria for cost and interfacing, and had minimal hidden costs—an indicator of long-term sustainability.

Northwood respondents explained that because their facility is associated with a long-term care facility, they chose to consider a vendor that would offer lab, clinic, long-term care, and therapy components. Aside from these criteria, Northwood also was interested in choosing a vendor system based upon relative value (cost) and hardware and database language requirements. One vendor offered a “deep discount” relative to another vendor that Northwood planners were considering. Additionally, four other area hospitals not immediately involved in the activities of the Flex CAH HIT grant notified Northwood that they would be willing implement this vendor’s system if the vendor was capable of consolidating all the facilities’ information into one datacenter. Combined, these factors were enough to prompt Northwood to implement the EMR with this vendor.

E. Staff Training

Northwood. At Northwood, staff training on the EMR was rolled out in three phases: in the first phase, six or seven users were sent off-site to the vendor’s headquarters in Omaha, Nebraska. These were “super-users,” identified to train other end-users when they returned from Omaha. The Northwood CIO reported that the training went very well, while it was “a lot to learn in a short time.” Following the training, super-users were given practice time on a test database at Northwood. The second phase of training consisted of clinical super-users working with other end-users at Northwood. The third phase focused on training staff at the long-term care facility.

Every clinician at Northwood was trained on the EMR system. Super-users worked with employees one-on-one or in small group settings, without a training manual. Respondents reported that there were multiple ways to navigate the EMR system, and therefore training was customizable depending on the end-users being trained, and their clinical responsibilities. Rather than relying on a training manual, training was therefore developed based upon departmental needs using printout screens (screen shots) of the system. Both of Northwood’s physicians were assigned to nurses who had already undergone training.

First Care. At First Care, three financial staff members received training initially. The CFO reported the financial training went well, and noted the importance of having staff trained on both the financial and clinical modules of the EMR simultaneously. The selected vendor assigned an onsite clinical specialist to train end-users on the EMR, but respondents also felt they had been able to learn much of the system components on their own, through trial and error. Two weeks after the lab and radiology components went live (June 2009), the vendor provided a follow-up training to clarify any remaining issues and staff concerns. First Care created a computer lab onsite to facilitate easy access to computers and a designated area for vendor training. The lab was later disassembled with hardware being placed throughout the facility.

Pembina. At Pembina, the financial part of the EMR was already in place by the time the Flex CAH HIT grant was disbursed. For the other eight clinical components, the selected vendor trained at least two super-users from each department onsite. Like First Care, Pembina created a computer lab onsite to facilitate easy access to computers and a designated area for vendor training. The lab was later disassembled with hardware being placed throughout the facility.

Altru - Clinical Workstation. Altru trained clinical staff from the CAHs to use Clinical Workstation, providing phone numbers and technical support for staff who encountered problems gaining access to patient records. Respondents reported that CAH staff found the training very helpful and accessing Altru staff for assistance to be simple. Presently, clinical staff, including nurses and dietitians, use Clinical Workstation.

F. Governance, Policies, and Procedures

Confidentiality and Privacy Policies

All hospitals stressed the importance of data confidentiality for staff. Pembina and Northwood set up guest accounts to accommodate temporary nurses or nursing assistants who do not need access to full patient records. IT is also vigilant about requiring end users to routinely update their passwords. First Care also views patient privacy as a challenge, as there has been at least one patient privacy complaint (which was found to be unsubstantiated). At Northwood, IT staff have examined their “acceptable use” policies.

Security

The CIO at Northwood stated that data are stored on a terminal server and are therefore extremely secure. The facility is looking to make contingency plans for the data center located in Grand Forks. A backup center in Omaha is being planned. . This set up is unique to Northwood.

Interoperability

Northwood plans to interface with the Community Health Center (CHC) when it implements its own EMR system in the future. Altru Health System has a 3-year plan to implement an EMR which will allow for a regional HIE system should CAHs within their service area (N=20) wish to participate. The State of North Dakota is also engaged in a statewide planning process to develop an HIE using lessons learned from this project.

G. Impact on Hospital Operations

Staff Satisfaction with the EMR

Respondents from each hospital agreed that there had been some resistance from physicians and it would likely take time to get the physicians fully using the EMR systems. To address physicians' concerns, the clinical coordinator at First Care showed physicians an EMR screen shot and asked them to tell her what was wrong with it. She reportedly found this interaction effective in incorporating physician buy-in and stimulating interest in the capabilities of the EMR system. The main problem, according to one CAH respondent was that, "the physicians want [the EMR] to be simple to use and to be right the first time." First Care respondents also said that some nurses who threatened to leave the facility when the EMR was installed are now satisfied with it.

Usage

Pembina has about 180 staff and about 120 use various modules of the EMR system on a daily basis. In comparison, Northwood has about 140 users out of about 180 staff and reported that the facility has about 30 users at a time on the system during peak hours. Nurses, physical therapists and laboratory clinicians use the EMR the most heavily. Nursing assistants use the system somewhat less, primarily just for charting, while as reported above, physicians are beginning to use it as they become more comfortable with it. At First Care, about 85 or 90 of the 110 to 120 staff use the EMR. During peak hours, there are about 30 to 35 users at a time. The physicians at First Care use the EMR only on the inpatient side to retrieve information, but are not yet inputting information. Respondents from First Care reported that laboratory clinicians are the heaviest users of the system.

The EMR enables a dietician consultant, who works only one day onsite at the hospital, to access patient records remotely, communicate with nutrition staff located outside the hospital, and access emergency room and clinic records from her desk.

Tracking Data Through the Continuum of Care

First Care developed a form to track how nurses and dietitians were using Clinical Workstation. Reportedly, dietitians and nurses at First Care and Pembina use the Altru Clinical Workstation to access medical record information from Altru for inpatient, outpatient, and swing bed patients. First Care's dietitian gave several examples of using Clinical Workstation to obtain information about diabetes patients who had received care at Altru. For example, she was able to check the record of a patient who had seen an endocrinologist at Altru and was uncertain about her insulin schedule. She was also able to check that another patient had laboratory work (i.e., HbA1c and lipid testing) completed at Altru and did not duplicate it, and that another patient had had a "swallow test" done at Altru. The dietician at Pembina found the EMR efficient for use by a

consultant dietician who worked only one day each week at the hospital. For instance, the electronic system enabled the dietician to access patient records remotely, and to communicate with nutrition staff located outside the hospital. She was also able to access emergency room and clinic records from her desk—easing the review of charts and the design of care plans.

One CIO noted that the EMR serves the same purpose, organizationally, as a paper-based system, but exposes weak linkages and identifies workload issues within an organization that a paper-based system simply would not.

Communication Between Providers and Clinical Staff

As the CIO at Northwood stated, “poor documentation before [the EMR] means poor documentation after EMR.” He emphasized that the EMR serves the same purpose,

organizationally, as a paper-based system, but exposes weak linkages and identifies workflow issues within an organization that a paper-based system simply would not. The EMR implementation has initiated discussion between nursing and financial/business staff that never occurred prior to the implementation. Respondents reported that clinical and business staff alike now view the computer as a tool and have become more engaged—“they are not afraid anymore.” The EMR also clarifies who is responsible for various situations, and with the use of user identifications, there is greater accountability among all hospital staff. Finally, according to First Care’s CEO, the Flex grant and subsequent EMR implementation has improved First Care’s working relationships with Altru. The CEO stated his belief that the EMR “really started people thinking about what they can do together instead of, ‘what can I do so that I survive and you don’t.’”

Feedback from Patients

According to First Care’s Medical Records Director, patients were neutral in regards to the paper-based chart. Immediately following the implementation at Pembina, patients expressed a negative sentiment toward the EMR, because nursing staff were slower admitting patients as they learned how to navigate the system. However, at present, patients appreciate the system, particularly the e-prescribing functionality and patient care instructions. Patients’ concerns about the security and confidentiality of the electronic record system have also lessened, particularly as a result of newsletters and public education initiatives that have helped to increase awareness.

H. Evaluation

The State Office of Rural Health contracted with John Snow Inc. (JSI) to conduct the evaluation, which focused on workflow, process, and lessons learned at each CAH. According to JSI’s March 2009 report, “Lessons Learned from Electronic Health Record Implementation at Three North Dakota Critical Access Hospitals,” the evaluation included onsite interviews with administrative, information technology, and clinical staff; reviews of facilities and infrastructure; and consideration of pertinent background documentation. The evaluation was designed to identify perceived successes and challenges of the EHR/EMR implementation, as well as any outstanding HIT issues facing each organization.

I. Supportive Factors

- **Investment in training.** CAH respondents emphasized the importance of training to a smooth and efficient EMR implementation. Northwood reported that “the best thing [we] did was to send 20 people to Omaha for training” by the vendor. While training was very expensive, it was highly effective and well worth the cost. One respondent added that having computers available for staff to practice using the EMR before going live worked well.

- **Adequate IT staffing.** Many rural hospitals do not have adequate IT staff. However, Pembina, First Care, and Northwood employed sufficient IT staff.
- **Communications between hospital departments.** Throughout the implementation, ongoing communication and interaction between hospital departments served as a support, in addition to maintaining open lines of communication with the vendor. Weekly meetings from the beginning of the planning phase and periodic presentations to clinical staff about the status of the Flex CAH HIT project activities were very helpful.
- **State environment.** Respondents noted that the implementation benefited because North Dakota is a small state in terms of population, with a smoothly functioning State Office of Rural Health and a Flex Program with well-established relationships with its rural hospitals.
- **National environment.** Participating hospitals and clinical staff understood that given the Federal stimulus dollars and national push for EMR systems, HIT “is here to stay” and it was consequently important to support the EMR implementation and “figure out how to make it work.”

J. Barriers and Solutions

- **Staff turnover and training.** Training new employees to use the EMR system was challenging. For example, at Pembina, training was problematic at the long-term care facility, because turnover tends to be high among nursing assistants and dietary staff. To address this drain on training resources, the facility planned to train key departmental personnel who were unlikely to leave and who would then pass on their knowledge as new employees were hired. However, one respondent noted that in some ways, training new staff who are not wedded to the workflow of the historically used paper-based system can be easier. Respondents also noted that it had been their experience that some nursing assistants might have benefited from a basic computer usage course to better familiarize themselves with the EMR and more easily navigate the system.
- **Rushed timeframe.** Adhering to the Flex CAH HIT grant timeframe of 18 months took a “tremendous effort and staff time.” Respondents believed a two-year timeframe would have been more realistic given the number of activities they needed to complete and the amount of planning involved prior to the EMR implementation. Unexpected barriers also played a role in the rushed timeframe. For example, the project lost 90 days because a tornado hit one community.
- **Limited vendor support.** Respondents reported that occasionally, the vendors were unresponsive or did not address issues immediately and this further slowed the implementation and bogged down the 18-month timeframe. For example, at First Care the pharmacy component had to be rebuilt, and over 1500 medication reentered because the vendor had given clinicians incorrect instructions with regards to entering brand and trade names. Respondents also expressed frustration that the vendor passed off questions or requests for explanations about some component of the EMR as unnecessary or frivolous, stating, “you don’t need to know that now.” Despite these complaints, the vendor was overall very patient with facility end-users, and quick to respond to major problems.
- **Lack of HIT expertise.** Respondents explained that “small rural hospitals don’t know what a vendor should do for them” and “don’t know how to translate a list of what they do to workflow.” They reported that it would have been helpful to know what questions to ask of the vendors; for example, “How do you order a diet for a patient in the EMR?” Oftentimes, the facilities simply did not know from whom to request help during the grant period.

K. Lessons Learned

- **Do not underestimate the time, work, and costs required to implement an EMR.** The grantee noted that “no one seemed to anticipate all of the work involved in implementing varying modules

of software—it seemed like one more thing after another instead of what people envisioned—having an EMR installed as one product.” As such, it was necessary for all staff involved to be flexible, as much changes throughout the course of the project (e.g., vendor and staff availability, weather, and emergencies.) In addition, the grantee emphasized the need for adequate time to plan, as well as to allow the staff time to adapt to the new environment. The grantee also noted that unseen costs were “a surprise” (i.e. ongoing maintenance and additional modules with updates).

- **Invest in planning and readiness activities prior to implementation.** The idea of conducting a workflow analysis and redesign proved to be a challenge from the beginning of the project, with the principal investigators (PIs) seeking guidance from their quality improvement organization, consultants, and other CAHs. The hospitals were advised that their vendors would walk them through the process, and numerous efforts to look beyond vendor assistance were rejected. As the project progressed, the need for workflow analysis continued to surface; the PIs decided to reallocate a portion of the project budget to support consultants to work with each of the three CAHs to evaluate how the implementation related to increased workflow efficiencies and improved data flow. While this occurred after the implementation, the benefits were nonetheless substantial and provided each of the health facilities with a report outlining current processes and recommendations for improvement.
- **Anticipate the need for connections between the various participants and facilities.** The grantee noted that participating CAHs did not anticipate the needed connection between their IT and clinical staff—that both needed to understand and appreciate the EMR’s connection to patient care and the logistics of IT infrastructure. At the facility level, the grantee noted that the Flex and State Office of Rural Health Care programs are well suited to assist with these types of initiatives, having established relationships with the facilities and the trust needed to assist with network activity between large and small facilities. The grantee further noted that the process was invaluable in terms of building relationships and trust in the region; for example, now IT staff from approximately ten facilities, both large and small, meet quarterly to share information and experiences with each other.

L. Sustainability

All facilities involved in this project are committed to sustaining their EMRs in the future. All three CAHs have budgeted for maintenance fees and system replacements and upgrades. Pembina respondents added that the facility employs two IT staff, one of whom is also the CIO at another area hospital. Northwood built sustainability into its cost report, and is planning for the next software system in five to six years. The CIO estimated that Northwood’s support costs are flat because the facility already employed several IT staff. The CIO further estimated that about half a full-time equivalent (FTE) is still needed to work with the network hospitals who are implementing the clinical EMR.

Respondents also reported an interest from hospitals in neighboring States in visiting and learning from their implementation and ongoing project activities. Further, the State Office of Rural Health program director, who chairs the State HIT Committee, recently had an opportunity to talk with State legislators concerning State HIT legislation. Each of these factors bodes well for the long-term sustainability of the network.

Impediments to Sustainability

The hospitals will need to be able to connect with Altru to have information exchange.

Complementary Funding and Plans for Expansion

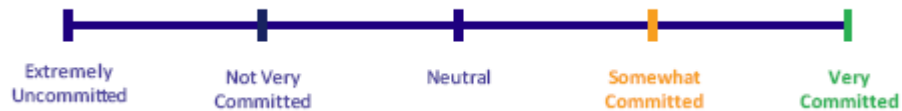
The Blue Cross Blue Shield of North Dakota grant paid for the server that is used by the other facilities.

M. Value-Based ROI¹⁸

1. Clinician commitment

North Dakota’s CAH HIT Network respondents were asked to rate user clinician commitment before and after implementation of Flex CAH HIT grant activities along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



User training and support

Collectively, North Dakota respondents used both vendor-supported training materials and staff, and supplemented this with internal hospital staff for additional support. All sites referenced a need for training and support beyond what was supplied by the vendors. Respondents noted a particular challenge among system users, especially clinicians, who lacked computer skills and confidence: “This group had not had to work with entering and retrieving data electronically before.” At the outset of the project, Northwood Deaconess surveyed user staff to assess their computer skills and confidence. Those survey results led to additional supports, called “Computer 101 Training,” being put in to place for users. All facilities also noted concerns with initial, vendor-supplied training support. Staff reported finding the training too rushed, having too little one-on-one interaction, and needing more training reinforcement once actual use began. Sites noted that in-house IT staff were utilized to supplement vendor trainings and provide basic system support to troubleshoot issues before contacting the vendor. Pembina staff noted that of particular help were the scenarios set up with test patients in a test system to familiarize staff with actual workflows and system use.

User feedback

For Pembina and First Care facilities, staff feedback was obtained through utilizing existing mechanisms for gathering staff input. These sites pointed to standing staff meetings (involving different types of staff), emails and memos as their main feedback mechanisms. Northwood Deaconess set up regular EMR implementation-related meetings.

For all facilities, working daily and directly with system users was noted as critical. As smaller facilities, respondents shared that it is easiest for staff to have issues reported and responded to as they come up – usually immediately. As one Northwood Deaconess staff member put it, “we have discovered that we need to over-communicate. If we don’t, people quickly jump to conclusions or will stop until communication is resumed.” Internal IT and other staff evaluate issues to see whether they can be handled in house, or if contacting the vendor is warranted. Users are encouraged to work with vendor tech support as well as internal support.

Implications

Measured from pre-grant implementation to post-implementation, North Dakota respondents reported greater information availability post-implementation – moving responses from a pre-grant level of

¹⁸ Refer to Appendix C for a detailed description of each variable used to calculate the value-based ROI.

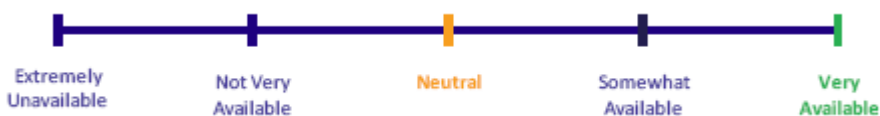
Somewhat Committed to Very Committed. From the outset, respondents indicated methods to specifically engage clinicians in planning and implementation efforts. Pembina respondents shared that user clinicians were verbally supportive of the grant activities and willing to informally discuss issues (e.g. ‘wants and needs’) but were reluctant to attend meetings. At other facilities, clinicians were reported as being more engaged during planning – participating in vendor demonstrations.

North Dakota respondents shared a collective sense of inevitability for many of their clinicians and other staff regarding the HIT implementation – as one staff member put it, “this is the future so we may as well be on the forefront.” Also, staff shared that as implementation has continued, clinicians have stopped looking for ways to work around the system, and are even seeking ways to utilize it more.

2. Information availability

Within the context of information affected by Flex CAH HIT grant activities, North Dakota respondents were asked to rate how available information is, when and where it is needed, along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

Measured from pre-grant implementation to post-implementation, North Dakota respondents reported significantly greater information availability post-implementation – moving responses from a pre-grant level of **Neutral** to **Very Available**. Respondents shared that the paper-based system was all that they knew going into this implementation, so the paper-based system at the time was seen as acceptable in terms of facilitating the availability of information. However, comparing it to the EMR systems, staff were able to recognize how much time it had taken to track and locate medical records and to validate the information contained in them. While staff are still learning where and what are the best ways to access information with the new systems, respondents noted information needed daily and in a timely manner is very accessible and available.

3. System usability

For the HIT system(s) implemented as part of the Flex CAH HIT project, North Dakota respondents were asked to rate system usability prior to and post system implementation along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



User perceptions of ease of use

North Dakota respondents collectively reported some apprehension on the part of system users during planning and before full implementation, noting that staff were unsure as to how all the pieces of the systems would fit together and work together.

At the time of the North Dakota site visit, implementation had progressed significantly, but was not complete. Therefore, respondents shared that user’s perceptions of ease of use were still evolving as they learned how to properly use the systems. Pembina and First Care respondents noted that clinicians reported having to spend more time to document patient encounters; these users felt the new systems were less useful and not as easy to use as the paper system. However, these respondents also noted that clinician responses to these documentation challenges were improving, and that clinician feedback on ease of use was mixed between positive and slightly negative.

Pembina laboratory staff found the system very easy to use, reporting that the system followed their workflow and has helped them to share the responsibility of ordering accuracy with clinicians. All facilities noted some challenges with merging existing administrative workflows and processes with the new systems – specifically noting technical interface challenges – but shared a commitment to continue to work through these challenges with the assumption that these interactions would improve.

System use

Respondents expressed some surprise in terms of system use: –users were using the systems more than had been anticipated, and staff had started to look for ways to use the system beyond the initial training. Further, staff shared a forward-looking view that as users become more comfortable with the systems, any gaps in knowledge and use that exist will quickly be closed. Respondents recognized that users are not yet using the new systems to their full potential, and it will likely take a good deal more time to fully utilize them.

Implications

Measured from pre-grant implementation to post-implementation, North Dakota respondents reported system usability improvement from **Neutral** for pre-grant systems to **Somewhat Usable** for the implemented system. One Pembina staff member noted that now using a system of electronic medical records represents a not unanticipated, but still a “different reality [for] our users.” Further, Pembina respondents shared a collective desire to constantly look for ways to incorporate documentation not collected directly by the system into the EMR. Staff reported examining how, where and why data are collected and searching for alternative solutions so that it can be incorporated into the EMR. This

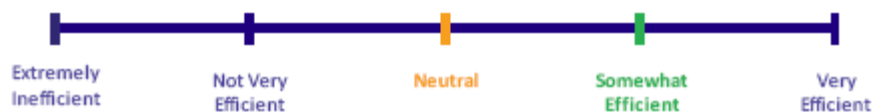
process includes adding or modifying electronic forms, scanning and importing information into the system.

Other respondents shared some surprise with the complexity of their implemented systems, and referenced this complexity as hindering full utilization.

4. System efficiency

For the HIT system(s) implemented as part of the Flex CAH HIT project, respondents were asked to rate system efficiency prior to and post implementation along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

Measured from pre-grant implementation to post-implementation, North Dakota respondents reported greater system efficiency post-implementation – moving responses from a pre-grant level of **Neutral** to **Somewhat Efficient**. As in other discussions above, respondents noted some difficulty in responding to this question fairly, because the interview occurred while implementation was still underway.

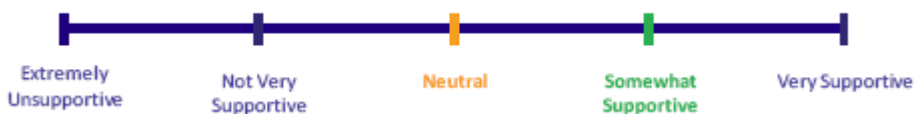
Laboratory respondents in particular noted that turnaround time for their work has not yet improved and that they are still struggling with incorporating external data and interfacing with external systems (reference lab data).

Respondents noted many inefficiencies with the paper-based system that were expected to improve as part of the EMR implementation – notably a reduction in time spent tracking and collecting data; manual copying, faxing and record updating; and compiling data for reporting purposes. Facilities shared that many changes had been made, but that they are not finished incorporating all of the tools available in the systems, and that they anticipate significant gains in efficiency (in the areas noted above) over time and as users become more comfortable with the system.

5. Clinical outcomes

Respondents were asked to rate their perceptions as to the pre- and post-implemented systems in terms of supporting positive clinical outcomes along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

Measured from pre-grant implementation to post-implementation, North Dakota respondents reported that the implemented system increased perceived support for positive clinical outcomes – moving responses from a pre-grant level of **Neutral** to **Somewhat Supportive**. Again, as discussed in previous sections, respondents found evaluating the implemented system difficult as it had only been in place for a few months. Collectively, North Dakota respondents shared expectations for significant gains in their

ability to evaluate health outcomes in the future. Pembina staff referenced already having the ability to compare and trend information alongside clear and consistent documentation. Further, Pembina reported that they will be using the system to evaluate clinical outcomes in their next Quality Improvement Cycle, in which they will be focusing on the EMR system and its impact. First Care clinicians reported seeing improvements in medication reconciliation and patient care instructions – two clinical outcome factors that they feel the EMR system has significantly impacted.

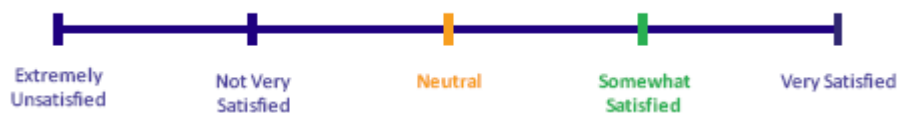
6. Non-financial values

In the case of First Care, their existing financial information system was not going to be supported after 2008, and the timing of the Flex grant was ideal to push for finding a system that could not only support the financial management needs of the facility, but to implement and interact with an EMR as well. Pembina staff referenced the increased readability and clarity of chart information and orders as providing significant value for their staff. At Northwood Deaconess, one respondent shared that they have received great value from the EMR acting as a one-stop source for information and facilitating stronger collaboration among clinical staff.

Patient satisfaction

Respondents were asked to report patient satisfaction of the pre-grant and post-implementation systems along the Likert scale shown below.

Both the baseline measure and implemented system measure were noted at Very Satisfied:



Implications

Measured from pre-grant implementation to post-implementation, North Dakota respondents reported that the EMR system has increased patient satisfaction – moving responses from a pre-grant level of **Neutral** to **Somewhat Satisfied**. Pembina staff shared that they focused primarily on the financial values of the implemented system, noting that eventually they would also likely see improvements in accuracy, readability and timeliness of information as part of the EMR. Staff then reported surprise in realizing improvements in these non-financial factors so soon after implementation. Conversely, First Care staff reported not yet realizing expected gains in time, money and quality, but noted that they are still committed to the EMR implementation and that it will be their new standard of care. For all North Dakota facilities, formal patient satisfaction surveying had not yet been implemented, but is being considered at some facilities.

Case Study 2: Northeastern Oklahoma CAH EHR Network, Oklahoma State University Center for Health Sciences

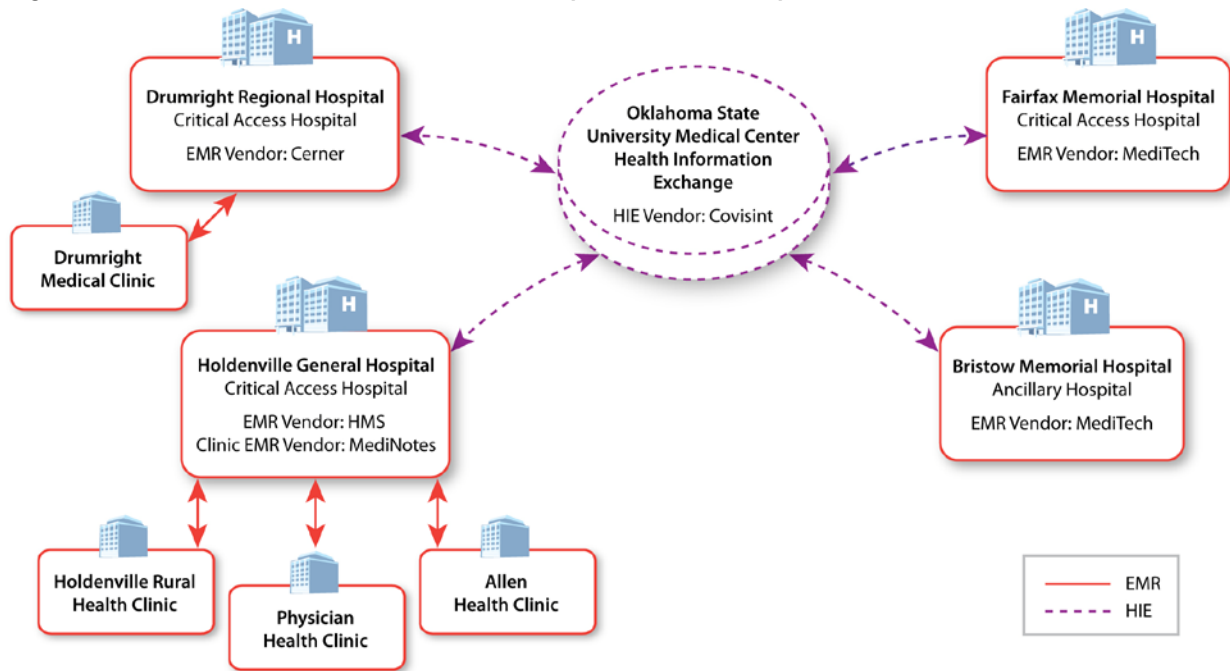
A. Introduction

The Oklahoma Flex CAH HIT grant project created a CAH Electronic Health Record (EHR) Network in Northeastern Oklahoma (the “Network”). The Network participants engaged in the Flex project were Oklahoma State University (OSU) Medical Center (urban tertiary hospital to which other partners primarily refer patients); Drumright Regional Hospital (CAH) and Drumright Medical Clinic; Holdenville General Hospital (CAH), Holdenville Rural Health Clinic, Physician Health Clinic, and Allen Health Clinic; Fairfax Memorial Hospital (CAH); Bristow Memorial Hospital; and the private practice physicians who staff each hospital and are responsible for the majority of the hospital’s referrals (Figure 2). This site visit consisted only of discussions with representatives from Drumright and Holdenville hospitals and OSU staff, so the majority of the case study reflects responses from these facilities and participants.

The Network members’ vision for the EHR Network was to ensure that patient clinical information would be easily accessible to providers within a healthcare organization and to other providers as patients migrated from ambulatory care to acute service delivery sites within the region. Improving access to patient information by integrating it into a coordinated system of care was expected to lead to more effective and efficient health care delivery and ultimately to improved safety and quality of care for patients.

Each CAH received \$291,500 and provided \$8,500 matching funds to purchase and implement an EHR system at their hospital and in the physician offices of their staff physicians. OSU Medical Center, the tertiary referral hospital for the Network CAHs, received \$350,000 and provided \$650,000 in matching funds to purchase and implement an EHR system at its hospital.

Figure 2. Oklahoma Flex CAH HIT Network Implementation Map



Drumright Regional Hospital and Holdenville General Hospital both began the Flex project with no electronic clinical system, but did have electronic systems for billing. As a result of the Flex CAH HIT project, Drumright has now implemented their EMR system, including all acute care modules except for the emergency department and ambulatory systems. Holdenville has currently implemented all modules including clinical, billing and registration, except for the emergency department, prescription drugs and ambulatory modules. Holdenville plans to continue documenting emergency department visits on paper and will scan the note into the EMR, and is in the process of trying to interface the current prescription drug system with the EMR. The associated clinics were expected to go live with the clinical modules before July 2009.

Fairfax Memorial Hospital and Bristow Memorial Hospital are both owned by the same management company – Community Partners. Both hospitals joined the Flex project part way through the period of performance (when Cleveland Area Hospital left the project). Fairfax and Bristow came into the project with some EMR modules in place, and decided to expand that functionality under the same vendor rather than start over, and both are in process of implementing the new EMR modules.

All hospital sites (CAH and ancillary) are in the process of determining what data will be shared within the HIE. OSU Medical Center and OSU physician clinics currently do not have an EMR system that will directly connect to the HIE. One portion of the purchased HIE system is a portal that will query information from all the disparate systems, utilizing HL7 messaging, and allow physicians as well as clinical staff to view, update and send requests for information from other locations. OSU is in the process of negotiating the integration of other third-party systems such as labs, e-prescribing, and payers into the HIE. This portal will allow physicians and staff real-time access to patient data.

B. Background

The Director of Grants and Resource Development at the Center for Rural Health directed the application for the Flex CAH HIT grant as the mission of the Center (part of Oklahoma State University Center for Health Sciences) includes bringing technology to rural populations.

C. Planning Approaches

From the very beginning of the Flex grant period, OSU mapped out workflows from all the departments of participating CAHs. OSU utilized an extensive questionnaire in addition to a vendor scorecard to determine what needs the CAHs might have for a vendor solution. OSU disseminated the questionnaires, conducted interviews, and provided workflow assessment templates to the CAHs. Staff interviews or end-user assessments were identified as particularly important in gathering what end-users were envisioning for the EMR. Interviews were conducted by department (i.e., physicians, lab, radiology, pharmacy, and nursing), based upon personnel job descriptions. OSU also interviewed departmental heads.

Involvement of Clinical Stakeholders in Planning

OSU reported that part of the work plan included organizing Hospital EHR Workgroups, which included CEOs and clinicians, to assess hospital-level needs and secure project buy-in. The Medical Records Manager, CFO, Business Manager, Lab Director, Nurse Director, and CAH Administrator were involved in planning at Drumright CAH. A number of clinical staff from Drumright CAH also traveled to Northern California to examine an EHR system in a live hospital environment.

OSU reported that Holdenville CAH providers were involved in planning; however, these were contractual physicians not directly employed by the hospital. Other Holdenville staff were connected with the project implementation process through updates during staff meetings. A meaningful proportion of clinical staff from both sites participated in the vendor scorecard process. When Holdenville CAH was initially considering the vendor products, clinical staff were very involved. For example, the Director of Nursing went on-site to a hospital where the vendor's ancillary, clinical, and business components were all represented. In addition, a number of staff participated in the visit to Bedford Regional Medical Center in Indianapolis to see the vendor's system. Staff who attended included the CFO, Director of Nursing/Pharmacy, Radiology Manager, Lab Manager, Controller/IS/Payroll/AP, Business Office Manager/Clinic Billing, Nurse/Quality Improvement, HIM Director, and the OSU Project Director and Project Manager. Similar personnel attended the site visit to Coon Memorial Hospital to see the EHR system. The CFO and OSU Project Manager wanted to include physician representation on the vendor site visit, but physicians were needed at the hospital and could not take time away from their clinical practice.

Physician Participation in Project Planning

While physicians were invited to be a part of all aspects of the project, some respondents reported that they generally did not participate. Holdenville CAH's CFO and OSU remarked that the physician response to the HIT implementation was generally, "whatever you want" and "if [HIT implementation] needs to be done, let's do it." The CFO noted that such a response was typical in any CAH environment, especially one without a strong physician HIT advocate. CAH respondents reported that although clinical staff were, for the most part, very open and fairly easy to work with as far as training prior to implementation, and that nursing staff were "on board" with the implementation, physicians were slightly more difficult throughout the process. However, the CFO reported that there was a "good

effort” made to ensure that the physician perspective was captured throughout the entire planning period.

Vendor Selection

The OSU Project Director reported that several vendors were considered for the Flex CAH HIT implementation. Ultimately, Holdenville and Drumright chose different vendors. According to OSU, each participating CAH was allowed control in selecting the EHR system that met the needs of its particular hospital. OSU stated that its task was to ensure that the vendor’s vision and strategy matched that of the respective CAHs; to evaluate all the software options offered by each vendor; to acquire and check vendor references and take current users on site visits to watch the product in operation; and to review the packages of several vendors for comparison and negotiation purposes.

CAH-Specific Planning Approaches

Holdenville General Hospital. The Holdenville project kicked off in October 2007. The OSU Project Manager and the Project Director began by gathering information about technologies available; creating the RFP; and narrowing the prospective vendors down to three. Holdenville desired a system to encompass everything from clinical to financial/billing modules. This narrowed the vendor selection to two finalists. From there, OSU scheduled site visits and saw the vendor systems in use at hospitals in both Indiana and Texas. OSU and Holdenville staff then selected one vendor that would best meet Holdenville’s core requirements. Shortly thereafter, Holdenville began its implementation. The system went live on December 1, 2008.

Holdenville CAH’s CFO reported that the decision to implement with the selected vendor was driven by the desire to have an integrated EMR for its clinical and financial informatics system. However, from OSU’s standpoint, the business-side modules were not a priority, given that the Flex grant paid for only the clinical aspects and activities of the implementation. Consequently, the vendor scorecard was designed to weigh more heavily on the clinical components of vendor systems. The “practice management,” or financial component of the system was not funded by the grant, since the hardware involved was specific to the practice management system.

The factors identified as most critical in the selection of the selected vendor included cost, availability of staff training, company stability, IT support, company long-term goal, and application functionality based upon physicians, nursing, and other levels of staff. These factors were all detailed and weighted in the OSU-designed vendor scorecard. An additional criterion in choosing the vendor was a system that could integrate the CAH’s associated clinics, including one rural health clinic and two provider-health clinics.

Holdenville’s workflow analyses (of various hospital departments) were planning tools used to assess current processes. The workflows were helpful for the vendor to review in order to plan the implementation. From the standpoint of OSU management, the workflow analyses were helpful in identifying various departmental needs within the CAH and to ascertain what needed to be accomplished to get Holdenville ready to implement the EMR.

Drumright Regional Hospital. CAH respondents reported that Drumright began the HIT implementation project with “literally no money.” Therefore, one of the biggest drivers in vendor selection was the cost of the EMR. Although staff were interested in other vendors initially, these were quickly eliminated due to price.

“Anybody in health care sees the writing on the wall that you’re going to have to do this with an EMR. We didn’t know how we were going to make it work because money is so tight.”

– Drumright CAH Administrator

Initially, Drumright narrowed its vendor selections to the most affordable vendors. One vendor was eliminated because it was not designed for interfaces to ancillary systems. Originally, Drumright chose another vendor as the “winner,” however, since this vendor was strictly an ambulatory system there was only one remaining option within their price range. OSU and several Drumright staff conducted a site visit to a 40-bed hospital in Northern California that had implemented this vendor’s system. OSU and Drumright staff liked this vendor’s system because it was an application service provider (ASP) model, and therefore hiring in-house IT staff was unnecessary. The Drumright Administrator reported that choosing this vendor was a “no brainer,” because the monthly maintenance fees were minimal.

The CAH Administrator’s original goal had been to avoid monthly vendor/system upkeep fees. However, OSU was able to negotiate down the vendor’s monthly fee by considering only add-ons or irreplaceable components of the EMR. After negotiating with the vendor, the CAH Administrator realized that while the existing payments looked cheaper on paper, there were many hidden costs. For example, Drumright was paying \$600 per month, at the time, for exit care and discharge planning, \$800 per month for the T-System, as well as \$2,000 per month for 1.0 FTE used for a data entry staff person. Since the selected vendor was all web-based, the only maintenance would be “from the wall out.” Drumright negotiated a support contract with the vendor which was built into the monthly fee, as well as a contract with a Tulsa-based IT support group.

Fairfax Memorial Hospital and Bristow Memorial Hospital. As mentioned previously, Fairfax and Bristow hospitals joined the Oklahoma Flex project following Cleveland Area Hospital’s departure from the project. OSU reported “significant challenges” with Cleveland CAH’s management company, Community Partners, throughout the vendor selection process. Consequently, OSU dissociated with Cleveland CAH midway through the grant period. However, Bristow and Fairfax, also managed by Community Partners, took Cleveland’s place, and intend to be a part of the HIE network housed at OSU.

Vendor Perceptions

Holdenville General Hospital. The CFO reported that Holdenville made a wise choice of vendor, and that a similar vendor selection process would have been used over again because, overall, the selection process went smoothly. Respondents reported that while the vendor has “had their fair share of ups and downs, [the vendor] has tried every inch of the way.” However, negotiating with the two final vendors was difficult, especially because the vendor not selected was “ready to give their [system] away.” Despite the Flex grant’s emphasis on the clinical portion of HIT, CAH respondents reported that the clinical modules of the systems under consideration were not the deciding factor of the final selection. Rather, the choice came down to “some very minute details of the business side.” In addition, the intent of purchasing the EMR was to unify the clinic and the CAH systems, to have one point of entry for all. Respondents reported that indeed, the vendor accomplished this by integrating Holdenville’s modules with the clinics’ systems.

Drumright Regional Hospital. For the most part, Drumright staff agreed that everything has been going well with the vendor as the implementation is wrapping up. Overall, Drumright was identified as being “very happy” with its vendor selection, however staff were nervous with their selection at the start of the Flex grant. The Nurse Manager reported, “Something’s changed with [the vendor]. I think it’s the possibility of the CAH market. They’ve always been good to us, but there’s been a real change.”

The CAH respondents emphasized the importance of having the vendor on-site 24/7 during the implementation period. Additionally, the OSU Project Manager reported that Drumright’s Administrator “did a good job on the ROI,” in his determination of how Drumright could recoup some of their upfront costs. He further reported that the Administrator’s vision has, for the most part, been realized to this point.

D. The EHR System

Established Infrastructure at Participating CAHs

Prior to the Flex CAH HIT grant, both Holdenville and Drumright CAHs existed almost entirely on paper-based systems. Drumright had teleradiology and pharmacy systems, but surgery documentation was completed in an Excel spreadsheet. In March 2009, after the EHR implementation had been completed at Drumright CAH, respondents reported that the old, paper-based system had been “awful.”

Phases of HIT Implementations at Holdenville and Drumright CAHs

Drumright. Drumright implemented nursing documentation on January 21, 2009, and modules for physician orders, transfers, discharges, and patient education on February 16, 2009. At the time of the site visit, Drumright was working toward the implementation and interfacing of the medication and pharmacy portions of the EMR, which were expected to go live on April 6, 2009. The radiology portion of the EMR had gone live as of March 2009, and the vendor was continuing work on the interface with radiology transcription. CAH respondents reported that no definite implementation date was planned for either the surgery or radiology modules; rather, implementation was occurring gradually as staff became ready.

On a related note, CAH respondents reported that the emergency department (ED) portion of the EMR had not yet been implemented because staff were not happy with the way the nursing portion of it was designed, believing the navigation to be “messy.” According to the Nurse Director, successive screen pages within the nursing emergency department module did not flow logically into one cumulative report, and that “it would be a nightmare to go to ten different pages” to input information. As a consequence, Drumright requested a hold on the go-live date until the system was considered more user-friendly for clinical staff. The vendor has not yet built nursing care plans, which it is now supposed to be working on. From a management and nursing point of view, the nursing care plans must be developed and implemented very quickly.

Holdenville. Holdenville reported being on target for the revised July 31, 2009, project end date. The December 2008 go-live included the patient accounting/business module, as well as lab, pharmacy, order entry, and clinical modules. The physician documentation module, however, has been delayed. Additionally, the current version does not have a way of “noting nursing orders,” so the vendor has announced plans to implement an order entry module to cover both lab and radiology orders. This is the only separate module that has not yet been implemented within the CAH itself. However, the EMR system has not yet been implemented in the clinics.

Holdenville management is still considering implementing an ED module; however, the ED system might always be stand-alone due to a contractual agreement for ED coverage and turnover of physicians (lack of continuity of ED medical staff). They currently use the T sheets (T sheets are used to document ED visits, based upon CMS guidelines), which are scanned into the medical record.

Health Information Exchange with the Oklahoma State University. The OSU Project Manager reported that he has been in contact with the HIE vendor about moving forward with the interfaces at Drumright and Holdenville. Drumright has begun talks with the vendor, and went live with the HIE in March 2009.

E. Staff Training

Holdenville. At Holdenville General Hospital, the vendor was responsible for scheduling trainings with hospital staff. CAH respondents reported that the vendor trained staff concurrently for five days after the clinical modules were installed. Approximately ten staff were trained on the floor, and four staff were trained in surgery. Six CAH-employed and two contractual physicians were also trained. In total, ten nursing staff were trained and presently use the vendor's EMR.

Holdenville's staff and contractual physicians received training in early December 2008. They were trained on how to operate the EMR and "where to find things" in that system. Nursing staff were trained in the pharmacy and order entry modules in late August and early September 2008, in preparation for the scheduled go-live on September 15, 2008. The vendor trained three head nurses first, and then those nurses trained the remaining staff. The vendor offered several sessions for each module for nurses only and physicians only.

Training on the surgery module was set up in three stages. For example, a test module was conducted, where nursing staff "played with test patients" and the head nurse checked all their documentation. Even after the surgery module went live, the head nurse took responsibility for checking all the documentation. In general, the nurses were able to access the modules before the go-live, if they had free time on the floor. However, there was not a lot of downtime for staff to practice because the patient census went up dramatically during the initial go-live phase. The vendor's clinical expert was on-site when the system went live.

Drumright. In December 2008, the vendor began "super-user" training for the charge nurses at Drumright. This training comprised a two-hour overview of the EMR. However, CAH respondents reported that this amount of information packed into a one-time training was overwhelming. Consequently, the vendor offered two additional trainings prior to the implementation of the nursing documentation modules, and a third training prior to the order entry go-live. In addition, the vendor planned to conduct at least one more training session for the Medication and ED modules, dependent on staff requests.

The vendor also offered trainings for the physicians and PAs on how to build reports. As of March 2009, two surgeons had yet to be trained, because they resisted training until 100 percent of the EMR modules were fully implemented. CAH respondents noted that one surgeon refused training, but only visits Drumright once weekly.

Staff Satisfaction with Vendor Trainings

Holdenville. It was reported that all Holdenville staff have been trained and are using the EMR. Staff did not initially receive training on the clinical documentation application, and had to request a second training to fully understand how to build reports and "the whole digital patient record." The CFO reported that while implementation went smoothly through the initial stages, Holdenville's vendor's project manager has "dropped the ball and the following stages have been more lackadaisical."

The plan for staff training by the vendor going forward includes free training, and "teaching how to use the system above and beyond the standard." This training will occur every year in October. The group reported that the vendor also offers plenty of opportunities for free webinars, and the vendor's site is full of helpful hints and suggestions. Holdenville "just has to figure out how to work it in for staff."

It was reported that there was a great staff response to the trainings. Specifically, overall nursing staff were very pleased the system. With regard to the physicians, their technology skills were "not great," so their satisfaction was not as pronounced. One physician did not know how to type, and did not know

what a pull-down menu was. In this case, additional one-on-one assistance has been helpful, and physicians have been receptive overall to help. After testing out some group training scenarios, the nurse trainers learned that one-on-one training was most effective for teaching purposes.

Drumright. The vendor was “fabulous at being on the floor when they went live.” The vendor placed two or three employees at Drumright during the day shift, and at least one during the night shift. For a small hospital, “it is hard to do all this training.” Training has been very expensive as far as staffing, and has taken a lot of overtime. One notable challenge was in training pain resource nurses (PRNs) – as they do not work many shifts, getting them scheduled for trainings was particularly difficult.

Anonymous staff evaluations were distributed after the super-user and phase training. The purpose of the evaluation was to discern how employees felt about the impending go-live and to gauge their comfort level. It was unanimous that the super-user sit-down training was too overwhelming. Consequently, two more training sessions were offered. After the ensuing trainings, the nurses’ anxiety levels “really settled down.” Any issues encountered were submitted to the vendor, which was reportedly helpful, because the vendor was not aware that such issues existed. For example, the vendor had set up certain alerts as reminders for the next nurse on shift to complete a task, but the times were not set up to properly align with the shifts. This led to nurses re-entering reminders, and the vendor staff “pulling [their] hair out” because there were double reminders for everything. The problem was rectified by the vendor redefining alert times. There were also some language differences, similar to issues encountered at Holdenville, where staff wanted to keep the language in line with what CAH staff were accustomed to seeing.

Charge nurses were strongly encouraged to take advantage of the vendor’s on-site support staff while the implementation is still in the go-live phase. The importance of being proactive and asking questions has also been stressed, and nurses were instructed that they would be accountable for information when the vendor staff have completed the implementation.

System Testing

The vendor was in Holdenville for “two weeks straight” to build the interfaces and set up standardized templates with existing workflow. The templates were “built from the ground up” and customized for Holdenville. The lab and radiology departments built their procedures internally, and the vendor tested those procedures during their two-week standardization period. The vendor used mnemonics similar to those already in use to minimize staff confusion during training.

Some gaps that have been identified pertain to the duplicative lab process. For instance, staff must enter information into the EHR and then into the LabCorps computer. The lack of communication was related to interface with the reference lab. However, the CFO reported that the capabilities for interfacing the lab system were included in the EHR vendor package, and was surprised to hear from other staff of the duplicative nature of the work.

Drumright conducted testing with the vendor at each “phase.” Physician ordering was tested, with the assistance of the vendor; for example, the vendor verified that an order was sent to the correct places in the chart. During the go-live, the vendor provided 24-hour, on-site support. One respondent reported that the vendor was very confident because they had, in the past, spent months testing every different scenario.

Drumright staff expressed some concerns about physicians placing medication orders/missed orders. The EMR displays a small icon that reads ‘you’ve got an order.’ However, the way the system is currently designed, the order is directly transmitted to the patient’s chart and the nurse may dispense the medication without prior physician review and approval. When Drumright staff approached the vendor

about the medication order problem, the vendor replied, 'this is just the way our [system] is built,' because the vendor is accustomed to working with larger hospitals that can handle quick medication turnover. However, the vendor accommodated Drumright's problem by developing a template to enable review and approval of the medication before transmittal to the patient chart.

In small CAHs like Drumright, there is less "departmentalizing" than in large hospitals. Therefore, the vendor had to rebuild the Drumright's EMR to accommodate the multi-faceted responsibilities of its CAH staff. For instance, CAH nurses essentially take on other roles, which may include jobs such as respiratory therapy; in larger hospitals, individuals are hired to do very distinct jobs.

Technical Support

At Holdenville, the nurses act as the support staff. The head nurse reported keeping a log book with staff questions and concerns, and also noted that if a call needs to be placed to the vendor immediately, she is responsible. The head nurse places several calls a week to the vendor, to resolve "little glitches" and she reported that the response is generally good. The vendor's Website and online support has also been helpful in troubleshooting problems.

At Drumright, the vendor and nursing director meet and generate a list of problems with the system. Drumright staff are able to express problems with the system through an "issue notebook" which is then communicated to the vendor. Additionally, each week, Drumright staff receive an update from the vendor, and new information regarding the system is shared at staff meetings.

F. Governance, Policies and Procedures

Holdenville and Drumright CAHs approached modifications to their facility policies and procedures in different ways. Drumright's Nurse Manager reported reviewing over 500 policy forms/templates offered by the vendor, and choosing the forms which most closely corresponded to Drumright's existing processes. She also ensured that each selected form included the CAH's rules and regulations. These new forms initially had a "big impact" on workflow, until CAH staff became accustomed to the modified processes. While the Nurse Manager had designed a "cheat sheet" as a stand-in for Drumright CAH's policies and procedures, she reported that there was no mechanism to hold staff accountable for appropriately identifying and properly filling out the modified forms. Nevertheless, she emphasized, "Our cheat sheet is our lifeline" to guiding clinical staff through the new forms. Conversely, Holdenville had not begun to update their policies and procedures as of March 2009. The CFO reported that this "process update is one of our administrative goals," but anticipated that making changes to the CAH's policies and procedures would be "the worst part of all, because it's one thing to learn the system, but another when all the processes change."

Data Confidentiality

At Holdenville, concerns cited with regard to data confidentiality included the vigilance of staff to sign out of the EMR when they were finished, and the loss of data after program timeout. The program timeout (e.g., the active report "times out" after five to ten minutes of inactivity) was reportedly cumbersome because staff are not permitted to save patient information until they are finished with the entire report. Respondents suggested an auto-save function so staff would not have to save as often, and to prevent data loss. Drumright respondents reported that all staff signed a HIPAA form before the go-live, and that staff only have access to the EMR while physically at the hospital. A confidentiality issue of note at Drumright was the necessity of positioning the computer portal cart so patient information was not visible to anyone passing down the hall next to the cart. Drumright staff were also trying to be careful to close the session as soon as they were finished entering patient information.

Interoperability

The CAHs described a number of problems related to interoperability and interfacing. At Drumright, the existing patient registration system has experienced issues interfacing with the EHR. Drumright staff reported that “[Vendor] is usually very on top of [interoperability] issues.” However, a major problem is the T-1 connection for day-to-day services. Drumright has low bandwidth and a lot of latency, causing the system to run rather slow. That has been resolved by the vendor, who installed a dedicated T-1 to the vendor itself. However, there have been redundancy problems with the vendor-dedicated T-1, because no matter how many communication lines enter the hospital, if one goes down, they both go down. This occurred once, and staff reverted to using paper documentation. At Holdenville, the vendor is in the process of building customized templates for reporting in order to fully integrate the EMR. Terminology has not been an issue, since the vendor built the system based on Holdenville’s existing systems. Holdenville reported that they have “had nothing but problems” with the pharmacy system which was purchased 1.5 years ago, prior to going into the EMR conversion. The pharmacy system has been very problematic in the past and will not “talk” to the pharmacy module.

G. Impact on Hospital Operations

Tracking Data through the Continuum of Care

While Holdenville “originally had a pretty efficient paper-based system,” CAH staff reported that nursing documentation is going very well and that the EMR has been improving the quality of nursing documentation. Staff are now able, for instance, to generate a cumulative report on different labs, whereas as prior to the implementation, a single sheet of paper was required for each individual lab. Transfers between facilities have also been easier and faster post-implementation.

Availability of Data

Holdenville respondents reported that functionality of the EMR was “disjointed.” However, they also reported that the vendor has stated that this “disjointedness” would be rectified in the next software update. Holdenville staff also reported disappointment that “they have to go to different places to get the big picture,” and, while re-entering the data has become “three to four times more cumbersome at this point,” once the data are entered “everything flows smoothly.” Holdenville respondents believed “it will always be [duplicative] unless technology changes, especially if there is a high volume of patients.”

In contrast, Drumright respondents agreed that the implementation has had a “phenomenal” impact on the availability of data. The Nurse Director was able, for instance, to pull up patient information remotely to check whether everything is being done correctly with a patient. She reported that it has made her job a lot easier to be able to develop “points of intervention” during the process, where a manager can look to see who is overdue for their nursing interventions, instead of just asking, “Are you guys doing okay?” Staff are also more easily able to adjust to the changes in volume.

Feedback from Staff

Most staff are positive about the implementations and satisfied with the system. However, at present, the system has increased the cost of care and required staff to do extra work and training in addition to their existing responsibilities. At Drumright, clinical staff completed a survey related to the vendor’s training, but have not yet taken a survey related to the overall EMR project or their satisfaction with the implementation. Overall, respondents reported satisfaction with the EMR implementation. Drumright respondents in particular were satisfied with the vendor’s technical support and responsiveness to staff concerns. One physician reported that from an operational standpoint, e-prescribing has been very helpful, as well as the ability to see the full patient record and medical history remotely. In this respect,

the EMR has made providers' jobs easier and more streamlined than the paper-based system. Respondents stated that overall, "physicians are complaining less" and while "everything was tense for a while...it's moving forward again. The physicians just needed some time to figure [the EMR] out." Physicians are still figuring out how to deal with medication reconciliation, which will be facilitated by additional training. The CFO reported that since the implementation team was "scared to throw physicians [into the EMR], and didn't want to overwhelm them," they have initially limited physicians' use of the system to order entry.

The impact of the EMR differed by provider type. For example, it changed the process of physician rounds, because it took physicians longer, and physicians had a more difficult time finding necessary information. Now, physicians are changing the way they do their rounds. Initially, the nurses saw some physicians look at the computer screen and copy all the information down so they could then get that information in the patient rooms and return and input the information into the EMR. The laptops are supporting their morning rounds better and physicians are becoming more comfortable with their use. Additionally, at the outset of the implementation, physicians were unwilling to trust what they saw in the electronic system. If they did not see something filled out in a field, they thought it might be an omission. They just were not sure if they were supposed to be looking somewhere else. This mistrust of the system is gradually eroding with increased use, however. For nurses and other ancillary staff, the implementation has been seen as more positive because they are able to complete documentation faster.

Further, respondents reported that the availability of information between physicians and other providers has increased dramatically, and information is much more retrievable. This has also contributed to better communication between individual providers and across departments. Clinical staff were also pleased to note that they are now able to "call the doctor and ask them to look at information while they are off-site, and the physician is able to do that from their desk wherever they are. There is no longer that morning scramble to get the charts on the doctor's desk."

Impact on Patient Care

Drumright staff believe the EMR will be "a huge factor for patient quality of care" and emphasized that patient care should be the number one priority. Drumright's Nurse Director explained that her biggest fear was that patient care would be ignored. "It just takes one bad outcome, or one bad person. It's been a challenge," she said.

Feedback from Patients

No patient complaints had been reported from either Drumright or Holdenville as of March 2009. There have been several articles in the local paper about the phases of the EMR project, and some positive comments related to this publicity, but nothing directly from CAH patients. The EMR publicity and the good reputation the facility has maintained since recently opening its new building is of critical importance for the financial stability of the CAH, especially since Tulsa is only 30 minutes away. The short distance to Tulsa is not a deterrent for patients who may choose to drive to a bigger referral hospital if Drumright's service suffers due to the EMR implementation.

Additionally, there will be a formal assessment by JL Morgan and Associates at Holdenville, although the CAH has always administered patient satisfaction surveys at discharge. However, there are no plans to change the way this survey will be implemented or questions added about the EMR.

H. Evaluation

The goal of the grantee-level evaluation was to develop a solid Quality Improvement (QI) foundation, which would enable participating facilities and end-users to move forward with implementing more advanced HIT systems in the future. According to the Flex CAH HIT application submitted by OSU, baseline data were to be extracted from records prior to September 2008, as well as CMS Hospital Compare. All the Network hospitals report quality data to CMS Hospital Compare, and demonstrated a commitment to improving quality and reporting data, according to the grant application.

CAH respondents noted that as of December 2008, Duke University Medical Center and the HIE vendor had been extracting real-time data to send to Duke for analysis. Duke was using an SITR grant to develop a disease management system, and has partnered with OSU for a pilot project.

As for specific evaluation of the Flex project effects, evaluators hired by OSU participated in the site visit interviews, but as of the time of the site visit (March 2009) reported having done “nothing formally” yet towards the evaluation. Although plans for the evaluation were reported as including a “pre-post snapshot”, evaluators commented that this evaluation structure would then make it difficult to “tease out the impact of HIT without a nice econometric model.” When pressed for specifics for the pre-post evaluation (metrics, roll-out plans), the evaluators did not identify definite structure or plans for the evaluation, and reported no information gathering had taken place to inform the evaluation to date.

I. Challenges and Solutions

- **Pre-existing facility infrastructure.** The CAHs struggled with low bandwidth and an outdated or inadequate T-1 system, which negatively impacted the implementation.
- **Overextension of staff resources.** Pinched staff resources made it difficult to set aside time solely for staff training sessions and limited the times at which staff could take time on their own to practice using the EMR systems.
- **Vendors’ unwillingness to design interfaces and modify templates.** Holdenville reported encountering resistance from the vendor when facility staff requested modeling templates for the electronic modules on existing facility workflows. The vendor required Holdenville to pay for this type of standardization, which was not cost-effective for the CAH, nor was it a contractual agreement CAH staff were aware of at the time of vendor selection. Staff reported being unsure of the vendor’s flexibility to make changes to workflow templates and the vendor’s commitment to make the changes required by law.
- **Modifying CAH policies and procedures.** Addressing how Drumright’s existing policies and procedures would fit into a newly implemented electronic system was “a lot of work,” according to the CAH Administrator. Drumright underestimated the amount of time necessary to convert existing policies and procedures into a format that would work with the EMR. The Administrator reported, “It was naïve to think that the vendor would have it all set for us.” Holdenville also expressed concerns about its capabilities to design templates to capture documentation and build reports without undergoing an intensive conversion of its existing policies and procedures.
- **Limited grant timeframe under which to select vendors.** Staff from both CAHs as well as grant management at OSU cited the limited timeframe as a major stressor on the HIT implementation.

The original timeline imposed under the Flex CAH HIT grant “made it real stressful and difficult, and that’s one of the reasons why it got easier as it went along; because the timeline has been pushed back. If you can go into it knowing you have twelve to eighteen months [to complete the implementation], it would make things a lot easier, especially for a CAH with limited resources.”

— Drumright CAH Administrator

The Drumright Administrator reported that Drumright staff felt rushed during the vendor selection process.

- **Staff turnover.** Staff turnover at rural CAHs is difficult because several larger hospitals that offer higher wages and greater flexibility are located within an hour's drive. Respondents at Holdenville reported that the CAH was struggling to compete for qualified staff with these larger hospitals. Consequently, the threat of key clinicians and hospital personnel leaving during or following the EMR implementation was a major concern. The CFO reported that ongoing staff training to address turnover issues would be factored into the budget, but was something that needed to be thought about in more detail.
- **Detachment of management-level staff.** Holdenville's Board of Directors reportedly "had not gotten a good feel for the quality pieces of the EMR," and were more concerned with the potential return on investment a business/financial-focused electronic system could bring to bear. Holdenville's CFO reported wanting the Board to be more concerned with the clinical and quality aspects of the implementation, particularly because these were the components funded by the Flex CAH HIT grant. The CFO further admitted that partially because of the Board's emphasis on financial systems, the implementation wasn't "quite as organized because [the CFO] was pulled in the business direction."

J. Supportive Factors

- **Collaboration between CAH, OSU, and vendor staff.** Collaboration among CAH personnel, OSU project management, and the HIT vendor to ensure a tight reading of the project schedule, acted as a support to completing the implementation activities in accordance with the stringent HRSA timeline.
- **Facility-level project management role.** Drumright's nurse manager served as the de facto project manager and HIT champion. The CAH Administrator praised her time and devotion to the project as a critical element to its success. The administrator also recognized his own role in understanding and accommodating the demands of such a role, which the nurse manager undertook in addition to her significant clinical responsibilities.
- **Facility management-level buy-in.** Related to the necessity of accommodating management for a clinical project "champion," management-level buy-in and advocacy were considered integral to the success of the implementation activities. The CFO at Holdenville, as well as the CAH Administrator at Drumright, both served to move the HIT projects forward through their leadership of clinical staff and influence with the hospital boards and other management-level staff.
- **Small hospital environment.** Respondents reported a positive benefit of planning and implementing HIT systems within a small hospital environment. Few and close-knit staff streamlined communication and consensus about the content of vendor modules as well as the direction of training and implementation activities. CAH administrators and clinical staff reportedly had mutual respect for and confidence in one another, which enabled decision-making and acceptance among the EMR end-users.
- **Established relationships with or knowledge of similar vendor implementations.** OSU project management as well as CAH respondents acknowledged the importance of having a relationship with Owasso, a large tertiary hospital which had previously implemented the vendor's EHR on a larger scale. Advice and reports of vendor experiences from staff at Owasso were reportedly very helpful when considering how to best approach vendor oversight, planning, and implementation at both Drumright and Holdenville.
- **Attentive vendor training and technical support.** Drumright's vendor has been supportive throughout the implementation and this support, along with the nurse manager's role as Drumright's champion/nurse director, contributed to the success of the project.

K. Lessons Learned

- **Designate a clinical or facility-level champion.** Drumright’s nurse manager has, since June 2008, essentially acted as the project manager on top of her nurse management role, and has been “on heavy duty” with the implementation since October 2008. Respondents encouraged other small facilities to designate such a staff person who had committed to “be on board with the project and have a good positive attitude” throughout the process. However, CAH respondents warned that it might be “easy for someone in [the nurse manager’s multifaceted] role to end up with a bad attitude,” presumably because the task was overwhelming for the time allocated to one FTE. It would be important to identify, they reported, the structural aspects of the situation and the leadership qualities that would best serve to support an EMR implementation before designating such a champion at the facility-level. The CAH administrator noted that someone at the facility level was especially important to be attentive not only to the “show stoppers,” but the minutia of the daily routine. He suggested that several CAHs implementing a HIE system underwrite such a dedicated staff person familiar with hospital processes, policies, and procedures, to take on a project management role and serve as a nucleus of communication within the institution.
- **Employ a knowledgeable HIT consultant.** One of the drawbacks encountered during both the project planning and implementation phases was the lack of facility staff expertise in or experience with HIT. Holdenville CFO reported that because of this knowledge and experience gap, it should be a top priority of small hospitals, particularly those without dedicated IT staff, to hire a consultant who knows the “right questions” to ask of the vendor. One CAH respondent reported, “You don’t think about the compatibility of the different [vendor] systems, [or] how many screens you have to go through” to see all the patient information. Staff should have asked more probing questions about the capabilities of the vendor systems and application processes, but simply did not know. A specialized HIT consultant would make a good addition to any facility-level implementation team.
- **Establish relationships with other facilities familiar with the selected vendor’s reputation.** The OSU project manager reported that one of the big problems with HIT implementations in CAHs is that the vendor systems are not designed to merge with the workflows of small facilities. He reported, “Even if you do ask the questions, the vendors might not know [the answers] because they’re not used to [implementing the system] in a particular way. It makes it difficult given the complexities.” The project manager offered that one of the best responses to vendor unfamiliarity with small hospital processes is to build a relationship with other, larger or tertiary hospitals, where the vendor has done business in the past. If CAHs build such a relationship and introduce some dialogue as they are implementing about past workflow issues or difficulties encountered during planning or implementation, this communication may work to their advantage.
- **Recognize staff training needs.** Drumright CAH’s Nurse Director reported the importance of “overstaffing” during the go-live period. She brought on an extra nurse and CNA for each shift to ensure that clinical staff duties were fully covered, even with the new work required by the EMR. It is important to keep in mind that not all staff are computer savvy, and learning curves among staff vary drastically. Drumright has been taking these differences into account, and “training the heck out of the younger administrative assistants” to support the nursing staff, and assisting those who were least used to computers.

L. Sustainability

A portion of Drumright and Holdenville’s annual fees for maintaining their EHR systems will be eligible for cost-based reimbursement from Medicare. The CEOs anticipate using funding from their Small Hospital Improvement Program (SHIP) grants each year to cover annual maintenance costs. Holdenville

reportedly had not designated funding for sustainability; however, the Board has plans to consider sustainability funding through the July 2009 budget process. The Board also approved the purchase of a larger, mid-size server to “grow” the EHR system for at least seven more years. The upgraded server has the capacity to hold both clinical and business documentation. Holdenville included an FTE for an IT specialist in the budget, as well as funds for hardware, software, and infrastructure. Holdenville is supported by sales tax and city property taxes, and has established a relationship with OSU (beginning with the Flex project), and OSU will continue to look for grants. Holdenville is a Public Trust 60, so gets its T-1 line free of charge, and will be able to get up to two more T-1 lines free, as well.

Impediments to Sustainability

CAH finances were the biggest impediment to sustainability. According to Holdenville respondents, the biggest single issue in regard to sustainability will be “keeping up” with modifications to the infrastructure. In contrast, at Drumright, the vendor’s Web-based ASP model allows the CAH to maintain the EMR with minimal costs. Holdenville respondents also raised the need for funds for a backup system or “disaster recovery system,” which was not offered by their vendor. There is, however, a duplication of the system as a temporary backup, but if the server failed for some reason, Holdenville will not have access to the clinics’ electronic system. In this case, the clinics would be obliged to use “downtime” procedures until the system was again accessible.

Complementary Funding or Support for the HIT Implementation

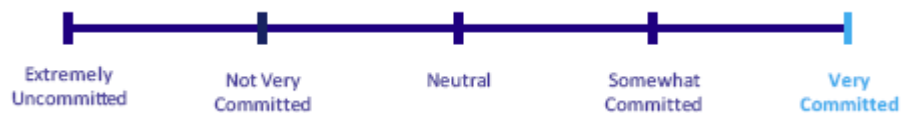
Aside from the Small Hospital Improvement Program sought each year to cover annual EHR system funding, neither of the CAHs has sought outside funding for sustainability. Holdenville’s CEO stated she would “love to get a hold of something” and “will continue to search for anything that’s out there grant-wise” but reported she had not yet heard of any newly applicable grants. Neither does Drumright have ongoing funding to sustain the Flex CAH HIT activities, but, as discussed above, is confident that monthly feeds for the EMR will remain low and costs recoupable by increased staff efficiency and greater billing accuracy.

M. Value-Based ROI¹⁹

1. Clinician commitment

Northeastern Oklahoma CAH EHR Network (the Network) respondents were asked to rate user clinician commitment before and after implementation of Flex CAH HIT grant activities along the Likert scale shown below.

Both the baseline measure and implemented system measure were noted at Very Committed:



However, respondents did note that clinician commitment at Fairfax and Bristow hospitals was varied, due to a lack of satisfaction with the implemented system.

¹⁹ Refer to Appendix C for a detailed description of each variable used to calculate the value-based ROI.

User training and support

Oklahoma Network respondents reported a wide range in terms of the quality and quantity of user training and support conducted as part of the different hospitals' implementations. Drumright respondents collectively noted being very happy with the training and support they have received from their vendor, Cerner. Clinicians received several hours of training for each system module, such as documentation, orders, scheduling, and so on. Cerner also trained laboratory staff. In general, this support was seen as complete and very responsive. However, respondents were quick to note perceptions that Cerner was trying to make a particularly good impression with this implementation. Two comments received were that this project was Cerner's first CAH implementation and that it wanted Drumright to become a "poster child" for future, similar business development, and that Oklahoma State University is looking to implement an HIT system and Cerner wanted to go "above and beyond" to make a good impression. Grant administrators did not think hospitals would be treated so well in the future.

For Holdenville, training conducted by its vendor, HMS, occurred for one week, and then additional training was offered at an additional cost. Staff noted that overall, this training was not very efficient. However, staff did find that using a "train-the-trainer" approach worked much better – initial trainings were conducted by the vendor on their suggested schedule, then ongoing trainings for current and new users are set up by the respective hospital department, based on training needs. Fairfax and Bristow respondents reported similar training and support to Holdenville, noting that internal training staff are very committed to making sure all users are appropriately trained and capable of using the implemented systems.

User feedback

Again, Oklahoma Network participants reported varying methods for seeking and considering user feedback, depending on the individual facility. Holdenville reported weekly meetings throughout the implementation to discuss issues or concerns and have them addressed. As part of its implementation, Holdenville is striving to keep ongoing communications with all user staff; for example, clinical staff keep and share a log book of issues or recommendations. One respondent noted that "being a small hospital, communication is daily and we continue to find new and/or better ways to work through a process."

Drumright designed written feedback reports/surveys to assess user satisfaction and comfort with the implemented system. Fairfax and Bristow respondents noted that open communication is encouraged, and as questions or concerns are raised, they are dealt with as quickly as possible. If needed, additional training is then made available.

Implications

Measured from pre-grant implementation to post-implementation, Oklahoma respondents reported the same level of user clinician commitment for both points in time – **Very Committed**. Each facility reported significant staff commitment to the activities of the implementation. Drumright respondents noted having received positive feedback from staff – that they are excited about the improvements and efficiencies of the new system. As a result, staff have been persistent about moving forward with implementing additional components of the system. At Holdenville, the group nature of deciding to pursue the project and following through together as a team was reported as key to staff excitement during the project and in implementation. Ancillary and clinical staff, financial/revenue cycle staff, and administrative staff were engaged in product demos and site visits to decide on a final vendor. Staff reported excitement about getting a new system in place to help with everyday job tasks as well as to help with patient safety.

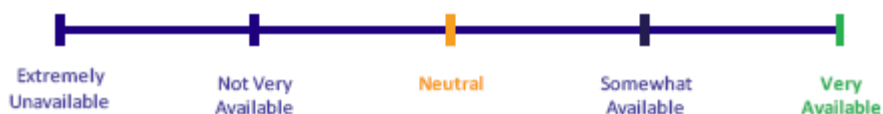
Fairfax and Bristow hospitals reported strong commitment by internal training staff to making sure that all users are trained and capable of using the systems, and implementation has gone well and has been successful.

The Oklahoma Network facilities reported different methods of staff training, somewhat dependent on the level of training included by their vendor. Staff satisfaction was reported to be somewhat tied to training – in that facility resources devoted to training, support, and feedback were received well, when available.

2. Information availability

Within the context of information affected by Flex CAH HIT grant activities, Network respondents were asked to rate how available information is, when and where it is needed, along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



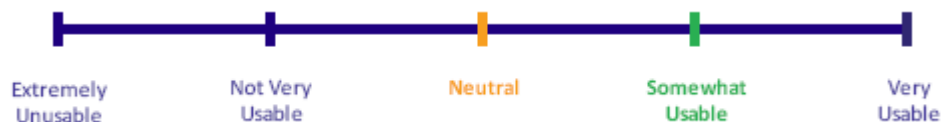
Implications

Measured from pre-grant implementation to post-implementation, Oklahoma Network respondents reported greater information availability post-implementation – moving responses from a pre-grant level of **Neutral** to **Very Available**. Respondents from Holdenville and Drumright hospitals reported frustration from clinical staff with searching for records in the paper-based system. Many times, information was tracked manually in each department, so information was technically available, although it required a lengthy process to retrieve it. At the time of the site visit, Fairfax and Bristow hospitals were at a point in their project implementation where they were still primarily using a paper-based system.

3. System usability

For the HIT system(s) implemented as part of the Flex CAH HIT project, Network respondents were asked to rate system usability prior to and post system implementation along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



User perceptions of ease of use

Network respondents noted that their expectations of the implementation focused heavily on the new system's ability to help streamline processes within the hospitals and ancillary departments and clinics. Holdenville in particular referenced their existing electronic lab information system and challenges associated with disparate, pre-grant systems (some paper, some electronic). With the implementation, Holdenville respondents reported that streamlining these systems was an expectation, and that the

benefits of such streamlining helped the perception of the implementation – that the end results would help to ease the challenges of implementation.

Respondents did raise some limitations to understanding how workflows would change with implementation of the new system, noting that staff knowledge is limited to their workflows with paper documentation.

System use

At the time of the site visit, all sites reported implemented systems were being used as anticipated. Fairfax, Bristow and Drumright reported that they had not yet run across any unexpected challenges or benefits associated with system use – that their focus was the change in use from paper processes to electronic. While Holdenville respondents shared that system use was occurring as expected, respondents indicated challenges with interfaces between different systems as an unexpected challenge. At the time of the site visit, Holdenville was working with the pharmacy interface – respondents shared that at the time of procurement, they tried to save money on the pharmacy system, but now they are finding many interoperability issues with the EMR system.

Implications

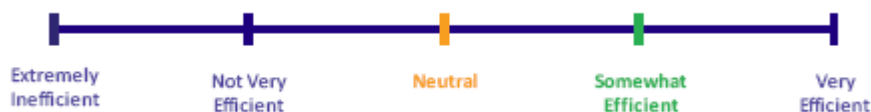
Measured from pre-grant implementation to post-implementation, Oklahoma respondents reported system usability improvement from **Neutral** for pre-grant systems to **Somewhat Usable** for the implemented system. Drumright respondents were particularly pleased with the usability of the implemented system. One staff member shared, “There’s no way in this world you could ever talk [us] into going back to paper. Everything came out better than anticipated.”

Other hospitals have experienced varying usability of their implemented systems. As referenced above, Holdenville has experienced issues with interfaces between existing systems and the newly implemented EMR system. Holdenville is also still working through scanning in historical medical records (particularly relevant for their emergency department), and referenced this example as a hindrance to fully advancing system utilization. Respondents reported that these gaps in utilization were being addressed, but staff mentioned that they can only do so much to address these issues – that they are somewhat at the mercy of the technology vendor. As another example, staff noted mechanisms to integrate their fee-based pay structure with the HMS emergency department system is still in process, and is therefore making work more difficult in the short term.

4. System efficiency

For the HIT system(s) implemented as part of the Flex CAH HIT project, respondents were asked to rate system efficiency prior to and post implementation along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

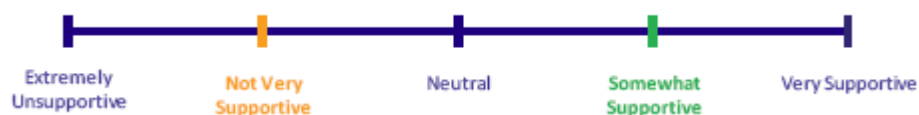
Measured from pre-grant implementation to post-implementation, Oklahoma respondents reported greater system efficiency post-implementation – moving responses from a pre-grant level of **Neutral** to

Somewhat Efficient. All sites referenced the efficiency of the paper-based system as being acceptable at a basic level for singular episodes of care. The real gains noted for the implemented system were in the larger value of providing aggregate care or transferring information. With the paper-based system, staff reported a lack of efficiency in getting all the treatment information into the paper chart in a timely manner to satisfy the physician and/or nurse caring for the patient. Staff also noted issues with charts being issued to physicians for chart completion (or other administrative function) and then the patient presenting to the emergency department for care, where treating staff then had to treat without the chart information or spend time tracking down documentation. Holdenville also noted that for its existing lab system, all information had to be entered manually (from paper charts as opposed to information being electronically transferred or populated), thus leaving much room for error.

5. Clinical outcomes

Respondents were asked to rate their perceptions as to the pre- and post-implemented systems in terms of supporting positive clinical outcomes along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

Measured from pre-grant implementation to post-implementation, Oklahoma respondents reported that the implemented system increased perceived support for positive clinical outcomes – moving responses from a pre-grant level of **Not Very Supportive** to **Somewhat Supportive**. Holdenville staff shared a perception that collectively, staff knew they were doing the best they could with the system (paper-based) they had. One respondent said staff shared an acceptance of “pretenses that we have to wait for things and it may or may not delay the care for the patient.” Collectively, staff referred to a longstanding hope to have more timely information to and from the lab down the hall, as well as from the radiologist reading reports miles away. Staff further noted that manual records, charting and ordering did increase the likelihood for incorrect or misinterpreted information being used to care for the patient; they noted that while computer-based systems have room for error in data entry, automated checks and balances can help to detect errors immediately.

6. Non-financial values

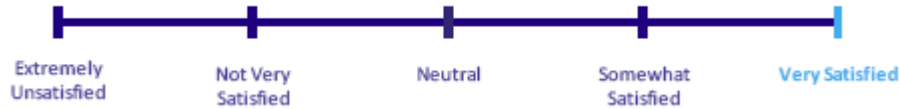
Oklahoma respondents noted several non-financial values of the new system, including gains in information accessibility, completeness, accuracy and efficiency; use of less paper; improved ease of documentation; and improvements in patient safety. The Oklahoma grant administrators said that “all the facilities knew [the value of accessibility of patient records] going in, but didn’t conceptually realize how good that was going to be.” Physicians were noted as being the most leery or skeptical user group of the technology implementation, but “they have been pleasantly surprised.” This staff satisfaction and more efficient workflows for staff were noted as specific non-financial values. Since implementation, paper workflows were reported as restricted to downtime procedures only.

Respondents noted that as result of the implementation, they anticipate decreases in malpractice premiums and in adverse drug events, though neither has happened yet. Also reported were expectations that the system will facilitate clinicians’ ability to code correctly and submit proper charges to the billing systems to further increase efficiency. Respondents noted that charts are simply more accessible and less redundant—illegible handwriting is no longer an issue, and duplicate data are no longer collected.

Patient satisfaction

Respondents were asked to report patient satisfaction of the pre-grant and post-implementation systems along the Likert scale shown below.

Both the baseline measure and implemented system measure were noted at Very Satisfied:



Implications

Measured from pre-grant implementation to post-implementation, Oklahoma respondents reported the same level of patient satisfaction for both points in time – **Very Satisfied**. The hospitals noted that patient surveys have been and will continue to be part of their internal assessments, and that the facilities have added questions to their normal patient satisfaction surveys (encounter follow up surveys) to appraise activities related to the Flex CAH HIT grant implementation. At Holdenville, staff reported that patients have not noticed a difference in their experience at the facility, other than during the registration process. As of yet, there have not been any complaints.

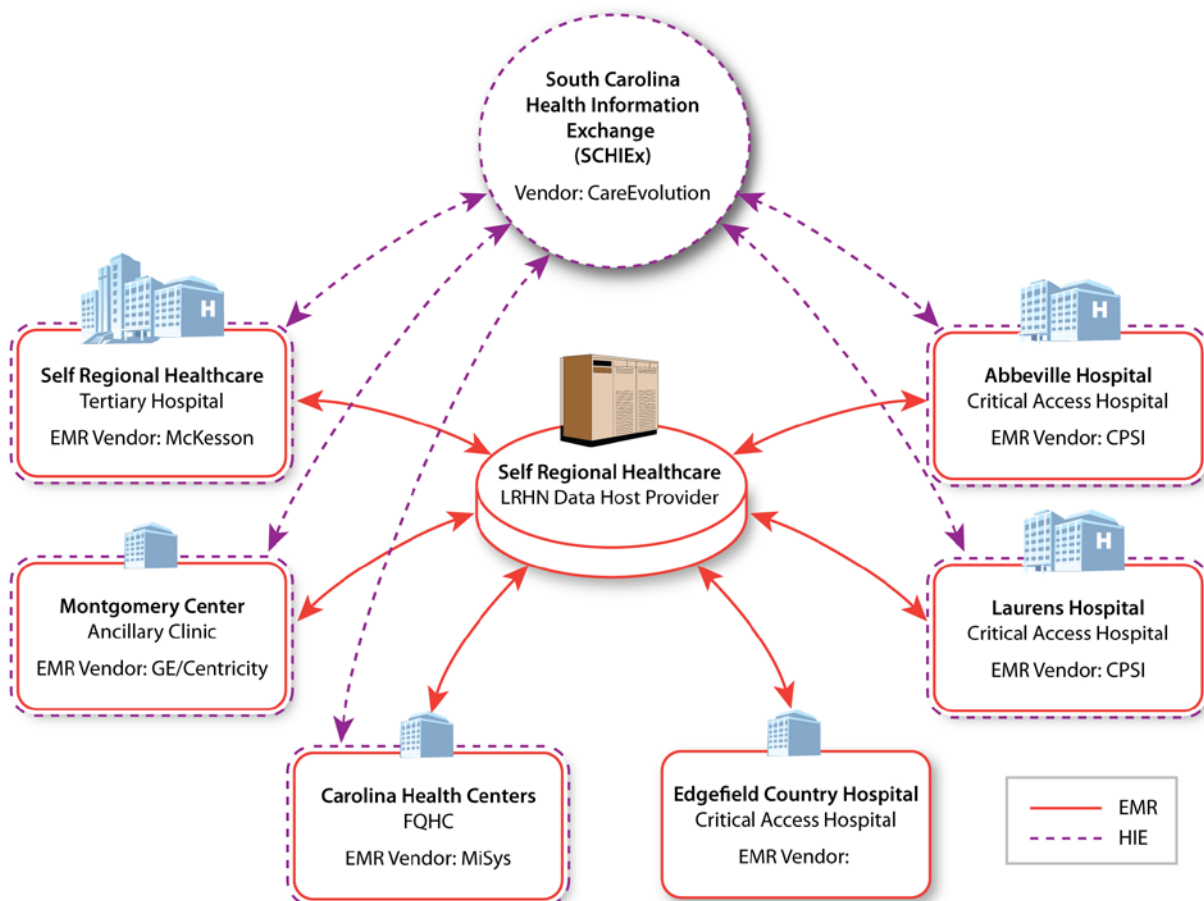
Case Study 3: Lakelands Rural Health Network HIE, South Carolina Office of Rural Health

A. Introduction

The purpose of the Lakelands Rural Health Network (LRHN) Flex CAH HIT grant project was to acquire the necessary funding and technical resources to implement a regional health information exchange and quality improvement initiative in the Lakelands area of western South Carolina. The LRHN is a nonprofit, multi-county vertical network that was developed in 2004 with the guidance and financial assistance of the South Carolina Office of Rural Health (the State FLEX grantee) to achieve efficiencies, expand access, coordinate and improve the quality of essential health care services, and strengthen the rural health care system as a whole. The goals for this grant were to:

- serve as the SC rural pilot site for an already developed HIE technology platform that includes a personal health record; and
- establish a regional quality improvement (QI) program and reporting function within the HIE.

Figure 3. Lakelands Rural Health Network Implementation Map



The LRHN Flex project consisted of both EMR and HIE implementations, as depicted in Figure 3 above. As of May 2009, Self Regional Healthcare (tertiary hospital), Montgomery Center for Family Medicine (ancillary clinic), and Carolina Health Centers FQHC were connected through the HIE. Abbeville Area Medical Center (CAH) and Lauren’s County Medical Center were in process of connecting with the HIE. Also, as part of Flex project activities, Abbeville and Edgefield County Hospital (CAH) implemented an EMR.

B. Background

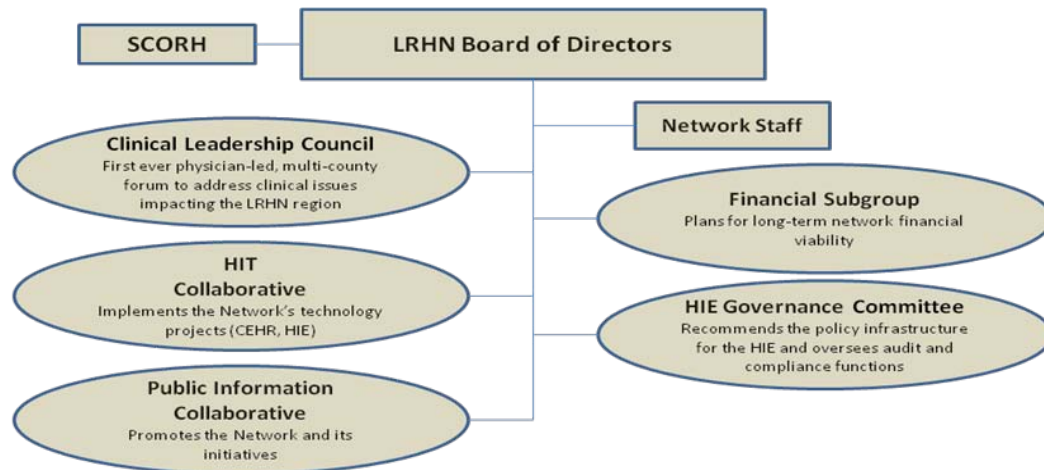
The Lakelands region of South Carolina is very rural and low-income, with declining economic health. The population is aging, diverse, poor, underemployed, and suffers from health disparities. The region has the highest rate of infant mortality in South Carolina, as well as high rates of diabetes. LRHN is a six-county partnership of key players and safety net providers in the Lakelands region designed to achieve efficiencies, expand access, coordinate and improve the

LRHN critical assumption

“Technology is not an end but a means to an end. Technology is one of many valuable tools that will achieve our goal of improving the health of residents throughout the Lakelands region of South Carolina.”

quality of health care services, and strengthen the rural health care system as a whole (Figure 4). It was developed in 2004 with the guidance and financial assistance of the South Carolina Office of Rural Health. Partner organizations include Abbeville Area Medical Center, Carolina Health Centers Inc., Edgefield County Hospital, DHEC Public Health Region 1, Laurens County Health Care System, Montgomery Center for Family Medicine, Self Regional Healthcare, The Self Family Foundation, and the South Carolina Office of Rural Health. The activities of the Flex CAH HIT grant impact nine primary partner organizations in addition to 25 practice sites that comprise LRHN.

Figure 4. Lakelands Rural Health Network Organizational Structure



The mission of LRHN is to “develop a collaborative, economically viable health network to improve the quality of care in the Lakelands service area.” Several objectives targeted by the collaborative include:

- Establishing a regional QI council to lead regional QI initiatives.
- Developing a regional HIT plan that includes expansion of an existing electronic health record (EHR) to rural primary care providers.

- Installing a HIE to help rural primary care providers fulfill the “Meaningful Use” requirement by reporting on quality indicators.

Prior to the release of the Flex CAH HIT grant in 2007, LRHN oversaw a number of activities that helped set the stage for and complement the Flex CAH HIT-funded activities to follow. For instance, the Clinical Leadership Council developed a physician-led Electronic Medical Record (EMR) Task Force to evaluate ambulatory EHR systems and recommend products that would best meet the needs of LRHN providers.

C. Planning Approaches

Role of the Physician-Led EMR Task Force

In 2006, LRHN conducted an inventory of readiness of 300 physicians located in the Lakelands, South Carolina region, the results of which indicated that the Network had only an 18 percent EMR adoption rate, but that 40 percent of inventoried practices wished to adopt an EHR within one year. Consequently, a task force comprised of physicians (the ongoing EMR Task Force) was formed and began meeting under the assumption that Self Regional Healthcare, the Lakeland region’s tertiary hospital, would serve as the host of an EMR system for the Network. The initial plan was for Self Regional to “open the system up” to all LRHN physician practices and clinics, but this arrangement encountered considerable opposition from local physicians who wished to select an EMR that would best meet their individual needs. In response, LRHN developed and distributed a survey to Network physicians to document their “wants and needs,” and the EMR Task Force examined and narrowed the multitude of HIT vendors under consideration. The Task Force used a standard assessment tool as well as the analysis of aggregate physician survey responses to make a recommendation, deciding upon the vendor that would best meet the needs of LRHN providers to lead the EMR implementation.

Planning the Health Information Exchange

The co-Principal Investigator (PI) of the Flex CAH HIT grant and de facto “physician champion” of LHRN’s Flex CAH HIT implementation project first became interested in pursuing the Flex CAH HIT grant opportunity because it included a number of elements that fit closely with the LHRN’s established mission and was a logical progression from the EMR implementation project. His personal goal was to establish QI with a focus on education and health promotion, and clinical intervention at the participating sites using HIE and comparative effectiveness research supports. However, many of LRHN’s facilities at that point had not yet implemented EMRs, with some working off a completely paper-based system.

The Co-PIs and other key personnel from the LRHN attended two strategic planning retreats at the Georgia Health Policy Institute and reviewed the Markle Foundation’s Common Framework for health information sharing to learn more about the technology and policy implications of implementing an HIE. The co-PIs engaged in a formal process as part of the Clinical Leadership Council (CLC), a physician-led multi-county forum, to discuss the clinical elements necessary for an HIE. The CLC reported its major findings to the LRHN Board of Directors, who were amenable to the implementation plan. It was reportedly a six-to-seven month process, directed by the CLC, to determine the components of a final HIE product for the Lakelands Network.

South Carolina Health Information Exchange

Unlike the EMR vendor selection, planning tools were not utilized to select an HIE vendor because a vendor had already been selected by the State as the vendor for the South Carolina Health Information Exchange (SCHIE) platform. The State designated the selected vendor to implement its HIE in partnership with the South Carolina Office of Research & Statistics (ORS). SCHIE functions much like a

Master Patient Index (MPI), which works with ORS to leverage existing data. SCHIE data will include claims data only, from Medicaid, the South Carolina immunization registry, and LabCorp reference lab. The Flex CAH HIT grant award was an important step because it allowed the LRHN to purchase and test the adapters required to implement a two-way data exchange of claims as well as clinical data with ORS. Essentially, the Flex grant enabled clinical data to be layered on top of existing claims data held by and continuously submitted to ORS under a legislative mandate to collect hospital claims information.

Involvement of Clinical Stakeholders in Planning

The HIE QI Coordinator and Flex CAH HIT project co-PI is also the Director of the Montgomery Center for Family Medicine, a teaching hospital, and has experience implementing the Chronic Care Model and measures from the National Health Quality Report (NHQR). He reported that as co-PI, his role was to “push the QI agenda” and “push what physicians want out of the HIE,” and to expand the HIE to incorporate other LRHN clinics. His co-PI on the Flex project is the Director of the South Carolina Office of Rural Health. Both co-PIs worked to ensure provider buy-in for the HIE implementation.

CAH respondents reported that at its core, LRHN is a physician-driven QI initiative. LRHN personnel visited every physician in the region to gauge their level of buy-in to the EMR and later, to Flex-funded HIE implementations. Physicians reported that the Flex award had moved them “to a point of engagement that we otherwise wouldn’t have been able to get to so quickly.” While LRHN providers were not involved in the vendor selection process because the decision for the HIE was reached at the State level, many were involved in the EMR vendor selection process, as the CLC sought their counsel and ultimately selected a vendor after thorough consideration of physician requests for various components of an electronic system.

Vendor Selection Process

The HIE vendor was written into the Flex CAH HIT grant application following approval by the LRHN Board, based upon the existing use of and established relationship with the vendor at the State-level. CAH respondents reported that there were no challenges with the HIE vendor selection process because “it was a no-brainer” and they “didn’t want to recreate the wheel.”

The Flex CAH HIT grant funded the connection of the HIE system with EMR systems already selected and installed at LRHN partner facilities. The HIE implementation project served as a support for and add-on to these EMR systems, which pre-date the Flex award.

Connecting to HIE and the State Record Locator Service

In keeping with the State’s choice of HIE vendor, LRHN desired to link to the core technology of the State for purposes of cost-savings and long-term sustainability. LRHN chose the HIE vendor because the

SCHIEx.
The South Carolina Health Information Exchange (SCHIEx), gives providers the ability to view clinical data to include medications, diagnoses, procedures, and common problems, thereby positively affecting continuity and quality of care provided, as well as assisting with controlling cost. SCHIEx will also include lab results, immunizations, discharge summaries, e-prescribing, and operative and clinical notes. These clinical data are driven from 10-years of paid SC Medicaid claims, as well as information shared from participating providers’ EMR systems.
Through SCHIEx, clinicians get the healthcare information they need, when and where they need it, to support the best possible outcomes for their patients. SCHIEx’s unique structure allows data to be organized around a person -- not a transaction, provider, or organization. By centralizing relevant patient data, SCHIEx helps practitioners make more informed clinical decisions at the point of care.
SCHIEx enables clinicians to reduce duplication and potential errors by providing them with information on services previously rendered. Through SCHIEx, providers can reduce inappropriate and unnecessary orders, paperwork and treatment delays. Providers gain insight into the care their patients have received at other locations - all at no extra cost.
Excerpt from <http://www.schiex.org/index.php>

Network had already contracted with South Carolina’s statewide Record Locator Service (RLS). The RLS adapter technology linking individual health care providers’ EMR systems to the HIE had already been fully developed at a test site in Charleston. Since the initial system design was complete, the cost-savings for connecting to the HIE vendor were significant (near \$1 million). Further, LRHN received approval from the South Carolina Data Oversight Council in March 2009 to become the second site in the State to connect to the RLS’ existing data holdings. The LRHN plans to expand the Flex-funded HIE to enable real-time clinical information sharing from disparate electronic data sources.

A subset of provider-level clinical data is attached to and shared by the RLS, providing a “thin” level of data immediately to LRHN and other State providers with access to the Internet. This capability will allow for the measurement and comparison of high-risk populations in the Lakelands region, particularly individuals with diabetes and cardiovascular disease (CVD). The Flex-funded HIE, therefore, will be instrumental in enabling physicians to generate quality reports to gauge how their patients compare nationally (using data from the National Health Quality Report). This capability of the State HIE model to report and compare provider-level clinical data

with the RLS offers an immediate benefit to coordination of care. As a result, LRHN considered an important component of the HIE to be the system’s ability to improve the Network’s quality indicators, while delivering care in the most cost-efficient manner possible.

D. The EHR/HIE System

Phase of HIT Investments at Participating Facilities

A variety of EMR systems were installed within LRHN facilities at the time of the LRHN application for the Flex CAH HIT grant. Each of the three Network CAHs also had received funding to choose and implement a vendor to meet their needs prior to the release of the Flex grant. While the co-PI reported that the HIE vendor “was comfortable” connecting its HIE applications with one of the EMR systems, he was unsure about its ability to connect to the other EMR system.

By June 2009, the HIE was interacting with Self Regional Hospital and Self Physician Practice. A July 2009 “go-live” was planned for the CAHs/clinics. The co-Principal Investigator reported delays in the initial HIE

connection with Carolina Health Center because its EMR vendor was not providing optimal service and the HIE vendor was struggling to connect to a marginally interoperable system. Additionally, delays were anticipated connecting Edgefield County Hospital because it had not yet implemented all modules (such as order entry) necessary for the facility's EMR to connect with the HIE. Edgefield had also purchased but not yet installed a practice management system, as well as modules for nursing and physical therapy, as of May 2009.

As of May 2009, the Network had three physician practices ready to go live; however, it is ideal for all ten to go live simultaneously. Eventually, any physician will be able to log on to the HIE and have access to primary care data. However, that has not yet happened, since the network administrators are waiting for the ten practices to be ready; until then, with only a few hospitals participating, the value is just not there for the clinicians. The LRHN would like the HIE rolled out as a network for all the communities rather than piecemeal; if one physician logs into the HIE and the data are not there, then the physician only "gives it a few shots" before he stops using it. At the last LRHN Board meeting, it was decided that they will go live with the HIE rollout by July 2009.

Features and Functional Components of the HIE System

Implementation involved connecting a live HL7 interface of demographic data visit information, lab data, medication lists, and reports to an HIE adapter. The HIE adapter sends fourteen unique identifiers to the ORS in Columbia, which then matches and responds back through the adapter to the other LRHN sites where the identified patient has been located. Then, other LRHN adapters send the patient's visit information into a longitudinal record. Self Regional Health Care built the HL7 architecture to support six hospitals and 22 sites, each of which has an adapter. Once a patient encounter is requested and the visit sent, the data are dropped from the central system. Patient information is secure because the only information sent is the information that the Web server requests and the database recognizes one Web server. Under this federated model, there is no central repository – each hospital, clinic, or physician practice site owns its own data. While the member sites are hosted by Self Regional Health Care at present, this functionality is movable. The facilities share responsibility for monitoring and auditing the information exchange.

System Testing

The HIE patient matching process is based on seventeen variables, and IT personnel reported a very high degree of confidence in records matching. To verify the system's reliability, a number of "dummy" records were mixed in with the legitimate patient information. The HIE successfully filtered out the false information. The vendor has also been testing algorithms.

Technical Support

LRHN employs IT technicians to staff a round-the-clock helpdesk and hotline to answer HIE training-related questions. Several layers of Helpdesk expertise are available—the users' first place to look for help is the site administrator, followed by the system administrator. If either of these parties cannot resolve an issue, it will be passed to the HIE vendor developers.

Site administrators are responsible for collecting and documenting issues and identifying recurring problems. A number of such (recurring) questions were covered during the site administrator training, enabling them to troubleshoot the most basic issues without deferring to the systems administrator or vendor developers for assistance. Early during the initial trainings targeting the site administrators, LRHN and project personnel collected a list of potential issues to be addressed, to pass on to the HIE vendor. The vendor also offers a "provide feedback" button on their Web site. CAH respondents thought

that technical support had, to date, been sufficient for their needs, and though at times they encountered vendor delays, any issues were ultimately resolved.

E. Governance, Policies, and Procedures

LHRN Network Policies

As a result of the Flex CAH HIT award, LRHN developed specific data host policies and new legal agreements. This section accounts for changes to LHRN policies and procedures anticipated by CAH respondents, as the HIE implementation was planned to go-live in late summer 2009.

In order to enter a “live mode” within the planned timeframe, LRHN developed a policy framework. Respondents explained that initially, the LRHN took responsibility for “policing” the Network, but ultimately decided to return the responsibility for enforcing policies and procedures to individual Network facilities. It was decided that each partner should have and be accountable for its own security and HIPAA privacy policies. However, the legal structure is such that the greater LRHN monitors the HIE and can approach facilities if “something goes awry.” For example, in the instance of a security breach at a Network facility, the facility’s site administrator would be notified by the LRHN, whereupon that facility would hold sole responsibility for dealing with the problem according to its own established policies and procedures.

Security

Network Architecture

Self Regional Health Care built the architecture for the HIE system to support six hospitals and twenty-two LHRN sites, each of which has an HIE adapter to communicate and share information with other sites. The idea behind this architecture was for patient data to stay within facility source systems. For instance, once a patient encounter is requested and the visit information is sent, the data is “dropped.” Patient information is therefore secure because the only information sent is information that the Web server requests. There is no central repository: each site owns its own data. The benefit of this federated model is that in the case that any one facility has a failure, patient information is secure because it is warehoused separately and not “owned” by the Network.

User Agreements

Prior to the HIE implementation project, everyone who used the EMR systems had to sign a user agreement. However, because the HIE falls under Network ownership, individual end-users no longer need sign an agreement; instead, site administrators (usually the IT manager) at each facility sign one agreement, as does the system administrator housed at

Informed Consent and the Option to Opt Out of the HIE

Part of the LHRN “governance redirection” was driven by the concept that informing patients about the HIE should be a provider-led conversation. Patients are given a brochure describing the HIE and the option to opt out, in hopes that this information will initiate a provider-patient interaction during a primary care visit, rather than at the level of office staff.

The LHRN held off the go-live date of the HIE in part to allow enough time for patients to have a conversation with their providers about how the HIE will impact privacy and confidentiality. One CAH respondent noted, “This is the quietest rollout of HIE on the planet, because we want people to come to their physician to talk about why this is a good thing or a bad thing for them. It keeps them from thinking this is a big government conspiracy” [to capture patient data].

Self Regional Healthcare tertiary hospital. The system administrator is then responsible for assigning user identification codes and passwords. Each end-user, is, however, obligated to sign a security form obligating them not to share their password.

End-users not directly caring for a particular patient have only limited access to patient data, and are not able to identify or locate demographic information on the patient. The level of access to patient data is typically in four tiers: the site administrator, the clinician, the audit record, and finally, the demographic record, available to front office personnel. If an end-user does not have an established electronic relationship with the patient, the patient's identity is hidden. The HIE system offers an advanced confidentiality feature which documents who has viewed the components of a patient record, as well as when and what components were viewed. This audit log essentially serves as a deterrent to people who should not or need not be looking at the patient chart. It is open to anyone who has been given access to the patient record.

Data Privacy and Confidentiality

CAH respondents explained that initial concerns about protecting patient privacy were unduly amplified. Key LRHN and facility personnel realized that the facilities would still be exchanging the same information as had been exchanged before the HIE implementation, just along a different (electronic) continuum. Therefore, key personnel decided that the only needed policy change related to privacy was a notification to patients about the HIE go-live, and a vehicle to allow patients to opt-out of participating in the electronic data exchange system. The Public Information Collaborative, one of the functional subgroups of the LRHN, developed material for use by Network facilities, including recommended verbiage for a notice of privacy practice, and public education material for data privacy and confidentiality, including a brochure of FAQs, an informational poster for each site, and a Website notice. The LRHN also crafted a Global Confidentiality Agreement in concert with all HIE-participating facilities, to prompt these facilities to abide by the specified policies according to HIPAA law.

Privacy and Confidentiality Components of the Lakelands Rural Health Care HIE System

- Health care providers will ask for patients' written permission to view their health information.
- Access to health information is restricted to only authorized users.
- Health providers are required to follow all the same privacy and security laws that they do now.
- HIE participation is completely voluntary; patients can opt out at any time.
- There is not a single "combined" data base. Each provider's information is kept separate and a "view" of the patient's information is created only when needed for care.
- Except for medical emergencies or special situations, health care providers must have an established relationship with a patient to view his health information.
- Health care providers must include information about the HIE in their notice of privacy practices.
- Lakelands HIE System is subject to robust audit guidelines.

F. Staff Training

As of May 2009, a designated site administrator at each participating facility was trained to be “familiar” with the features and functionality of the HIE system. Site administrators included the co-PIs, as well as IT Managers. Super-users, including medical managers, were to be trained by the co-PIs. One co-PI was responsible for training the residents, as well as other providers at the Montgomery Center. Other site administrators were tasked with simultaneously training providers and nurse super-users at their sites. The super-users were then tasked with spreading the information to all clinical staff using a “train-the-trainer” approach in order to accommodate the geographically disparate nature of the sites. This approach will also allow super-users to apply lessons learned from prior trainings as they conduct trainings at successive sites.

Site administrators reported that prior to the super-user and clinician trainings, each LRHN facility built awareness of the HIE through informational updates and general staff meetings. There were also plans to conduct subgroup staff meetings to address the concerns of specific clinical personnel. For instance,

training for medical managers was intended to target both the clinical and patient education and HIPAA components of the HIE, whereas providers would receive training only on the clinical applications. Training of front office staff would be focused on how to present notices of privacy practice to patients, since these personnel would likely receive the majority of patient questions regarding the electronic storage and transmission of their health information. One respondent noted the ability of front office staff to respond to patient questions could “make or break” patient buy-in to the HIE federated model.

Training to Respond to Patient Privacy Concerns

One of the biggest challenges to overcome during the HIE go-live is ensuring that front office staff understand how to explain the federated model of data management to patients. Patients received a brochure describing the EMR and HIE and given the opportunity to opt out of these systems. While key project personnel hope that patients will discuss the relative merits of the EMR and HIE systems directly with their providers, they are aware of the importance of addressing patient concerns at the first point of contact with office staff. Therefore, training front office staff how best to articulate the privacy and confidentiality components of the electronic transmission and storage of data in a federated model will serve as a cornerstone of staff training.

Types of Staff Trained

“Those staff who have need will be given access” to the HIE, reported a site administrator. Physicians, nurses, billing staff, and clerks will be given access to the system. The current LRHN policy for access to the HIE is to allow access only to those personnel who are inputting information. However, key LRHN personnel reported they would be amenable to the use of a de-identified patient server to make information available in the aggregate for research purposes. CAH respondents noted expectations of the percentage and type of staff that use the HIE routinely will depend on the robustness of the system.

Training Schedule

The Network determined that training should be done close to the time at which the HIE becomes functional so immediately following training, clinicians would have access to the system. As one site administrator explained, “We all have been sitting around waiting until we got enough [electronically accessible historical patient] information. If we showed the system to providers tomorrow, and they couldn’t use it right away, they’d forget about it.” While Self Regional Healthcare, the Montgomery Center, and Carolina Health Centers had the capabilities and infrastructure to go-live with the HIE, the actual date of implementation (and with it, training), was reportedly on hold until Abbeville, Edgefield, and Laurens CAHs/clinics reached a stage of connectivity.

Site administrators reported that they preferred to minimize refresher-like trainings, which contributed to the decision to hold the staff trainings as close as possible to the date of implementation. However, after the HIE go-live day, site administrators and super-users anticipate offering ongoing training. Training that encompasses the EMR and HIE system at each facility must become a part of new employee or resident physician orientation.

Satisfaction with Training

The LRHN conducted a pre-HIE staff satisfaction survey at Abbeville Area Medical Center and Laurens County Health Care System, and plan to roll out a post-live HIE evaluation, as well. However, since the CAHs/clinics received generally favorable responses to the pre-HIE (post-EMR) survey, a significant improvement in staff attitudes subsequent to the implementation was not expected. Despite the delay on staff trainings, the co-PI reported that hospital staff have been very energized and excited about the HIE implementation process, particularly young, tech-savvy doctors and resident physicians.

G. Impact on Hospital Operations

Tracking Data Through the Continuum of Care

Planners believe that the implementation of the LRHN HIE will not interfere with physician daily practice due to the behind-the-scenes extraction of data. The EMR implementations at each participating facility have positively impacted the availability of data, and CAH respondents expected the HIE go-live to further increase their ability to track data through the continuum of care. One respondent stated, “Obviously [the HIE will increase] availability, especially for the patients who don’t have any of their records with them, or who [are] incompetent or unresponsive [to information requests].”

While access to information is helpful at certain times with certain physicians and certain rules, it is not a fix for everything in health care. According to the co-PI, “Rural is the difference... because rural has space. Even distance, now [with the HIE], does not mean lack of health care. The HIE gives [providers] the ability to connect to clinics, and get a discharge summary, and be part of quality improvement even when they are one physician out in the middle of nowhere.”

Quality Improvement

Many of the more progressive LRHN providers had been interested in doing their own quality reporting, but either did not know how, or did not have the hardware or software necessary. Those clinicians who tracked QI within their own EMR systems prior to the HIE implementation had no means of validating or comparing their patient data to other Network providers or nationally, or of using QI to make ongoing improvements in health care delivery within the Network. In particular, some types of quality measures, especially those not driven by lab data or prescriptions (i.e., aspirin use or smoking status), may not have been recorded in the patient health record at all. This type of data will begin being captured by either clinicians or support staff with the HIE go-live. QI will also improve data tracking through the continuum of care, as physicians and nurses work more closely to document patient information. The capacity to track QI data will also facilitate linkages between providers through competition, and will serve as a communication mechanism among clinicians.

H. Evaluation

Diabetes Measures and Case Management

Diabetes is a major problem in South Carolina, and was an ideal chronic condition for tracking by the HIE, because the measures covered a wide range of metrics, including clinical data (e.g., foot exam), lab data (e.g., LDL cholesterol), vital signs (e.g., blood pressure), outside data (e.g., eye exam), and other measures such as smoking cessation advice and status. The standards for the evaluation measures originated from HRSA, but it was decided to use the more rigorous, NCQA point standards as a guide. CAH respondents anticipate that within a year, diabetes outcomes will show a marked improvement from baseline data collected from 2007 to 2009 across sites. They also are confident that the HIE system will contribute to decreased incidence of myocardial infarction and stroke.

How Do You Define Success?

CAH respondents defined success as meeting NCQA standards for diabetes management across the Network. Monthly provider and physician practice-level data will be used as an important tool to get clinicians to meet yearly diabetes management goals.

The use of a rigorous, national-level diabetes grading system has generated interest at the provider level. The co-PI projected that at least forty LRHN providers, in addition to residents, will send their individual and practice-level data to NCQA in order to become certified in diabetes care (diabetes certification is reimbursable by Blue Cross Blue Shield). The co-PI further described his ability to do case management using de-identified patient diabetes information. The HIE will allow for the

tracking and comparison of disease measures between providers and physician practices for the identification and documentation of individual or systemic problems. He anticipates that following the HIE go-live, physicians or nurses will be able to manage patient cases in this way themselves.

I. Supportive Factors

- **Strong Administrative/Network Leadership.** The LRHN Coordinator, the CEO of Carolina Health Centers and Board Chair of LRHN, the Associate Director of the South Carolina Office of Rural Health, and two physician champions, the Medical Director at Carolina Health Centers and the Director of the Montgomery Center for Family Medicine, each worked to advance the Flex CAH HIT implementation. Together, they served as strong advocates to enlist provider and hospital staff buy-in, to collaborate with the EMR and HIE vendors, and to generally ensure the success and sustainability of the project.
- **Engaged Physicians.** LRHN administrators reported that having two physician champions intimately involved in the construct of the implementation was immensely useful. As one co-PI explained, “Physicians help bring the impact of the EHR down to earth – where we are, what we can do, and where we can take this in the future.” Essentially, physicians serve to ground an HIT project in practicalities, and to guide implementation activities with a pragmatic, clinical-centered approach. Additionally, CAH respondents reported the two physician champions to be very hands-on with the vendor in the development of various HIE modules, workarounds, and forms.
- **Consistent Vendor Terminology.** Negotiating IT is extremely difficult for staff who are not familiar with IT jargon. Therefore, respondents reported that clear, consistent, and well-defined vendor terminology was very helpful.
- **Support from the State Office of Rural Health.** The South Carolina State Office of Rural Health (SORH) was accommodating and directly supportive, according to key personnel involved in the Flex grant activities. For instance, the SORH collaborated with LRHN staff to work through budgetary

issues, and was helpful in communicating directly with HRSA to get timely answers to facility and staff questions about the HIE implementation and vendor support.

J. Challenges and Solutions

- **Planning and Vendor Selection.** CAH respondents reported that one of the biggest challenges has been ensuring that the network technology partners understand the “real world” and the limitations within hospital systems. Many challenges with the HIE implementation were related to the “philosophical framework that is the gap between the IT world and the health care world.” From a process standpoint, the Network has had to take “a few steps back” in the timeline of the implementation when it was thought the technology would be able to accommodate a particular approach, but in fact was not yet ready to do that. “You don’t just turn a switch and have this stuff work perfectly.”
- **Interoperability.** The LRHN found one existing EMR vendor system troublesome because of difficulties encountered interfacing with the HIE system. A facility IT manager reported their EMR had a 24-hour delay when uploading information to the HIE HL7 server. The Network has attempted to deal with this delay by designing a “work-around,” or querying program that automatically uploads information to the HIE server twice daily. CAH respondents also reported a number of challenges with the corporate structure of this particular vendor. The vendor is sun setting its EMR application in favor of another EMR; however the HIE implementation was delayed in large part due to persistent interoperability problems.
- **Coordinating the HIE Implementation Timeframe.** Key personnel reported that “HIE timelines [were] kind of crazy,” whereas implementing EMR systems was a much more standard, cookie-cutter process. HIE implementation involved many more players simultaneously. “If one player is dragging its feet, then the whole process may be held up that much further. That’s why implementing an HIE is much more complicated and harder to predict.”
- **Governance.** One of the major governance challenges with which LRHN grappled, termed “breaking the glass,” was how to approach situations where clinicians require immediate access to patient information not within their jurisdiction. The ED is one department where providers often need to have this type of information access. Another scenario might include a consult, where a treating physician discusses a patient condition with another physician not typically involved in the case. The Lakelands Executive Director reported that the Network is taking “a very conservative route” to patient privacy and data accessibility, and has approached other HIEs/Regional Health Information Organizations (RHIOs) like the LRHN to consider alternative solutions.
- **Quality Improvement.** While the HIE system is capable of collecting QI data, planning for how to effectively evaluate the impact of the HIE system on patient outcomes has had “all kinds of challenges.” For example, the co-PIs spent significant personal time querying provider-level patient data and uploading it to one master spreadsheet. As one co-PI reported, he “spent all his time turning data” from the approximately fifty LRHN providers. While the result –shareable QI data across sites – was considered well worth the effort – it was possible only after much complicated and time-consuming backend work.
- **Staff Turnover.** Staff turnover at the individual facilities has been a real challenge, and has reportedly affected the Network’s philosophical approach to governance and privacy. Because LRHN’s HIE is a federated model where each facility owns its data, the facilities themselves are ultimately responsible for maintaining standards. The LRHN, however, is still responsible for producing training materials that can be implemented and adapted at the site level, as a way to maintain relative consistency among members. The co-PI added that he is not sure that staff turnover will impact sustainability significantly. LRHN respondents also expressed concern about staff turnover in relation to some key hospital

personnel who essentially championed the project. For instance, the co-PIs position was “not sustainable” if he were to leave the Network for some reason.

- **Limited IT Staff At Rural Facilities.** IT staff are hard to come by at small, geographically isolated hospitals.

K. Lessons Learned

- **Build on Established Vendor Relationships.** Building an HIE is difficult, and having pre-existing relationships with vendors is important. While conducting vendor assessments, LRHN respondents noted that the most important component is looking at which vendors are already established at facilities within the Network.
- **Technology is Only One Part of the Equation.** Respondents noted that while technology is an important component of quality health care, it is only a means to an end. While implementing the HIE, participants also remained focused on more “low-tech” components of health care, such as patient education materials, which help to change patient behavior.
- **Plan HIE Implementation.** Implementing an HIE requires the collaboration and coordination of many providers and entities; the respondents feel that an HIE implementation is therefore more complicated and harder to predict. Providers in the Network had been communicating with one another since 2003 regarding the EMR implementation. Respondents felt that this prior communication, established relationships, and previous work done on the EMR implementation bolstered their efforts to implement an HIE.

L. Sustainability

The LRHN, as the first rural test site for the HIE system, expressed hopes that other parts of South Carolina will connect to and eventually form a Statewide HIE network. LRHN respondents reported that when thinking about sustainability early on during the project planning phases, they envisioned an associated fee that would generate a revenue stream. However, because SCHIEx is offered to providers free of charge, this plan was abandoned. The LRHN Board also decided on the importance of offering a free or reduced-fee HIE to providers because the organization’s mission was to establish an electronic system that would improve quality of care, not one that would be tenuous because of providers’ inability or refusal to pay an associated fee. Other more viable approaches to sustainability mentioned by LRHN respondents, possibly dependent on Federal stimulus incentives, included:

1. Connecting the LRHN with a Regional Extension Center for technical assistance and support in the form of grant-writing and outreach.
2. Selling de-identified patient data for research.
3. Selling access to a Personal Health Record (PHR) to the public. For example, CAH respondents cited an initiative in California where individuals are reimbursed by their insurance companies for access to their PHRs. One co-PI believes that after a robust EMR/HIE system is established at the CAHs (Abbeville Area Medical Center and Edgefield County Hospital), patients might be willing to pay for a Web-accessible PHR.

Impediments to Sustainability

The cost of maintaining the HIE system was quoted at \$200,000 to \$300,000 annually. A large portion of this maintenance fee is related to the cost of maintaining the adapters at each facility. Given the present state of the economy, it is uncertain whether patients and physicians will be willing to pay for quality reporting. This is also dependent on the State financial environment and the Federal Government’s

willingness to pay for quality. CAH respondents also noted that training is a barrier to sustainability, because the resources and staff time required for adequate and routine training need to be built into the maintenance costs for the HIE.

The tertiary hospital and the HIE vendor have funded a great deal of the EMR and HIE implementation projects with in-kind donations. However, Edgefield has “a long way to go” before it has a fully functional EMR, and needs to find more grant money before it will be able to connect to the HIE.

Complementary Funding or Support for the HIT Implementation

The LRHN routinely monitors for grants that would sustain the HIE and assist facilities with annual maintenance and staff training costs. LRHN respondents reported that a QI project funded by USC Preventative Health and Family Medicine will bring in additional funding. LRHN also has earmark requests in queue through a local Congressman.

Access Health, a Duke University endowment project attempting to build a Statewide model for establishing business partnerships, is looking to approve between two and five applications in South Carolina with the goal of building sustainable networks. The LRHN HIE project is a viable candidate for an award. The Access Health project will conduct a comprehensive community needs assessment, and provide within the first year, technical assistance around building sustainability for the Network. In years two and three, funding for infrastructure and implementation will become available. Respondents reported that the technical assistance offered by Access Health would be especially useful to sustain the project.

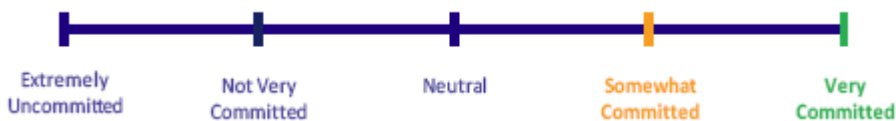
eHealth South Carolina is an initiative convened by the Office of Research & Statistics that is comprised of a number of coordinating entities, including an HIE workgroup considering how to link sub-network organizations. Since the Lakelands Network is the most rural HIE initiative in the State, the Network plans to be a key player in eHealth South Carolina. The LRHN is spreading the word about the Network’s HIE implementation at State and national conferences in hopes of learning about new funding opportunities, as well.

M. Value-Based ROI²⁰

1. Clinician commitment

LHRN respondents were asked to rate user clinician commitment before and after implementation of Flex CAH HIT grant activities along the Likert scale shown below.

Baseline Likert scale (orange) measure versus implemented system Likert scale (green) measure:



User training and support

South Carolina reported that system user groups – primarily clinicians, laboratory workers and administrative staff– were receiving initial and ongoing trainings. These trainings included formal (structured) interactions with system features. Additional user groups would be considered for training

²⁰ Refer to Appendix C for a detailed description of each variable used to calculate the value-based ROI.

if and when they were to interact directly with the system. At the time of the evaluation site visit, physicians had not yet received HIE training. Administrators planned to have lead physicians train other physicians as “physicians wouldn’t take other staff seriously.”

User feedback

LRHN respondents reported myriad methods and forums for soliciting user feedback, including a “Wants and Needs” inventory sheet, meetings, weekly scheduled conference calls, breakout groups, governance summits and emails, followed up with meeting minutes, agenda setting and action items. Within each facility, the IT Director and CEO receive feedback from clinicians and administrators, and who in turn receive information from IT Steering Committee meetings (where issues are discussed formally) in the form of meeting minutes. Additionally, historical system data are available to system users with proper authorization, allowing for better coordination of information and feedback across sites.

Implications

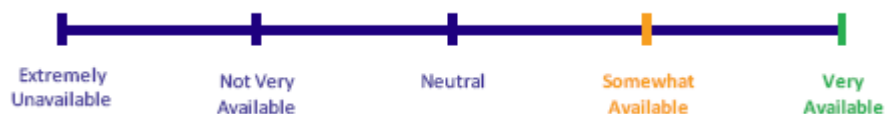
Measured from pre-grant implementation to post-implementation, South Carolina respondents reported that clinician commitment to Flex CAH HIT grant activities moved from **Somewhat Committed** to **Very Committed**. Comments received during interviews further explained that clinician knowledge of system offerings affected their commitment, as did the stage of system implementation at the time of the survey.

Further, at the time of the site visit, LRHN’s plan for system user training and support was a work in progress. Plans for both structured and more informal peer-to-peer training were under development, with some user groups – primarily clinicians (non-physicians), laboratory workers and administrative staff–receiving initial trainings. Further support for system users includes many avenues for soliciting feedback on the overall implementation and specific system functions (e.g., a “Wants and Needs” inventory sheet). Additionally, the IT Steering Committee shares information about the process and outcomes of addressing specific system issues with clinicians and administrators.

2. Information availability

Within the context of data affected by Flex CAH HIT grant activities, LRHN respondents were asked to rate how available information is, when and where it is needed, using the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



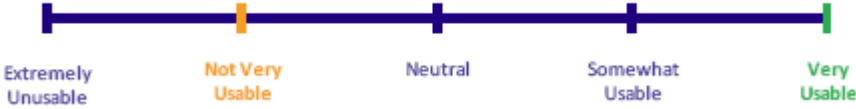
Implications

Measured from pre-grant implementation to post-implementation, South Carolina respondents reported greater information availability post-implementation – moving responses from a pre-grant level of **Somewhat Available** to **Very Available**. CAH respondents reported that before implementation, information was somewhat available, but fragmented, and that data not in-house were difficult to obtain, as access was only possible through a variety of manual means such as telephone or fax. Upon system implementation, data were not only very available for clinical data, but for de-identified (population) data as well.

3. System usability

For the HIT system(s) implemented as part of the Flex CAH HIT project, South Carolina respondents were asked to rate system usability pre- and post-system implementation using the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



User perceptions of ease of use

One grant administrator, talking about the paper-based medical records system said, “It’s like asking how you did wash before a washing machine? You just expected patient encounters to be a disaster.” Mark One respondent noted that the paper-based medical records system was problematic for new resident physicians who are mostly familiar with EMRs, and who find the transition to a rural community with only paper records very difficult. “Residents are horrified – it makes recruiting in medically underserved rural areas much harder.”

As for the overall HIT implementation, LRHN reported that physicians perceived that the EMR and HIE systems would be useful tools for integration, giving them easier access to data that would otherwise not be able.

System use

South Carolina’s sites were not all fully implemented (particularly in terms of populated data in their HIE), impeding full use of Lakelands Connect. Additionally, governance and policy procedures were also identified as inhibitors to staff fully utilizing the HIE and EMR systems.

Implications

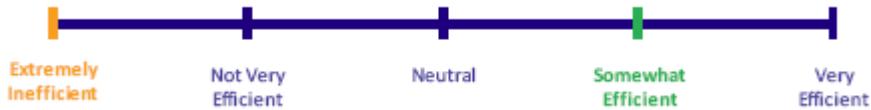
Measured from pre-grant to post-implementation, South Carolina respondents reported significant system usability improvement from **Not Very Usable** for pre-grant systems to **Very Usable** for the implemented system. Comments detailed that the pre-grant, paper-based system was not convenient and duplicative. Outside of an individual hospital site, information was fragmented, although though staff within a hospital found their own records and other information useable for their needs.

South Carolina noted that paper-based systems added to the significant challenges with recruiting resident physicians in rural, medically underserved areas. Thus, the Flex CAH HIT implementation project is seen as an opportunity to affect this information access disparity, and it was reported that overall, LRHN-affiliated physicians perceived that the EMR and HIE systems would be useful tools for integration and easier access to data that would otherwise not be available.

4. System efficiency

For the HIT system(s) implemented as part of the Flex CAH HIT project, LRHN respondents were asked to rate system efficiency before and after implementation using the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



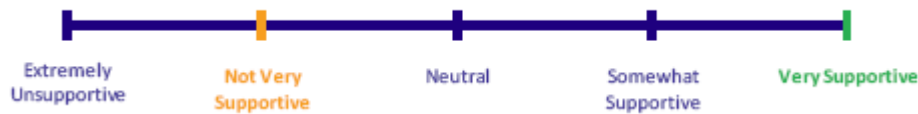
Implications

Measured from pre-grant implementation to post-implementation, South Carolina respondents reported significantly greater system efficiency post-implementation – moving responses from a pre-grant level of **Extremely Inefficient** to **Somewhat Efficient**. Comments on the pre-grant systems mentioned stop-and-go processes for information access that impeded efficient decision making and action. Information/data were fragmented and compartmentalized with cumbersome, if any, access. At this point in implementation, respondents see the system as being somewhat efficient but significantly improved over the pre-grant systems, and expect that as it is further deployed, additional efficiencies will accrue. The Web-based nature of the systems and consolidated view of the EHR, arranged in tabs, enabled users to understand information more easily and make decisions more efficiently.

5. Clinical outcomes

LRHN respondents were asked to rate their perceptions as to the pre- and post-system implementation in terms of supporting positive clinical outcomes using the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

Measured from pre-grant implementation to post-implementation, South Carolina respondents reported that the implemented system significantly increased perceived support for positive clinical outcomes – moving responses from a pre-grant level of **Not Very Supportive** to **Very Supportive**. Respondents shared additional comments that the implementation has had a huge impact on outcomes such as motivating providers to more effectively manage chronic conditions (diabetes in particular) via thorough documentation and clinical information capture. The grant administrator reported that the whole process has helped show how clinicians were collecting data – and stated that the HIE/EMR has helped him go through the documentation and care management processes more meticulously to ensure accuracy, completeness, and efficiency.

In a specific example of the implementation’s effect on clinical outcomes, South Carolina reported that before the grant, clinicians did not look closely at longitudinal diabetes numbers. However, since implementation, providers have noted that the HIE and EMR have made “a huge difference.” The grant administrator reported that he was not doing a good job of sharing diabetes-management information with other providers, but with the activities of the grant, suddenly, “we got down to individual offices having their own information and seeing what the other offices are doing and comparing themselves to everybody else, and going a step further to physicians. This motivated people much more in trying to improve their outcomes and make their patients better than everybody else.”

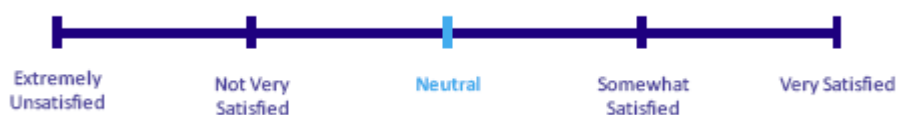
6. Non-financial values

With their EHR and HIE systems fully implemented and functioning, respondents reported that South Carolina is on the cutting edge of technology and is meeting national targets for information exchange and electronic health data with timely governance and leadership.

Patient satisfaction

LRHN respondents were asked to report patient satisfaction of the pre-grant and post-implementation systems along the Likert scale shown below.

Both the baseline measure and implemented system measure were noted at neutral:



Implications

Measured from pre-grant implementation to post-implementation, South Carolina respondents reported the same level of patient satisfaction for both points in time – **Neutral**.

One LRHN respondent shared their perception of patient satisfaction as “patients don’t have a clue about what is happening on the other side,” referencing a paper-based or an electronic system. If patients have to wait for an hour due to a lack of information availability, then they can be really dissatisfied. The grant administrator shared that “the [patient] assumption in the paper-based world, was that docs had all the information, but they didn’t” further, that “[patients] don’t appreciate the benefits so much, but they also didn’t see the drawbacks.” Respondents suggested that the bottom line is that patients are neutral to information systems, whether they are paper-based or electronic when there are no problems, and similarly highly dissatisfied when there are problems with either type of system. LRHN reported that they will continue to monitor and assess patient satisfaction through their Press Ganey patient satisfaction surveys upon discharge.

Case Study 4: Rural Wisconsin Health Cooperative Information Technology Network, Board of Regents of the University of Wisconsin System

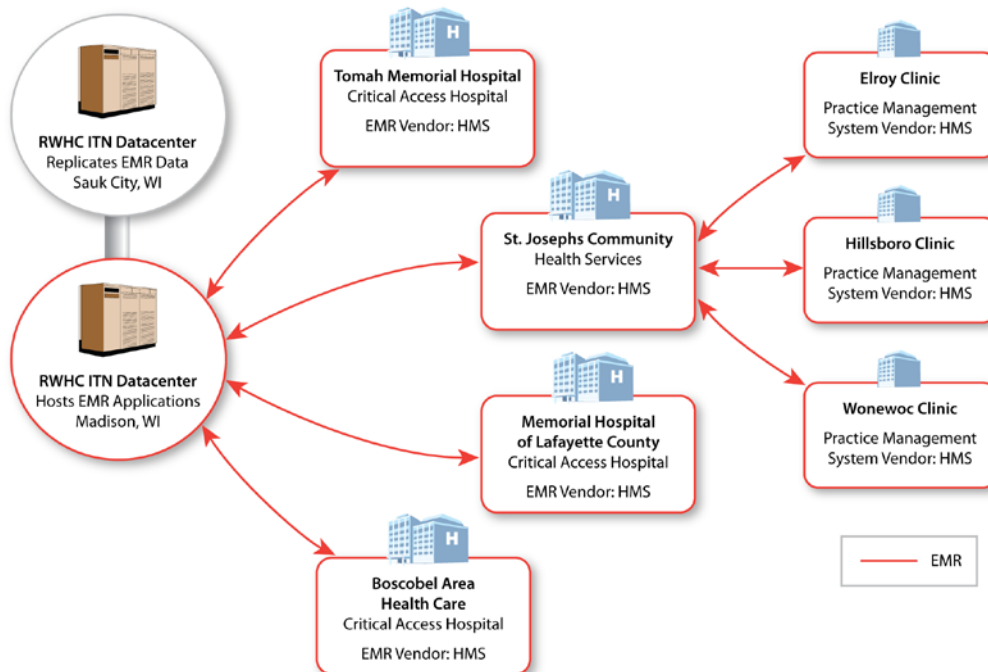
A. Introduction

The goal of the Wisconsin Flex CAH HIT grant project was to implement a collaborative electronic health record (EHR) environment (initially consisting of a hospital information system and a physician practice EMR system) that is shared by multiple CAHs from a common datacenter and supported by a pooled staff. In this model, a single CCHIT certified vendor provides the EHR software, and a collaborative non-profit entity supports a shared staffing structure in addition to a shared data storage center.

The Rural Wisconsin Health Cooperative Information Technology Network (ITN) is the nonprofit consortium organization that operates the collaborative EHR environment. The ITN’s mission is “to provide community hospitals and their affiliates with HIT applications and support services that promote high quality, cost effective healthcare.”

Figure 5 depicts the EMR information paths and relationships implemented as part of Flex CAH HIT grant activities. The secondary datacenter in Sauk City supports the Madison datacenter where the EMR application is hosted. Information is accessed at each facility from the datacenter through the use of high speed telecommunications funded by the FCC Rural Healthcare Pilot Program. While sites are not yet able to access medical record information outside of their own facility, program development is in process to allow clinicians at one ITN member facility to access patient information from other ITN member facilities.

Figure 5. Rural Wisconsin Health Cooperative Network Implementation Map



B. Background

As a result of an extensive planning process begun in 2005, the ITN recognized the need to channel resources into small hospital systems otherwise lacking the capacity to participate in EHR implementation and HIE. ITN invited a number of small, rural facilities to participate in the Flex CAH HIT grant after deciding that the formation of a collaborative of multiple small facilities using the same vendor platform was the best approach to EHR implementation. ITN involved four rural CAHs and three clinics in the activities funded by the Flex grant. The CAHs included Tomah Memorial Hospital, Memorial Hospital of Lafayette County (Darlington), Boscobel Area Health Care, and St. Joseph's Community Health Services (Hillsboro). The three participating clinics are associated with St. Joseph's.

C. Planning Approaches

Prior to the release of the Flex CAH HIT grant in 2007, driven by its vision of a collaborative HIE environment among multiple small facilities, a Wisconsin collaborative of rural hospitals (four of which would eventually become founding ITN members) initiated a goal-setting and vendor selection process in 2005. According to the ITN CIO, cost and quality were the overarching goals of vendor selection. The criteria deemed necessary to consider a vendor included the vendor's ability to support a multi-facility EHR with an integrated physician EMR and to develop data exchange capabilities between participating facilities.

After establishing these fundamental criteria, the ITN organizers solicited input from interested facilities to develop a vendor RFP. Departments such as lab, pharmacy, and nursing were given the opportunity to contribute to the RFP by outlining departmental goals in order to ensure that the chosen vendor system best met their needs. After compiling facility- and departmental-level input, the ITN incorporated the results into their vendor selection tool and RFP.

"The biggest piece of this is collaboration." The shared-staffing model enabled by the choice of a single vendor by multiple facilities saved costs and increased the feasibility of the HIT implementation project in a small hospital environment.

In addition to the release of the vendor RFP, the ITN organizers took several other steps to establish a functioning network, the intent of which was to anticipate and address future challenges:

- **Development of a legal approach.** Facilities interested in participating in an EHR collaborative agreed upon a 501(e) framework and developed a number of documents related to tax-exempt status. This work eventually led to the establishment of the ITN.
- **Establishment of staffing levels.** The ITN organizers estimated FTEs at each facility for the implementation by examining staffing levels at hospitals of similar size and revenues. The ITN ultimately recommended a combined 7 to 8 FTEs across the four participating facilities for a successful implementation.
- **Establishment of workgroups.** The ITN launched and facilitated a variety of monthly workgroups that provided a "collaborative stimulus" to guide the activities of the implementation. The workgroups included a monthly "Board of CEOs" to guide the overall strategic approach and engage hospital leadership; a "Project Workgroup" that identifies needs (for instance, how to approach order verification when facilities lack coverage by a certified pharmacist); a "Medical Records Workgroup" that works to define policies (for instance, a policy to describe the transition from a "hybrid" record to a complete electronic record); a "Quality Improvement Workgroup," a "Patient Care Workgroup," and a "Patient Accounting Workgroup."

- **Development of a vendor selection tool.** The ITN organizers developed a vendor selection scorecard, the “Hospital Information System Evaluation Methodology.” The ITN organizers established a recommended weight for the clinical, financial, ancillary, and physician EMR applications of an EHR system, as well as an “other” category to include factors such as cost. While the ITN recommended that facilities take into account the importance of clinical applications, the final scorecard weighted equally clinical and financial indicators, because, according to the ITN CIO “everyone could ultimately ascribe whatever they wanted, and the CFOs in the room felt that [clinical and financial] should be equally ranked.” The ITN organizers then distributed the Evaluation Methodology to each facility to assist them in choosing a vendor.

Involvement of Clinical Stakeholders in Planning

The ITN CIO’s role was to facilitate a process where each facility identified its preferred vendor, and then to foster collaboration among facilities if there was enough “energy” generated around any individual vendor. The ITN organizers invited the participation of all area facilities in the vendor selection process, and established a workgroup called the “Shared HIS Task Force.” This Task Force began with nine facilities, each with several staff deeply engaged in the criteria development and vendor selection process. Staff from each facility provided input to develop a set of evaluation questions to be asked of a number of vendors invited to showcase their systems at a “vendor fair.” Additionally, facilities were encouraged to submit individual staff questions and address facility priorities that were not adequately addressed in the collaborative process of the Shared HIS Task Force or other planning workgroups.

In 2007, after the HRSA Flex CAH HIT grant was announced, four of the original nine facilities involved in the vendor selection process agreed to participate in the shared EHR environment. The Flex CAH HIT grant project, according to the ITN CIO, seemed like an ideal match, given the detailed planning and vendor selection process the ITN organizers had undertaken prior to its release. In October 2007, the ITN incorporated and received its 501(e) designation.

Vendor Selection

As the initial five vendor options were narrowed by the determinations of end-user evaluations from the vendor fair, the two finalist vendors returned for a full day question-and-answer session. End-users also had the opportunity to participate in site visits at other locations to see the vendor system up and running. Four facilities ultimately agreed to collaborate--to use a shared platform, shared set of efficiencies and staff, and shared training method across sites--if one finalist was chosen as the vendor. Three facilities, in contrast, agreed to these conditions with the other finalist as the vendor of choice. Because one vendor was preferred by an additional facility, it was the final choice for the implementation because having a greater number of participating facilities maximized project benefits while reducing costs.

Anatomy of a Vendor Fair

The ITN developed a variety of tools to assess potential vendors, including a "vendor fair" to formally present vendor products to interested facility staff and stakeholders. The ITN employed "Media Site," to record and capture the presentations to allow facility staff unable to attend the fair to get a sense of vendor capabilities from their home facilities. Based on the criteria developed by the Shared HIS Task Force during initial planning for the implementation (ability to support a multi-facility EHR and develop data exchange capabilities between facilities), five vendors were invited to present at the vendor fair. Drawing from facility priorities and common themes compiled from the vendor scorecard, the Shared HIS Task Force developed a script organized by three categories: clinical-ancillary, financial-administrative, and physician-patient EMR. For each category, the Task Force developed a 90-minute script in order to demonstrate how each of the five vendor systems might handle a patient encounter from start to finish. The nine facilities involved in the vendor fair brought a variety of end-users to rank the vendor presentations using a scale that addressed each of the three categories in detail. Additionally, each vendor also set up a booth to allow end-users to "test drive" the system after the formal presentation and ranking.

Organizing the vendor fair involved a detailed process of invitation and follow-up. The organizers articulated the need to use the vendor fair as a vehicle for developing staff buy-in to the implementation by encouraging staff attendance. Staff representation from several of the involved facilities was "really impressive," and according to the ITN CIO, some facilities had as many as 30 staff people attend. However, other facilities sent only a few representatives to the vendor fair. These differences in attendance projected the respective level of involvement in and commitment to the implementation as the project progressed.

Vendor Perceptions

"Given how the project has been implemented, [the selected vendor] does a lot of things well, technology-wise. With some other vendors, it may have been a little more onerous," reported the ITN IT Manager. ITN respondents agreed that while there were pros and cons to the vendor implementation, participating facilities would likely have chosen the same vendor if given the opportunity again, particularly in the context of comparable price tags for other vendor systems.

One of the participating facilities, which had worked with the vendor's applications prior to the multi-facility implementation, reported that the vendor support was good. However, other ITN respondents surmised that because the vendor had never before conducted a multi-facility implementation, it failed to devote needed resources to strengthening the collaborative structure. The vendor viewed the project as four independent implementations, according to the ITN CIO and consequently, he was obliged to "do some real fighting at the 'upper levels' [of the vendor management] to get some of the resources for the specific needs of the [collaborative] project." Many of the issues with the vendor were resolved, according to the ITN CIO, when he requested the vendor implementation team return to Wisconsin to address several facility complaints. He reported the situation was "triaged pretty well."

Additionally, end-users expressed some frustration about the nature of “departmentalization” of the implementation. Hospital staff reported that individual facilities were burdened with determining the way in which departments should communicate information within the EHR, a challenging prospect given inexperienced staff. At the outset of the project, it was difficult to impose a higher structure over vendor workflows, according to ITN respondents. As the implementation progressed, the ITN reportedly developed the expertise and familiarity with each facility and its processes to better address workflow compartmentalization issues.

D. The EHR System

Applications of the implemented system include:

- A real-time Web-based EMR Portal application which offers “sortable” lab results, transcriptions, medication information, vital signs, patient care plans, historical documentation, and is primarily used for viewing patient information. Clinicians have the ability to see which end-users have viewed patient data, which orders have been placed and what resulted, as well as who placed the order and when it was placed. Documentation is entered via transcription in the Medical Records or Radiology departments, as well as the Patient Care Documentation system.
- A report function which includes cumulative lab results, a reporting function for medications, and an electronic signature function.
- A Patient Care documentation application which enables nurses to input vital signs and other data, as well as design and implement care plans to best meet patient needs.
- An application that allows facilities to add patient information at intake, including diagnoses and drug allergies, which will cross over with discharge information.

Tomah Memorial Hospital was the most advanced in terms of EMR at the start of the Flex grant process, as the facility had installed an electronic record for its Lab, Radiology, Pharmacy, order entry and inpatient nursing departments prior to participating in the project (self-identified as HIMSS²¹ EMR Adoption Scale level of 3 – 4). The implementation required clinicians at Tomah to access new admissions from the EMR portal (called Clinical View) rather than a paper chart. In addition, it moved Tomah from an older version of Nurse Documentation to a newer, Java-based version. Additionally, Tomah is scheduled to implement Computerized Order Entry (CPOE) to supplement its wrist verification barcode system.

Boscobel Area Health Care began the implementation with all electronic ancillaries and

HIMSS Analytics EMR Adoption Model is used to evaluate the progress and impact of EMR systems in acute care delivery environments, where:

- Stage Zero: All three ancillaries not installed
- Stage One: Ancillaries – Lab, Radiology, Pharmacy – All installed
- Stage Two: Clinical Data Repository, Controlled Medical Vocabulary, Clinical Dec, may have Document Imaging
- Stage Three: Clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology
- Stage Four: CPOE, CDSS (clinical protocols)
- Stage Five: Closed loop medication administration
- Stage Six: Physician documentation (structured templates), full CDSS (variance & compliance, full R-PACS)
- Stage Seven: Medical record fully electronic; HCO able to contribute CCD as byproduct of EMR; Data warehousing in use

²¹ HIMSS Analytics. (2009). U.S. EMR Adoption Model. Retrieved from <http://www.himssanalytics.org/stagesGraph.html>

order entry in place (HIMSS EMR rating 1 – 2). Boscobel has since added the functionality of Document Imaging (scanning) to its EMR in Medical Records and at Registration. Boscobel has also implemented the EMR portal, which allows clinicians to electronically access lab results, transcriptions, medication information, and scanned images. The facility is scheduled to implement a nurse documentation and electronic signature function. Currently, Boscobel lacks a Picture Archiving and Communications System (PACS). According to the ITN CIO, the cost of a PACS rivals the cost of an entire EMR, and because of the current economic environment, the facility will likely not be able to purchase a PACS in the near future.

Memorial Hospital of Lafayette County, the smallest participating facility, began the implementation without electronic Lab, Radiology or Pharmacy applications (HIMSS 0). During the project period they implemented financial and administrative applications, each ancillary, order entry, scheduling, patient care documentation, eMAR, Surgery Management, and the EMR portal. Memorial Hospital is also slated to implement an Exit Care discharge instruction application as part of the implementation. Memorial currently lacks a PACS system.

St. Joseph’s Community Health Services did not have electronic lab or pharmacy systems prior to the Flex grant (HIMSS 0 – 1); these were installed along with financial and administrative applications, RIS, OR Management, scheduling, patient care documentation, the EMR portal, and the Exit Care discharge instruction application. Additionally, the facility’s clinics implemented a physician practice management system. St. Joseph’s had a pre-existing relationship with the University of Wisconsin, through which it is provided PACS functionality. Prior to the implementation, St. Joseph’s bypassed Radiology by sending films directly to the University for reading. ITN and St. Joseph’s are currently working on an interface to bring Radiology results from the UW system back into the EMR portal.

System Testing

During the “file build” process, the vendor’s applications were tested by end-users and refined to best meet the needs at each facility before the go-live. The timeframe of the test period for each application was generally several weeks, but variable and dependent on the application and facility. Staff involved in system testing included 100 percent of planned end-users. The vendor relied on the training and test period to identify gaps in system functionality.

Technical Support

Technical support concerns were heaviest during the transition period from system testing to go-live. Not all the facilities were equipped with internal IT support; therefore, these facilities either used a contractor or passed issues to the shared ITN Helpdesk as needed. The Helpdesk maintains a list of hundreds of request tickets, including troubleshooting end-user questions about computer, printer, scanner, and security settings, as well as software glitches or configuration issues. While feedback from an end-user satisfaction survey evaluating IT support was complimentary, ITN IT support staff emphasized the need for additional resources in order to increase responsiveness and engage end-users in additional collaborative efforts. For example, “a big workflow problem” occurred as a result of a clinical staff person sharing a system password with a contract physician who could not access the system because IT support was not available “around the clock” to deal with the issue as it played out.

E. Staff Training

End-users were trained to use the EMR applications following a “train the trainer” model. First, vendor representatives trained ITN staff in November 2008, who then took full responsibility for training facility staff. ITN staff identified and recruited a number of super-users from nursing, as well as one ancillary staff person from each shift, who underwent specialized training before they, in turn, held trainings with

all other staff. Those end-users identified as “super-users” also met weekly to suggest changes and provide feedback as Patient Care Assessments were being developed prior to the implementation, or “go-live” period. Super users involved in the Patient Care Workgroup built files after the initial trainings, and continued to help staff throughout the go-live period.

In all, 100 percent of clinical staff at the four facilities were trained, including all nursing, dietary, occupational therapy, physical therapy, and OR staff. Depending on the facility, end users from some departments (i.e., ED, OB, OR) were not trained because there was a delay in implementing various applications.

RNs underwent four-hours of specialized training and ancillary end-users two hours of specialized training, in addition to an eight-hour training required of all clinical staff. Physicians received one-on-one training of variable length. Training time was flexible and dependent on the availability of staff and patient admit volume at each facility. Re-trainings and “touch-ups” were planned on an as-needed basis, and were necessitated in some but not all areas of the implementation. For instance, continued training on the clinical view application was reported to be necessary, as well as ongoing training for new employees.

Satisfaction with Training

While pre- and post- tests of staff attitudes of HIT were not administered to assess staff attitudes and knowledge of the applications, St. Joseph’s Community Health Services assessed staff IT savvy, and provided computer-based trainings for staff deemed less adept at computer use. Tomah Memorial Hospital also rolled out a quarterly exercise to encourage staff to practice their IT skills, which ITN staff planned to share with other facilities. Staff can exercise their skills using online resources, such as an online training library. While each clinical staff person participated in ITN-facilitated trainings, the expectation was that these staff spend additional time prior to go-live to practice their skills in the training library.

Despite these efforts to acclimate end-users to functional use of the applications, ITN respondents reported end-user concerns that the initial trainings were too broad, simply covering too much information to absorb in one session. In several cases, staff felt overwhelmed or frustrated because even after training, they judged themselves unequipped to handle the dramatic changes to workflow set in motion by the installation of an electronic system. Nevertheless, ITN respondents believed the trainings were effective overall, and increasingly so as the training cycle progressed.

F. Governance, Policies and Procedures

At the organizational level, the ITN applied for and received 501(c)3 status, developed numerous legal documents and policies pertaining to Form 990 filings with the IRS, and established an effective governance structure. The ITN also engaged in ongoing strategic planning and balanced scorecard processes that utilize data from various tools to ensure that the project “stays on track.” As circumstances change, the ITN recognizes the need to change its documentation of policies and procedures. The ITN has provided model policies for the four participating facilities that may be used in the absence of an applicable facility policy. ITN staff have completed drafts of a number of policies crafted for the CAH HIT network, however; several practical changes have been made but not yet articulated on paper as the implementation has progressed.

Security

The ITN implemented various technologies to protect the integrity and availability of the ITN Network, and developed detailed HIPAA-related policies and procedures that were found to be effective by an

independent auditing firm in their Type 1 Statement on Auditing Standards (SAS) #70 audit.²² Policies and procedures at the forefront of consideration included disaster recovery and contingency planning. For instance, the ITN is developing a risk mitigation strategy, which measures potential risks to HIT equipment and connections based on probability of occurrence. Security and auditing concerns will also be centerpieces of newly developed CAH HIT network policies and procedures.

There are two data centers, one in Madison, and a smaller, backup data center at the RWHC ITN building in Sauk City, Wisconsin. The Madison data center is on two power grids to eliminate the risk of going down. The pair of data centers enables the provision of a redundant environment that is highly available and positively affects quality. ITN staff monitor “uptime,” “downtime,” connection speeds, and overall facility usage, and receive notifications in case of downtime with the goal to eliminate such periods. This type of redundant capability would be impossible with a single-facility implementation.

Data Confidentiality

While the ITN is “strong” on physical security (for example, the user identification and biometrics required to enter the server storage units offer reliable protection), it is working to better define its remote access policy by identifying encryption and other security assessment strategies. In a rural health care environment, security is a challenge because end-users play a multitude of roles within an organization, and consequently, access must be more malleable.

The four participating facilities expect that the ITN will be very careful with data confidentiality, especially as the project moves closer to implementing the health information exchange (HIE) component. The hospitals decided rather than using a single Master Patient Index to store patient data, to maintain control of their data as four individual entities. The ITN’s focus on auditing is a key component of confidentiality that goes hand-in-hand with appropriate user accessibility to the EHR. The ITN is working to facilitate a collaborative arrangement in which each facility employs a process to address confidentiality and potential security incidents. Presently, each hospital has intrusion-detection devices funded by the Rural Health Care (FCC) Pilot Program, to monitor unauthorized network penetrations.

Interoperability

Because the facilities don’t have HIE functionality, related policies are not yet applicable and will not be until the project is closer to the HIE go-live. However, the ITN will “definitely have to consider interoperability” and will be reassessing all of these policies as the implementation progresses.

G. Impact on Hospital Operations

Tracking Data Through the Continuum of Care

The Flex grant activities have had a positive impact on data tracking and end-user accountability. Before the system go-live, respondents reported that paper charts were routinely misplaced, or handwriting was illegible, whereas after the go-live, data available electronically was accessible in a centralized repository and information was clearly legible. Also following the go-live, patient care became linked with individual end-users who completed the care. Consequently, the level of documentation is expected to improve as end-users adapt to use of the electronic system and as problems inherent in the paper-based system are eliminated.

²² SAS #70 is an auditing standard and indicates that a service organization has been through a thorough audit of their control objectives and activities, often including controls over information technology and related processes.

Clinical respondents reported satisfaction with the flow of data through the electronic system, and noted that ongoing improvements are being made since the go-live. Staff reported a number of benefits, including the ability to:

- View and compare results,
- View an entire patient encounter and historic record, and
- Review a patient record or patient complaint with a physician over the phone (where both parties have access to the information).

ITN IT staff reported that it has been very rewarding to see clinicians using the system and having all patient information accessible at their fingertips. ITN staff believe physicians will continue to have a positive experience with the electronic system, especially as it eases demands when other providers are on-call or unavailable for in-person consultation.

Efficiency

In terms of streamlining and automating reporting, the electronic system is expected to free up staff hours, thereby benefiting daily time management. However, concerns about changes in workflow were expressed, including the time consuming nature of writing notes longhand and later transcribing them into the electronic system. This was a process that was necessary for some staff, because at least one of the participating facilities had yet to purchase an adequate number of computer portals for all clinicians to carry into patient rooms while conducting rounds. One nurse reported that staff satisfaction with the efficiency of the electronic workflow was evolving as end-users develop workarounds to better navigate their new electronic responsibilities. She reported, “There are days when I could literally tear the hair out of my head, but that is part of the process. We have lots of work to do – people are on the right path – people are buying in. But, there is still some angst, especially when it gets fast and there are lots of patients.” Nevertheless, end-users noted that facility struggles with workflow were perhaps a result of hospital design rather than the EHR system.

At the start of the project, physicians in particular “dug in deep” with the existing, paper-based system. They were reticent to adopt a new workflow when they believed the existing workflow was functional. Now, according to ITN and clinical respondents, there is complete buy-in to the electronic system, even from physicians who protested the loudest at the outset of the implementation. While there have been challenges, physicians and nurses have generally worked together to troubleshoot issues and learn the “ins and outs” of the applications. One clinical respondent reported that a year ago, she was unsure whether the project would continue because of staff hesitancy, but was presently “very happy” because with some “handholding” from ITN and nursing staff, physicians have “jumped on.” She explained, “Physicians have to see a purpose and [the electronic system] cannot affect their time management. If it is going to take more time and effort on their part, they are going to be more resistant.”

H. Impact on Patient Care

Patient Safety

The general perception of end-users is that the implementation will improve quality of care as a result of more complete documentation and information availability, and fewer medication errors.

From a quality perspective, Tomah respondents reported they “are satisfied and much better off.” Clinical respondents reported that patient safety had already improved since the various facility go-lives. For example, standardization of the nomenclature has improved a lot among staff; as one end-user put it, “we are calling things by the same name.” Clinical respondents noted that while they had not necessarily realized it prior to the implementation, medication administration was unsafe without bar-scanning. Prior to the implementation, staff “probably didn’t recognize that this feature was so significant.” The medication barcoding system has been most useful in improving medication safety numbers. The results have been “remarkable,” according to clinical respondents, with a dramatic improvement already in effect for the safety of patients. The medication barcoding system “is absolutely the right thing to do for your patients. It increases safety dramatically,” reported an end-user.

Feedback from Patients

According to end-users, it has been difficult to ascertain the impact of the implementation on patients because facilities have not received a necessary quantity of patient satisfaction surveys to draw significant conclusions. To alleviate concerns about the new electronic system, during the go-live process nurses explained what was happening to patients and apologized in advance for spending time looking at a computer at the bedside. Patients reportedly seemed satisfied with the explanations and conveyed the “general sense,” according to end-users, of feeling safer. Noticeable benefits to patients described by end-users included:

- Physicians are able to show patients data in real-time.
- Patients are able to take their medication reports with them at the time of discharge.
- Physicians may produce radiology images on a compact disc for patients to take home with them.
- Electronic transmission of radiology allows physicians to review films before patients’ arrival at a facility, expediting the patient visit and eliminating the chance of films being lost during transport between referring facilities.

I. Evaluation

The goal of the project evaluation is to develop a solid QI foundation, enabling facilities and end-users to move forward with implementing more advanced HIT systems in the future, while avoiding an extraordinary amount of burden. The evaluation is examining four overarching measures. It is an ongoing process that ITN staff hope will serve as the framework for a formal QI program. The four measures are:

- **Medication Error Rates.** Medication error rates are being used as an evaluation metric because these data were already being collected, though whether consistently among sites is unknown. Medication error rates were also chosen because at least three applications were implemented related to patient safety: pharmacy, eMAR (which will potentially reduce communication errors between hospital departments), and medication bar-coding. Medication error rates in a paper-based system are reportedly “incredibly complicated to monitor,” in part because the onus to detect, report, and complete all the required documentation falls on point-of-care or frontline staff. In selecting this metric, the ITN hoped to understand how facilities capture their medication error

rates, with the goal of bringing a more “systems approach” to monitoring error rates and detecting more errors following the implementation. Indeed, at St. Joseph’s Community Health Services, the medication error rate has increased from 0.65 to 0.79 percent post-implementation. This metric was pointed to as an example of heightened error rates presumably not because of more errors, but of better capture of the information in total.

- **Discharge Instructions.** Discharge data will be monitored in hopes of improving standardization of patient care. The discharge application has gone live at Memorial Hospital at Lafayette County and at St. Joseph’s Community Health Services. The automated software will help guide staff in order to raise core measure scores in this area.
- **Patient Satisfaction.** ITN staff decided to address the following three questions with regard to patient satisfaction:
 1. The extent to which staff checked the patient’s ID bracelet before treating him/her;
 2. The extent to which the patient felt the use of computer systems improved his/her care experience; and
 3. The extent to which the patient felt the use of computer systems improved the safety of his/her care.

The ITN expected a dip in patient satisfaction as staff were trained, but also expect an improvement over time. The ITN is still waiting to receive pre-implementation patient satisfaction reports from the facilities.

- **End User Satisfaction.** End user satisfaction will be measured in the form of a Web-based survey, the focus of which is satisfaction with the RWHC ITN program, which was also used in the Balanced Scorecard.

J. Supportive Factors

- **Facility Investment in Training.** A noted support to a successful implementation was the time and energy invested in training prior to the go-live period. Clinical respondents from Tomah Memorial Hospital, whose Board and Administration were reportedly supportive of training, reported that “go-live day went very smoothly, because the training was good, problems were anticipated, and the fires were put out before they began.” End-user training encompassed two eight-hour days, plus another four-hour and two-hour training session – a significant investment in time that “really made a big difference.” “You can’t say enough for the dollars spent in training,” emphasized one end-user.
- **IT Support.** Clinical respondents praised the constant support provided by the ITN Clinical Application Specialists. Facilities lacked an adequate number of IT staff or expertise to provide readily-accessible support onsite, and the Clinical Application Specialist and Helpdesk functionality were reported to be invaluable resources. As one nurse noted, “having ITN trainers on the floor to assist with end-user questions and provide support was essential.” Another clinical respondent reported that having an IT person to serve as the “resident expert” for how to maintain the system was important to reduce fragmentation among departments and facilities, and necessary for success.
- **Staff Buy-in.** The degree of group buy-in contributed to the success of the implementation. A key success factor noted by respondents was end-user engagement in the vendor selection process. According to the ITN CIO, developing staff buy-in must begin in the early stages of planning to carry through the implementation. Staff need to “feel they had some say or stake in the decision upfront” to remain committed to the goals of the project even when encountering challenges later in the process. Valuing clinician engagement, in particular, early in the process, led to a smoother “go-live” later on in the implementation. Consensus among all types of clinical staff is important, particularly

because changing one component or application has an effect on other departments. In addition, garnering support from a wide range of staff was critical when requesting technical assistance from the vendor. “When we need something from [the vendor], we all get together, so it’s four facilities asking for a change” instead of one. “That little bit of extra clout” was very helpful for leveraging purposes.

- **Learning from Best Practices.** Tomah Memorial Hospital, the first facility to implement the system, helped the remaining three facilities set up patient care and intervention plans. Access to templates from past go-lives was very beneficial to the success of future implementation efforts, according to clinical respondents. Staff from the other three facilities visited Tomah Memorial Hospital to practice using Tomah’s forms. End-users found the ability to ask questions and discuss concerns with their colleagues at other participating facilities to be reassuring, and this process improved staff buy-in across the spectrum.
- **Sharing Lessons Learned.** The ITN CIO reported that the monthly HRSA all-grantee conference calls were useful for identifying common concerns across projects and enabled the project directors to reach out to each other to learn from shared experiences.

K. Challenges and Solutions

Training

Participating CAHs experienced various challenges pertaining to end-user training, such as sudden high patient census during planned training time prior to or immediately following go-live, and trouble scheduling re-trainings with end-users who needed a “refresher.” Other barriers encountered in training clinical staff included:

- Super users, those staff handpicked and trained by ITN trainers, encountered some difficulty training newly hired nurses. One super user said that there was a need to integrate traditional nursing skills with multi-tasking skills to efficiently enter information into the EHR. This respondent reported struggling to teach some of the less experienced nurses how to properly use the applications.
- Clinical respondents noted that a particular challenge was keeping contract physicians, who used the EHR only periodically, up to date. Additionally, nurses, who often worked shifts in several departments, were more apt to forget components of the system that differed between departments. Therefore, routinely engaging end-users with the EHR was important to preventing information loss.
- Access to training materials was a significant challenge, given limited staff time to use the training library as a resource to prepare for the go-live.

Physician Resistance to Perceived Inefficient Workflow

Clinical and ITN respondents reported that physician perceptions of the EHR led to resistance in adopting the electronic system. Physicians tended to be more hesitant to use the EHR because some elements were not as efficient as the paper-based system. For instance, template-driven documentation required in the electronic system, while more thorough and exportable, also takes longer. It would be much faster for a physician to jot notes down than to log into an application, especially order entry or CPOE. These slowdowns in large part affected physician workflow, which reduced their buy-in. ITN respondents reported that over time, physician acceptance is expected to gradually increase to a level of consistent buy-in.

Staff Turnover

Staff turnover is an especially profound issue in small hospital environments, and this held true for the ITN project. In fact, respondents reported staff turnover to be “a nightmare” and cited several examples of hospital super users who were very involved in implementation planning and strategy leaving the CAH. The ITN CIO reported that he was “very worried” about staff leaving the ITN. “It’s critical for the ITN to keep its people, because the industry is such that expertise is built over years and cannot be learned overnight.” The CIO further noted the critical role of managers to balance staff sustainability with the achievement of project goals and objectives.

L. Lessons Learned

Foster a Shared Staffing Model

Project management at the ITN repeatedly emphasized the benefits of using a shared staffing model to approach the implementation. Collaboration among facilities was essential in learning from others' experiences, prioritizing resources across the project, garnering across-the-board support for vendor selection and file-building, and getting input from the workgroups with representatives from all four participating facilities.

Mitigate the Risk of Staff Turnover

The ITN tries to hire the “kinds of people who are energized by challenges and want to make a difference.” Respondents reported that RWHC ITN staff are very mission-driven, and that the ability of ITN project management to inspire facility-level staff has likely hindered end-user turnover as a result of the EHR implementation. Keeping careful documentation and detailed work plans was cited as a method to protect against turnover-related inefficiencies.

Invest in Planning Phases and Staff Preparation for Change

Respondents agreed that it was of critical importance to invest heavily in planning for the implementation, and to prepare facility staff from the outset that there would be several months of stress immediately prior to and following the go-live period. A mentality of preparedness for challenges was thought to better enable end-users to effectively respond to unexpected issues. Painstaking file building and template design during the planning stages reap significant benefits, as well.

“Don't just have the department director explain the implementation plan to staff, but have forums and group discussions, and be honest about the difficulty of the transition [from paper to an electronic system]. Change is hard! You have to plan for change. Flexibility – the willingness to change frequently, and on the spot—is key.”

Invest in Training and Go-Live Support

A number of lessons learned were offered in regard to training and go-live support. ITN trainers recommended leaving ample time—at least two or three weeks—between scheduled trainings and go-live day, in order to give end-users a chance to absorb and practice their newly learned skills. ITN trainers also recommended putting a hold on end-user trainings until all applications were installed and available to reduce the propensity of end-users to forget elements of the trainings during the lag time. Other lessons learned about training included:

- The benefits of site visits to facilities that had already implemented EMR to supplement “spoon fed” trainings consisting only of PowerPoint screen shots from the applications. Allowing as many end-users as possible the opportunity to get practical experience was advised. Clinical respondents also encouraged the design of “cheat sheets,” or tools with screen shots explaining how to navigate the applications step-by-step.

“If you are the primary person in your organization, you feel very isolated and alone. In [the shared staffing model], because it was a collaborative effort between four facilities and the ITN, this was not the case. It is nice to bounce things off of each other and understand that ‘this is not unique to you, this is part of the process.’”

- Clinical staff suggested that read-along manuals, which would allow them to focus their attention on the training content rather than note-taking, would be helpful during the trainings. Also suggested

as potentially useful was the provision of an EHR workflow outline of “what is done and how to do it” with a new patient.

- Fully staff facilities on the day of, and for several weeks following, the go-live. Provide around-the-clock IT support in case the need arises.
- Ensure that support is available to end-users aside from full-time staff. For instance, a trainer cannot be a full-time nurse who has responsibilities on the floor if a trainee has questions. Hospital administration must provide the requisite FTEs for a trainer who is fully accessible and dedicated to that task.

Continue “Tweaking” and Improving the System

Since changes made to one application could quickly create problems with successive functions, the grantee benefited by having mechanisms in place to serve as checks that all the systems were working properly. It was considered important to make modifications when needed and to develop an audit process to ensure that “everything you think is there is *really* there.” To maintain a level of awareness about system glitches or concerns occurring at the facility-level, end-users keep a notebook to document concerns, and make these available to the ITN and vendor. “Communication is absolutely key,” as is listening and responding to staff concerns in a timely manner.

Strong Project Management and Staffing

Project leadership and standardization directed by the ITN was a success factor that streamlined the implementation. The ITN served several important functions, such as monitoring care plans to see that patient charts were accurate and complete, and providing ongoing informatics assistance and support to participating facilities. The ITN CIO recommends the inclusion of a CIO or a clinical-minded IT person, at the “administration table.” He explained that oftentimes, as the director of the IT department, the hospital CFO has a strong influence in developing the strategic plan, which consequently may be very financially driven. The expertise of the ITN in both health *and* IT enabled it to fill in this clinical gap; however, oftentimes it is difficult to find someone to fill the CIO role in a small hospital environment.

M. Sustainability

Collaboration and Shared Staffing Impact on Sustainability

During the vendor selection process, the ITN created a cost-modeling exercise to project the price to implement a single EHR vendor at the participating facilities, compared to implementing several unique vendors at one or more facilities. The model identified every cost of the implementation and essentially compared the relative cost for facilities to buy their own servers, vendor support, and additional staff time to effectively support an electronic environment and a number of other telecommunications issues. Then, it compared these individual facility costs to those generated in a collaborative environment, and found a savings of twenty percent, due to the collaborative nature of the implementation, shared infrastructure, and negotiated discounts among the facilities. The cost savings were dependent on the number of participating facilities, so as more facilities were added, savings increased. As a result of this process, the ITN has “hard evidence” that implementing an EHR in a collaborative environment results in significant cost-savings, of which long-term sustainability is a key component.

The ITN offers support services otherwise inaccessible to the CAHs and other small facilities participating in the Flex grant activities. The ability to take advantage of clinical and financial strategic planning, database expertise, and IT and Wide Area Network specialists provided by the ITN will play an important role in maintaining the viability of HIT implementation over time.

From a practical perspective, the CAH HIT project is sustainable because all the facilities signed a binding contract. Additionally, each facility organization committed to five years of participation. In other examples of this around the country, ITN research determined that facilities tend *not* to drop out of collaborative HIT implementation projects after five years. The ITN CIO stated a belief that the sustainability for this implementation is indefinite, and depends only on the ability of participating facilities to pay their monthly ITN service fees.

Impediments to Sustainability

The cost of supporting HIT goes beyond the initial capital investment required to customize vendor applications and install hardware. Particularly at small facilities, the cost of supporting an electronic system is generally much more burdensome. According to the ITN CIO, the return on investment (ROI) of an electronic system is almost always predicated on volume, where “bigger volume gets the bigger ROI.” In illustrating this point, he described the workflow at a small facility, where a single transcriptionist may keep his or her job, even after an HIT implementation, while at a large facility with a dedicated transcriptionist department, a number of staff may be eliminated and consequently, more significant cost savings incurred. “In a smaller hospital setting, there isn’t the volume, ROI, or level of IT expertise [whereas in a larger facility], there is essentially a support person for every application. A small hospital simply cannot afford that size of an IT department. This is an issue the ITN has attempted to mitigate by employing the collaborative model.” The ITN CIO emphasized that without the expertise and support services offered by the ITN, the facilities participating in the activities of the Flex grant would simply not have access to critical CIO strategic planning skills, as well as database expertise, Wide Area Network (WAN) specialists, and clinical, financial, and other IT expertise. “These are skills that a small hospital couldn’t support internally, but by collaborating, there is more of that potential.”

Complimentary Funding or Support for the HIT Implementation

Rural Health Care Pilot Program

This grant program, initiated by the Federal Communications Commission (FCC), is intended to facilitate the creation of a nationwide broadband network dedicated to health care by providing access to broadband in rural and urban areas. Because the cost of receiving broadband is significantly higher for rural areas (a 20 MG broadband connection may cost \$3,000 monthly for the participating facilities), the RWHC ITN was awarded \$1.5 million under the Rural Health Care Pilot Program. The FCC grant also funds a variety of equipment related to WAN management that has been incorporated along with the hardware paid for by the Flex CAH HIT grant. Following the award, the ITN worked with the FCC to revise the plan to meet the specific needs of the CAH HIT project, based on the more intensive needs of the four facilities that decided to participate.

Other Funding Requests

The ITN has received a Congressional Appropriation, has applied for a USDA DLT loan/grant, and has put in a request for State funding allocated from Federal stimulus dollars, to be spent to expand the CAH HIT collaborative environment from four to six, or even eight, facilities. The ITN also has submitted requests for interface support, additional support for WAN costs, and a shared PACS environment beyond the scope of the CAH HIT network participants.

Plans for Expansion

Four additional facilities are currently considering joining the ITN collaboration, so there may be expansion through additional facility participation.

Participating hospitals are planning to expand HIT functionality; one noted that “it is always a building process. No one ever finishes.” Tomah and the other hospitals are still working toward CPOE functionality. The Project Workgroup has an ongoing agenda item of collaborative technology implementation (“what can we do together, what should we be looking at...”). The ITN CIO emphasizes that only a handful of facilities that have achieved an HIMSS level 7, and the CAH HIT facilities are only at a level 3 or 4, leaving room to expand HIT functionality/capability in the future.

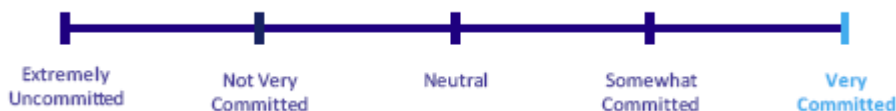
Now that the facilities have a solid foundation, the ITN CIO is available to meet with any facility to the extent that it is interested in developing a longer-term strategic process. The ITN CIO states, “A lot of people are now waiting to see what the definitions of the stimulus Medicare incentives are, because you want to take advantage of that opportunity, so you need to understand what qualifies as a certified EHR cost, which is very important for CAHs.” When the definitions of the incentives are released, the ITN CIO will recommend that he meet with the CEOs to begin sketching some strategic plans for the next few years. “As long as they understand their continuum – the strategy that they’re on – and they’re adding to that in a consistent way, then they are going to be fine. The problem becomes when people don’t have that long-term strategy, and they’re doing things piece-meal, and they don’t really know where they’re going to.”

N. Value-Based ROI²³

1. Clinician commitment

RWHC respondents were asked to rate user clinician commitment before and after implementation of Flex CAH HIT grant activities along the Likert scale shown below.

Both the baseline measure and implemented system measure were noted at Very Committed:



User training and support

RWHC respondents reported many methods for user training and support, as well as methods for assessing user satisfaction with trainings. Post-training surveys for the e-MAR implementation indicated that the training provided was seen as effective, useful and helpful, but that there was interest in more time being devoted to expand the training and support programs. Respondents also noted that those end users who spent time practicing were the most successful in utilizing the system appropriately.

Several hospital representatives noted generally that training and support are done well when there is a new implementation, but that ongoing support (i.e., for upgrades, training new hires) is troublesome. Additionally, a particular issue raised repeatedly by hospital representatives was that the quantity (i.e., time spent) and quality (i.e., detailed documentation) of vendor-supported training were below expectations.

In terms of support and training beyond what the vendor, HMS, provided and that of individual facility’s efforts, several RWHC respondents noted that the RWHC Information Technology Network (ITN) made a

²³ Refer to Appendix C for a detailed description of each variable used to calculate the value-based ROI.

significant difference in the success of the Flex CAH HIT implementation. ITN staff were able to support CAH staff during planning and implementation and serve (as one respondent put it) as translators from the vendor into everyday life. ITN’s role allows for sharing knowledge between facilities through workgroups and in collecting information related to a problem, then translating it to the vendor so it can be resolved effectively.

User feedback

RWHC relies on a variety of committees and processes to gather and consider general and ongoing user feedback. For example, for day-to-day end user feedback at Tomah Hospital, notebooks are left on every nursing cart, so users can write down suggestions. Designated staff address these suggestions promptly, and the nurses feel heard. Other hospitals rely on weekly educational sessions that are available for providers, as well as surveys and learning portals to train users and identify gaps in training and support. As referenced above, post-training surveys for the e-MAR implementation were implemented and responses indicated that users found the training to be effective, useful and helpful.

User feedback has been part of the Wisconsin Flex CAH HIT implementation from the outset – a group of clinicians was involved in the initial vendor selection processes and discussions. To feed into those discussions, information was gathered from super users and department directors about processes that needed improvement.

Implications

Measured from pre-grant implementation to post-implementation, Wisconsin respondents reported the same level of user-clinician commitment for both points in time – **Very Committed**.

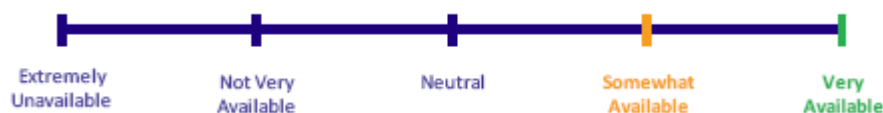
RWHC hospitals reported significant commitment throughout the Flex CAH HIT planning and implementation efforts. All hospitals noted that commitment to the project began first with the administrative staff, with other staff (clinicians, management) following their lead. Some sites reported a critical staff member—a champion-- who greatly helped planning and implementation efforts along.

This commitment was identified as vital to implementation success, as the hospitals reported struggling to overcome significant challenges. For example, one hospital reported that when the implementation began, some users could not even turn on a computer. Another challenge reported was a lack of time by people who were identified as super users, which then caused significant problems – it was shared that “people had full time jobs, and then were being asked to learn how to use computers, e-mail, SharePoint, and all the HMS applications, so it was a real challenge.” The high level of staff commitment to the project and responsiveness to addressing problems were factors in addressing and meeting these workflow changes and challenges.

2. Information availability

Within the context of information affected by Flex CAH HIT grant activities, RWHC respondents were asked to rate how available information is, when and where it is needed, along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

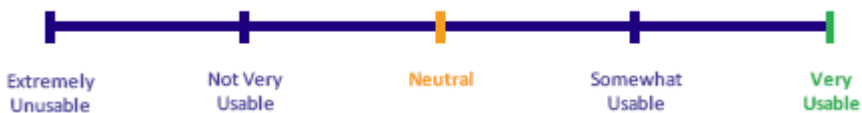
Measured from pre-grant implementation to post-implementation, Wisconsin respondents reported greater information availability post-implementation – moving responses from a pre-grant level of **Somewhat Available** to **Very Available**.

RWHC respondents reported that prior to implementation, information was incomplete (particularly in charting) and dispersed, making information difficult to manage. Also, care plans were difficult to follow completely when operating in the paper-based system, as these protocols needed to be remembered to be followed entirely. In the new, electronic system, respondents noted quicker access to lab orders and results, greatly decreasing lag time. Also, care plans were more completely followed as the implemented system prompts for missed vaccinations, referrals, and other documentation. Finally, respondents noted that electronic access to the chart has greatly diminished “fighting” over access to the paper chart.

3. System usability

For the HIT system(s) implemented as part of the Flex CAH HIT project, RWHC respondents were asked to rate system usability prior to and post system implementation along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



User perceptions of ease of use

RWHC respondents noted several user perceptions of the implemented system in terms of ease of use. CAH staff noted the following improvements upon system implementation: viewable information, without needing to flip through the paper chart or needing to track down information; easier access to previous encounter information; compliance on information date/time/authorship stamp is largely alleviated; and legibility of documentation.

Some challenges were also noted in using the implemented system. Respondents noted the paper-based system was easy to use for patient interviewing, but that it also often ended in incomplete interviewing, so the implemented system provided for more complete documentation. However, this more thorough documentation has called attention to the actual time it takes to perform appropriate documentation.

System use

As discussed above, the implemented system has been reported as very useful in facilitating more complete adherence to patient care plans, and utilization of care plans throughout the patient stay. Hospital staff reported preferring scanned information as opposed to pulling records, particularly in finding the right information within a record.

Respondents also reported that although increased information can be helpful, it can also pose challenges in some situations. Auto-generated reminders were generally seen as helpful, but also sometimes bypassed, and Memorial Hospital delayed the auto faxing of lab results because providers

were getting more information than they wanted. Also, with the implemented system, staff reported that forms are not always completed online because staff forget the form; some forms are filled out that do not have to be. Sometimes workload affects which forms are completed or not.

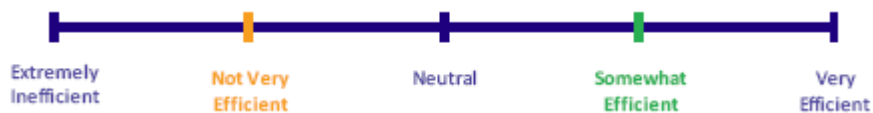
Implications

Measured from pre-grant implementation to post-implementation, Wisconsin respondents reported significant system usability improvement from **Neutral** for pre-grant systems to **Very Usable** for the implemented system. As detailed in the sections above, RWHC respondents generally found the implemented system easy to use and that system elements (for the most part) were used effectively as intended. The major area where impacts were noted for both ease of use and use as intended was in documentation – that the implemented system aided in gathering and finding appropriate, complete documentation, but that this thorough documentation took longer than it had with the paper-based system. One respondent noted “appropriate documentation isn’t always easy to do, whether on paper or electronically.”

4. System efficiency

For the HIT system(s) implemented as part of the Flex CAH HIT project, respondents were asked to rate system efficiency prior to and post implementation along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



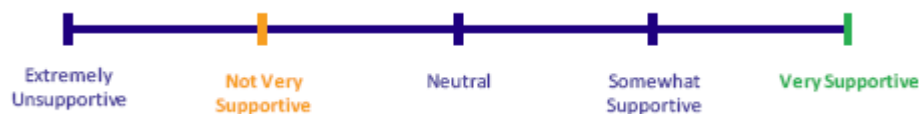
Implications

Measured from pre-grant implementation to post-implementation, Wisconsin respondents reported greater system efficiency post-implementation – moving responses from a pre-grant level of **Not Very Efficient** to **Somewhat Efficient**. Comments on the implemented system referenced an ongoing learning-curve for users of the grant. At the time of the site visit, the Wisconsin CAHs were still in the process of helping users effectively use the electronic system, affecting the overall efficiency users experienced with the system. Respondents at Memorial Hospital did note that the change process they underwent in planning and implementation forced staff to examine different department’s needs and communication paths, resulting in more effective and efficient work processes.

5. Clinical outcomes

Respondents were asked to rate their perceptions as to the pre- and post-implemented systems in terms of supporting positive clinical outcomes along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

Measured from pre-grant implementation to post-implementation, Wisconsin respondents reported that the implemented system significantly increased perceived support for positive clinical outcomes – moving responses from a pre-grant level of **Not Very Supportive** to **Very Supportive**. Respondents shared additional comments that the implementation has had significant impact on specific outcomes such as: capturing and sharing information related to patient transport; more complete charting; catching missed immunizations and vaccinations; conducting dietary evaluations and smoking cessation more frequently; and reducing early, late, or missed medication administration. Also, respondents mentioned that the patient discharge instruction process will continue to improve, as it is standardized and automated based on diagnosis. Overall, staff reported a general improvement toward working together towards common patient care goals: “The new system made us realize that we depend on one another for information, and we have to speak the same language.”

6. Non-financial values

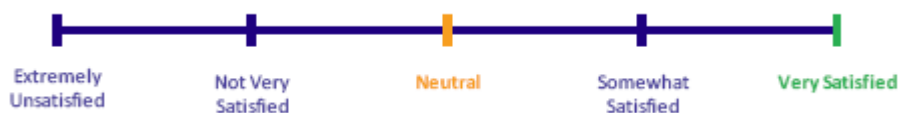
With their EMR and e-MAR systems fully implemented and functioning, Wisconsin respondents reported many benefits outlined in detail in the sections above in terms of information organization, availability, and completeness. In addition, respondents noted a greater sense of individual responsibility for completing information documentation, and staff seeing the value of timely charting. Staff also liked that multiple people can view a record at one time, without having to track down or share a single paper record.

Beyond these benefits, respondents also noted that the activities of the implementation help the affected hospitals with their reputation, as “technology savvy is perceived as an organizational accolade,” and, that by going paperless, there is the benefit of using less paper and being “greener.”

Patient satisfaction

Respondents were asked to report patient satisfaction of the pre-grant and post-implementation systems along the Likert scale shown below.

Baseline (orange) measure versus implemented system (green) measure:



Implications

Measured from pre-grant implementation to post-implementation, Wisconsin respondents reported greater system efficiency post-implementation – moving responses from a pre-grant level of **Neutral** to **Very Satisfied**. Respondents reported ITN facilities have collaborated on some common patient satisfaction surveys. These surveys include questions regarding: (1) extent to which the patient felt that computer systems improved the safety of their care; (2) extent to which the patient felt computer systems improved their care experience; and (3) extent to which staff checked patient identification bracelets before treatment. A specific area of improvement noted by one respondent was in patient medical history information – that with the paper system, patients always had to repeat their allergies, medications, and other information from their medical history, and would sometimes complain about having to do so.

Hospital staff reported some negative impact on patient satisfaction during implementation transition phases, when staff are still not completely comfortable with the system. However, staff also reported anticipating that this dip in satisfaction would be temporary, and over time patients would experience better care and coordination of care as result of the EMR and e-MAR systems.



V. Recommendations from Grantees and Conclusion

The results of the evaluation pointed to several recommendations from grantees, particularly in terms of grant administration and technical support to grantees. Throughout the grant period, grantees experienced many challenges in simply administering the grant; future programs could be designed to limit or eliminate these challenges. In addition, grantees noted that although they often needed technical support or assistance, they were uncertain of how to find or access resources available to them. This theme of TA gaps and more proactive support to ensure HIT implementation success and meaningful adoption is the most significant lesson learned highlighted by grantees, and is particularly relevant given the significant investment and emphasis on HIT in the post-ARRA world of health care. Flex CAH HIT grantees are poised to be catalysts in their states for all manner of HIT projects. For individual facility or communities investing in HIT, these grantees offer key perspective and experience to inform similar projects. For large regional or statewide HIT projects funded by ARRA – the State HIE Cooperative Agreements, Regional HIT Extension Centers, Medicaid EHR Incentive Programs, and HIT workforce development initiatives – the Flex CAH HIT grantees can serve as resources to engage priority providers and offer guidance and perspective in the execution of these projects in a rural setting. Following this idea, an HIT Primer has been developed to benefit future Flex grantees but also all rural providers in approaching HIT implementation projects. This Primer is a toolkit designed specifically for CAHs to aid them in adopting an HIT-based application or system and builds upon other tools such as those encompassed in HRSA’s Rural Health IT Adoption Toolbox²⁴ and the Rural Assistance Center²⁵ (RAC)

HIT Adoption Primer

- **Engagement:** Evaluate organizational readiness
 - Assemble multidisciplinary implementation team
 - Review and document current systems and processes
 - Define clear goals and objectives to prepare CAH/CAH network for change process
 - Detail an overall strategy to increase technology acceptance and diffusion
- **Selection:** Thorough organizational understanding and effective vendor relationships
 - Review HIT needs and current capabilities to inform RFI/RFP
 - Building the business case (i.e. estimated benefits and life cycle costs)
 - Guide for soliciting product/vendors to suit CAH needs
 - Support services for negotiation of appropriate contract terms

²⁴ More information about the Rural Health IT Adoption Toolbox developed by the Office of Rural Health Policy can be found at <http://healthit.ahrq.gov/portal/RuralHITtoolbox>

²⁵ Information guides offered by the Rural Assistance Center can be found at <http://www.raconline.org/>

guides. This Primer includes modules to address many of the specific TA needs described below in more detail, and is intended to benefit the front-end of HIT adoption challenges: engagement and selection.

A. Recommendations from the Grantees

Grant Administration

During the evaluation, grantees emphasized several grant administration challenges they had experienced, including, the limited timeframe within which to complete the project, governance issues, unclear evaluation expectations, and issues sustaining the activities of the grant. These challenges lead to the following recommendations:

Consider a longer grant funding period for future HIT planning and implementation grants. Many grantees stated that they needed more time to complete the project well. Many found the combination of planning and implementation activities expected to be covered in an 18-month period of performance to have been unrealistic. Grantees emphasized the need to plan early and plan well, noting that network partners have different levels of knowledge and comfort with technology; a thorough planning process helps an HIT project advance on a level with which all partners are comfortable. Grantees noted that planners must be “brutally honest” about existing functions and processes. One grantee noted that “taking an inefficient process and having it run faster is not effective.” Good HIT implementations should include change management, and time for these activities should be included in planning and in implementation timeframes. Project managers and planners must “engage early and engage often,” and must have a plan for the unpredictable – particularly in rural environments where HIT implementations are often blazing new trails with limited staff and expertise, and thus require additional time to do things properly to ensure project success.

Acknowledge potential governance issues and facilitate resolution. Grantees reported having widely varied governance structures, within which real and perceived challenges existed. Some reported a culture of working together as being common among smaller CAHs and/or with existing collaboratives, reporting that it was easier to generate interest, involvement, buy-in, and decision making. One noted, “Small hospitals support a culture of working together where people wear different hats [and] there’s a much more community-oriented environment and agreeable attitude in smaller hospitals.” However, for many sites, the inclusion of larger hospitals or health systems in the Flex CAH HIT network added additional complexity to ongoing governance challenges. Structural issues were exacerbated when specific governance policies were considered – such as patient compliance, patient consent, and privacy and security matters. Future grantees must be more fully cognizant of these potential governance issues. HRSA must be ready to support meaningful mitigation of such issues throughout the grant process.

Emphasize the importance and value of ongoing evaluation and clearly state expectations. Grantee evaluation intent, methods and execution also varied widely across sites. Many sites were conducting or planned to conduct staff (user) and/or patient satisfaction surveys. The benefits of HIT are theoretically and academically clear, but assessing new information systems in live health care settings, and in particular in rural health settings, have proven difficult. Disease outcome(s) and financial evaluations can take years to show outcomes, but process and value based evaluations can indicate successful projects (using intermediate evaluation), and projects likely to show disease-based and financial improvements in a longer evaluation timeframe. Trying to assess disease and/or financial outcomes prematurely can lead to successful projects being labeled as ineffective or unsuccessful, simply because not enough time has passed for these measures to be assessed. For evaluation to be meaningfully conducted by future Flex CAH HIT grantees, HRSA should clearly communicate

expectations and intent of internal evaluation, and provide technical assistance (evaluation plan examples, selecting appropriate measures, data collection methods, etc.) where possible and appropriate. In turn, grantees must understand the importance of evaluation and commit to make evaluation a central component of their project plans and execution.

Support broader sustainability planning. HIT implementation involves a lot of unknowns that can be costly from a financial (and other resource) perspective, and many grantees acknowledged this issue. Some types of sustainability may be more of an acute issue for rural hospitals – where budgets are small and staff and infrastructure resources are also seriously constrained. Many grantees reported at least some detailed plans to address sustainability – either by incorporating sustaining costs into existing budgets, and/or broadening the project to include new partners to spread expenses such as hosting fees, maintenance fees, and upgrade fees. HRSA has provided guidance to grantees in considering different types of sustainability issues – financial and other resource constraints, operational or workflow challenges, and ways to mitigate these challenges. HRSA has encouraged and supported grantees in considering the total cost of ownership (financial and other costs) for HIT systems, rather than focusing on initial purchase prices.

Technical support

Also raised by grantees throughout the evaluation were a series of technical support issues. While many grantees recognize many technical assistance (TA) resources do exist, knowledge of these resources and how to access them is extremely varied and often depends on self determination to uncover or utilize one-size-fits-all resources. Also raised was a sense that rural grantees have a difficult time articulating their needs and don't know all the relevant questions to ask, and have limited access to resources such as quality broadband services. These challenges, detailed in Section X, lead to the following recommendations:

Expand vendor selection, procurement and implementation assistance. Grantees experienced a wide range of satisfaction with their selected vendors, and noted specific times and situations during the vendor engagement where additional help from HRSA would be extremely helpful. For vendor selection, grantees commented they were unsure of what and how to ask vendors meaningful questions tailored to the site's circumstances. As rural hospitals, grantees noted (in many cases) serious inexperience in understanding and negotiating contracts and what recourse sites had during implementation to resolve issues. HRSA has been suggested by many grantees as ideally suited to actively engage with grantees to keep expectations between sites and vendors mutually reasonable, and to be an advocate for the collective grantees in navigating vendor interactions. Also, HRSA could more readily provide or point grantees to resources to develop a site's needs assessment, RFQ/RFP development, vendor selection process, vendor evaluation /comparison tools and contract development tools.

Require key staff succession planning and adequate staff education/training. Grantees identified a number of workforce issues that effected project success – namely staff retention and turnover. While grantees acknowledged that staff shortages and recruitment challenges in a rural environment are inevitable, they also pointed to turnover training and knowledge retention as aspects of larger workforce issues that could be readily improved. Grantees need to consider what happens if there is turnover in a key position. This "succession planning" can help ensure that no one person solely holds critical information, and that key staff can be effectively replaced. Additionally, many grantees shared a desire to have planned/budgeted for more staff training, and certainly beyond the training provided by the vendor. Particularly in rural environments, vendor and marketplace estimations of time to train staff can be grossly underestimated. Many grantees shared a need to allow staff time to learn basic computer skills and combat a general fear of new technology. Grantees would like HRSA to provide

succession planning tools for key staff, and explicitly encourage more staff education with specific tools and estimations for such training, tailored to rural environments.

Establish a mechanism for cross-grantee collaboration, best practices and networking. Throughout the evaluation, grantees were appreciative of the networking and collaboration opportunities facilitated by HRSA, but grantees consistently wanted additional ways to learn from each other, work together and share information. Also, grantees requested the ability to work with prior grantees, in the event that additional rounds of Flex CAH HIT are funded. However this collaboration mechanism is created or expanded, grantees indicated that they would benefit from building a stronger consortium across rural care facilities.

Additional supports for successful implementation. Grantees were aware that implementation consists of more than just buying a product and installing it, but often noted a lack of confidence in handling some of the larger issues inherent in large system implementations. Ensuring a facility or group of facilities is ready to implement and understands the technical environment in which that implementation will take place is a far more complicated and critical series of tasks. Understanding existing/legacy technology systems and infrastructure (or lack thereof), and related functions results in a complex “asset map” that defines the implementation environment that any large implementation (such as the Flex grants) will have to work within. As mentioned previously, successful implementation also should involve “change management” – where existing workflows and processes are reconsidered for efficiency and efficacy as a new system is implemented. HRSA can support “change management” procedures in future grants – to not only aid in a successful system implementation, but to uncover dysfunctional procedures and fix them.

B. Conclusion

The Flex Program itself helps to sustain the rural health care infrastructure, relying on the Critical Access Hospital as the hub of an organized system of care. To this end, the Flex Program fosters the growth of collaborative rural delivery systems across the continuum of care. Robust, useful and usable HIT systems that coordinate patient and treatment information while respecting privacy, and that enable inter-setting health care information exchange, are critical to building an infrastructure that supports patients and leads to the best possible outcomes for them. This report describes this model effort to establish and sustain HIT systems in 16 rural communities. The report describes the performance of grantees as they designed, created, and implemented functioning CAH HIT pilot networks, and describes the experiences of partner organizations in this effort. In all, theirs is a remarkable story of success, one in which some organizations reported having been entirely paper-based—indeed, with some reporting that their clinicians could not even turn on or operate a computer—to moving toward an entirely electronic system of medical and health records accessible by providers throughout a rural region. Without the commitment, funding, and support of HRSA, such successes would not have occurred. This successful pilot program will point the way for subsequent projects to promote HIT not only in rural networks, but in other systems that might be inspired by and learn from the stories told here.

Appendix A: Telephone Interview Protocols

**FLEX CAH HIT GRANTEE QUARTERLY PHONE CALL
GRANT PROJECT DIRECTOR PROTOCOL**

Grantee Name: Reporting Quarter: Date Conducted: Interviewee (name and contact info):
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In addition to discussing any issues that have been described and for which there is required follow-up in the monthly reports for the quarter, the following questions will be asked of all grantees:

- 1) If you are experiencing barriers to accomplishing and completing activities [*refer to monthly reports*], what are the predominant reasons for them? Please describe your plan for resolving them. If you do not see a clear resolution to the barriers at this time, please describe what it might take to resolve them.
- 2) What is your biggest challenge to date and what challenges do you see on the horizon?
- 3) What do you feel are the staff, resource, logistical, environmental (organizational) or serendipitous elements which have contributed to date to the implementation of your project plan? How have each of these contributed? How do these differ by CAH?
- 4) What lessons have you learned about HIT planning and implementation? Do you think these lessons are transferable to other sites?
- 5) What are the differences between CAHs with regard to planning, implementation, acceptance, and (as appropriate) utilization?

CAH-HIT Close-Out Interview Protocol

Grantee Name:

Date Conducted:

Interviewee (name and contact info):

Activities to Date

1. What activities in the workplan for this project have been completed? What activities are currently underway?

Technology

2. What, if any, technology is still needed to meet the goals of this project?

Utilization

3. What percentage of staff (by type) have been trained to use the HIT system?
4. What percentage of staff is using the HIT system, by staff type? Do you have a plan to achieve 100% use?

Outcomes and Impact

5. How do you define success? What measures are currently in place or will be put in place to track success? (*probe for HRSA-specific measures and other measures chosen by the site*).
6. What impact, if any, has the implementation had on your patients?
7. To what extent has the HIT implementation impacted the availability of data?
8. To what extent has implementation of the project allowed patient data to be tracked through the continuum of care?
9. Has the HIT implementation helped providers to work more efficiently with other providers to manage the health care needs of patients? If so, how?

10. Have any formal assessments been done of satisfaction with the project implementation among medical staff, nursing staff, other types of staff, and patients? If so, what were the results? If not, have you received informal feedback on the process and are there plans to do a formal assessment in the future?
11. What effect did this project have on the operations of your hospital and other community providers that participated in it? *Probes: What impact did the project have on quality of care? The cost of care provided? Did the impact differ by type of provider? What factors influenced the choice of providers for the HIT network, and how did the project affect linkages across providers?*

Vendor Selection

12. What has been your experience with the vendor(s) chosen for the EHR/HIE/other HIT products implemented for this grant? Would you select the same vendor(s) and product(s) if you were doing it again? Why or why not?
13. What criteria/factors were used in selecting your vendors (e.g. sustainability, cost, availability)?

Sustainability

14. How do you anticipate that the HIT implemented through this grant will be sustained both in terms of maintenance and financial, and upgraded? What type of support and maintenance has been planned for?
15. What do you think the impediments to sustainability will be?
16. Have you sought funding to complement, support, sustain or enhance the Flex activities? From whom, when, and for what purposes was the funding sought? Was funding received?

HRSA

17. What was HRSA's role with regard to your project? Was HRSA's involvement in your project helpful? If yes, how? If no, why not? What other assistance did you need from HRSA?
18. What advice would you give to HRSA with regard to any future funding (e.g. grant processes, funding limitations, structure or focus of grant program) for rural HIT projects?

19. What future types of evaluation or studies would be most valuable to you (i.e. outcome measures) as you implement and expand HIT activities?

Successes, Challenges, and Lessons Learned

20. What challenges have you encountered in implementing this project? How were they addressed? Probes for possible challenges: Staff attitudes? Resources? Time? IT infrastructure? Others?

21. What types of supports assisted in the planning and implementation of this project? How?

22. What has gone particularly well in the implementation of this project? Why do you think that is?

23. What lessons have you learned about HIT planning and implementation? Do you think these lessons are transferable to other sites?

24. What advice would you give to other CAHs about planning and implementing HIT?

Appendix B: CAH-HIT Site Visit Interview Protocol

Introductions and Project Overview

Topics: Network Background, Vendor Selection, Organizational and Staff Development, Strategic Plan, Sustainability, Value Based ROI Preliminary, Q&A

Introduction

- 1) What is your role in this organization, and how long have you worked here? (ASKED OF ALL RESPONDENTS, BUT THERE IS A SLIGHTLY DIFFERENT VERSION OF THIS QUESTION FOR EACH TYPE OF PERSON INTERVIEWED)
- 2) What is your involvement in the current HIT implementation project? How long have you been involved?
- 3) What prompted you to apply for/participate in the Flex CAH HIT grant project? (PD, CAH CEO)
- 4) Which providers are participating in the project activities? (PD, CAH CEO)
- 5) How have the medical staff/local physicians and nursing staff been involved in planning and implementing the HIT activities funded by this grant? (MEDICAL AND NURSING DIRECTOR)
- 6) What types of planning approaches were used to determine the needs and focus of your HIT implementation project (e.g. readiness assessment, workflow analysis, strategic/business plan)?
- 7) What types of relevant HIT existed at each CAH and network member prior to implementation?

Vendor Selection

- 8) What criteria/factors were used in selecting your vendors (e.g. sustainability, cost, availability)?
- 9) Who was involved in the process of selecting vendor(s) for the EHR/HIE/other HIT for this grant? For those involved, what challenges were encountered in that process? How were they addressed? Would you use a similar process if you were doing it again? (IT DIRECTOR)
- 10) What has been your experience with the vendor(s) chosen for the EHR/HIE/other HIT products implemented for this grant? Would you select the same vendor(s) and product(s) if you were doing it again? Why or why not? (IT DIRECTOR)
- 11) Was the same vendor/system selected by all CAHs or other participating entities? How has that impacted the project implementation? (IT DIRECTOR)
- 12) What providers were involved in vendor selection?

Sustainability

- 13) How do you anticipate that the HIT implemented through this grant will be sustained both in terms of maintenance and financial, and upgraded? What type of support and maintenance has been planned for? (PD, CAH CEO)

14) What do you think the impediments to sustainability will be? (PD, CAH CEO)

15) Have you sought funding to complement, support, sustain or enhance the Flex activities? From whom, when, and for what purposes was the funding sought? Was funding received? (PD, CAH CEO, IT DIRECTOR)

Funding Source	When requested	Timeframe of funding	Funding received?	Purpose of Funding

16) Are there plans to expand HIT functionality/capability at the hospitals that are currently part of the network or to additional hospitals? If so, what will the expansion involve? If not, why not? (IT DIRECTOR)

17) What is the impact of staff turnover on the sustainability of the system? (PD, CAH CEO)

HRSA

18) What was HRSA’s role with regard to your project? Was HRSA’s involvement in your project helpful? If yes, how? If no, why not? What other assistance did you need from HRSA? (PD)

19) What advice would you give to HRSA with regard to any future funding (e.g. grant processes, funding limitations, structure or focus of grant program) for rural HIT projects? (PD)

20) What future types of evaluation would be most valuable to you (i.e. outcome measures)?

Network/Telecommunications Infrastructure

Topics: Datacenter Tours, Server Configuration/Redundancy, Wide Area Network (WAN) Configuration, Network Security, Q&A
 Confirm network implementation map

System Functionality

Topics: Demonstration of Various Applications in Use, Including Patient Care Documentation, E-MAR, Clinical View, ExitCare, and Others, with Focus on Clinical Applications; Q&A
Use this time to learn about system.

Functionality – review Step 1 of ROI and use to confirm understanding

- 1) As part of your project, what functional components have been implemented in your hospital and/or clinic (e.g., laboratory data, pharmacy data, radiology data, surgical procedures, clinic and inpatient notes etc.)? (PD, CAH CEO, MEDICAL DIRECTOR, NURSING DIRECTOR)

Technology

- 2) What testing of system functionality has occurred? What measures were used? What are the results? What problems or gaps have been identified? (PD, CAH CEO)
- 3) What, if any, technology is still needed to meet the goals of this project? (PD, CAH CEO, IT DIRECTOR)
- 4) To what extent has the HIT implementation impacted the availability of data?
- 5) To what extent has implementation of the project allowed patient data to be tracked through the continuum of care? (PD, CAH CEO, IT DIRECTOR)
- 6) Has the HIT implementation helped providers to work more efficiently with other providers to manage the health care needs of patients? How? (HIE DIRECTOR)

Implementation Activities

Topics: Recap of Activities To Date/Workplan Review; File Building Process Discussion; End-User Training and Go-Live Discussion, Next Steps; Q&A

Activities to Date

- 1) What activities in the workplan for this project have been completed? What activities are currently underway? (PD, CAH CEO)

Staff Training

- 2) What type of staff training has been conducted? What types of staff have attended? Was the training required? How many staff have participated in the training, by staff type? (PROJECT DIRECTOR, CAH CEO)
- 3) When did the training occur? How frequently has it occurred? (PROJECT DIRECTOR, CAH CEO)
- 4) How has it been determined what trainings should be held? (PROJECT DIRECTOR, CAH CEO)
- 5) Have pre- and post-tests of staff attitudes and/or knowledge of HIT been conducted? If so, what were the results? (PROJECT DIRECTOR, CAH CEO)
- 6) Was staff satisfied with the training? Has there been any assessment of staff satisfaction with the training? If so, please describe. (PROJECT DIRECTOR, CAH CEO)
- 7) How effective do you feel the trainings have been? (PROJECT DIRECTOR, CAH CEO)
- 8) What additional training, if any, would be useful? (PROJECT DIRECTOR, CAH CEO)
- 9) How was the medical staff and nursing staff trained to use the EHR? What percentage of medical staff (and nursing staff) participated in training? How effective do you feel the training has been? Was the medical staff (and nursing staff) satisfied with the training? What additional training, if any, would be useful? (MEDICAL AND NURSING DIRECTOR)

Utilization

- 10) What percentage of staff (by type) have been trained to use the system?
- 11) What percentage of staff are using the system, by staff type? Do you have a plan to achieve 100% use? (PD, CAH CEO, MEDICAL DIRECTOR)
- 12) What is the average number of users on a daily basis, by staff type? (PD, CAH CEO)

Helpdesk/Application Support and Education

Topics: Helpdesk Structure; PhaseWare and Sharepoint Demonstration; Educational Activities and Tools; Q&A

Technical Support

- 1) How is technical support provided to the medical staff (e.g., internally by CAH staff or externally by the network or another entity)? What types of technical support have been requested? Please describe support requests by type of staff, including physicians, nurses, clerical/support staff, and accounting. How effective do you feel the technical support has been? What additional support, if any, would be useful? (MEDICAL DIRECTOR, NURSING DIRECTOR, and IT DIRECTOR, PD, CAH CEO)

Policies and Procedures

Topics: Review of Various Operational Procedures, with Focus on Operational Security, Q&A

1. How have policies and procedures changed since the HIT implementation? What new types of policies and procedures have been put in place?
2. How has the project implementation handled interoperability issues?
3. How has the project implementation handled data confidentiality issues? (IT DIRECTOR)

Project Evaluation

Topics: QI Plan: Discharge Instructions, Medication Errors, End-User Survey Results, Patient Satisfaction, and QI Submission Facilitation; Levels of Utilization; Next Steps; Q&A

Outcomes and Impact

- 1) What is the status of the individual site evaluation for the grant? What methods were used? What have been the results to date? (PD)
- 2) How do you define success? What measures are currently in place or will be put in place to track success? (*probe for HRSA-specific measures and other measures chosen by the site*).
- 3) Is your system capable of collecting data to report on the outcome measures you have chosen? (PD, CAH CEO) If not, how and when do you anticipate you will be able to collect this data? (IT DIRECTOR)
- 4) Do you have baseline data on your outcome measures? (PD, CAH CEO)
- 5) What impact, if any, has the implementation had on your patients? (PD, CAH CEO)
- 6) Have any formal assessments been done of satisfaction with the project implementation among medical staff, nursing staff, other types of staff, and patients? If so, what were the results? If

not, have you received informal feedback on the process and are there plans to do a formal assessment in the future? (CAH CEO, MEDICAL AND NURSING DIRECTOR)

- 7) What effect did this project have on the operations of your hospital and other community providers that participated in it? *Probes: What impact did the project have on quality of care? The cost of care provided? Did the impact differ by type of provider? What factors influenced the choice of providers for the HIT network, and how did the project affect linkages across providers?* (CAH CEO)

Staff Attitudes and Lessons Learned: Panel Discussion

Topics: Panel Discussion of Challenges, Barriers, and Benefits of EHR Implementation Initiative. Topic Detail to be Developed and Distributed Prior to Meeting.

Participants: Network Staff; 3 Representatives from Each of the Network Member Facilities (Including Nurses, Physicians, IT Managers, Executives, Pharmacists, QI Managers, etc. to the extent available.)

- 1) Is staff satisfied with the system?
Probe for: relevance of available data, timeliness, accessibility, impact on patients, facilitation of workflow/daily tasks, and responsiveness to requests for support.
- 2) Has the implementation of EHRs (or specific components if not all have been implemented) improved the ability of clinicians to provide patient care? How? (e.g., track quality measure data for patients with chronic conditions and follow up)? Which system components are most useful to your clinical practice? (MEDICAL AND NURSING DIRECTOR, PD, CAH CEO)
- 3) What impact has implementation had on patients? What feedback have you received from your patients? (MEDICAL AND NURSING DIRECTOR)

Successes, Challenges, and Lessons Learned

- 4) What challenges have you encountered in implementing this project? How were they addressed?
Probes for possible challenges: Staff attitudes? Resources? Time? IT infrastructure? Others? (PD, CAH CEO)
- 5) What has been the most challenging aspect of this HIT project for clinicians? (MEDICAL AND NURSING DIRECTOR) What types of supports assisted in the planning and implementation of this project? How?
- 6) What has gone particularly well in the implementation of this project? Why do you think that is? (PD, CAH CEO)
- 7) What lessons have you learned about HIT planning and implementation? Do you think these lessons are transferable to other sites? (PD, CAH CEO)
- 8) What advice would you give to other CAHs about planning and implementing HIT? (CAH CEO, IT DIRECTOR)

Appendix C: Value-Based Return on Investment (ROI) Protocol and Tools

There are many methods and approaches to consider when evaluating return on investment (ROI) of health information technology (HIT) implementations. Financial and disease outcome-based ROI can take years to accrue, but more value-based ROI measures can be good predictors of future financial and disease outcome-based ROI. The focus of the Flex CAH HIT ROI evaluation is on how and where users (patients, clinicians, administrators, etc.) of an implemented HIT system obtain value. For the Flex CAH HIT projects, the following tools are designed to incorporate both qualitative and quantitative value-based ROI measures to capture important information in an appropriate and reasonable manner within the evaluation timeframe.

Steps 1 & 2 are mostly concurrent and serve as tools for establishing baseline measures for comparison with the implemented grant system(s) and activities. Step 1 is a clarification and understanding exercise that also serves as the context for completing Steps 2 & 3. See attachments for further detail.

Step 1

For each project to be evaluated, Flex CAH HIT grantees will first utilize the attached Functional Definition tool. This tool is used to parse out the individual functions and participants involved in the project's scope, and to further define the specific relationships among data suppliers, data users and the purpose of the information being shared.

The tool provides lists of possible HIT functions as well as possible HIT participants, however individual CAHs will have the opportunity to add or combine up to three user defined functions and three user defined participants.

CAHs will fill in this tool to the best of their ability prior to a conversation with a member of the Altarum team. The result will be confirmation between the CAH and Altarum as to the specific functions and participants affected by the Flex CAH HIT grant.

Step 2

Next, grantees will utilize the Understanding Pre-Grant System(s) and Activities questionnaire to assess several measurement elements of the pre-grant system(s) and activities involved in the Flex CAH HIT project. This tool serves as a baseline measure to understand where each CAH is (their "pre-grant processes") as a means towards comparing the impact of the grant activities (their "to be processes").

CAHs will fill in this questionnaire to the best of their ability prior to a site visit with a member of the Altarum team. The result will be confirmation between the CAH and Altarum as to the current state of the specific systems and activities to be affected by the grant.

Step 3

Finally, grantees will utilize the Understanding Implemented Grant System(s) and Activities questionnaire to assess several measurement elements of the implemented system(s) and activities involved in the Flex CAH HIT grant. This implementation information collection step would then be compared against the baseline measurements taken in Step 2.

CAHs will fill in this questionnaire to the best of their ability prior to a conversation with a member of the Altarum team. The result will be confirmation between the CAH and Altarum as to the implemented state of the specific systems and activities affected by the grant.

Beyond the tools currently developed for Flex CAH HIT evaluation, it should be noted that additional ROI measures of specific clinical outcomes and quality improvement are extremely important effects in HIT implementation. Clinical and quality improvement measures require a significant observation period to

appropriately assess implementation and ROI effects, and therefore are not reasonable to directly consider in the limited timeframe of this evaluation project.

Given this, the baseline measures Flex CAH HIT grantees will establish in Steps 1 & 2 may be utilized in future ROI evaluations of clinical and quality improvement measures. Additionally, it may be desirable to have CAHs answer additional questions regarding specific disease outcome, workflow and staffing changes to be affected by the grant, including any relevant measurements (e.g. FTE changes, task time, functional or other direct costs).

Step 1 – Functional Definitions

The first step in this tool is to define the list of HIT functionalities that your Flex CAH HIT project is implementing. Below is a list of possible HIT functionalities, however, you may not find the specific function you are looking for on the list. Or, you may wish to combine several functions under a single label. If so, you may enter up to three of your own function labels in the yellow cells (text in these cells reads “Enter User Defined...”) below. The goal is to try and find your project's functions and participants on the list as much as possible, so as to be consistent. Please read the full list before you begin making selections.

List of HIT Participants	Additional Detail
Ambulatory surgery	Ambulatory surgery (hospital-based and free-standing)
Ancillary staff	Ancillary staff (such as cleaners, porters, kitchen staff, etc.)
Behavioral/Mental Health inpatient providers	
Behavioral/Mental Health outpatient providers	
CMS/Medicare	
Community outreach clinics	Community outreach clinics (public health, school health, nursing clinics, express care)
Durable Medical Equipment providers	
Employers/Plan Administrators	
Health plan enrollment stations	
Hospitals	Inpatient hospitals
Inpatient pharmacies	
Inpatient physicians	Medical/surgical inpatient physicians
Inpatient nurses	Medical/surgical inpatient nurses
Laboratories	Laboratories (including hospital-based, public health and free-standing)
Local public health agency	Local public health agency (excluding clinics and labs)
Non-radiology procedure centers	Non-radiology procedure centers (including hospital-based and free-standing)
Other therapists	Other therapists (e.g., occupational therapy, physical therapy)
Outpatient pharmacies	Outpatient pharmacies (including hospital and free-standing)
Outpatient physicians	Medical/surgical outpatient physicians
Outpatient nurses	Medical/surgical outpatient nurses
Patients or caregivers	
Pharmacy Benefit Managers (PBMs)	Pharmacy benefit management companies
Pharmaceutical and Medical Device	

List of HIT Participants	Additional Detail
manufacturers	
Primary care physicians and clinics	
Private health plans	
Quality improvement personnel	
Radiology centers	Radiology centers (including hospital-based and free-standing)
Regulators	FDA, DEA, state regulators
Researchers	
Skilled nursing facilities	
Specialty Care Physicians and clinics	
State Medicaid	
State public health agency	State public health agency (excluding clinics and labs)
Enter User Defined Participant #1	
Enter User Defined Participant #2	
Enter User Defined Participant #3	
Case management and care coordination	
Claims management	
Clinical document availability	Clinical document availability (e.g., populating an EMR)
Clinical document exchange	Clinical document exchange (e.g., discharge summaries sent between providers)
Health plan enrollment verification	
Historical allergy list	
Historical procedure list	
Historical visit/hospitalization list	Historical medical encounter (hospitalizations, visit list)
Medical record	Medical record (remotely stored, internet-served EMR)
Medication decision support	Medication decision support (safety or other alerts)
Medication formulary check	
Medication list	Historical medication list
Medication prescription delivery	Medication prescription delivery (e-prescribing)
Patient access to health records	
Patient alerts or reminders	
Patient sending health information to providers	
Patient-provider e-mail	
Price/cost information	

List of HIT Participants	Additional Detail
Procedure or test ordering	
Procedure/referral authorization	
Provider-to-provider e-mail	
Public health information to clinicians	Public health information to clinicians (alerts)
Public health reporting	
Referral and/or consultation management	
Registry for disease care management/improvement	
Registry for public health surveillance	Registry for public health surveillance (e.g., cancer, injuries)
Registry of immunization, medication or devices	
Reporting and analysis of quality or safety performance	
Results delivery	Results delivery (lab, radiology)
Results list	Historical results list (lab, radiology)
Enter User Defined Function #1	
Enter User Defined Function #2	
Enter User Defined Function #3	

Functional Definition Tool- Step 1 of 3

Starting with row 6, below, please indicate who will be exchanging data with whom, and for what purpose, as part of your Flex CAH HIT implementation. Multiple Data Suppliers and/or data users may be selected for each functionality by selecting each participant in a new cell moving down the list. For additional participants, Functionality should only be listed once, at the first line of the relationship. Please change the Func # column (first column) to be numbered appropriately for each Functionality. Next, indicate the current level of interoperability for each function. Fill in as many rows as needed. Please read the full list before you begin making selections.

In addition to this specific relationship assignment, please describe the expected impact of the HIT intervention and how the project will exert this impact (read text on next page).

Func #	Data Supplier	Data User	Functionality	Pre-Grant Level of Interoperability	Expected Level of Interoperability
1	Inpatient nurses	Ancillary staff	Procedure or test ordering	Level 1	Level 3
	Other therapists				
2	Ancillary staff	Inpatient physicians	Results delivery	Level 1	Level 3
		Inpatient nurses			

Func #	Data Supplier	Data User	Functionality	Pre-Grant Level of Interoperability	Expected Level of Interoperability
		Other therapists			
3	Inpatient nurses	Inpatient physicians	Clinical document availability	Level 1	Level 3
	Other therapists	Inpatient nurses			
	Ancillary staff	Other therapists			
		Quality improvement personnel			
4	Inpatient pharmacies	Inpatient pharmacies	Medication list	Level 1	Level 3
	Inpatient physicians	Inpatient physicians			
	Inpatient nurses	Inpatient nurses			
		Other therapists			
		Quality improvement personnel			
5	Ancillary staff	Ancillary staff	Medical record	Level 1	Level 3
	Inpatient nurses	Inpatient nurses			
	Inpatient physicians	Inpatient physicians			
	Other therapists	Other therapists			
		Quality improvement personnel			

Narrative Description of Intervention

1. Procedure or Test Ordering: Rather than writing down orders and sending or faxing to ancillary departments (Lab, Radiology), nursing areas input orders through the HMS Order Entry System. The ancillary departments immediately (in real time) receive orders electronically. This eliminates the process of nurses writing and delivering and then ancillary staff transcribing the paper information into ancillary systems. In addition, orders go through various contraindication, duplicate order and therapy checking decision support algorithms. Also, orders are checked against diagnosis to ensure medical necessity for coverage, and advanced beneficiary notices (ABNs) are automatically generated in case of potential non-coverage. For verbal or phone physicians orders, the HMS system requires readback verification documentation, which is routed to the physicians electronic signature inbox in Clinical View. Orders (and results) are available to be viewed as a component of the patient's medical record
2. Results Delivery: As by-product of HMS order entry system, results are delivered and available in a variety of ways. They can automatically print out at the ordering departments network printer, and also

are available through HMS's Monitor and Clinical View applications, and are sent to the physicians electronic signature inbox in Clinical View, where a warning notification is given when new result/orders are available. Out-of-range results are flagged as priority items. Through Clinical View, results can be graphed to indicate changes over time. Results are over the life of a patient and no data is archived, which allows clinicians easy access to past data

3. Clinical Document Availability: Using the HMS multidisciplinary Patient Care Documentation application, inpatient nurses and other therapists input initial assessments, progress notes, vital signs, and a variety of other clinical documents directly into the Patient Care application rather than using paper forms. This intervention allows for the use of logic driven processes, including skip and branch logic, required fields, reminders, and careplans and orders being generated as byproducts of documentation. Care plans include goals and interventions to achieve completion; and careplan worklists with time intervals are created automatically. Accurate authenticated user and date/timestamp information is automatically logged through all phases of documentation. And the information generated is available for multiple caregivers from multiple locations to review, rather than in a single paper chart location, as was previously the case

4. Medication List: Rather than maintaining multiple paper medication lists, pharmacists and nursing staff use the HMS Pharmacy and Patient Care applications to collaborate on a single electronic medication administration record that is updated in real-time as medications are added, removed, and administered. This allows for accurate user and timestamping, and also for the most current medication information to be available to all providers. The system captures home medications and provides for medication reconciliation as part of the CPOE (not yet implemented) and discharge process

5. Medical Record: Through the HMS Clinical View application, caregivers can effectively view the patient's electronic medical record, including the information related to the above interventions, as well as physician dictations, various scanned documents, clinical information from previous visits, and other information. Clinical View also allows physicians to e-sign off on dictations, and will be the application from which they perform CPOE. PACS images can be integrated through Clinical View (PACS integration is currently implemented at only one of the facilities), and there is flexibility as to the presentation of the various data elements, which may be customized by provider preference. This intervention allows multiple clinicians simultaneous flexible access (including remote access) to much of the information they need to make care decisions; whereas previously the information was only available in a single paper chart.

Interoperability Levels	
Level 0	Data not exchanged prior to grant activities
Level 1	Phone and mail (paper based) communications
Level 2	Machine-transportable data (standard fax)
Level 3	Machine-available data (EMR, email and electronic messaging)
Level 4	Machine-interoperable data (interoperable data exchange with standardized message formats and content)

List of HIT Participants	List of HIT Functions
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List of HIT Participants	List of HIT Functions
Ambulatory surgery	Case management and care coordination
Ancillary staff	Claims management
Behavioral/Mental Health inpatient providers	Clinical document availability
Behavioral/Mental Health outpatient providers	Clinical document exchange
CMS/Medicare	Health plan enrollment verification
Community outreach clinics	Historical allergy list
Durable Medical Equipment providers	Historical procedure list
Employers/Plan Administrators	Historical visit/hospitalization list
Health plan enrollment stations	Medical record
Hospitals	Medication decision support
Inpatient pharmacies	Medication formulary check
Inpatient physicians	Medication list
Inpatient nurses	Medication prescription delivery
Laboratories	Patient access to health records
Local public health agency	Patient alerts or reminders
Non-radiology procedure centers	Patient sending health information to providers
Other therapists	Patient-provider e-mail
Outpatient pharmacies	Price/cost information
Outpatient physicians	Procedure or test ordering
Outpatient nurses	Procedure/referral authorization
Patients or caregivers	Provider-to-provider e-mail
Pharmacy Benefit Managers (PBMs)	Public health information to clinicians
Pharmaceutical and Medical Device manufacturers	Public health reporting
Primary care physicians and clinics	Referral and/or consultation management
Private health plans	Registry for disease care management/improvement
Quality improvement personnel	Registry for public health surveillance
Radiology centers	Registry of immunization, medication or devices
Regulators	Reporting and analysis of quality or safety performance
Researchers	Results delivery
Skilled nursing facilities	Results list
Specialty Care Physicians and clinics	<i>Enter User Defined Function #1</i>
State Medicaid	<i>Enter User Defined Function #2</i>
State public health agency	<i>Enter User Defined Function #3</i>

List of HIT Participants	List of HIT Functions
<i>Enter User Defined Participant #1</i>	
<i>Enter User Defined Participant #2</i>	
<i>Enter User Defined Participant #3</i>	

Step 2 – Understanding Pre-Grant System(s) and Activities

1. In the context of activities affected by the Flex CAH HIT project, how did pre-grant information systems fit with the workflow of the following groups?
 - *Narrative response for each*
 - Clinicians (e.g. physicians, nurses, PA's)
 - Public health officials
 - Laboratories
 - Payers
 - Administrators (e.g. executives, QI/process staff, support staff)
 - Others

2. In the context of activities affected by the Flex CAH HIT project, how will the implemented information systems change the workflow of the following groups, including those who support them?
 - *Narrative response for each*
 - Clinicians (e.g. physicians, nurses, PA's)
 - Public health officials
 - Laboratories
 - Payers
 - Administrators (e.g. executives, QI/process staff, support staff)
 - Others

For each affected group, are these workflow changes clearly understood? Please explain.

- *Narrative follow-up*

3. For the following groups, what are the user perceptions of the pre-grant information systems in terms of usefulness or ease of use?
 - *Narrative response for each*
 - Clinicians (e.g. physicians, nurses, PA's)
 - Public health officials
 - Laboratories
 - Payers
 - Administrators (e.g. executives, QI/process staff, support staff)
 - Others

4. For each user group (clinicians, public health officials, laboratories, payers, administrators) what training and support will they receive as part of the system implementation?
 - *Narrative response for each user group*

5. Currently, how committed are the user clinicians to the activities of the grant?
 - Very committed
 - Somewhat committed

- Neutral
- Not very committed
- Extremely uncommitted

Please explain how you arrived at your answer above – why do you feel this way?

- *Narrative follow-up*

6. As part of the grant activities, how is user feedback sought? How do you let users know their feedback is considered/incorporated?

- *Narrative response*

7. For the pre-grant system, what is the level of patient satisfaction?

- Very satisfied
- Somewhat satisfied
- Neutral
- Not very satisfied
- Extremely unsatisfied

Please explain how you arrived at your answer above – how do you assess patient satisfaction?

- *Narrative follow-up*

8. In the pre-grant system, how available was information when and where it was needed?

- Very available
- Somewhat available
- Neutral
- Not very available
- Extremely unavailable

Please explain how you arrived at your answer above – how do you know?

- *Narrative follow-up*

9. How usable was the pre-grant system?

- Very useable
- Somewhat useable
- Neutral
- Not very useable
- Extremely unusable

10. Why and how was the pre-grant system used or not used?

- *Narrative response*

11. What non-financial values did various stakeholder groups (clinicians, public health officials, laboratories, payers, administrators) receive from the pre-grant system? What do they anticipate receiving from the implemented system? What steps will be taken to support/assure use of the new system?

- *Narrative response for each stakeholder group*

12. For each user group (clinicians, public health officials, laboratories, payers, administrators) how efficient was the pre-grant system?

- Very efficient
- Somewhat efficient
- Neutral
- Not very efficient
- Extremely inefficient

Please explain how you arrived at your answer above.

- *Narrative follow-up*

13. For each user group (clinicians, public health officials, laboratories, payers, administrators) what is their perception of the pre-grant system in terms of supporting positive clinical outcomes?

- Very supportive
- Somewhat supportive
- Neutral
- Not very supportive
- Extremely not supportive

Please describe what clinical outcomes you are basing your answer on.

- *Narrative follow-up*

Step 3 – Understanding Post-Grant System(s) and Activities

1. In the context of Flex CAH HIT project activities, how do the implemented systems fit with the workflow of the following groups?
 - *Narrative response for each*
 - Clinicians (e.g. physicians, nurses, PA's)
 - Public health officials
 - Laboratories
 - Payers
 - Administrators (e.g. executives, QI/process staff, support staff)
 - Others

2. In the context of activities affected by the Flex CAH HIT project, how do the implemented information systems change the workflow of the following groups, including those who support them?
 - *Narrative response for each*
 - Clinicians (e.g. physicians, nurses, PA's)
 - Public health officials
 - Laboratories
 - Payers
 - Administrators (e.g. executives, QI/process staff, support staff)
 - Others

For each affected group, are these workflow changes clearly understood? Please explain.

- *Narrative follow-up*

3. For the following groups, what are the user perceptions of the implemented information systems in terms of usefulness or ease of use?
 - *Narrative response for each*
 - Clinicians (e.g. physicians, nurses, PA's)
 - Public health officials
 - Laboratories
 - Payers
 - Administrators (e.g. executives, QI/process staff, support staff)
 - Others

4. At this point in the implementation process, how do users (clinicians, public health officials, laboratories, payers, administrators) feel about the training and support they are receiving as part of the system implementation?
 - *Narrative response for each user group*

5. At this point in the implementation process, how committed are the user clinicians to the activities of the grant?

- Very committed
- Somewhat committed
- Neutral
- Not very committed
- Extremely uncommitted

Please explain how you arrived at your answer above – why do you feel this way?

- *Narrative follow-up*

6. As part of the grant activities, how is user feedback sought? How do you let users know their feedback is considered/incorporated? How has this changed from your answer in Step 2?

- *Narrative response*

7. For the implemented system, what is the level of patient satisfaction?

- Very satisfied
- Somewhat satisfied
- Neutral
- Not very satisfied
- Extremely unsatisfied

Please explain how you arrived at your answer above – how do you assess patient satisfaction?

- *Narrative follow-up*

8. With the implemented system, how available is information when and where it is needed?

- Very available
- Somewhat available
- Neutral
- Not very available
- Extremely unavailable

Please explain how you arrived at your answer above – how do you know?

- *Narrative follow-up*

9. How usable is the implemented system?

- Very useable
- Somewhat useable
- Neutral
- Not very useable
- Extremely unusable

Please explain how the implemented system's usability compares with what was anticipated, the reason for any gaps and mitigation strategies to close these gaps.

- *Narrative follow-up*

10. Why and how is the implemented system used or not used as anticipated?

- *Narrative response*

11. What non-financial values have various stakeholder groups (clinicians, public health officials, laboratories, payers, administrators) realized as part of the implementation? How does this compare to what was anticipated? What steps will be taken to support/assure use of the new system? What non-financial values have various stakeholder groups realized as part of the implementation?

- *Narrative response for each stakeholder group*

12. For user groups (clinicians, public health officials, laboratories, payers, administrators) how efficient is the implemented system?

- Very efficient
- Somewhat efficient
- Neutral
- Not very efficient
- Extremely inefficient

Please explain how you arrived at your answer above.

- *Narrative follow-up*

13. For each user group (clinicians, public health officials, laboratories, payers, administrators) what is their perception of the implemented system in terms of supporting positive clinical outcomes?

- Very supportive
- Somewhat supportive
- Neutral
- Not very supportive
- Extremely not supportive

Please describe what clinical outcomes you are basing your answer on.

- *Narrative follow-up*

1. Clinician commitment

Several studies of HIT implementation as well as direct-user feedback in using HIT point to the critical need for end-user commitment to the activities of implementation and especially to the specific technology being implemented. In the case of the Flex CAH HIT projects, the main end-user group is clinicians – including physicians, nursing staff, PAs and other clinical staff. To measure this important factor in HIT implementations, the Flex CAH HIT Value-Based ROI protocol asked questions of CAHs to assess clinician commitment to the grant activities.

In addition to a specific question regarding pre- and post-implementation rating of clinician support for the activities of the grant, CAHs were asked to respond to two other issues related to clinician commitment – user training and support, and user feedback. Well-designed user training can improve the likelihood that end users, particularly clinicians, will accept new HIT; in general, effective training is well-established as key to promoting end-users embracing new technologies.²⁶ Lessons from e-prescribing initiatives and other HIT projects have shown strong support for one-on-one training and support including on-site software support, customization by specialty, and office workflow integration as part of successful HIT implementations.²⁷ Similarly, user feedback needs to be developed and implemented with a focus on continuous improvement based upon end-user feedback. Given the complexity of health care, the need for iterative and continual refinement of HIT based upon user feedback may be even more critical for success than in IT implementations in other industries.²⁸

2. Availability of information

HIT systems, appropriately implemented and used, enable clinicians to store, retrieve, and access more information than what is available to them in a paper-based system. Electronic means of recording and/or sharing health information for patient care may provide clinicians a mechanism to better coordinate care and information, and as a result, improve continuity across transitions in providers and settings. Studies have reported that clinicians working in treatment environments that had completed an HIT implementation such as an EHR/EMR and/or HIE were significantly more likely to report high levels of both clinical information availability and timeliness.²⁹ For the Flex CAH HIT projects, an important element to capture in assessing the value of the implemented system was end-user perception of information available to them. CAH respondents were asked about the availability of information before HIT implementation (pre-system) and after implementation (post-system).

²⁶ Karsh, B. (2004). Beyond usability: designing effective technology implementation systems to promote patient safety. *Quality and Safety in Health Care* 13(5), 388-94.

²⁷ Halamka, J., Heinold, J., Fournier, G., Stone, D., & Berry, K. (2006). E-Prescribing in Massachusetts: Collaboration leads to success. *Patient Safety & Quality Healthcare*, September/October 2006. Retrieved from <http://www.psqh.com/sepoct06/e-prescribing.html>

²⁸ Doebbeling, B. & Pekny, J. (2008). The role of systems factors in implementing health information technology. *Journal of General Internal Medicine* 23(4), 500-501.

²⁹ Graetz, I., et al. (2008). Care coordination and health information technology: Information availability and timeliness across care transitions. *Clinical Medicine & Research* 6(3-4), 149.

3. Importance of system usability

End-user perceptions of usability of HIT systems are another critical issue in their implementation. Unless clinicians deem it usable and useful, clinicians will not use an HIT system. Usability has been defined as a measure of how efficient, effective, enjoyable, and safe an IT system is to use.³⁰ Many studies have documented the importance of usability in terms of its impact upon the adoption of HIT systems by clinicians; indeed, there are many documented cases of organizations that have deployed HIT systems that were later turned off, boycotted, or were not used to their fullest extent because of clinician dissatisfaction with them.^{31, 32} To measure perceptions of system usability for Flex CAH HIT projects, the value-based ROI protocol asked for user measurements of pre- and post-grant systems in terms of usability.

4. Importance of system efficiency

Implemented HIT systems – EMR/EHRs in particular – can contribute to improvements in care organization and delivery efficiency. Most Flex CAH HIT grantees reported that the decision to implement HIT was aimed, in part, to improve site efficiency, workflow, and clinician productivity. Increased clinical efficiency and provider productivity are frequently cited as benefits of EMR/EHRs and HIE – e.g. tracking down previous lab results, eliminating reams of paper records, reducing time required for chart reviews— thereby making workflows more efficient. During implementation or “go live”, sites will experience some slowdown in productivity as clinicians and administrative staff become familiar with the HIT system(s).^{33, 34} CAH respondents were asked about how efficient they found the pre-grant system and following implementation, about the efficiency of the implemented system.

5. Supporting positive clinical outcomes

HIT holds enormous promise for supporting positive clinical outcomes; demonstrating these effects is extremely important in demonstrating the value of an HIT investment. Many studies have demonstrated that implementation of HIT, particularly EMRs, has led to improvements in morbidity, mortality, complication rates, prescribing errors and disease management associated.^{35, 36} However, as discussed previously, specific clinical outcomes and quality improvement measures related to a particular HIT implementation require a significant observation period to appropriately assess effects; for the purposes of this evaluation, it was not possible to study this outcome. Instead, as part of the

³⁰ Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., & Carey, T. (1994). *Human-computer interaction: Concepts and design*.

³¹ Borycki, E. & Kushniruk, A. (2005). Identifying and preventing technology-induced error using simulations: Application of usability engineering techniques. *Healthcare Quarterly* 8(Sp), 99-105.

³² Ash, J., Stavri, P., & Kuperman, G. (2003). A consensus statement on considerations for a successful CPOE implementation. *Journal of American Medical Informatics Association* 10(3), 229-234.

³³ Moiduddin, A. & Gaylin, D. (2007). Health information technology adoption among health centers: A digital divide in the making? [Background paper]. Retrieved from http://www.nhpf.org/library/background-papers/BP_HealthCenterIT_07-23-07.pdf

³⁴ Gaylin, D., Goldman, S., Ketchel, A., & Moiduddin, A. (2005). *Community health center information systems assessment: Issues and opportunities*. Retrieved from <http://aspe.hhs.gov/sp/chc/chc.pdf>

³⁵ Amarasingham, R., Plantinga, L., Diener-West, M., et al. (2009). Greater use of information technology impacts mortality, complication rates, and costs. *Journal of Clinical Outcomes Management* 16(3), 108-109.

³⁶ Koppel, R., Metlay, J., et al. (2005). Role of computerized physician order entry systems in facilitating medication errors. *Journal of the American Medical Association* 293(10), 1197-1203.

value-based ROI protocol, site respondents were asked for their perceptions of the pre-grant (paper-based) and post-implementation (electronic system) in terms of supporting positive clinical outcomes, with the idea that their perceptions would be likely indicators of substantive clinical outcome changes that would eventually be measurable over time.

6. Other non-financial values of HIT

In order to solicit input on other areas of value identified by system users, respondents were asked to share other non-financial value they had derived from their pre-grant system(s) and then from the implemented system(s).

System implementation and patient satisfaction is one such non-financial value of HIT to which respondents were specifically asked to respond. Theoretically, greater access to information about prior care, medication prescriptions, laboratory test results, or clinical guidelines and faster information availability could allow physicians to support more productive discussions about medical issues and leave more time to thoroughly explain diagnoses and treatments or address patient concerns. At the same time, there could be unintended consequences in terms of time spent navigating the computer system, searching for information, exam room computing, and documenting visit activities that might limit time to address patient needs.³⁷ It is important to note that similar to the discussion on efficiency, potential adverse effects such as slowdowns in productivity or time lost to navigating new systems tends to be prominent in the period shortly following implementation. For these reasons, Flex CAH HIT grantees were asked to estimate patient satisfaction prior to and post-implementation for the systems affected by grant activities.

³⁷Hsu, J., Huang, J., et al. (2006). Health information technology and physician-patient interactions: Impact of computers on communication during outpatient primary care visits. *Journal of the American Medical Informatics Association* 13(2), 236.

Appendix D: Flex CAH HIT Grantee Profiles

Alabama

Project Title: Flex CAH HIT Network Implementation Program

Project Summary: Randolph Medical Center (RMC) is a Hill-Burton era Critical Access Hospital in Roanoke (Randolph County), Alabama. The over-arching problem the project was intended to solve is the high mortality rate due to cardiovascular disease (CVD) in the hospital's three county service areas. The hospital had started on a solution with an investment of over a million dollars in a 64 Slice CT Scanner but needed a Health Information Technology (HIT) major upgrade and follow-up system to attract the at risk patients to the hospital to use the scanner that this grant opportunity provided.

Project Background: ADPH and the management team at RMC applied for the Flex CAH HIT Program to make a dramatic and positive impact on cardiovascular disease (CVD) in the hospital's service area. CVD is one of the major causes of death in rural America and in rural Alabama. ADPH selected RMC because they have a sound vision to improve cardiovascular care, they have put down money towards realizing that vision, and they have a passion for their vision. RMC has the necessary staff, as well as an established referral pattern with a tertiary center for complex invasive cardiac disease. However, they lack an HIT system to integrate their efforts from the rural setting in Roanoke, AL to the tertiary medical center 45 miles away.

Network Participants:

- Randolph Medical Center (RMC) is one of three Critical Access Hospitals in Alabama. It is located in Roanoke in rural Randolph County in the Eastern part of the state. It is a not-for-profit hospital owned by the city of Roanoke. RMC was the lead agency for implementation of the project including selecting the vendors, managing the on site installation of the software and hardware, providing the personnel to be trained, and numerous other daily tasks.
- East Alabama Medical Center (EAMC) is the 352 bed tertiary hospital that RMC refers most of their patients to for higher level care. EAMC contracted for software changes to their database to enable the networking component. They were critical to the successful resolution of network privacy and HIPAA concerns.
- Institute for Advanced Cardiology (IAC) is a cardiologist physician group with offices in Randolph and Lee Counties. They use the 64 Slice CT Scanner at RMC for prevention procedures. They will be a node on the network when additional funding is obtained.
- Southern Family Health Care (SFHC) is a Rural Health Center in Roanoke that is a node on the network.

Project Management: The Alabama Department of Public Health (ADPH) is the largest state agency in Alabama with subordinate units in all 67 counties. As the grantee, ADPH performed several important functions including grant administration, contracting, fiscal agents, top level project management, evaluation, and liaison with the HRSA Office of Rural Health Policy. All of these were accomplished by the Office of Primary Care and Rural Health except for fiscal agent which was done by Health Finance. Other ADPH central office units such as General Counsel and Computer Systems Center made occasional but important contributions.

Project Goals:

- *Raise the HIT capabilities at RMC.* RMC cannot effectively share data with other providers when its systems are several generations old and still very much reliant on paper. Therefore, the

primary need is to move RMC further along on a path to acquiring a cost effective, functional EHR.

- *Improve data sharing among network providers.* Define and integrate the critical data to be shared among network participants that will allow true insights into CVD. These data will be housed in a disease registry and data warehouse available for access by network providers across the continuum.
- *Install reporting and trending capabilities.* It is imperative that data can be retrieved, analyzed, and used as a basis for additional action.

Project Objectives:

- Formalize a provider network to include Randolph Medical Center, East Alabama Medical Center, and a seven-cardiologist physician group that has offices in both cities and privileges at both hospitals.
- Bring the network together for shared information in order to identify more at-risk CVD patients and to provide more coordinated care for those already identified.
- Develop and implement specific interventions aimed at improving patient compliance with best practice medicine. These interventions include but are not limited to: initial and follow-up lab tests; health fairs and other screenings to identify at-risk patients; reminders of periodic care requirements; educational sessions on diet, exercise, and medications; and care assistance to ensure the patient is being appropriately treated within the continuum.
- Frequently report and analyze performance around key metrics such as blood pressure, HbA1c, and cholesterol.

Expected Project Impact: Improved effectiveness, efficiency, safety, and outcomes, including improved health, as evidenced by an increase in outpatient utilization and decrease in more costly inpatient events due to a better focus on compliance.

Catchment Area and Target Population: The service area encompasses Randolph, Chambers, and Clay Counties. According to 2000 Census figures, 17.0 percent of all Randolph County residents were living on incomes below the FLP compared to 16.1 percent in Alabama and 12.4 percent nationally. According to 2005 estimates of per capita personal income, \$22,189 was available for spending per person in Randolph County, the 11th lowest among all 67 AL counties. This level is \$12,282 less per person than the \$34,471 national per capita personal income. Cardiovascular disease is killing people at an alarming rate in all three represented counties.

Evaluation: RMC is currently using a database called Sci-Health to track a host of collectable data to measure success. RMC has begun to track the core measures and compare them to past months. RMC is tracking census levels in various departments including psychiatry, swing bed and OR. RMC is using this data to spot trends and determining reasons for these trends. RMC is also using this software to track other things such as numbers of radiology exams performed as well as customer approval and the customer's willingness to return to or recommend RMC to a friend or family member. RMC is also tracking mortality numbers and health performance indicators

Metrics:

- Access to physicians, measured by a count of unassigned at-risk CVD patients that are identified and tracked in the disease registry, assigned to a doctor and are verified to have visited the physician.

- Missed appointments, measured by a percentage of CVD patients in the disease registry that failed to show up for scheduled visits.
- High blood pressure management, measured by trending patients with blood pressure <140/90 mm/Hg.
- Cholesterol Management, measured by trending patients with LDL cholesterol levels <130 mg/dl.
- Incidence of smoking, measured by a percentage of active smokers within the CVD registry.
- Diabetes compliance (as a risk factor for CVD), measured by average HbA1c.
- Other measures under consideration: triglyceride trends and calcium scoring.

Project Status at End of Grant Period: The original goal was the implementation of an EHR system in a rural CAH setting using existing grant dollars. This task was accomplished using the grant money for the CAHHITN program as well as using alternate grants such as Flex and SHIP. However, the initial plan was to have a network that included RMC, EAMC, IAC, SHRC and a data warehouse. When all of the requested funding was not awarded, the data warehouse was dropped in favor of a more elegant (and cheaper) solution, direct data links. The link to IAC has not been implemented due to a lack of funding.

Sustainability: RMC has the ability to continue use of the EHR as-is for the foreseeable future. RMC ensured during the initial contract procedure that it received a cost for ongoing maintenance and support that the hospital could afford, independent of any grants. The only possible anticipated issues are a changing of technology in the future that would cause this system to have to be replaced. There will also be the cost of replacement for the hardware not covered under the maintenance contract (e.g., desktop computers) due to normal wear and tear. In addition, with the American Recovery and Reinvestment Act (ARRA) funding and mandate for meaningful use, including networking, the expansion of this network to other CAHs and providers is a near certainty.

Hawaii

Project Title: An Electronic Health Record Implementation for Critical Access Hospitals (CAH) and Clinics in the Kauai Region of the Hawaii Health Systems Corporation (HHSC)

Project Summary: The purpose of the project was to:

- Establish a model CAH and clinic EHR capability based on the Indian Health Service Resource and Patient Management System (IHS RPMS), a derivative of the VA vista system;
- Implement the RPMS infrastructure with appropriate servers and end-user equipment in two CAHs (West Kaua`i Medical Center and Samuel Mahelona Memorial Hospital) and three associated clinics;
- Implement security protocols and security software in RPMS to enable the HHSC Kaua`i Region CAHs and clinics with authorized access to patient records;
- Develop application interfaces with patient management and billing systems to ensure adoption and improve the efficiency of the EHRs in Hawai`i; and
- Evaluate the implementation and usability of the Kaua`i RPMS EHR to provide lessons learned for future RPMS implementations in Hawai`i CAHs and clinics.

Project Background: This pilot FLEX program application was submitted by the State of Hawai`i Department of Health (DOH), as a partnership with the Kaua`i Region of the Hawai`i Health Systems Corporation (HHSC), and the Telecommunications and Information Policy Group (TIPG) of the University of Hawai`i (UH). The Partners have been rigorously working over the past two years to develop a strategy to implement EHRs in CAHs and clinics to improve patient safety and quality, and to improve efficiency and effectiveness for reasons well-documented in national studies, reports, and executive orders. The DOH has been working as a partner with the HHSC and the University of Hawai`i to ensure a cost-effective and sustainable EHR capability.

Network Participants: The Hawai`i Health Systems Corporation is a public benefit corporation established by the State of Hawai`i in 1996. The HHSC is the largest health provider for the “Neighbor” Island residents and provides acute, rural, and long-term care services with 1,260 licensed beds on five islands. The hospitals of the HHSC have approximately 23,000 inpatient admissions annually. The sites included in the implementation were Kauai Veterans Memorial Hospital (KVMH), Samuel Mahelona Memorial Hospital (SMMH), and the West Kauai Medical Clinics (WKMC).

Project Management: The Telecommunications and Information Policy Group (TIPG) of University of Hawaii led the project implementation and facilitated the communication between all other organizations involved. TIPG provided project oversight and formed groups and committees within the other organizations to lead various aspect of the project. TIPG also established a Cooperative Agreement with the Indian Health Service to provide consultative support and assistance to the project.

In addition, a Steering Committee, consisting of administrators and department heads from the facilities involved in the project, was formed to guide and manage the project from the facilities point of view. The primary function of the Steering Committee was to take responsibility for the feasibility, business case and the achievement of outcomes of the Kauai RPMS project. The Kauai RPMS Steering Committee

monitored and reviewed the project status, as well as provided oversight of the project deliverable rollout.

There were regularly scheduled meetings for the various teams to facilitate the communication and open communication and sharing of information to the facilities using tools such as Microsoft Sharepoint.

Goals: To improve health care, patient safety, and the efficiency of health care delivery through the cost-effective implementation of EHR and other HIT system in the rural communities in Hawaii by substantially implementing the RPMS in the Kauai region of the Hawaii Health Systems Corporation (HHSC).

Objectives:

- Establish a model CAH and clinic EHR capability based on the Indian Health Service Resource and Patient Management System (IHS RPMS), a derivative of the VA vista system;
- Implement the RPMS infrastructure with appropriate servers and end-user equipment in two cahs (West Kaua`i Medical Center and Samuel Mahelona Memorial Hospital) and three associated clinics;
- Implement security protocols and security software in RPMS to enable the HHSC Kaua`i Region cahs and clinics with authorized access to patient records;
- Develop application interfaces with patient management and billing systems to ensure adoption and improve the efficiency of the ehers in Hawai`i; and
- Evaluate the implementation and usability of the Kaua`i RPMS EHR to provide lessons learned for future RPMS implementations in Hawai`i cahs and clinics.

Expected Impact: A successful implementation was expected to result in improved quality of health care, patient safety, and cost-effectiveness of the Kauai CAHs and clinics. It was also anticipated that other CAHs in Hawaii would have a cost-effective model for EHR implementation, and CAHs nationwide will be able to learn from their experience.

Catchment Area and Target Population: The catchment area was the Island of Kauai; no specific target population was identified.

Evaluation: At the time of the final report, the evaluation was described as “in progress.” The grant application described the following evaluation activities:

- Formative Evaluation: life cycle systems development methodology
- Evaluation of Implementation Process: assessment of the implementation of both the core HOV implementation and the enhancements provided under this grant via satisfaction survey and personal interviews
- Evaluation of Clinical Measures: Health Disparities Collaborative measures as the primary method to track and report outpatient clinical measures. Secondary clinical measures will focus on the existing Health Plan Employer Data and Information Set and the Ambulatory Quality Alliance.

Project Status at End of Grant Period: The project has gone through several evolutionary processes since it was initially planned due to significant problems encountered during the course of this project which caused major delays in the implementation of the EHR system. First, it was initially planned to build upon an existing EHR infrastructure (Hui OpenVista), however the project has needed to make adjustments to build the entire infrastructure for the HER (using the Indian Health Service's Resource and Patient Management System (RPMS)). These changes had a major impact on the project by shifting focuses, redirecting resources, impacting timelines, and adding a significant amount of work. If the existing EHR infrastructure was in place as anticipated we would not have suffered such major delays. An existing network communications infrastructure was in place which was necessary to support the project. Without the network communications infrastructure it would have been very difficult to implement the EHR network.

The second significant issue that was encountered was the delay in open source release of the proprietary Graphical User Interface (GUI) for RPMS, VueCentric. Without the GUI the RPMS is not an acceptable system to be implemented in the HSC Kauai Region. The GUI was originally planned for its open source release in early January of 2009, however to date it has still not been released. Initial attempts to license the GUI software have been denied from the company, Medsphere, as they did not have a model to license the software outside of the Indian Health Service. With the inability to license the GUI and unavailability to get it via an open source method, it became questionable if the RPMS would be an EHR solution for the HHSC Kauai Region. Through discussions with the HIS, the project administrators are in the process of obtaining a royalty free license for the use of the RPMS GUI in the participating facilities.

Sustainability: The project will be sustained after CAHHIT funding has ended. Since the project is using open source software the ongoing costs have been minimized to an affordable level. The program will be sustained using operating funds of the facilities. The CAHHIT project has provided the significant funding required to begin the project and get the base system implemented. There are expansion projects planned to begin following the CAHHIT project with funding obtained through other grant programs.

Illinois

Project Title: Patient Health Information Network (PHIN)

Project Summary: The purpose of the project was to implement electronic health records in the rural health clinics of two critical access hospitals; implement a picture archiving and communications system at one of the participating hospitals; implement health information exchange software; and identify the processes and activities that best supported technology implementation in the critical access hospital environment.

Project Background: The Patient Health Information Network project was designed to develop a replicable process for the implementation of electronic health records and health information exchange technologies in the critical access hospital environment. Another goal of the project was to overcome the limited selection of available vendor options for electronic health records for small, rural hospitals by modifying an ambulatory product for use in the inpatient setting of a critical access hospital, thus keeping costs to a minimum and making implementation of the electronic health record as streamlined as possible for the users.

Network Participants:

- Good Samaritan Hospital, a tertiary hospital with 141 beds.
- Washington County Hospital, a CAH, with 25 acute and swing beds, and 33 long-term care beds.
- Salem Township Hospital, a CAH with 25 acute and swing beds.

Project Management: Network management built upon the relationships that already existed between the participating hospitals, the Illinois Critical Access Hospital Network, and the Illinois Department of Public Health Center for Rural Health. The relationship among all was governed by a memorandum of understanding created before the grant proposal was submitted and that functioned without amendment throughout the project. Each entity maintained autonomy and decisions related to project implementation were agreed to by group consensus. Project management was provided by Illinois Critical Access Hospital Network staff, in an arms-length relationship with its member hospitals.

Project Goals:

- Seamless continuum of care, improved coordination of care, reduction of medication complications, and improved patient safety
- Reduction in healthcare costs for patients, payers and providers as a result of the reduction in duplicative services
- Dissemination of results of HIT pilot project to CAHs

Project Objectives:

- Finalize HIT implementation plan (administrative operations, partner selection, establishment of baseline data for performance measures)
- Test and modify HIT implementation plan (secure staff, purchase and install hardware and software)
- Implement community wide secure portal for data exchange (identify secure data exchange provider, disseminate equipment and connectivity requirements)

- Document that HIT has improved clinical outcomes (develop five performance measures with national benchmarks)
- Implement community wide electronic health record
- Increase knowledge database of PHIN representatives

Expected Project Impact:

- Common EHR repository allows providers to more effectively treat patients, make a more accurate diagnosis, and develop a more effective treatment plan.
- Reduction in duplicative orders, automatic generation of recall reports and reminders to promote patient compliance with provider recommendations
- Reduction in healthcare costs that results from inefficiency, medical errors, inappropriate care, incomplete information, and duplicate testing
- Providers will be able to treat more patients without adding additional hours to their workday by having the complete record available during the patient encounter, use a template driven format to document their encounter, and electronic communication with pharmacies
- Functionality improved by defining scheduling templates, controlling over-bookings, resolving appointment conflicts, scheduling recurring appointments, and improving billing and collection procedures. More efficient workflow.
- Patient safety measures such as pharmaceutical recalls can be standardized and evaluated in a more quantitative fashion with actionable outcomes.

Catchment Area and Target Population: The rural, low-income population of Washington, Marion and Jefferson Counties.

Evaluation: Performance measures focused on process – successful electronic health record software implementation and PACS installation – and on disease management performance measures for the multiple chronic diseases required by the project. The chronic disease management indicators addressed patients with diabetes and those with cardiovascular disease. Screening indicators were collected for breast cancer screening, prostate cancer screening. Influenza immunization prevalence indicators were evaluated.

Project Status at End of Grant Period: A process review of the project indicates a significant level of achievement by project participants and electronic health records implementation is supporting the activities described below.

- Centralized, enterprise-wide appointment scheduling is in use.
- Point-of-care clinical documentation is in use in the ambulatory rural health clinics operated by the hospitals.
- Point-of-care documentation is in use in the physical therapy departments of the hospitals. Project staff continue to work together to identify template modifications needed to more closely match the requirements of a hospital-based physical therapy department rather than the ambulatory-based documentation format of the software product.
- Project hospitals expect to participate in the development of a new inpatient product to be announced soon.

- Health information exchange software has been installed and tested. Electronic health records data are being pushed to the central data repository, using CCR/CCD standards, and have been accessed by other authorized users.
- The health information exchange software is self-hosted by Illinois Critical Access Hospital Network on a temporary basis until all testing is complete and additional users are identified.
- Capabilities of the health information exchange software have been demonstrated to other Illinois Critical Access Hospital Network members in multiple Webinars and in-person presentations. Planning is underway to add another critical access hospital's 11 medical practices to the health information exchange. Those practices, all members of a PHO, all use NextGen electronic health records. Following that implementation, three more hospitals that have expressed interest in joining the health information exchange will be connected. All use CPSI for their hospital information system and electronic health records, requiring the development of an interface to the health information exchange.
- Development of the necessary HL7 interface is underway to link the State of Illinois immunization database to the Illinois Critical Access Hospital Network's health information exchange.
- Preliminary discussions have begun to possibly link our health information exchange to a similar exchange in a neighboring state.
- One of the clinical informatics specialists has met all requirements to be certified by the electronic health records software vendor at the highest level of proficiency.

The installation of a picture archiving and communications system at one of the project hospitals has been completed with the financial support of the project funds. The PACS at both hospitals will be interfaced to the health information exchange software.

A chronic disease management review process has been established that uses data collected from the electronic health records on the last workday of the month for each of the clinical indicators. The hospital's Quality Improvement team will be responsible for the review and follow-up of the indicator values. The initial comparison of data selected from the electronic health records to the baseline data abstracted at the beginning of the project period identified inconsistencies, most likely due to the baseline having been developed from a one-month sampling of patient records while the first end-of-month report was based on total patient electronic health records created over a one year period. Future monthly reviews are expected to document improved outcomes.

The development of the inpatient electronic health record software is the most significant unresolved issue. However, the grantee expects that issue will be resolved by the participation of the project hospitals in a beta project with a software vendor. Several functionality issues remain with the health information exchange software but the vendor is working with the grantee and has expressed its commitment to address the issues. The grantee continues to have weekly calls with vendor programmers and administrative staff and feel confident the issues will be resolved.

Sustainability: The project is sustainable beyond the grant period. Program activities will continue at the close of the project and the health information exchange network will be expanded. The project hospitals have included within their annual budgets future software annual maintenance fees for the software purchased with grant funds. Both hospitals have increased staff to support the electronic health record use and its future expansion; infrastructure enhancements also have been budgeted.

The health information exchange network also will be expanded and the first new user will be connected soon. Costs associated with the software will be shared by all users. Other administrative costs will be built into a user fee, most likely on a subscription basis. The information exchange software is licensed to the Illinois Critical Access Hospital Network, which most likely will develop a distinct limited liability corporation to manage the health information exchange.

Several grant opportunities will be pursued by the Illinois Critical Access Hospital Network related to supporting the adoption and use of health information technologies by its members: a statewide health information exchange development process has been implemented by the state's Department of Healthcare and Family Services and the Illinois Critical Access Hospital Network is an invited participant in those developments.

Illinois Critical Access Hospital Network is participating in a consortium's application for funds from the recently announced HITECH Health Information Technology Extension Program. If funded, this consortium will assist critical access hospitals and rural primary care professionals, among others statewide, implement electronic health records and participate in health information exchange opportunities. Illinois Critical Access Hospital Network's experience in this CAHHIT project has prepared it for participation in this expanded effort.

Indiana

Project Title: Flex CAH-HIT Grant

Project Summary: The overall purpose of the project was to improve the safety, quality, efficiency, and effectiveness of health care provided in rural areas, and among rural providers. St. Vincent Health developed a project that would roll out electronic health record (EHR) technology into the outpatient primary care setting (Rural Health Clinics and one Federally Qualified Health Clinic), inpatient Critical Access Hospital setting, and connect electronically for records and results transfer to the tertiary care setting. The demonstration project results were instrumental in illustrating how to connect and deliver patient care results into the Indiana Health Information Exchange (IHIE) which is being recognized as one of the most successful HIE's in the country.

Project Background: The literature on HIT delivery clearly indicates a significant shortage of technology penetration in rural health care clinic (outpatient) settings as well as rural critical access hospitals. Without dissemination of technology in rural settings, quality reporting and improvement efforts will be greatly delayed in comparison to their urban counterparts. Currently within all of the St. Vincent CAHs there are no electronic medical record or patient care management systems in place, only only isolated systems. The purpose of the project was to create a 'hub' to attach these spokes to.

Network Participants:

- **St. Vincent Mercy Hospital:** the CAH location in Elwood, IN. works closely with the FQHC in Elwood. There are several service agreements in place that include reduced rent, laboratory and radiology services at reduced rates, physician support services from the hospital, insurance and benefits for the FQHC administratively have all been offered between the CAH and FQHC locations.
- **Madison County Community Health Center:** the FQHC location, with home office located in Anderson, IN. This FQHC also has a location in Elwood, IN. that works closely with the St. Vincent CAH location. It should be noted that this location is separately owned and operated from the St. Vincent Health operations. Allscripts was installed into the FQHC location and is submitting data to IHIE at the State level for the IHIE / results delivery component of the project.
- **St. Vincent Randolph Hospital:** the CAH location in Winchester, IN. that also operates a RHC location next to the hospital. Allscripts was installed into the RHC location and the clinic is also submitting data to IHIE at the State level for the IHIE / results delivery component of the project.
- **St. Vincent Jennings Hospital:** the CAH location in North Vernon, IN. also operates a RHC location within the hospital medical office building structure. Allscripts was installed into the RHC location and they are submitting data to IHIE at the State level for the IHIE / results delivery component of the project.
- **St. Vincent Indianapolis Hospital:** this is the tertiary care hospital located in Indianapolis, which serves as the transfer partner for the CAH locations.

Project Management: In general, the CAH HIT project was managed through the St. Vincent Health project management office which manages all HIT related work effort across the delivery system.

Goals:

- Serve as a viable CAH HIT demonstration project for HRSA and for the Indiana State Office of Rural Health
- Link information management systems of Emergency departments, Imaging and Radiology departments, Picture Archival and Communications (PACS), Pharmaceutical management, and Laboratory information management systems with the new clinical management system in each CAH
- Establish connectivity to the Indiana Health Information Exchange (IHIE) network to share patient vital patient vital quality of care to patients.

Objectives:

- Implement centralized clinical documentation that is easily accessible regardless of location the patient was originally admitted
- Facilitate easy access to patient chart for historic and previous admission information
- Provide an effective tool for care providers to record and measure objective and quality data related to a patient's vital signs
- Provide an effective tool for care providers to record and measure objective and quality data related to a patient's intake and output
- Provide an effective tool for care providers to view and graph lab results in a variety of ways for optimum patient safety and user ease
- Provide an effective tool for care providers to view transcribed documents
- Facilitate the transition of intake and output times
- Configure core admission components to create a patient list that incorporates all inpatient beds and locations with patient demographic data
- Replace specific non-physician clinical documentation currently captured on paper
- Provide availability to print out all clinical documents
- Design documentation headings and sort order within document review chart section
- Results interface for Lab, Radiology and Transcription
- Develop all ancillary results interfaces to send results to SCM
- Develop a clinical summary view to enhance current reporting process use by nursing and provide current patient information to appropriate clinicians
- Create and deliver quality training to staff prior to go live activation
- Configure and deploy core clinical documentation flow sheets for Vital Sign and I&O
- Additional high-level goals

Expected Impact:

Indiana State Office of Rural Health (SORH) anticipated the following improvements:

- Effectiveness of chronic disease management for primary care patients
- Performance on published measures of hospital quality and pay for performance
- Care coordination across the continuum of services
- Quality and safety of care provided in acute care settings

Saint Vincent Health anticipated the following improvements:

- Improving access to tertiary and quaternary health care services
- Integrating its health services in a manner that focuses on stewardship of its ministry dollars
- Assisting these rural locations and affiliated clinics with a higher level of care
- Overall increase of patient, physician, and associate satisfaction
- Improved communications between providers
- Decrease in patients seeking inappropriate care due to improved communications by the ED physicians, the CAH, and the participating clinics
- Decrease in known and unknown medical error incidents
- Decrease in duplication of testing throughout the organization
- Improved communications throughout the local primary care delivery system will lead to higher quality and a reduction in patient 'hand-off' errors
- Improved medication management systems
- Potential increase in patient volumes that occur due to positive word of mouth by locally satisfied customers
- Reduction in pharmacy costs over time and improved safety
- Recruitment and retention of qualified health care providers
- Potential increase in clinical sites from area colleges
- Reduction of charges that lead to bad debt due to the reduction in duplication of testing
- Reduction of bad debt that is generated by inappropriate patient visits
- Reduction of supply overhead in many cases
- Cost shifting will occur versus dramatic cost reductions.

Catchment Area and Target Population: St. Vincent Health has a service area of approximately 50 counties throughout central Indiana. The CAH HIT demonstration project was focused on a rural health clinic and CAH location in Randolph County market in eastern Indiana, a rural health clinic and CAH location in the Jennings County market in south-central Indiana, and a FQHC location in Elwood, Indiana that has clinical service linkages to a CAH location in Elwood, located within Madison County north of Indianapolis.

Madison County is specifically noteworthy due to its' economic challenges, unemployment rates, chronic disease prevalence, high levels of uninsured & under-insured, extremely high bad debt and charity care delivery levels. Upon completion of this project, it is believed that 95% of the county primary care and hospital providers were submitting patient data to IHIE, thus allowing physicians and hospitals to obtain this valuable information to help manage utilization, while attempting to reduce the extremely high cost of care to the residents of Madison County in Indiana.

Evaluation: The goals of the overall EHR design were to improve the effectiveness of chronic diseases management and preventive care for primary care patients, improve care coordination across the continuum of services, and reduce the potential for adverse drug events. To accomplish the goals of this project St. Vincent Health developed both a quantitative and qualitative evaluation model. Specific performance measures that were addressed included:

- **Chronic Disease Management:** Required Diabetes and Cardiovascular Disease Measures and Pharmacology Therapy for Pediatric Asthma;
- **Preventive Care Measures:** Adult Flu Vaccination Status, Pneumococcal vaccination;
- **Care Coordination:** Use of IHIE patient summaries by hospital and clinics;
- **CPOE Adoption:** Percent of inpatient orders entered by a physician; and,
- **Medication Safety:** Percent of unreconciled medications upon admission.

As anticipated, St. Vincent was not able to demonstrate a significant amount of value upon completion of the project because not enough time had transpired for SVH to measure the results of the technology installation. For this reason, grant administrators sought to develop a balanced set of measures that either currently exist within the St. Vincent Health Critical Access Hospitals (CAH) or can be generated through post-implementation electronic reporting systems. Because of the relatively small number of patients seen in rural healthcare settings, they also focused on more process-based measures that have been demonstrated elsewhere to improve patient outcomes (e.g., measures of adoption and satisfaction, effectiveness of chronic disease management, coordination of care, performance on hospital-based quality of care measures, and improved quality and patient safety). The grantee states that "this should still provide credible evidence to CAH peers that the improvements associated with HIT are meaningful, yet not impose an undue burden on the collection of data to demonstrate reductions in mortality and significant morbidity."

Project Status at End of Grant Period: According to the grantee's final report, the project "was a successful implementation EHR software and integration of health care delivery in primary, critical access, and tertiary care providers." St. Vincent Health met the project goals and deliverables. The data collected in this project demonstrate the success of the implementation and provide information on areas that need continued intervention. Continued monitoring of these measures and comparison with baseline rates will provide feedback on the success of the HIT systems and processes implemented.

Sustainability: The support funding was added to the operations budget for the next fiscal year. The grantee has also budgeted for the expense of expanding the network, and will further expand the EHR strategy for the entire network.

Louisiana

Project Title: LA Pointe Coupee HIT Network

Project Summary: The Pointe Coupee Parish health system has evolved without a strategic system design. The object of the project was to provide a system(s), which will allow access to patient data in a secure web enabled environment. The ultimate goal was the sharing of appropriate health information among all partner organizations. This will be accomplished by connecting all of the information systems and processes implemented in a secure, hosted environment. This will provide essential data, in an efficient manner, to the network's health care providers.

Project Background: The Pointe Coupee Parish health system has evolved without a strategic system design. In an attempt to bring "systemness" this CAH-HIT Network pilot program was proposed.

Network Participants: The Pointe Coupee HIT Network includes Pointe Coupee General Hospital, a 25-bed CAH; the CAH's transfer tertiary hospital, Our Lady of the Lake Regional Medical Center (the Lake), a 740-bed community hospital located in Baton Rouge (approx 45 miles); and four local rural health clinics managed by the Lake--an FQHC with two sites in the parish (Innis Community Health Center); one local community clinic; two private practice primary care clinics; and one home health agency, Point Coupee Home Bound.

Project Management: The PCGH CAH HIT network can be described as an affiliation rather than a structured network. The CEO of the hospital is on the board of the Federally Qualified Health Center.

Goals: The purpose of the proposed network is to fully implement functional electronic health records with practice management system capabilities within each network partner organization and enable appropriate health information exchange among all partner organizations.

Objectives:

- Develop capacity for business and patient information sharing and clinical decision support
- Ensure effectiveness of network infrastructure
- Efficient deployment of full scale network architecture
- Have a fully functional electronic information capture, tracking, reporting, and sharing network

Expected Impact: HIT systems that will enable the hospital and physician practices to exchange information, track patients, define weak areas in the chain of care will benefit the entire health care system and more importantly the patient population. Project administrators expected improved coordination of care, increased quality of care, and cost savings to the system.

Catchment Area and Target Population: The Pointe Coupee HIT Network serves the Pointe Coupee Parish service area, which is located in south central Louisiana. Pointe Coupee's land area is 557.4 square miles. Agricultural production is a mainstay of the economy. Pointe Coupee is one of the most diverse agricultural parishes in the state. Close to 165,000 acres of land are used to farm cotton, sugarcane, soybeans, corn, milo, wheat, cattle, hay, vegetables, rice, crawfish and pecans (LSU Agricultural Center, 2007).

The 2006 estimated population for Pointe Coupee Parish is 22,648 (U.S. Census, 2007). The largest town in Pointe Coupee Parish is New Roads (home to Pointe Coupee General Hospital), with close to 5,000 residents (U.S. Census, 2000). According to the 2000 U.S. Census estimates, 49% of the population is male; 61% is white, and 38% is black. Only 69% of the population 25 years and older has earned a high

school diploma. The unemployment rate is high with only 55% of residents at least age 16 in the labor force. Consequently, 23% of all individuals and 19% of all families in the parish are below the poverty level (U.S. Census County Quick Facts, 2000). Over 40% of area residents receive some form of public assistance and 27% of the community is enrolled in Medicaid (Louisiana Medicaid Annual Report, 2004/2005).

Evaluation: According to the grantee's final report, an external evaluator is conducting the evaluation of the project. A final project evaluation report was to be submitted separately. The grant application described four main evaluation components: policy review and strategy, process review, program review, and health outcomes measures.

Project Status at End of Grant Period: At Pointe Coupee General Hospital, no major issues were encountered. The personnel quickly became involved and implemented on time and very well. However, the failure to engage one of the software vendors eliminated the home health agency data from being a part of the portal. In addition, the FQHC had a very difficult time and is still not implemented. They did not have nor acquire the resources necessary to do a timely implementation. Finally, after many attempts to meet with the tertiary center, project administrators were unable to obtain any level of participation.

Sustainability: Information not available.

Michigan

Project Title: Michigan's Thumb Area Flex CAH HIT Network Implementation Grant

Project Summary: The primary purpose of Michigan's FLEX CAH-HIT Network project was to create an effective health data exchange between two Critical Access Hospitals and their tertiary referral center, so that the electronic health records of a transferred patient could be shared electronically between the referring physician in the 3 rural communities and specialty physicians at the tertiary hospital. It was anticipated that the project would improve the safety, quality, efficiency, and effectiveness of health care delivery through a full continuum of care. The anticipated results will be measurable improvements on the health status of local communities including improvements in: (a) the safety and quality of care delivery and patient's care; (b) the effective delivery of health services and continuity of patient care; and (c) operating efficiencies in terms of time saved, increases in revenue, increased tracking and/or reporting of patient's quality and health outcomes.

Project Background: According to the Michigan Department of Community Health, the service area experiences high levels of hospitalizations for heart diseases, injuries, cancer, pneumonia, cerebrovascular diseases, and osteoarthritis. The area has a higher-than-average rate of deaths due to diabetes. According to the region's hospital officials, relevant barriers in the service area include: (a) at least a 70-minute travel time to the closest tertiary care services; (b) poor communications between primary and tertiary care professionals; and (c) poor access to needed specialty care services.

Network Participants: Two Critical Access Hospitals, **Deckerville Community Hospital** in Sanilac County, and **Harbor Beach Community Hospital** in Huron County were selected as the rural target sites to be electronically connected with a tertiary hospital partner. Although each hospital faced unique local challenges, they both shared common problems including: (a) Federal designation as a Critical Access Hospital; (b) both are located in Michigan's rural "thumb" region; (c) both send patients requiring tertiary care services to the same regional medical center; and (d) both seek to develop common regional solutions to their local HIT, access, and quality-of-care issues and challenges. In the spring of 2009, **McKenzie Memorial Hospital** in Sandusky was added to the project as a third Critical Access Hospital partner site. **Mercy Hospital in Port Huron** was selected as the tertiary partner for the CAH HIT Network.

Project Management: The **Thumb Rural Health Network (TRHN)** provided overall long-term governance and direction to the project. TRHN is a 16-member organization located in the rural counties of Huron, Sanilac and Tuscola in Michigan's Thumb region. TRHN's membership includes seven CAHs and one sole-community hospital; the region's two Health Departments; six tertiary hospitals serving the region; and one Multipurpose Collaborating Council. By using the TRHN as an oversight body for the project, the participants took advantage of an existing, successful regional collaborative body to: (a) provide project oversight; (b) communicate with other health care providers in the region; and (c) facilitate subsequent expansion of the HIE Network to other CAHs in the Thumb as well as other tertiary facilities. The TRHN also helped to identify other related HIE services that could generate a revenue stream to help support long-term sustainability of the HIE Network.

However, to date, the lack of an operational HIE Network has not required management and oversight of the Thumb Rural Health Network as originally planned. The Network has received progress reports and information concerning the project by the Principal Investigator quarterly. Once the HIE becomes operational, the TRHN is expected to exercise management of the Network including: (a) provide Network oversight; (b) communicate with other health care providers in the region; and (c) facilitate subsequent expansion of the HIE Network to other CAHs in the Thumb as well as other area tertiary facilities.

Goals: The goal of the project was measurable improvements on the health status of local communities including improvements in: (a) the safety and quality of care delivery and patient's care; (b) the effective delivery of health services and continuity of patient care; and (c) operating efficiencies in terms of time saved, increases in revenue, increased tracking and or reporting of patient's quality and health outcomes.

Objectives:

- Use HIT as a tool to improve the safety, quality, efficiency, and effectiveness of health care delivery in the Thumb region of Michigan
- Adopt the effective use of a clinical information system through an integrated system with a common architecture
- Create sustainable business model for deploying HIT in the Thumb region
- Improve the quality and performance of our organizations both individually and jointly
- Improve healthcare quality through the elimination of handwritten clinical data
- Successfully deploy or enable the deployment of hospital HIT practices that reduce medical errors and improve overall patient safety
- Increase the identifications and reporting of medical errors and adverse events
- Develop HIT systems that support the regional collection and assessment of patient care data as part of the state-wide Michigan Critical Access Hospital Quality Network for the measurement of health care quality
- Enhance the Network's ability to collect data regarding the impact of HIT on healthcare outcomes, improving patient safety and quality of care
- Increase the number of non-hospital providers in our local communities utilizing CPOE with CDSS and HER Systems and identify and support local and regional HIT collaborative projects that lead to standards-based data sharing across healthcare delivery sites
- Share their HIT implementation experiences with other organizations and networks.

Expected Impact: The CAH HIT Network was expected to produce measurable improvements on the health status of local communities including:

- Improvements in the safety and quality of care delivery and patient's care.
- Improvements in the effective delivery of health services and continuity of patient care.
- Improvements in operating efficiencies in terms of time saved, increases in revenue, increased tracking and/or reporting of patient's quality and health outcomes.

The project will be used as a template for adoption and/or expansion to Michigan's other CAHs, as well as those in other States.

Catchment Area and Target Population: The targeted service area for the project is located on the eastern Lake Huron shoreline of Michigan's Thumb, and included Deckerville Community Hospital in Sanilac County, and Harbor Beach Community Hospital in Huron County. The service area is rural with no freeway access to more populous areas and primarily agricultural (approximately 80% of the land devoted to agriculture). The 2006 average income of residents in the service area is nearly 20% less than

the State average. This lower-than-average income is also reflected by the region's higher levels of population living at or below 200% of the poverty level.

In addition, the target service area has a high number of persons aged over 65 years; a higher-than-average number of residents both Medicare and Medicaid eligible, and a higher-than-average level of unemployment. The two target counties are also designated as Medically Underserved and Health Professional Shortage Areas. According to the Michigan Department of Community Health, the service area experiences high levels of hospitalizations for heart diseases, injuries, cancer, pneumonia, cerebrovascular diseases, and osteoarthritis. The area has a higher-than-average rate of deaths due to diabetes.

Evaluation:

- Surveys were completed at the 3 hospital sites by December 2008.
- The onsite Technology Consultant distributed pre-surveys to clinical staff at the 3 hospital sites by December 2008.
- Surveys, initially scheduled for distribution in February 2009, have been delayed pending completion of interfaces between the HIE and Mercy Hospital in late August 2009.
- Post-surveys cannot be completed until patient data is transferred. A complete project evaluation cannot be completed until patient data is transferred after October 2009.

Data collected-to-date consists primarily of "process outcome" measures concerning the successful accomplishment of implementation schedules as planned. In addition, pre-surveys of physicians and clinicians were collected at each hospital site in December of 2008 for use in comparison with Post-surveys to be conducted after the HIE becomes operational. At that time, the planned electronic transfer of patient records between facilities will become possible, and an evaluation of how the HIE Network impacts the transfer of patients between facilities, and the care they receive, will ensue.

Project Status at End of Grant Period:

As of August 31, 2009, the following projected outcomes have been achieved:

- The sharing of electronic health records between separate and unique health care providers to improve the safety, quality, efficiency, and effectiveness of health care delivery in the Thumb region of Michigan;
- Adoption of the effective use of a clinical information system through an integrated HIE system with a common architecture;
- Development of HIT systems that support the regional collection and assessment of patient care data as part of the Michigan Critical Access Hospital Program's Quality Committee for the measurement of healthcare quality;
- The ability to share the project's HIT implementation experience with other organizations and networks.

As of August 31, 2009, the following projected outcomes have not been achieved:

- Creation of a sustainable business model for deploying HIE in the Thumb region;
- Improvement in the quality and performance of rural health care organizations both individually and jointly;
- Improvement in healthcare quality through the elimination of handwritten clinical data;

- Successful deployment of hospital HIT practices that reduce medical errors and improve overall patient safety;
- An increase in the identification and reporting of medical errors and adverse events;
- Enhancements to the Network's ability to collect data regarding the impact of HIT on healthcare outcomes, improving patient safety and quality of care.

While the grantee anticipates that the network will perform as expected, as of August 31, 2009, the network is not fully operational. However, the grantee noted that the Michigan project is the initiation of a HIE network and its existence does make a difference in the outcome of the project.

Sustainability: The operation and use of EHRs at each hospital site is now an integral part of each organization's patient care delivery system. The ongoing cost of the Covisent HIE is being built into the existing insurer costs of transferring a patient between the local CAH and the tertiary referral center. The electronic patient data will be made available seamlessly within each facility's EHR system.

As additional CAH facilities in the Thumb Rural Healthcare Network establish their EHR systems and seek to electronically transfer patient information with a tertiary facility, they only need to have their EHR vendor create the data interface with the HIE to access the Regional HIE Network. Coordination of the HIE Network is currently an integral component of the TRHN. The TRHN will continue to: (a) provide communications about the benefits of the HIE with other health care providers in the region; (b) facilitate subsequent expansion of the HIE Network to other CAH in the Thumb as well as other Tertiary facilities; and (c) identify other related HIE services that can generate a revenue stream to help support long-term sustainability of the HIE Network.

Minnesota

Project Title: Minnesota Flex CAH HIT Network Implementation Project

Project Summary: The grantee successfully implemented an electronic health record system among its three facilities, Madison Lutheran Home, Johnson Memorial Health Services, and Appleton Area Health Services, in order to create an integrated community health information system to allow patients served to travel seamlessly through the continuum of care and permit reporting of quality measurement data.

Project Background: In 2007, the LqPHN conducted an HIT strategic planning process that provided a comprehensive blueprint for the selection and implementation of a system-wide electronic health record (EHR) system. The three organizations identified a need for patients in the three communities to move seamlessly through the continuum of care from emergency services to acute hospital-based care to assisted living and/or nursing home and referral to Rice Memorial Hospital in Willmar or other referring hospitals, such as Avera McKennan in Sioux Falls, South Dakota, or Level I Trauma Hospitals in the Minneapolis-St. Paul metropolitan area. It also identified a need to continue improving patient quality of care and safety by integrating outcomes reporting into its EMR environment.

Collaboration on HIT implementation would allow the facilities to share hardware and software purchases, share consulting fees for HIT implementation and rollout, share IT staff positions and support, and achieve efficiencies. Finally, an HIT collaboration would support the practitioners in those communities as they experience the challenges of a major environmental, procedural and cultural change.

Network Participants: The Minnesota Office of Rural Health and Primary Care selected Lac qui Parle Health Network, an incorporated non-profit network of three Critical Access Hospitals in two neighboring counties in western Minnesota, for participation in the Flex CAH HIT Network Grant. The Lac qui Parle Health Network members - Johnson Memorial Health Services (JMHS), Dawson; Madison Lutheran Home (MLH), Madison; and Appleton Area Health Services (AAHS), Appleton – each 1) represent a full service health care delivery system in their communities, 2) have a successful history of collaboration in a number of areas, 3) had completed a six-month Health Information Technology strategic planning process, and 4) were close to selecting products and vendors from an identified list and were ready to implement a fully electronic health records environment across the organizations.

The **Lac qui Parle Health Network (LqPHN)**, a non-profit tax-exempt hospital services cooperative, incorporated in 1998 to assist its members in building and maintaining quality health services, consists of:

- **Johnson Memorial Health Services (JMHS), Dawson, MN** (Lac qui Parle County) – a community based hospital district made up of the following providers: Critical Access Hospital, Rural Health Clinic, nursing home, home care agency, and ambulance service.
- **Madison Lutheran Home (MLH), Madison, MN** (Lac qui Parle County) –a non-profit community based organization made up of the following providers: Critical Access Hospital, Rural Health Clinic, nursing home, assisted living housing, and senior residential facility.
- **Appleton Area Health Services (AAHS), Appleton, MN** (Swift County) – owned by the city of Appleton made up of the following providers: Critical Access Hospital, clinic, nursing home, assisted living housing, and senior residential facility.

Project Management: The Minnesota Office of Rural Health and Primary Care provided coordination and program guidance to project and distributed funds to sub-grantees. **Stratis Health**, Minnesota’s Medicare Quality Improvement Organization, provided consultative planning services to the Lac qui Parle Health Network and to each of the Critical Access Hospitals in Dawson, Appleton and Madison to assist with final planning, selection of an EHR product and adoption and integration of health information technology and electronic health records (EHR). Stratis was brought into the project to emphasize planning and address the cultural shift necessary to help the organization(s) move toward the adoption of an electronic health record. They did this by adapting the structured DOQ-IT program that has been shown to be effective in helping clinics successfully adopt and integrate electronic health record systems to a small hospital setting.

Goals: To implemented an electronic health record system among the LqPHN’s three facilities, Madison Lutheran Home, Johnson Memorial Health Services, and Appleton Area Health Services, in order to create an integrated community health information system to allow patients served to travel seamlessly through the continuum of care and permit reporting of quality measurement data.

Objectives:

- Completing a collaborative long range health information technology (HIT) strategic plan, including development of change management strategies.
- Verifying organizational readiness for electronic health record implementation.
- Selecting a vendor and electronic health record product and entering into contract.
- Developing an implementation plan, to include:
 - Application design

- Infrastructure build
- Testing, and
- Staff training
- Implementation.

Expected Impact: It was determined that a strong, integrated Critical Access Hospital-based community health information system would allow patients served by these community health systems to travel seamlessly through the continuum of care, would build efficiencies and cost-savings by sharing of resources, and would build upon already-existing quality improvement programs in each of the facilities, enhancing their ability to utilize patient data to improve care and report outcomes. In addition, the LqPHN CAH-HIT network project was seen as a potential model that could be replicated and in other CAH-based hospital systems in communities in Minnesota and other states.

Catchment Area and Target Population: Located in a remote region of Southwest Central Minnesota, LqPHN's primary service area in Lac qui Parle and Swift Counties is a federally designated underserved area. West Central Minnesota is similar to the Great Plains states with which it borders; an agricultural economic base with declining and aging populations. Lac qui Parle and Swift counties are typical of its surrounding rural counties and face the same challenges.

Over 25 % of the approximate 20,000 people living in these two counties are over the age of 65. According to 2005 Minnesota Demographer estimates, the percentage of persons over 65 years of age in the service area and adjacent counties of Minnesota is higher than the State average. Of note, Lac qui Parle and Swift Counties have greater than 20% of the population over 65 years of age.

Projected changes in the distribution of persons over the next twenty years within the state indicate the population of the proposed network service area will continue to decline, a reflection both aging population and declining economies. This aging population will be high users of healthcare services, yet the ability to finance and staff technologies and services will become increasingly more difficult.

Evaluation: With assistance from Stratis Health, LqPHN defined and developed processes to collect point of care patient data at the clinic, hospital and nursing home settings through collection and analysis of primary and secondary patient data for the purposes of improving patient outcomes, to include:

- Establishing, monitoring and analyzing performance indicators for:
 - Heart failure
 - Pneumonia
 - Diabetes
 - Cardiovascular care
 - Adverse events
- Participating in Hospital Compare Reporting

At the time of the final report, LqPHN was in the process of phasing in the EHR product and was to begin measurement and analysis of quality indicators as the EHR is implemented. Stratis Health assisted LqPHN to evaluate and assess their quality measures and to develop a plan to adapt the measures for the new EHR environment. The Health Information Management (HIM) Directors from each organization were guided to facilitate an internal analysis, working with physicians, nurses, and other

staff members to review and evaluate clinical practice guidelines, determine discrete data requirements, and map process to ensure the EHR will capture key data to enable LqPHN to more efficiently and effectively measure quality improvement activities.

In addition, LqPHN management submitted monthly progress reports to the Office of Rural Health and Primary Care (ORHPC) along with a final report of progress. One site visit was conducted midway through the project to observe joint facility steering committee activity and the process for evaluation of vendors. In addition, regular informal communication occurred between the ORHPC and LqPHN leadership. Stratis Health submitted mid-term and final progress reports.

Project Status at End of Grant Period: LqPHN successfully implemented an electronic health record system among its three facilities, Madison Lutheran Home, Johnson Memorial Health Services, and Appleton Area Health Services. Implementation of the long term care modules were delayed because of software delays product development by the vendor, and a home care software interface was delayed due to a scheduled major upgrade on the part of the home care vendor. Both of these installs are anticipated for full completion by the end of 2009 or the first quarter of 2010 at the latest.

Sustainability: The project will be sustained after CAHHIT funding has ended. The prior existence of LqPHN's organizational network and prior HIT strategic planning work positioned the LqPHN members to build sustainability into their planning. Resources for shared IT staff and ongoing costs are incorporated into both the network's and the individual health system's long range planning.

Stratis Health assisted LqPHN in developing a five-year total cost-of-ownership plan. This gave the network an insight to the cost savings achieved through a group purchase through the LqPHN. Charles River Consulting assistance with contract negotiation resulted in contract terms that will lock maintenance fees at the current rate for five years. In addition, because maintenance fees are calculated from the initial purchase price, LqPHN was able to negotiate a group discount because three hospital systems purchased the software at the same time. With a fully implemented interoperable medical record system in place, LqPHN hospitals have also positioned themselves as meaningful EHR users and thus able to capture Medicare and Medicaid HIT stimulus incentive payments.

LqPHN is willing to expand membership into the network and has held discussions with regional facilities. They are also considering joining a regional effort to establish a data center. A long range plan is to consider this option when it is time to upgrade current servers approximately five years from now.

North Dakota

Project Title: Flex CAH HIT Network Implementation Grant

Project Summary: The overall project goal was to facilitate the exchange of health information by implementing an interoperable EMR along the continuum of care that is patient-centered, facilitating patient safety, efficiency, and effectiveness of health care services. Three CAHs, one tertiary referral hospital, and ancillary providers including a community health center, will serve as the network model.

Project Background: At the time of the application, North Dakota had 31 critical access hospitals (CAHs), none of which was involved in a health information technology (HIT) network with its tertiary. Statewide data indicated that CAHs were supportive of the need and benefits of HIT; however, they struggled with available resources (e.g. financial and IT staff). At the time only 16% of ND CAHs had a formal HIT plan; yet, 68% were starting to budget for HIT. Additionally, 89% reported not yet using any form of electronic medical records.

Currently, the participating tertiary facility utilizes a clinical portal to allow dissemination of patient information from their facility to the CAHs, clinics, and other providers. There is no electronic transmission of patient information from the CAHs to the tertiary facility, nor between each other. Northwood Deaconess (CAH) has limited patient information sharing capabilities between itself and Valley Community Health Centers—a limited pilot-project was tested with mixed results that involved the sharing of laboratory test results with clinic providers, using an intranet-based web portal.

Network Participants:

- **Northwood Deaconess Health Center:** a 12 bed CAH and 77 bed skilled nursing facility in Northwood, ND. Included in the original grant application.
- **Valley Community Health Center:** a CHC co-located with Northwood Deaconess Health Center. Included in the original grant application.
- **First Care Health System:** a 14 bed CAH and clinic in Park River, ND. Selected through a competitive application process upon receiving the HRSA grant.
- **Pembina County Memorial Hospital:** a 15 bed CAH, clinic and long term care center in Cavalier, ND. Selected through a competitive application process upon receiving the HRSA grant.
- **Altru Health System:** a 277 bed integrated health system in Grand Forks, ND that serves as the region's tertiary referral center for approximately 20 CAHs. Included in the original grant application.

Project Management: The project was managed by the ND Flex and State Office of Rural Health (SORH) Program Directors which was beneficial due to each person's relationships with the facilities and knowledge of quality improvement and health information technology. Coordination of the project was to be the responsibility of the executive director of the North Region Health Alliance, a health consortium consisting of 20 health facilities in northwestern MN and northeastern ND. However, within the first few months of the project the realization was made that there were trust issues between this individual and the hospitals within the network as well as the PI's observations related to lack of follow through and inclusiveness. The individual was spoken to and advised that a change of the coordination needed to be made in order for the project to be successful. The PIs assumed additional responsibility

for coordination of project activities and asked the project’s CIO to increase his involvement from an IT perspective and work with all three CAHs, not just his own. This was negotiated and supported by the network participants.

Goals:

- Access quality health services. ND Flex facilitates CAHs’ ability to develop systems of care that are responsive to improving health status, monitoring patient outcomes, improving patient safety, and other central facets of quality focused access.
- Health communication is a second primary focus of the NRHA CAH HIT Network through the development of a network approach to HIT and EMR function.

Objectives (as stated in the grant application):

- to assist CAHs with the implementation of electronic medical records and the sharing of patient data with at least one ancillary facility within their respective communities;
- facilitate the exchange of patient information (diabetes) between the CAH facility/ancillary and the regional tertiary center; and
- strengthen regional network to address HIT needs and issues.

Expected Impact: There are no other tertiary-CAH HIT networks in place in ND, so this will be the first true HIT network of its type in the State. The partners believe that this pilot is a significant opportunity and incentive to begin further testing of the benefits of HIT exchange in ND, and will serve to add depth to the State Rural Health Plan. The timeliness of this pilot project will strengthen the future planning of the ND Flex Program as it looks to further support other CAHs.

This proposal focuses on two significant chronic conditions, diabetes and cardiovascular disease, putting in place the technology to gather baseline data as part of an overall HIT plan with the building blocks for evidenced-based practices to guide care delivery. The project will also improve safety and quality of care in the service area.

Catchment Area and Target Population: The intent of the project was to eventually impact the northeast region of North Dakota and northwest Minnesota consisting of 18 CAHs, 1 rural non-CAH, 1 tertiary facility and 1 mental health agency. The potential regional impact covered 20,000 square miles serving a population of over 207,000 residents in 17 counties. In rural ND areas, a simultaneously shrinking, aging population, coupled with low population density, presents challenges in terms of an adequate workforce, health service options, and infrastructure. ND ranks highest in the proportion of residents 85 and older.

Evaluation: A portion of the evaluation plan submitted in the original proposal was geared to the implementation of an integration engine which allowed access to a bi-directional clinical portal. This did not come to fruition, therefore the PIs revised the original goals to support the redirection of the project (i.e. changes to consultants, coordinator, partner roles, budget, etc.). Therefore, process outcomes were used to evaluate this project as originally described. The following activities were part of the overall implementation process.

Activity	Date	Outcome
1) A “kick off” meeting was held with all project partners.	October 2007	23 - attended

2) Staff from each CAH completed a survey to assess computer skills, attitudes about EMR (via SurveyMonkey)	Nov-Dec 2007	All three CAHs completed the survey and were provided a report of the survey results to be used for developing training.
3) Each CAH was required to submit an updated work plan to the PIs/program directors every two months.	Every two months December, 2007- February, 2009	Information provided was used to engage project partners in problem solving discussions on monthly conference calls or one-on-one meetings.
4) Monthly conference calls were held with CAH HIT Steering Committee in order to provide updates from each facility; problem solve as needed.	Monthly	Meeting minutes and roster of attendance were emailed out to all partners and retained on file with PIs.
5) Each CAH was asked to track their use of Clinical Workstation to assess how it was used; examples of improved care, saved costs, etc.	Three month period	CW was accessed 31 times, for various information, within 3 months. Only one facility followed up with this.
5) The PIs decided it would be more useful for the CAHs and best use of grant funds to engage John Snow Inc. to conduct site-visits at each CAH in order to evaluate the success of EHR implementation at it relates to workflow efficiencies and improved data flow.	January/February 2009	A site visit was conducted at each CAH; an individual analysis was completed and a report given to each CAH. In addition an overall report was compiled of common successes, challenges and lessons learned and provided to PIs and each CAH.
6) A face-to-face “wrap up” meeting was held with all partners presenting their lessons learned to an audience of their peers throughout the state (in-person and over videoconference).	March 2009	75 participants from 18 CAHs, and others attended
8) The grantee was selected as one of four CA HIT projects to take part in the evaluation conducted by Altarum Institute – contracted with ORHP. As a result, each of the three CAHs were asked to complete a comprehensive three part survey designed by Altarum; in addition they also participated in an onsite visit/interviews.	May 2009	Surveys completed/compiled; site visit completed; report will be completed by Altarum.

Process Measures: A work plan was developed upon receipt of the award and provided to each of the CAHs. The expectation was for each to update their respective work plans every two months which they did. Process outcomes were tracked utilizing this format. Workflow analysis information also lends to outcome measures. John Snow Inc. was contracted with to assess this and provide the findings and recommendations with each CAH and an develop an overall report of common themes and recommendations.

Health Outcome Measures: Due to the limitation of the few months of actual EMR implementation for this grant project and the difficulties encountered with establishing a portal to share diabetes data across the continuum of care, therefore these measures were not collected at the end of the project. However, examples of adjustment/clarification of medications and treatment plans, reduced duplication of services, and potential cost savings were tracked and shared. Altru Diabetes Center staff worked in collaboration with rural clinical staff to discuss and agree upon “treat-to-target” indicators which were included on the electronic work sheet created and made available by clicking on a Regional Diabetes Project - Tab on clinical workstation (CW).

Average HbA1c for diabetic patients in the electronic patient registry (required measure)

Patients with blood pressure < 130/80 (required measure)

Patients with LDL < 100 mg/dl (required measure)

Dilated eye exam in last year. (selected measure)

Foot exam in last year (selected measure)

Are you a smoker? Y/N

Do you take aspirin? Y/N Start date

Have you seen the nurse educator in the past 6 months?

Have you seen the dietitian in the past 6 months? Y/N

Use of Clinical Workstation (CW) tracking: All CAHs were asked to track their use of CW. (Only one CAH, First Care Health Center, Park River did so.) Over three months – CW was accessed 31(reported) times.

Project Status at End of Grant Period:

The grant provided funding to support a portion of the cost to implement an EMR in three CAHs and their respective ancillary facility which in turn allowed providers access to health information for the rural residents of each service area. Patient information is now shared *electronically* within each rural facility; between the rural facilities (e.g. local clinics and nursing homes) and from the tertiary referral center back to the rural facility via a one-directional portal.

The network functioned as originally planned and the benefits of shared knowledge by working collaboratively made a difference in the successful outcome. The collaboration between the rural-to-rural and rural-to-urban improved as a result of the project and continues. The only network component change from the original plan was that of having the Executive Director of the network coordinate the project. This change did not impede the outcome of the project.

Sustainability: Each of health facilities involved in this project is committed to sustaining their EMRs into the future. The anticipated costs associated with maintaining their respective HIT systems has resulted in higher than expected HIT budget with one estimating an average cost of \$50,000 per annum. Products are continually being updated and the needed upgrades are costly. Additional modules that enhance the EMR systems implemented through this project will be needed for CAHs to achieve the recommended HIMSS level 4 necessary for the exchange of health information which will be required to be eligible for the enhanced Medicare/Medicaid reimbursement to be made available through the HITECH ACT portion of the economic stimulus package.

Each of the CAHs continues its membership with North Region Health Alliance (NRHA) and their relationship with the tertiary facility, Altru Health System. The benefits of networking is well understood and recognized by each, and going forward the health facilities will negotiate what they need from their partners as the need and “fit” arises.

Each of the CAHs have chosen a different server solution; one has a service agreement with Altru Health System which is very cost effective and involves 3-4 other CAH members of NRHA; a second originally worked with North Region Health Alliance to host their server but had difficulties with the maintenance, service, capacity, and compatibility with their EMR system which resulted in changing to their own server at additional unplanned expense; the third maintained their own server and continues to do so.

Three different work groups resulted from this project: 1) HIT personnel from the region began meeting over the course of this project and continue to meet sharing information and brainstorming solutions from a regional perspective; 2) representatives from a number of CAHs throughout the state, including this project’s participants, have held calls (and continue to work together) to work on policies and procedures that address changes with the implementation of HIT and the electronic exchange of health information (this group is working with a representative from the ND Health Information Management Association (HIMA)); and 3) a diabetes work group was convened between the Altru Diabetes Center and the health care professionals from the rural facilities for the purpose of developing shared outcome indicators for tracking on CW. The first two groups have continued to meet.

The UND Center for Rural Health continues to leverage funds (SORH/Flex, SHIP) to support planning and adoption of EMR in other facilities throughout the state which often requires networking as a framework to obtain those funds. The lessons learned from this particular project network (3 CAHs and one tertiary) has already expanded the “network” by sharing lessons learned with other CAHs within NRHA and outside of this network (i.e. state legislators during the 2009 Legislative Session, the ND HIT Steering Committee has and will use the information as the state HIT/HIE strategic plan is developed).

Lastly, the SORH and Flex programs are currently working on the development of a technical assistance (TA) project for other CAHs using the lessons learned from this project. The TA project will provide the necessary tools to assist facilities to work through the necessary steps/activities to assess their readiness to implement EMR. This project intends to accelerate the readiness of ND healthcare facilities.

The ND Legislature recently passed Senate Bill 2332 which will make available funds for a low interest loan program to purchase and upgrade EMR. However a certain level of readiness will be required in order to be eligible to access the loan funds.

Nebraska

Project Title: NE Flex CAHHITN Implementation Grant

Project Summary: The main focus of the Nebraska Project was to share and exchange clinical health information along a continuum of care. This continuum involved the Thayer County Health Services (a Critical Access Hospital and physician's clinic), five additional rural health clinics, one assisted living facility, one nursing home, three EMS ambulance units, an independent pharmacy, a hospital-owned retail pharmacy, a home health agency, and the network hospital (St. Elizabeth Regional Medical Center in Lincoln). The desired outcome of the project was to improve the quality, safety, efficiency, and effectiveness of the Thayer County Health Care system.

Project Background: This project was designed to meet the health needs of Thayer County and the surrounding communities in Nebraska and Kansas. The population of Thayer County is older and the mortality rates for many of the major health problems are considerably above the state average. For example, the heart disease death rate was 22 percent higher than the Nebraska average. The unintentional injury rate was 2.1 times higher and the motor vehicle death rate was 3.2 times above the Nebraska rate. The hospitalization rate of the county residents exceeded the Nebraska rate by 19 percent. Almost 26 percent of the residents of Thayer County are over the age of 65, and about nine percent live in nursing homes. There are also access to care issues. A major area of concern is the growing number of uninsured and underinsured, which directly translates into increasing levels of uncompensated care. Thayer County has been a federally-designated health professional shortage area (HPSA) for several years.

In terms of existing technology, the CAH has been successful in obtaining additional grants to support HIT projects. Recent investments include: online nurse charting for inpatient and outpatient services, patient scheduling for clinics and hospital departments, order entry for lab, radiology, and survey, online transcription, Pyxis Medication and supplies, computerized radiology, and financial packages for automated time clocks, payroll, accounts payable, general ledger, and materials management. Telehealth videoconferencing is available for interactive medical consultations. The Medi-Notes Electronic Medical Records program interface was recently implemented in the Hebron Rural Health Clinic, and will eventually link all rural health clinics, CAH, nursing homes, and pharmacy.

Network Participants: The network included a critical access hospital (Thayer County Health Services), and ambulance services in Hebron, Carleton, and Alexandria, a nursing home in Hebron, assisted living facilities in Hebron and Deshler, five rural health clinics in Milligan, Deshler, Davenport, Bruning, and Chester, two pharmacies in Hebron, and the network hospital in Lincoln (St. Elizabeth Regional Medical Center).

Project Management: The project was led the administrator of TCHS. One of the keys to their success was the formation of a 9-member project committee. This committee met at least weekly to assure that the project was moving forward in a timely manner and to work with the vendors and other health professionals to lay out a vision, objectives, and action steps to complete each of the modules.

Goals: The goal of the project was to create an electronic linkage among health care providers that will transmit clinical information so that each provider can make informed treatment decisions based upon current patient data and information.

Objectives:

- Improve the connection to share information with network tertiary medical center

- Build a bridge with EMS to improve communication and share information
- Improve communication and share clinical information with long-term care and assisted living facilities
- Improve connection to share information with satellite rural health clinics
- Improve electronic connection to pharmacies to strengthen patient safety, quality, effectiveness, and efficiency
- Improve efficiency and effectiveness of critical access hospital operations to strengthen patient quality and market position
- Address the safety and security of clinical health information

Expected Impact: The proposed project was expected to have a significant impact on the clinical and business operations of Thayer County Health Services. Clinically, it was anticipated that there would be: a reduction in medication errors and improved medication reconciliation for patients and residents through the implementation of electronic prescribing; improvement in the coordination of care and efficiency through access to electronic transmission of patient information among tertiary medical center and CAH and nursing homes; reduction in duplication and cost regarding radiology tests with the ability to transmit them electronically; and a decline in patient transfers and medical complications due to ability to discuss patient data in real time. It was also expected that the adoption of HIT will facilitate improvement of health outcomes for patients with diabetes, heart failure, and stroke and improve prevention by increasing and documenting influenza and pneumococcal immunizations. From a business perspective, the grantee expected a ten percent increase in patient days (at the CAH) because fewer patients will need to be transferred to the tertiary medical center.

Catchment Area and Target Population: Hebron (Thayer County, a designated HPSA) and surrounding communities and Lincoln (Lancaster County). The population of the targeted area has higher than average heart disease mortality and unintentional injury rates, as well as higher hospitalization rates. The proportion of adults that are uninsured and underinsured continues to be a major problem as well. Also, about 26 percent of Thayer county residents are over the age of 65 and almost nine percent of them live in nursing homes.

Evaluation: The project was evaluated by the Nebraska Center for Rural Health Research at the University of Nebraska Medical Center. The evaluation focused on three main areas: (1) the effectiveness of the planning process between TCHS and its partners (*i.e.*, a common vision, an agreement on the strategies, and the action steps in the work plan), (2) the accomplishments of the project (*i.e.*, were all of the goals achieved?), and (3) the outcomes of the project.

The Center concluded that the planning process produced strong collaborative partnerships and a common vision between them. All of the major decisions between the partners were made jointly, and all of the partners worked together to resolve the problems.

As previously documented, all of the major goals of the project were achieved and clinical patient information can be exchanged along the continuum of care. While there were some challenges, such as the slow speed of the CPOE and resistance from some staff, all of the major challenges were eventually overcome. As the system matures, nearly all of the technical issues should be resolved and the changes in staff beliefs and behaviors concerning the system have already created a more positive change in culture.

Because this project was primarily implemented during an 18-month period, it was more difficult to evaluate the performance measures. However, there have been some very encouraging early results in

the patient safety area. Since the project began, medication errors have declined from 48 per quarter to 9 per quarter. Also, medication reconciliation has been 100 percent for those physicians who are using e-prescribing but it has ranged from 17 percent to 50 percent for those who do not. There is also evidence that this project has greatly contributed to a culture of high quality and performance. One of the goals of the project was to improve communication within TCHS. Results from the AHRQ Hospital Survey on Patient Safety Culture found that major improvements had been made between 2005 and 2009. For example, in 2005, 46 percent of the employees that were surveyed responded positively to the question, “There are systems in place to ensure patient safety.” By 2009, 70 percent of the employees indicated a favorable response. Major changes were also observed in the following categories: (1) Manage actions promoting safety, (2) Non-punitive response to errors, (3) Support for safety by hospital management, and (4) Teamwork across hospital departments.

The 2009 survey also revealed several areas of strength. Some of these include:

Indicator	Positive Response Rate
<ul style="list-style-type: none"> • Patient safety is never sacrificed to get more work done. 	77%
<ul style="list-style-type: none"> • Our procedures and systems are good at preventing errors from happening. 	77%
<ul style="list-style-type: none"> • When a lot of work needs to be done quickly, we work together as a team to get the work done. 	92%
<ul style="list-style-type: none"> • Hospital management provides a work climate that promotes patient safety. 	90%
<ul style="list-style-type: none"> • The actions of hospital management show that patient safety is a top priority. 	89%
<ul style="list-style-type: none"> • Hospital departments work well together to provide the best care for patients. 	85%

These results and other positive findings from the survey clearly show a positive patient safety culture, and their culture provides a solid foundation for making improvements in the quality of patient care.

This changing culture has also helped to reduce the resistance to change, which translates into better patient care. This resistance was greatly reduced by selecting the best leaders to serve on the project committee, allowing end users to make the decisions on the hardware and software they would be using, creating a separate room for training, and having nurses assisting the physicians in completing the electronic medical records and the CPOE. Reducing resistance to change minimized the “down time” and allowed the medical and hospital staff to spend more time with patients.

There were also other changes which improved patient care. For example, the sharing of patient information with the physician hospitalists at the network hospital and using the 12-Lead EKG has made

it easier to determine if a transfer is really needed. Using telehealth consultations has also helped to reduce transfers as well as improve the quality of care.

Major changes have occurred in the workflow. For example, ordering tests and medications online has led to a faster turnaround on lab tests, which should result in more positive patient satisfaction scores and greater efficiency in the billing of services.

With the electronic medical record, physicians are more likely to follow the evidence-based clinical guidelines. As a result, children and adults are likely to receive more timely immunizations. Women should receive more timely mammograms, and both men and women over 50 will be tested for colon cancer.

Finally, the Nebraska Center for Rural Health Research also developed an analytical framework to calculate a return on investment (ROI) for CAH health information technology projects. They identified both quantifiable and nonquantifiable benefits. The quantifiable benefits included potential revenue increases such as increased patient encounters and coding and billing improvements. Other savings may be generated from reduced transcription time, a decrease in nurse documentation time, a reduction in lab tests and drug utilization, and increased staff efficiency. The nonquantifiable costs included (1) reducing medical errors, (2) increasing patient satisfaction (3) improving organizational efficiency, (4) improving clinical decision making, and (5) reducing malpractice and litigation.

Several performance measures have been incorporated into the Clinical Quality Improvement Scorecard to measure improvements in the quality of care. This scorecard consists of over 150 measures for the following categories: (1) Diabetes, (2) Heart Failure, (3) Stroke, (4) Immunizations, (5) Medication Safety, and (6) Effectiveness of Communication. Within each category, there are indicators to measure the quality of care for the CAH, the rural health clinics, the nursing home, the home health agency, and the assisted living facility. Because of the short time frame, it was difficult to demonstrate progress in most of these areas. Also, the page limitations of this report prevented displaying all of these indicators. However, the indicators for medication safety are shown in Table 1 for the CAH, the rural health clinics, the nursing home, and the pharmacy.

Project Status at End of Grant Period: According to the grantee, this project “was extremely successful and achieved all of its major goals.” The components of the system and the network were implemented as planned, although extra time was needed to complete certain tasks (*e.g.*, the CPOE system). Despite several changes that were needed to modify the software and hardware, the project committee was very successful in engaging staff, modifying the work plan, and keeping the project on target. The grantee reports that the project would not have been successful without the existence of the network. The network made it possible to improve patient care along the continuum.

Sustainability: The grantee reports that the program will be sustainable because of the leadership and commitment that has been demonstrated both before and after the project began. TCHS made significant investments in both hardware and software prior to this project. In order to be sustainable, new investments are needed for both maintenance and upgrades. These costs will be reflected on their Medicare Cost Reports and depreciated over a period of time. By setting aside the money for depreciation, these funds can be invested in new technology. It is also possible to use some of the depreciation funds from their building projects.

The network will continue to be expanded as other hospitals in the area become connected. The networks will also be expanded to include the BryanLGH hospital and the Nebraska Heart Institute in Lincoln. Eventually, the reference lab and mental health practitioners will be connected as well.

Oklahoma

Project Title: Northeastern Oklahoma CAH EHR Network

Project Summary: The project was designed to create a Critical Access Hospital (CAH) Electronic Health Record (EHR) Network in Northeastern Oklahoma. The Network members' vision for the EHR network was to ensure that patient clinical information would be easily accessible to providers within a healthcare organization and to other providers as patients migrate from ambulatory care to acute service delivery sites within the region. The improved access to patient information would be integrated into a coordinated system of care that would result in more effective and efficient health care delivery that would ultimately lead to improved safety and quality of care for patients.

Project Background: The partners were not part of a pre-existing network, but they have created one (the "Northeastern Oklahoma CAH EHR Network") for the purposes of this project. The project was new at the time of the application.

Network Participants: Bristow Medical Center, Drumright Regional Hospital, Fairfax Memorial Hospital, Holdenville General Hospital, and the OSU Medical Center (all located in northeastern Oklahoma).

Project Management: OSU managed the project, which included forming committees and conducting system selections, as well as travel to other locations for site visits. After the selection process OSU worked closely with both implementation teams as well as the vendor's project managers to ensure the hospitals were implementing the systems correctly, on time, and within budget. OSU-CHS helped provide guidance to the CAH's to ensure their goals and expectations were met.

Goals: The goal of the project was the creation of an EHR network that ensures that patient clinical information is easily accessible to providers within a healthcare organization and to other providers as patients migrate from ambulatory care to acute service delivery sites within the region.

Objectives:

- Create strategic plan to direct the activities of the Network and member hospitals
- Purchase an EHR system for each hospital that will meet its specific needs
- Train staff in preparation for implementation based on their identified needs
- Follow planning process to implement EHR at hospitals
- Provide technical support to ensure system is running smoothly
- Perform evaluation plan

Expected Impact: The network members expected improvement in the following areas:

Effectiveness

- Electronic records would allow for improved billing operations as it would be easier to identify billing errors and unbilled charges.
- Electronic records would enable users to improve coding for their patients visits, thereby decreasing time spent on correcting billing codes, which would improve revenue.

Efficiency

- Electronic records would save staff time on pulling charts and locating them when they are difficult to find.
- Electronic records would make it easier to file notes and medication refills in a patient's chart without having to track down the chart each time there was an entry.
- Network members would save money on transcription fees and reduce transcription errors.
- Providers would be able to access information across systems of care within a network.
- Providers would be able to access patient information when they were off-site.
- The time saved on performing administrative tasks would lead to more time with patients.

Safety

- Electronic records would allow users to verify accurate scripting. As a result, users would be able to reduce medical errors and increase safety.
- Providers would receive point-of-care decision support when providing care to patients and utilize evidence-based clinical guidelines.
- It would be easier to track and deliver patient education materials.
- Providers would be able to limit the number of people who have access to personal health information by restricting access according to job function.

Quality

- Providers would be able to retrieve patient records and information quickly.
- Electronic records would allow users to verify formulary compliance. As a result, users would be able to reduce costs for prescribing non-formulary scripts.
- Electronic records would make it easier to administer preventive care to patients and be proactive with disease management.
- It is easier to target interventions to patients with specific diseases

Catchment Area and Target Population: The original service area of the project was northeastern Oklahoma. The participating hospitals in the project changed during the course of the project, but it would eventually include Bristow Medical Center, Drumright Regional Hospital, Fairfax Memorial Hospital, Holdenville General Hospital, and the OSU Medical Center (all located in northeastern Oklahoma). Because the project included the purchase of a Health Information Exchange (HIE), however, the potential scope of the project has increased significantly. Other hospitals within the state and region may elect to connect to the HIE and exchange information with one another, making the scope of the project at least statewide.

Evaluation: Data collection sheets were distributed to each participating hospital in an effort to evaluate how the project affected the following categories: Heart Failure, Pneumonia, Financial Measures, Diabetes, and Cardiovascular disease. The data were requested monthly from a period of 1 year prior to implementation of the HIT project to the most current data available. As of August 2009, this data request has only been completed by one hospital. The remaining hospitals, while aware of the need for evaluation, have not been able to provide the requested data to the grant administrators in a timely manner. In particular, recent financial problems with the management firm associated with Bristow and Fairfax have put this data gathering effort low on their list of priorities. Short term success will be viewed as improvements in any collected measures less than 1 year after implementation. Long-term

performance measures will involve continuing to gather data after a full year of project implementation and reviewing trends in each of the observed categories.

According to the grantee, the evaluation of the project hinges on having usable data from the hospitals. The plan is to observe levels of the captured variables (Heart Failure, Pneumonia, Financial Measures, Diabetes, and Cardiovascular disease) prior to implementation of the HIT system, and compare these baseline measures with those taken as the project moved forward and finally post-implementation. For example, Drumright started their implementation in May 2008, and had the majority of their systems “live” by January 2009. Prior to May 2008, the grant administration obtained monthly averages for the various measures, and compared them to the same measures from June – December 2008 (implementation) and Jan – July 2009 (post-implementation). Results to date are mixed, including significant improvements in performance for some measures (most pneumonia, outpatient volume, net revenue) but drop-offs in others (some heart failure, profit margin). These comparisons, along with discussions with hospital personnel about other factors that might have influenced the results during the time frames in question, will provide measures of project evaluation from both a quality and financial perspective. Data and discussions are needed from each hospital in order to complete this evaluation.

Project Status at End of Grant Period: Drumright Regional Hospital and Holdenville General Hospital both began the Flex project with no electronic clinical system, but did have electronic systems for billing. As a result of the Flex CAH HIT project, Drumright has now implemented their EMR system, including all acute care modules except for the emergency department and ambulatory systems. Holdenville has currently implemented all modules including clinical, billing and registration, except for the emergency department, prescription drugs and ambulatory modules. Holdenville plans to continue documenting emergency department visits on paper and will scan the note into the EMR, and are in the process of trying to interface their current prescription drug system with their EMR. The associated clinics were expected to go live with the clinical modules before July 2009.

Fairfax Memorial Hospital and Bristow Memorial Hospital are both owned by the same management company – Community Partners. Both hospitals joined the Flex project part way through the period of performance (when Cleveland Area Hospital left the project). Fairfax and Bristow came into the project with some EMR modules in place, and decided to expand that functionality under the same vendor rather than start over, and both are in process, as of August 2009, of implementing the new EMR modules.

As of August 2009, all hospital sites (CAH and ancillary) are in the process of determining what data will be shared within the HIE. Oklahoma State University Medical Center and OSU physician clinics currently do not have an EMR system that will directly connect to the HIE. One portion of the purchased HIE system is a portal that will query information from all the disparate systems, utilizing HL7 messaging, and allow physicians as well as clinical staff to view, update and send requests for information from other locations. OSU is in the process of negotiating the integration of other third party systems such as labs, e-prescribing, and payers into the HIE. This portal will allow physicians and staff real time access to patient data.

Sustainability: According to the grantee, one of the participating sites has increased its revenue by \$10,000-\$15,000 per month, which is “more than enough” to sustain an EMR system such as one of these in a CAH. The grantee further states that “as for the HIE it should be [sustainable] as well depending on the system chosen.” The goal of the grantee is to continue the expansion of the network. Vendors were chosen based on additional functionality that could be offered to rural facilities that do not currently have an EMR system. This offering will help the grantee sustain this network in the future.

South Carolina

Project Title: Lakelands Rural Health Network HIE

Project Summary: The purpose of this project was to acquire the necessary funding and technical resources to implement a regional health information exchange and quality improvement initiative in the Lakelands area of western South Carolina.

Project Background: The Lakelands Rural Health Network (LRHN) is a nonprofit, multi-county vertical network that was developed in 2004 with the guidance and financial assistance of the South Carolina Office of Rural Health, the state FLEX grantee, to achieve efficiencies, expand access, coordinate and improve the quality of essential health care services, and strengthen the rural health care system as a whole.

Network Participants: The Lakelands Rural Health Network (LRHN) is a vertical network of health care providers LRHN was established in January 2004 and consists of a variety of partner organizations: a regional referral hospital, two Critical Access Hospitals (CAH), a Federally Qualified Health Center (FQHC) organization with nine medical practices, several Rural Health Clinics (RHC), a private foundation, a family practice residency program, the local public health agency, and the South Carolina Office of Rural Health.

LRHN partners specific to this project are identified in the table below.

Name of Tertiary Hospital for the CAH Network	Location	Number of Beds
Self Regional Healthcare	Greenwood, SC	421
Name of CAHs	Location	Number of Beds
Abbeville Area Medical Center	Abbeville, SC	25
Edgefield County Hospital	Edgefield, SC	25
Ancillary Providers	Location	Provider Type
Laurens County Health Care System	Laurens, SC	Acute care hospital
Carolina Health Centers 1. Calhoun Falls Family Practice 2. Lakelands Family Practice 3. Uptown Family Practice 4. The Children’s Center 5. McCormick Family Practice 6. Saluda Family Practice 7. Ridge Spring Family Practice	Calhoun Falls, SC Laurens, SC Greenwood, SC Greenwood, SC	FQHC “ Family Practice “ Family Practice “ Family Practice “ Pediatrics

8. Ware Shoals Family Practice 9. Ware Shoals Center for Family Medicine	McCormick, SC Saluda, SC Ridge Springs, SC Ware Shoals, SC Ware Shoals, SC	" Family Practice " Family Practice " Family Practice " Family Practice " Family Practice
Montgomery Center for Family Medicine	Greenwood, SC	Family Practice and Residency Program
Riley Family Practice	Saluda, SC	RHC
Due West Family Medicine	Abbeville, SC	RHC
Family Healthcare Center	Laurens, SC	Family Practice
Family Health Care	Greenwood, SC	Family Practice
# Annual Common Patient encounters expected between CAH-HIT Network Providers	250,000 (Shared Service Area)	
# Total Network Provider FTEs	77.5 FTE	
Software Licenses required for the project period	<ul style="list-style-type: none"> - CareEvolution Adapter License (one per facility) - SQL Database General Use Licenses (one per processor) - SSL Certificate License (one grouping per facility) - Business Objects Query Reporting Tool (one per 	

Project Management: South Carolina Office of Rural Health provided financial oversight to the project as well as served on its board. The LRHN network director helped coordinate meetings and organized policy and procedures that were developed.

Goals: The goals for this grant were: 1) To serve as the SC rural pilot site for an already developed health information exchange technology platform, that includes a personal health record; and 2) to establish a regional quality improvement program and reporting function within the health information exchange.

Objectives:

Expected Impact:

- Establish a platform that will meet the growing needs of area physicians, non-profit and CHA, health care organizations, and empower service area residents to be active participants in their own health care
- LRHN Health Information Exchange (HIE), an ambulatory Electronic Medical Records expansion, or Community Electronic Health Record (CEHR) for area physicians
- \$850,000 cost avoidance associated with purchase of an Enterprise Master Patient Index

- All authorized LRHN caregivers will have real-time access to dynamic health history for the target population
- Timely results and notification, patient reminders, etc. in clinical operations and improved patient satisfaction
- Dissemination of project progress: newsletters and websites of SC Office of Rural Health (SCORH) and South Carolina Rural Health Association, rural health, physician, and HIT-related conferences, through presentations to graduate public health students at the University of South Carolina, to other states through the National Organization of State Offices of Rural Health.

Catchment Area and Target Population: LRHN's service area is Abbeville, Edgefield, Greenwood, Laurens, McCormick, and Saluda counties (in a rural, economically depressed region of western South Carolina). The LRHN target population is aging, increasingly diverse, under-educated, poor, and under-employed. The impact of chronic conditions on the health of the target population is significant and contributes to the leading causes of death and morbidity.

Evaluation:

According to the grantee, the project had many components and therefore any outcome achieved has multiple ways to evaluate:

- Edgefield Hospital had no significant IT structure so the purchase of a complete system with an implementation of a practice management system in 2009 electronic medical record next year would be considered a success, especially since they do not have a full time IT staff member.
- Abbeville Hospital had practice management software through CPSI but older servers. Their implementation of an electronic medical record from a practice management system to a full EMR system and then connection of that system to the HIE would be considered a success.
- Self Regional Healthcare and 3 of their outpatient clinics fully connected to the HIE was considered a success.
- Carolina Health Centers and the Self Regional Healthcare outpatient centers were involved in the diabetes collaborative. Their data from 2007 to 2008 showed significant improvement in NCQA standards for diabetes and early 2009 data shows that they reached the 75 point standard.

Project Status at End of Grant Period: According to the grantee, the network was able to function extremely well as planned. The network was designed to use as little hardware as possible – allowing for a much lower cost. All four initial adapters used only a set of redundant routers, switches, firewalls and IPS sensors. The de-identified server worked well to gather information. However, data from Misys was difficult to map and is still being worked on. Without the network, practices would not have been willing to combine and share quality improvement results.

Sustainability: According to the grantee, the LRHN does not create any revenue itself. If it is not expanded, it may be sustainable. There are yearly cost involved such as internet connectivity, personnel, hardware and network support, additional tapes, storage medium that would have to be absorbed by the participants in the program currently. Sustainability depends on proving to insurance companies that the network is saving them money by avoiding duplication of tests, improving healthcare through quality improvement efforts, and decreasing expensive workups by all physicians in the network due to better information concerning the patient.

Washington

Project Title: Bridging the Gap—Building HIT Links in Rural Washington State

Project Summary: This project set out to connect three CAHs and their respective ancillary facilities, all with disparate information systems, to each other and to the tertiary referral hospital in Seattle, Harborview Hospital, which is the only Level 1 Trauma Center in the state, through a health information exchange. This HIT project aimed to develop a universal data exchange/interfacing capability on multiple levels, and has the potential to serve as the universal EHR exchange platform that can be integrated into the statewide telehealth pipeline, thus making the platform scalable to CAHs and other providers statewide.

Project Background: The three CAHs are members of the HIT Implementation Network of Western Washington Rural Healthcare Collaborative (WWRHCC), and have a long history of collaboration, particularly in the areas of HIT and telemedicine. Since 2003, all WWRHCC hospitals have been members of the University of Washington's Telehealth Network, and have been working together to develop HIT systems to support the delivery of specific specialty services through telemedicine. This is not their first technology endeavor. During 2005-2007 the WWRHCC implemented a teleradiology network.

Network Participants: The three CAHs in this project are Forks Community Hospital (FCH), Jefferson Healthcare (JH) and Morton General Hospital (MGH), all of which are Public Hospital Districts (PHDs) and are the sole healthcare providers in their districts (note: two of the three originally proposed CAHs had to be replaced). Each maintains at least one rural health center and JH has four. Harborview Medical Center (HMC) served as the urban referral center for this project. HMC is the only Level I trauma facility in the state.

Project Management: At the onset of the project, the grant administrator set up a steering committee that consisted of one member for each participating entity: or one per CAH, HMC, the Washington State Department of Health, and two from WWRHCC. The actual vendor selection occurred with WWRHCC since the other steering committee members (HMC WA DOH) while invited, did not participate in the site visits or the final decision-making process.

Goals:

- Develop a seamless patient information exchange capability among local rural providers for each CAH participant.
- Develop a seamless patient information exchange capacity to support rural trauma and inpatient consultations and transfers to Harborview Medical Center.
- After the grant project period, support the expansion of the project's HIT system to other WWRHCC members, and to other rural hospitals statewide.

Objectives:

- The FLEX CAH HIT project will give health professionals the ability to immediately access a single record containing all pertinent and current information belonging to an individual patient, and to make changes to that record.
- Reduce negative health outcomes of the 'hand offs' associated with non-HIT by providing an easily accessible and comprehensive vehicle for all information relating to a patient's care.
- Eliminate delays in and duplication of care, and thereby reduce the costs associated with transferring and assembling information from disparate sources.
- Improve safety and reduce medical errors.
- Establish a telepharmacy capability and increase the availability of CAH pharmacists.

Expected Impact: The project will employ HIT as a tool to support patient safety and quality by making clinical information available to prevent misdiagnosis and incorrect treatments. It is efficient as it prevents duplicative lab and imaging studies and other ancillary procedures, and reduces staff time currently spent managing paper-based patient records and data produced by the wide variety of disparate information systems currently used across all care settings.

Catchment Area and Target Population: The three CAHs in this project are Forks Community Hospital (FCH), Jefferson Healthcare (JH) and Morton General Hospital (MGH), all of which are Public Hospital Districts (PHDs) and are the sole healthcare providers in their districts. Each maintains at least one RHC and JH has four. Harborview Medical Center is the only Level I trauma facility in the State.

Forks is the northwestern-most city in the contiguous United States and experiences on average 12-14 feet of rain per year as part of the Olympic rainforest. There are two Native American tribes located on either side of Forks: the Quileute and Quinault. Neither has its own hospital and so they seek care from FCH. Forks is often “socked in” with fog and not accessible by air. Additionally, mud slides have isolated the area in the recent past, making it nearly impossible to transfer patients out of the hospital. Jefferson Healthcare is located in Port Townsend, a scenic port and maritime city. Its main facility also serves outlying areas as diverse in terrain as they are in population demographics. For both FCH and JH the fastest and easiest route by land to any urban facilities requires crossing the Hood Canal Bridge, which has been closed for retrofitting for more than three months in recent years. A ferry ride is required for land transportation to Seattle and HMC. Morton is located between Mt. St. Helens and Mt. Rainier. While picturesque, this location does pose inherent risks for the community. Like Forks, Morton experiences a great deal of fog and has been isolated due to flooding several times within the last two years.

This project will serve approximately 166,500 people (FCH, JH and MGH). When the project is expanded to include all nine of the WWRHCC members this number will increase to over 510,000.

Evaluation: According to the grantee, their project evaluation was the completion of the HIE; having all three CAHs sending information into the HIE and the training of HMC on the use of the system. Their intent was to have the system up and running by the end of March, which would have provided three months to evaluate the system. Unfortunately, the delays we encountered with MGH and the time it took to overcome those problems prevented them from achieving that goal.

Performance measures for the long-term use of the HIE will include:

- The number of providers using the system at each site.
- A decrease in adverse drug events with the inception of 24/7 telepharmacy coverage.
- Decreased transfer time when transferring trauma patients from the three CAHs to HMC (no longer having to wait for documents to be copied).
- An increase in the total number of providers utilizing the HIE and (CAHs and eventually other urban facilities) joining the HIE.

- A decrease in medical errors related to “hand-off” from outpatient (RHC) to CAH; CAH to RHC; from CAH to HMC or other urban provider, and lastly, from the urban providers back to the RHCs.

Project Status at End of Grant Period: All three CAHs are sending information into the HIE and HMC staff have been trained on the use of the system; grant administrators are still determining how to provide access to the multitude of users (residents and attending physicians) at HMC without using all of their user licenses and overburdening those responsible for the management of users, which has thus far prevented the use of the HIE when transferring trauma patients.

While some feeds flow freely into the HIE from MGH, the transcription feed continues to be a problem. The grantee also was not able work out all of the issues related to telepharmacy prior to the end of this project, and are currently working on determining needs from all WWRHCC members to develop an absolute cost for this project.

Sustainability: The three CAHs have agreed to pay for the costs of the T1 line when WWRHCC is unable to do so. There are maintenance fees that will be covered by a federal earmark, after which time the cost will have to be divided amongst those hospitals using the system. If other non-WWRHCC providers join the network they will be charged maintenance and professional fees.

In addition, the grantee is for ARRA funds through the state to expand the project. They also have a federal earmark which will provide some funds to assist with adding other WWRHCC members onto the HIE. The HIE vendor Orion is also helping the grantee look for additional funding.

Tennessee

Project Title: Middle Tennessee Rural Health Information Network (MTRHIN)

Project Summary: This project aimed to enhanced collaboration among health care providers within the Middle Tennessee Rural Health Information Network (MTRHIN), including three Critical Access Hospitals (CAHs), one Federally Qualified Health Center (FQHC) and their referral hospital by supporting the electronic exchange of health information. The purpose of this project was to support the use of health information technology (HIT) as a tool to improve the quality of patient care and minimize health access issues, which in turn improves patient outcomes, decreases medical costs and hospital admissions. The goals included the adoption and effective use of HIT; the creation of sustainable business models for deploying HIT in Medicare Rural Hospital Flexibility (Flex) CAH networks; enhancing the ability of safety net providers to leverage initiatives and resources as well as improving quality and promoting performance improvement within the Flex program.

Project Background: At the time of application, Tennessee already had three regional HIE networks and four statewide HIE networks in operation, from which MTRHIN planned to utilize lessons learned and related experience. Tennessee is the only state that has electronically connected all local health departments into a central database of patient data, and offers an affordable and secured private broadband network already in place that connects all 95 counties. This network was to be used to economically connect all health information exchange participants in the MTRHIN network.

Network Participants: The following organizations are the participants of the MTRHIN:

- Sumner Regional Medical Center, a tertiary hospital with 155 beds
- Macon County General Hospital, a CAH with 25 beds
- Riverview Regional Medical Center – South, a CAH with 25 beds
- Trousdale Medical Center, a CAH with 25 beds
- United Neighborhood Health Services, a Federally Qualified Health Center

Project Management: Community Health Network, (a group of ten Community Health Centers (CHC) in Tennessee and Mississippi which established CHN with the goal of creating shared information technology and other services for member organizations) has provided complete project management throughout the implementation phases of this project to include a director, assistant director, network administration, purchasing agent, financial oversight, training and daily administration of the HIE system. CHN worked with participating hospitals to develop a customized plan to fully deploy the MTRHIN and link those sites to a managed statewide network. CHN provides strategic planning support for hospital staff, and obtained the most competitive group purchase prices possible from software vendors. The network collaborated with hospital project teams to install and test the selected software, and train staff in its use.

Goals: The goal of this project was to connect three rural non-profit Critical Access Hospitals (Trousdale Medical Center, Macon County General Hospital, and Riverview Regional Medical Center South) with the

non-profit tertiary hospital, Sumner Regional Medical Center and a federally qualified health Clinic, United Neighborhood Health Services, Hartsville Family Clinic.

Objectives:

- Implement an integrated EHR network system at 3 CAH and one larger community hospital sites by June 30, 2010.
- Establish an EHR network system that provides for health record portability and that facilitates continuity of care for RHN patients across health providers and geographic settings (home, outpatient, inpatient, referrals, urgent, emergency), while at the same time protecting and ensuring patient privacy.
- To achieve outcomes at each hospital that result in:
 - Improved patient satisfaction
 - Improvement in patient safety and measurable quality
 - Improvements in the ability of patients and providers to monitor health conditions
 - Advanced care processes which include additional value of information to emergency department visits, ambulatory care, hospital discharge and admissions, and
 - Impact on provider and statewide health delivery organizational effectiveness through productivity gains including changes in work patterns, modification of quality improvement processes and lower cost of data aggregation, analysis, and reporting.

Expected Impact:

- Hospitals will be able to track and report on all five performance indicators.
- The quality of patient care will improve as demonstrated by performance indicator improvements over the baseline data for each hospital.
- Improved safety and quality of patient care is expected as a result of the improved provider communications capability.
- Patient satisfaction scores with respect to each hospital's service efficiency and patient-provider communication will increase.

Catchment Area and Target Population: The majority of the counties in the service area have been designated as federal shortage areas in terms of mental health services, dental care, medical professionals, and as medically underserved geographical areas and populations in general. The average rate of unemployment in the service area is 5.7 percent, while the average rate of unemployment nationally is 4.7 percent. The rural counties served by RHN are beleaguered by lack of industry which contributes to unemployment thereby increasing the numbers of low-income residents who are uninsured. Without income or insurance, these individuals are less likely to seek medical services until their health issues become life threatening, which then, sadly, requires extensive costs for care. In addition, communication between health professionals, service providers, and primary care facilities is limited because few of the hospitals in the more rural counties have updated electronic archiving and communication systems.

Evaluation: Base Camp online project management website was used as a reporting and communication resource to provide a one stop snapshot of the project progress to all participants at any one time. Milestones were created within base camp and assigned target completion dates and in turn actual

completion dates. Bi-weekly conference calls among project participants were conducted to share information and provide a status report on milestones. Monthly in-person meetings were also conducted with the UMTRHN members to provide project updates. Additional evaluation included the meeting of HRSA-established milestones for the grant reports.

The outcomes achieved include further development of the UMTRHN, implementation of a fully functioning HIE system and networking infrastructure in a rural setting; the collection of valid patient clinical information for use in rendering quality health care; an HIE system that provides the ability to effectively track quality health measures across a board area.

Project Status at End of Grant Period: According to the grantee, the network functioned as planned which is to provide better cooperation between respective service areas which, in turn, also assisted in the overall success of the project. As noted above, the outcomes achieved include further development of the UMTRHN, implementation of a fully functioning HIE system and networking infrastructure in a rural setting; the collection of valid patient clinical information for use in rendering quality health care; and an HIE system that provides the ability to effectively track quality health measures across a board area.

Sustainability: This program is sustainable due to plans to expand to other provider groups in the region and to duplicate the project in other rural areas of Tennessee. Funding is being sought for continuation and expansion. Participants in this pilot will be assessed appropriate fees for continued and future services.

Hardware and software for this project was purchased with the ability to allow expansion easily with little cost. Software vendor selection was made keeping in mind their stability and commitment to continued development of the product. A Memorandum of Agreement was developed and signed by each participant to provide funding for up to 2 years after the grant period ends. Opportunities for funding sources that will provide continuation and expansion are continuously evaluated.

Texas

Project Title: Improving Texas Rural Community Healthcare through HIT Implementation

Project Summary: The goal and primary need for this project has been to improve health care delivery and quality of life through Health Information Technology (HIT) implementation within two rural communities as a demonstration model for all rural Texas communities. The objectives are to improve the safety, quality, efficiency and effectiveness of healthcare delivery through implementation of health information technology.

Project Background: The long distances in rural Texas make access to healthcare extremely difficult. It is felt that interoperable connectivity can serve as a means to decreasing some access barriers. Additionally connectivity has the ability to improve continuity of care for emergency situations and chronic diseases that is otherwise interrupted when patients move from one community to another. Without the ability to transport patient information from one location to another electronically many tests are repeated resulting in increased healthcare cost. Piecemeal health care, which is the norm without community connectivity, also impacts negatively on patient safety and quality. Electronic exchange of patient information would enhance disaster preparedness and the ability to provide care in crisis situations.

There wasn't a formal network between the CAHs prior to this project. However, all the partners have signed MOUs among themselves. This project was their second collaborative effort. All the partners feel strongly committed to work together because they realize that the current climate indicates that no community will have adequate healthcare without network connectivity.

Network Participants: The two CAHs are Collingsworth General Hospital (16 beds) in Wellington and the Parmer County Community Hospital (25 beds) in Fiona, both located in the Texas panhandle. Northwest Texas Hospital in Amarillo is the tertiary referral partner. The network partners were picked as a result of geographic location, need, existing infrastructure, and referral structure.

Project Management: This grant was awarded to the Texas Office of Rural Community Affairs (ORCA). The Director of Rural Health for the Texas Office of Rural Community affairs served as the Principle Investigator. A member of the ORCA staff served as a project liaison and member of the project management team. An overarching management team was developed. This team composition included both ORCA staff members, the Texas A&M Health Science Center Project Manager, and the Regional Coordinator for Preferred Management Corporation. Both Hospitals selected for this project are affiliated with Preferred Management. The purpose of this team was to coordinate project oversight, ensure the Electronic Health Record (EHR) selection process was in alignment with the grant requirements and meet the goals of Preferred Management. In addition, the Rural and Community Health Institute (RCHI) of the Texas A & M Health Science Center was subcontracted to manage the project. The Texas A&M Research Foundation administered the funds and adhered to its policies and procedures for letting bids and subcontracts for the EHR, hardware and interfaces.

Goals: The goal and primary need for this project has been to improve health care delivery and quality of life through Health Information Technology (HIT) implementation within two rural communities as a demonstration model for all rural Texas communities.

Objectives: The objectives are to improve the safety, quality, efficiency and effectiveness of healthcare delivery through implementation of health information technology.

Expected Impact: ORCA hoped to show that this project addresses the service areas, creates opportunities for cost-sharing, and generates economies of scale. The partner centers and their clients expected to show the benefit of network activities and enhance the possibility of other CAHs modeling the same system. The network partners share a common vision of improving the health of the communities that they serve by providing vital health services and serving as agents for change in health care delivery.

Catchment Area and Target Population: This project impacts the two frontier communities of Wellington and Friona, located in the Texas panhandle. This region of west Texas is one of the largest medically underserved areas (MUA) in the U.S. In fact, the majority of Texas counties are designated as MUA's. The two CAHs in the project are the Collingsworth General Hospital in Wellington and the Parmer County Community Hospital (PCCH) in Friona. Both of these community hospitals and local providers offer limited specialty care, forcing local residents to drive more than 70 miles from one community and more than 100 miles from the other, to access specialty care in Amarillo.

The combined area of both counties served through this grant is 1,729 square miles. With a combined population of about 13,000, the population density is seven persons per square mile. These are both poor counties with a higher than average population over the age of 65. Transportation to medical facilities is a problem for many of the people. This area of Texas is more vulnerable to tornados than the average area of the U.S,

Evaluation: The first phase (vendor selection) of the project was evaluated using data collected by an independent evaluator through document study and semi-structured interviews. The evaluation utilized mixed methods: quantitative and qualitative. Qualitative data include: semi-structured telephone interviews with ten participants in the project and document study. The Project Director composed a quantitative Information Technology Assessment survey that was administered to the two communities at the beginning of the project. The ten interviews captured process evaluation. The interviews included semi-structured questions tailored to the interviewee's function, which were sent by email to each interviewee prior to the scheduled interview. The telephone interviews were audio-taped. The Evaluator utilized pattern coding to analyze and interpret the interview data. Essential documents were studied and compared.

After the go live two members of the management team conducted an onsite evaluation. Due to the remote location of both of these hospitals the team chose to visit when the go live was complete at both sites. The Wellington site had been live for approximately one month at the time of the visit. Staff reported they were very pleased with the EHR and the implementation process. The grantee noted that the staff openly discussed how they had changed some processes, for the better, as a result of the tool. They also noted that while they were still learning they could see how beneficial automation will be. In particular the nurse responsible for abstracting discreet data elements for Core Measure reporting was very excited that the data would be pull electronically.

The second location, Friona, went live four days prior to the grant completion date. They reported the go live went very well and that some of the lessons learned at Wellington were helpful in making their implementation smooth.

Project Status at End of Grant Period: The grant provided both communities with the same EHR provided by OPUS Healthcare Solutions. The hospitals' connectivity includes the billing, laboratory and patient scheduling functions. The clinic in Wellington is transmitting patient records to and from the hospital. The clinic in Friona is capable of transmitting patient records to and from the hospital, but was not engaged in that function at the expiration of funding because the administrator chose to implement the billing function first. The health record function will be utilized after the billing function is fully utilized and the staff is comfortable with the electronic tool. The telemedicine equipment has been installed and training for the use of telemedicine has been completed in both communities. In both communities, the system is currently capable of retrieving the CMS Core Measures. Information needed for public health can be retrieved, and the system can be used in times of disaster such as tornadoes.

It should be noted that all the activities originally proposed were too numerous to be accomplished within the 18 months of funding. In particular the pharmacy component and extracting measures with data-set that is large enough to be meaningful. Accordingly, this change in plans was reported to HRSA. These activities will be completed after the ending grant date in Phases II and III of the grantee's negotiated agreement with OPUS and the rural hospitals.

Sustainability: According to the grantee, much thought was given to sustainability of this project in both communities at the time of planning and writing the grant proposal. At this time there was strong evidence that both communities would be able to sustain the project if the start-up expenses were covered such as they were with the grant funds. Sustainability was also a part of the vendor selection process. The vendor selected, OPUS, negotiated an agreement that included three years of sustainability. It is felt the communities should be able to plan accordingly and be prepared to assume cost upon the completion of this timeframe.

According to the grantee, there is considerable evidence that the healthcare agencies in Wellington will continue connecting to and will utilize the EHR implemented during this project. This is predicated on the two young family physicians in this community who based their decision to practice in the community if electronic capabilities were provided. The community EMS has raised money to purchase equipment to connect to the EHR. Additional evidence is in the willingness of the hospital to pay more the \$15,000 in overtime pay to employees to complete the implementation on schedule. The pharmacy and physicians has given evidence that they are excited about implementing e-prescribing. Utilization will ensure sustainability of the EHR given the financial viability of the community that was investigated during the planning of the grant proposal.

Prospects for utilization of the EHR in Friona are less certain. The physicians in this community were a little more apprehensive about using electronic patient records. However, the hospital administrator has stated there is a great potential for using the EHR for quality improvement efforts.

The future of telemedicine is also uncertain. While the physicians in Wellington have used the equipment the referral network by the telemedicine provider is different from the community practice and referral patterns. This has made using the equipment less favorable than it could be. The physicians in the community of Friona have been trained to use the equipment; however, it does not appear that they are yet ready to adopt this technology.

The grantee stated that the team worked very effectively together and is definitely interested in expanding the network. Their only challenge is that neither ORCA nor RCHI as a university component, have the funds to cover the start-up. As a team they will research and seek additional grants to allow them to expand the network.

Virginia

Project Title: Virginia’s Medicare Rural Hospital Flexibility (FLEX) Program Critical Access Hospital Health Information Technology (HIT) Network Implementation Grant

Project Summary: Using the American Stroke Association’s “Stroke Continuum of Care” as an organizing framework, the VA Critical Access Health HIT (VA CAH-HIT) Network served as a test bed for the implementation of HIT interventions across the full stroke continuum of care within CAH service areas of the Virginia Acute Stroke Telehealth (VAST) statewide network infrastructure. The CAH-HIT grant funding was utilized to set up the first regional network for VAST. The specific focus of the program was to implement, test and evaluate a variety of information and telecommunication technologies to determine how technology could be leveraged to address functional requirements--particularly at the critical access hospital (CAH) level in highly rural areas of the state. The outcome of the effort was intended to not only set up a network in this region, but to develop a model to be leveraged statewide.

Project Background: Virginia’s incidence and mortality rates for stroke are among the highest in the nation. Research has found that situations similar to those found in VA can be partially attributed to a fragmentation in the delivery of healthcare, particularly lack of HIT (especially tools that promote collaboration and coordination between health care providers). Rural areas are often hit hardest by problems of fragmentation and access to care. In order to help resolve this fragmentation and enhance the prevention, treatment, and ongoing care of stroke patients, the ASA has developed the “Stroke Continuum of Care” blueprint. VHD has integrated this approach into its statewide HIT initiative.

Network Participants:

- **Bath Community Hospital (BCH)**- CAH located in Hot Springs, Virginia
- **Augusta Medical Center (AMC)** - community hospital (BCH sponsor hospital)
- **University of Virginia Medical Center (UVA)** - tertiary academic medical center and certified Primary Stroke Center

Project Management: The Virginia Department of Health contracted with the Virginia Telehealth Network (VTN) for management and implementation of the CAH-HIT grant. VTN then established subcontracts with designated network and industry partners.

Goals: The mission of the VA CAH-HIT Network is to reduce stroke risk and maximize the functional status and quality of life of Virginians with stroke, by systematically and comprehensively introducing targeted HIT applications into routine clinical practice in rural areas. The goal is to successfully deploy HIT solutions for each of the five areas of the Stroke Continuum of Care.

Objectives: One primary objective for improving each area of the stroke continuum of care in the targeted service area had been identified for this project:

- Prevention: increase public awareness of the signs and symptoms of stroke

- EMS Notification and Response: Strengthen and expand the stroke training delivered to EMS providers
- Acute Treatment: Accelerate time to diagnosis and treatment for strokes
- Sub-acute care and secondary prevention: enhance capacity of health care professionals to recognize and treat deterioration after stroke, prevent complications occurring in the early post-stroke period, and address relevant modifiable risk factors for heart disease and other cardiovascular diseases
- Rehabilitation: develop enhanced capacity for data sharing between healthcare providers to facilitate patient care after the patient is returned to the community for rehabilitation post-stroke.

Expected Impact: Coordinated efforts amongst rural and urban health care systems can make considerable impact through the design and implementation of innovative interventions leveraging telecommunications and HIT capabilities to strengthen stroke systems of care.

Catchment Area and Target Population: The service area for the VAST test-bed spanned five counties in the Central Shenandoah region of Virginia. Bath Community Hospital (BCH) is one of seven CAHs in Virginia. BCH is a 25 bed, not for profit, CAH located in Bath County. Bath County is a rural, sparsely populated county of 4,964 people nestled in the Allegheny Mountains on the western central border of Virginia. BCH has several unique characteristics as compared to other CAHs in Virginia. BCH is the smallest and most isolated CAH in Virginia. BCH is located 90 minutes from the closest community hospital (Augusta Medical Center) and two hours from the University of Virginia Medical Center (a large academic medical center). Along with its primary population, BCH cares for a seasonal workforce and influx of out-of-town guests who visit a neighboring resort. It also benefits from foundation funding that offers opportunities to acquire technology and pursue innovative services.

Evaluation: An evaluation plan was established for the VAST demonstration. It covered the three main focus areas within the stroke continuum of care: community outreach, EMS response, and acute stroke care. Each area included at least one intervention and a combination of process and/or short-term outcome measures.

Component	Intervention	Evaluation Objectives
Community Outreach	Development of a web portal for stroke professionals	<ul style="list-style-type: none"> • Document the deployment and usage of the web portal for stroke • Document increased rural community education opportunities
EMS Response	Deployment of a web-based learning management system (LMS) with modules on stroke recognition and treatment in the field	<ul style="list-style-type: none"> • Document baseline EMS stroke care in the region • Assess the success of the LMS intervention (deployment, usage, satisfaction, stroke knowledge)
Acute Care	Deployment of ITH's Remote Presence - 7 (RP-7) mobile robotic telemedicine device	<ul style="list-style-type: none"> • Assess clinician satisfaction with RP-7 training, usability, user interface • Assess regional impact on care • Description of RP-7 usage • Assess the generalizability of this approach to other regions /institutions in Virginia
	Deployment of PACS system at BCH and interfaces with UVA	<ul style="list-style-type: none"> • Technical assessments of system performance (system logs, networking tests) • Clinician acceptance/satisfaction with usability, image quality, etc. • Impact on workflow and communication

Project Status at End of Grant Period:

Community Outreach: The stroke portal site was officially launched February 9th, 2009. The site features a comprehensive set of resources that span the entire continuum of stroke care. Site ownership transferred to the VSS Task Force at the end of February 2009. A subset of Task Force members is also in the process of developing protocols and policies for site modifications, content authoring, etc, and has received training in use of the CMS. A fully functional, comprehensive stroke portal was successfully delivered in accordance with the project goals, and the site is now available.

EMS Response:

- A new LMS system was deployed and operational, but has not yet officially launched, pending communication between the vendor and VDH to ensure that course participants are able to receive continuing education credit.
- A new online stroke course was developed by CSEMS with input from domain experts.

- Evaluation instruments were developed to measure pre-post stroke knowledge and user satisfaction with the LMS.

Acute Stroke-Remote Consultation with RP-7:

- Description of the BCH and UVA experience with the RP-7 technology, including usage reports, assessments of satisfaction, usability, and impact on care by physicians
- Commitment to continued use of the RP-7 at both UVA and BCH, based on experience to date
- Description of specific challenges and lessons learned to assist other organizations in making decisions about deploying this kind of technology

Acute Stroke – PACS and Interfaces:

- Deployment of fully functional PACS system with substantial storage capacity and interfaces with UVA
- Descriptions of baseline workflows completed
- Post-deployment workflows described (but not yet fully tested)

The original goals for the evaluation of PACS implementation with interoperability with UVA systems included technical assessments of image transfer speeds, clinical satisfaction with the systems and image quality, and a comparison of pre- and post- workflows. The evaluation had to be modified as a result of delays in deploying the PACS and related interfaces and limited availability of specific technical data within the time frame required. From a process perspective, as noted above, the initial interface testing is near completion.

Sustainability: All technology implemented by the CAH will be sustained beyond the grant. The VAST pilot was able to sufficiently demonstrate data and results that could be used for decision-making relative to long-term investments. At BCH, information was presented to the Board of Directors regarding outcomes and anticipated benefits to come for the residents of Bath County and the surrounding region it supports. The Board agreed to include in its budget the funding to maintain and sustain both the PACS and RP-7 for another year. Plans are underway to expand services delivered over the RP-7. The ability to utilize it more broadly will play a role in its longer term sustainability.

Based on the success of the pilot using the RP-7 system at BCH, the UVA team submitted an application for competitive institutional support for a larger regional stroke telehealth program. This was exactly what was hoped for in terms of using the CAH-HIT grant to start the first regional network for VAST. At UVA, the telestroke program was based on research on various established business models, including that at Massachusetts General Hospital and the Michigan Stroke Network. The Stroke Telemedicine And Tele-education (STAT) program was awarded a competitive Buchanan Endowment Award effective on July, 1st 2009, with funding for three years. Financial independence is expected by the termination of the award.

Two technical platforms will be offered to spoke hospital systems, so that they can choose either the standard (for example Polycom, or Tandberg) or the RP-7 videoconferencing system. In addition the UVA Neuroscience Initiative has funds budgeted too continue the RP-7 system in the institution. Broader uses will include placement at the new Long Term Care Facility, in the UVA ER, and potentially at the HS Rehabilitation Hospital, for remote care and staff education.

At a statewide level, all data gathered from this pilot project will be provided to the Virginia Stroke Systems Task Force Committee members in their June 2009 quarterly meeting for full discussion. In addition, a separate workgroup within VSS TF on Stroke Telehealth has been designated to more critically analyze the experiences from this pilot CAH project in order to replicate the successes at other CAHs, improve upon the experiences, or to help in decision-making of how to best integrate RP-7, standard platform, and PACS system technology into the stroke systems of care within the state of Virginia.

Wisconsin

Project Title: Rural Wisconsin Health Cooperative Information Technology Network

Project Summary: The goal of the project was to implement an electronic health record in four CAHs, using a collaborative network model. Each of the sites implemented various EHR related applications. The RWHC ITN Network is one of several networks in which multiple independent hospitals use the same HIS/EHR vendor, access their applications from a shared datacenter, and use a pooled staff to achieve common goals. However, the grantee believes that this project is the only such network comprised solely of critical access hospitals.

Project Background: The RWHC ITN Project was designed to address a variety of critical access hospital (CAH) needs and problems. As has been discussed in several reports and studies, CAHs face a number of HIT adoption challenges, including lack of financing, lack of sufficient HIT professionals, and limited expertise to facilitate project management and workflow redesign. These challenges are especially pronounced for small-volume CAHs, since they generally have tighter margins and smaller proportions of staff to devote to HIT and EHR related activities. In many cases the result of these challenges is that CAHs are simply not structurally positioned to move forward with the technology implementations that can benefit their patients and that will be required to meet the demands of the changing healthcare landscape (including ARRA, value-based purchasing, and health reform).

The Rural Wisconsin Health Cooperative Information Technology Network (RWHC ITN) was designed to make it possible for all CAHs, including the smallest and most disadvantaged, to mitigate these structural challenges. By pooling resources and working collaboratively to meet common goals through a network approach, the four CAHs that are members of the RWHC ITN have worked to: (1) reduce datacenter, hardware, software, implementation, support, and operating costs due to group volume purchasing and a shared data center model, (2) improve HIT expertise and support quality with a network HIT staff, (3) better engage the high-level challenges of information exchange and quality reporting requirements through collaboration, and (4) implement advanced EHR-related systems that may have been out of their reach without the network model. The RWHC ITN has also worked with members to help them implement systems to address a variety of more specific challenges and needs.

Network Participants:

Boscobel Area Health Care (BAHC):

Boscobel Area Health Care is a 25 bed Critical Access Hospital that provides inpatient and outpatient services to approximately 17,000 rural residents in the following Wisconsin counties: Grant, Crawford, and Richland. The hospital's service area is concentrated in the most southwest portion of the state, which is almost entirely agricultural. Demographic data reflect poverty and unemployment rates that exceed state averages. BAHC is located in a Health Professional Shortage Area. In 2008 BAHC had 1015 inpatient admissions and 10,395 outpatient visits.

Memorial Hospital of Lafayette County (MHLC):

Memorial Hospital of Lafayette County (Darlington, WI) is a 25-bed Critical Access Hospital that provides inpatient and outpatient services to approximately 18,500 rural residents in the following Wisconsin counties:

Lafayette, Iowa and Green. Built in 1952, MHLC offers inpatient services in acute care, surgery, obstetrics, orthopedics, and cardiac care. In 2008, MHLC had 573 inpatient admissions and 2807 outpatient visits.

St. Joseph's Community Health Services (SJCHS):

St. Joseph's Community Health Services is a 25-bed Critical Access Hospital that provides inpatient and outpatient services to approximately 18,000 rural residents in the following Wisconsin counties: Vernon; Monroe; Juneau; Sauk; and Richland. Vernon County (including the city of Hillsboro and area surrounding St. Joseph's Community Health Services) is designated a Health Professional Shortage Area. In addition to the hospital, SJCHS also operates three of the physician practice clinics that service the community: one contiguous to the hospital, one in Wonewoc, and one in Elroy, which has been designated as a medically underserved area. In 2008, SJCHS had 485 inpatient admissions and 26,275 outpatient visits.

Tomah Memorial Hospital (TMH):

Tomah Memorial Hospital is a 25-bed, Critical Access Hospital that provides inpatient and outpatient services for a population of approximately 20,000 rural residents in the following Wisconsin counties: Monroe and Juneau. TMH has a hospice program that covers a five county territory. The two closest hospitals are 20 miles and 34 miles respectively, making their emergency room services especially vital to the community. In 2008, Tomah had 1062 inpatient admissions and 21,538 outpatient visits.

Project Management: The Rural Wisconsin Health Cooperative Information Technology Network (RWHC ITN) is the 501(c) 3 organization that provides the legal, collaborative structure for the member hospital participants, and it was established expressly for this purpose. The RWHC ITN Board is comprised of the CEOs of the member hospitals. The Board reviews and approves the annual budget, determines the course of action regarding financial and legal issues, and sets the strategic direction of the Network. The organization contracts with vendors for software and hardware, and hosts the hardware (such as servers and storage devices), which is shared between participants from datacenters in Madison and Sauk City. The RWHC ITN also contracts for the collaborative staff that helps implement and then supports the HIT systems with a 24/7 helpdesk and intensive onsite assistance. Through the facilitation of various workgroups, the RWHC ITN staff facilitates facility collaboration on best practices, goal setting, and decision-making.

Goals: The goal of the project was to implement an electronic health record in four CAHs , using a collaborative network model.

Objectives:

- Drive improvements to patient safety and the quality of care and service
- Increase secure access to healthcare information
- Improve patient-provider relationships
- Increase healthcare cost effectiveness
- Eventually provide all Wisconsin CAHs with an integrated, cost-effective option to meet their EHR needs

Expected Impact: According to the grant application, the grantee expected business and clinical improvement to be facilitated in the following ways:

- Information fragmentation and unavailability will be significantly reduced
- Quality of patient care will be significantly improved through implementation of applications that facilitate the practice of evidence-based medicine and provide decision support tools
- Cost of HIT system investment will be significantly reduced due to shared datacenter model and negotiated discounts
- Implementation and support quality and appropriate use of HIT systems will be significantly enhanced due to shared staffing model

Catchment Area and Target Population: The project serves four CAHs (Boscobel Area Health Care, Memorial Hospital of Lafayette County, St Joseph's Community Health Services, and Tomah Memorial Hospital) and their service communities in Crawford, Grant, Green, Iowa, Juneau, Lafayette, Monroe, Richland, Sauk, and Vernon counties of Wisconsin.

Evaluation: Evaluation of the project occurred/occurs in three primary ways: (1) a balanced scorecard of measures is used to evaluate the effectiveness of the Network; (2) a separate QI evaluation process is used to measure the long term effectiveness of the implementations at the sites; and (3) short term success of the project was measured using a value-based ROI process conducted prior to and during the Altarum site visit.

1. ITN Balanced Scorecard: This scorecard is intended to provide a multifaceted view of how the Network is performing. It is divided into three categories: Financial, Customer, and Internal. Financial measures are: (1) Profit Margin Variance, and (2) % of Monthly Service Fees Current. Customer measures are: (1) Service Satisfaction; (2) Helpdesk Ticket Resolution Time; (3) Wide Area Network Uptime; and (4) System Availability. Internal measures are: (1) Staff Training; and (2) Strategic and Operational Objectives Met. Data has been collected on these measures for three quarters through 6/30/2009.
2. QI Evaluation Metrics: These metrics were designed with input from the QI Directors of the participating facilities, and are intended to measure the long term quality ramifications of the implemented applications. The metrics include: (1) CVD Discharge Instruction Core Measure Scores; (2) Medication Error Rates; (3) Patient Satisfaction Relating to HIT; (4) RWHC ITN Network User Satisfaction Rates (same as in Balanced Scorecard); and (5) Progress toward Integrating HMS EHR Database with Core Measure Submission Process. Data has been collected on these measures for 2-4 quarters (depending on measure) through 6/30/2009.
3. Altarum Value Based ROI Evaluation: This evaluation tool collected responses from facility representatives relating to the following issues: (1) How did grant activities change and/or improve workflow? (2) Were systems implemented easy to use? (3) Was training and support effective? (4) What was the level of user commitment? (5) How was user feedback sought and used? (6) How did the project impact patient satisfaction? (7) How did the project make information more available? (8) Were the systems utilized? (9) What non-financial values were derived from the new systems? (10) What were the efficiency benefits of the new systems? (11) How did the new systems support positive clinical outcomes? The project PI and eventually the Altarum evaluators interviewed stakeholders at each of the 4 sites (first separately and then all in one group) to solicit answers to these questions.

Project Status at End of Grant Period: The Network was able to function as initially planned. The one major adjustment from initial planning was that four, rather than two, CAHs decided they wanted to participate in the project. Since additional participation creates additional value for all (as infrastructure costs are proportionately reduced), the grantee expanded the scope of the project to include all four CAHs.

Sustainability: The project will be sustained once CAHHIT funding has ended. The grantee developed a formal business plan, facility service fee schedules to pay for the associated network costs over five years, and legal service agreements to ensure payment. After five years, facility fees are reduced, since Network loans will be paid off. The services provided by the Network are required for the facilities to operate, so the Network is not something that facilities would “turn off” unless after five years they decided to pay significantly more to self-provide the services.

At the time of the submission of the final report, four new facilities were considering the ITN Network as an option to help them achieve “meaningful use” as required by ARRA. The ITN is working with these facilities to provide vendor demos, onsite visits to existing facilities, and cost modeling and network orientation sessions. The ITN “welcomes and anticipates expansion.” Each added facility would reduce the cost of Network operation by 5-10 percent.