Electronic Medical Record Systems in Critical Access Hospitals: Leadership Perspectives on Anticipated and Realized Benefits

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Abstract

The growth of electronic medical records (EMRs) is driven by the belief that EMRs will significantly improve healthcare providers' performance and reduce healthcare costs. Evidence supporting these beliefs is limited, especially for small rural hospitals. A survey that focused on health information technology (HIT) capacity was administered to all hospitals in Iowa.

Structured interviews were conducted with the leadership at 15 critical access hospitals (CAHs) that had implemented EMRs in order to assess the perceived benefits of operational EMRs. The results indicate that most of the hospitals implemented EMRs to improve efficiency, timely access, and quality. Many CAH leaders also viewed EMR implementation as a necessary business strategy to remain viable and improve financial performance. While some reasons reflect external influences, such as perceived future federal mandates, other reasons suggest that the decision was driven by internal forces, including the hospital's culture and the desires of key leaders to embrace HIT. Anticipated benefits were consistent with goals; however, realized benefits were rarely obvious in terms of quantifiable results. These findings expand the limited research on the rationale for implementing EMRs in critical access hospitals.

Key words: electronic medical record, electronic health record, critical access hospital, health information technology

Introduction

The widespread diffusion of health information technology (HIT) is seen as a vital means of improving the performance of both hospitals and healthcare providers.[1] Beyond improved performance, the growth of HIT in the form of electronic medical records (EMRs) and electronic health records (EHRs) is driven by the common belief that both will significantly reduce healthcare costs, improve the quality of healthcare services and patient safety, and ultimately improve the health status of the population.[2] In 2004, the federal government enacted a major HIT initiative culminating in a National Health Information Infrastructure (NHII) goal of achieving shared information by 2014.[3] Despite federal initiatives, adoption of EMR systems has been slow.[4]

Inconsistent use of the terms EMR and EHR creates a challenge in accurately assessing the diffusion of this technology. According to Garets and Davis, "these terms describe completely different concepts, both of which are crucial to the success of local, regional, and national goals to improve patient safety, improve the quality and efficiency of patient care, and reduce healthcare delivery costs."[5] EMRs are legal documents created in healthcare environments (e.g., hospitals and physicians' offices) that are fundamental components (data) of an EHR. An EHR facilitates sharing of medical information among stakeholders (e.g., patients/consumers, healthcare providers, and/or payers/insurers) and emphasizes the interoperability of medical information among users. Because many of the participants in this study do not have interoperable systems, we use the broader term EMR.

Large, urban, and/or teaching hospitals account for a large percentage of hospitals that have a partially or fully implemented EMR system.[6,7] Ward and colleagues[8] found that more than 80 percent of urban hospitals reported using computers to collect basic clinical information for potential use in an EMR system, compared to only approximately 40 percent of rural hospitals in Iowa. Likewise, Houser and Johnson[9] found that Alabama hospitals located in rural areas were less likely to have completed implementation of an EMR system when compared to those located in urban or suburban areas.

One factor that has affected many small rural hospitals' ability to invest in HIT is their conversion to critical access hospital (CAH) status. Rural hospitals meeting specific criteria were allowed to convert to CAH status by the Balanced Budget Act of 1997. To qualify as a CAH, a hospital had to be not-for-profit, located in a nonmetropolitan statistical area, be located at least 35 miles (15 miles in mountainous areas) from another short-term general hospital, have 25 or fewer beds (a combination of acute-care and swing beds), and avoid exceeding an average 96-hour length of stay through agreements, contracts, or affiliations for transfer and services.[10] The Medicare payment methodology for CAHs was changed from a prospective payment system to retrospective cost-based payment,[11] which resulted in many CAHs' transitioning from negative to positive margins.[12] The improved financial position of CAHs permitted many to refurbish aging facilities, enhance patient quality,[13] and invest in HIT.[14] Currently, there are 1,305 certified CAHs located throughout the United States.[15] However, only a few studies to date have examined the extent of HIT implementation in rural hospitals, especially CAHs.[16–18]

The American Recovery and Reinvestment Act of 2009 (ARRA) may substantially change the landscape of CAHs' investment in EMR systems due to the incentives and disincentives that the legislation provides.[19] CAHs are eligible to receive incentives (depreciation of the costs incurred for an EMR system within the same year) if they can meet the "meaningful use" criteria in a three-stage process that begins in 2011 and ends in 2015. After 2015, reductions in Medicare payments may occur if meaningful use of EMRs cannot be proven. The proposed definition of meaningful use was released on December 30, 2009, by the Centers for Medicare and Medicaid Services (CMS) and the Office of the National Coordinator for Health Information Technology (ONC) and is awaiting public feedback before being finalized. There are no specific Medicaid incentives for CAHs.

Several prominent theoretical models have been used to examine and explain HIT usage, including behavioral intention theories (e.g., the Theory of Reasoned Action and the Theory of Planned Behavior), Diffusion of Innovations theory, social-cognitive theory, the PRECEDE-PROCEED model, and the Technology Adoption Model.[20]While these theories have been useful in predicting end users' acceptance and adoption of HIT, they do not apply to the factors that influence organizations to implement HIT such as EMRs, and little research has been conducted on this topic.

Barriers to implementation of EMRs in acute-care hospitals include cost, technical issues, concern with information security, clinical staff resistance, and unquantifiable or delayed return on investment.[21,22] Studies have shown that incorporating EMRs into clinical practice requires large investments of capital, time, and human resources[23] in addition to changes in existing systems and processes.[24] Financial barriers present significant hurdles for healthcare providers.[25,26] Beyond cost, there are specific technical challenges with EMR implementation that apply to both urban and rural settings, including scalability, reliability, accessibility, usability, standardization, integration, and security of healthcare information.[27]

The implementation of EMRs is purported to show great promise in enabling the transformation of medical care.[28,29] However, published systematic reviews document that EMRs not used in conjunction with clinical decision support systems (CDSSs) and computerized provider order entry (CPOE) show limited evidence of value or effectiveness in terms of improving efficiency, quality, and patient safety.[30,31] Moreover, the purported benefits of EMRs have largely come from studies conducted on customized (expensive and internally developed) EMR systems in large academic medical centers rather than from commercial systems. Thus, other than commercial vendors and consultants, there are very few resources to guide independent providers, especially small rural hospitals, along the path toward EMR implementation.[32]

In spite of the numerous studies examining EMR technology, little is known about the rationale for adopting EMRs among CAHs. The Medical Records Institute[33] conducted a nationwide survey concerning the usage of and perceived need for EMR/EHR systems. Chen and Skinner[34] conducted a small study that examined the rationale for implementing EMRs and the decision-making process that was used to investigate and select an EMR system. These studies provide a foundation to further explore EMR implementation by rural providers. This study examines EMR purchases in the rural landscape by examining CAHs in Iowa that are early adopters of EMRs. Specifically, this study examines CAH leaders' rationale for implementing EMRs and choosing a specific vendor. It also explores perspectives on the expected benefits of EMRs and benefits that have actually been realized.

Methods

Sample Identification

A survey (Health Information Technology Capability Survey) of all hospitals in Iowa[35] conducted in the summer and fall of 2005 focused on HIT capacity and included a checklist of 46 business and clinical applications. Of these 46 applications, several items dealing with clinical applications were of particular interest in this study (see Table 1 and Table 2). The survey had a response rate of 85 percent both overall and for CAHs. Among the 70 CAHs that responded, 16 CAHs indicated that an EMR system was operational, and eight CAHs indicated that an EMR system was being installed.[36] These 24 CAHs became the eligible sample for follow-up interviews, in which 15 participated.

Table 1: Critical Access Hospital (CAH) Business Strategies in Support of Clinical Information Systems

Business Strategy	Number of CAHs (%)
Vendor for Electronic Medical Record (EMR) System	
Computer Programs and Systems, Inc. (CPSI)	5 (33.3%)
Healthcare Management Solutions, Inc. (HMS)	1 (6.6%)
Healthland (formerly Dairyland)	3 (20%)
Keane	2 (13.3%)
Medical Information Technology, Inc. (Meditech)	2 (13.3%)
Practice Partners	1 (6.6%)
Not specified	1 (6.6%)
Number of Full-Time Equivalent (FTE) IT Employees	
None	2 (13.3%)
1-2	6 (40%)
3-5	4 (26.7%)
6-10	2 (13.3%)
11-20	1 (6.6%)
Reliance on External Consultants or Subcontractors for Clinical System Applications	
"Not at all"	2 (13.3%)
"A small extent"	7 (46.7%)
"A large extent"	6 (40%)
Reliance on Application System Providers (ASPs) for Clinical System Applications	
"Not at all" or "Don't know"	9 (60%)
"A small extent"	3 (20%)
"A large extent"	3 (20%)

Iowa Hospital Association. *Profiles; Section VI: Hospital and Health System Specific Data.*

Table 2: Health Information Technology Capability Survey

Clinical System	Number of Systems Currently Implemented (%)		Number of Systems Being Planned for Installation or Upgrade (%)	
	Presently Operational or Installing	**None**	**Planned System**	**No Plans**
CPOE	6 (40%)	9 (60%)	9 (60%)	6 (40%)
CDSS	5 (33.3%)	10 (66.7%)	4 (26.6%)	11 (73.3%)
Clinical and financial data repository (retrospective reporting	10 (66.6%)	5 (33.3%)	2 (13.3%)	13 (86.7%)

and decision support)					

Iowa Hospital Association. *Profiles; Section VI: Hospital and Health System Specific Data*

Note: Some CAHs that have presently operational systems are also planning to upgrade to new systems, and thus the two halves of the table do not necessarily sum to 100 percent.

Interview Procedure

Role-specific follow-up interview questions were developed and reviewed by the project team and then pilot tested. Interviews were conducted during the spring of 2006 with 10 chief executive officers (CEOs)/administrators and 12 chief information officers (CIOs) or information technology (IT) directors or managers. All interviews were conducted and audio taped by two Master of Health Administration (MHA) students trained in the interview process. The audiotapes were transcribed by two undergraduate students. Identifying information was removed from the transcripts by the senior author (MMW). Analyses focused on synthesizing information regarding four issues:

1. Why their CAH decided to implement an EMR system
2. Why their CAH chose a particular vendor
3. What the expected benefits from an EMR system were
4. What benefits they have realized from the EMR system

The first author (TRM) abstracted all portions of the transcripts on interview questions related to these four issues. The same author, along with the second coauthor (JV), independently identified themes from the content of the interviews. Once these themes were independently identified, the two coauthors (TRM & JV) reviewed the themes with the senior author (MMW) until agreement on major themes was reached. Once major themes were agreed upon and relevant texts were identified, themes and accompanying text were arranged into three categories according to how commonly shared they were (see Table 3).

- Themes common to both CEOs and CIOs were major themes that were expressed by a majority of CEOs and CIOs.
- Shared themes among CEOs and shared themes among CIOs were major themes that were primarily expressed by the CEOs or by the CIOs but were not shared across leadership positions.
- Unique themes expressed by CEOs and unique themes expressed by CIOs were distinctive themes that were expressed by either a CEO or a CIO and captured important points of view that were not expressed by others.

Table 3: Reasons to Implement EMRs

Themes Common to Both CEOs and CIOs
Theme 1: Decision to implement EMRs was driven by the desire to improve efficiency (e.g., reduce the handling of paperwork), timely access (e.g., ease with which physicians can access patient information), and quality (e.g., reduce medication errors, improve patient safety), which would facilitate more patient-centered care.
Theme 2: Decision to implement EMRs was driven by key administrative personnel (e.g., CEO and CFO) and physicians.
Theme 3: Decision to implement EMRs was driven by the beliefs that EMRs are the wave of the future and will be mandated in the near future.
Theme 4: Decision to implement EMRs was driven by inadequacy of standalone systems that were not integrated.

Shared Themes among CEOs	Shared Themes among CIOs
Theme 1: Decision to implement was driven by hospital culture that emphasizes *staying ahead of the curve* (being early adopters), pertaining to new technology and innovation.	*Theme 1:* Decision to implement EMRs was based on a desire to be comparable to and compete with larger hospitals-a goal and vision that administration and staff took ownership of.

	Theme 2: Decision to implement EMRs was driven by the initial need to improve their financial process (e.g., accurate and timely billing).
Unique Themes Expressed by CEOs	**Unique Themes Expressed by CIOs**
Theme 1: Decision to implement EMRs was influenced by system affiliation.	*Theme 1:* Decision to implement EMRs was driven by the CIO but was supported by administration and clinical staff. *Theme 2:* The CIO was not involved in the decision to implement EMRs.

Results

Analyses include summary statistics of relevant survey items (shown in Table 1 and Table 2) plus the syntheses of the CEOs' and CIOs' responses to questions focused on the four issues, as summarized in Tables 3, Table 4, Table 5, and Table 6.

Table 4: Reasons for Choosing a Particular Vendor

Themes Common to Both CEOs and CIOs	
Theme 1: Vendor was chosen based on an existing relationship with the CAH (it installed and maintained financial software and other services).	
Theme 2: Vendor was chosen based on having the most affordable EMR product that offered a fully integrated system combining the best of both financial and clinical operations.	
Theme 3: Vendor was chosen based on end-user (clinical staff) satisfaction.	
Theme 4: Vendor was chosen based on cost of ongoing support and training after implementation-a necessary cost for EMRs and clinical staff to remain compatible and compliant with new and emerging standards.	
Shared Themes among CEOs	**Shared Themes among CIOs**
Theme 1: Vendor was chosen based on the vendor's experience with hospitals of similar size.	*Theme 1:* Vendor was chosen based on an on-site demonstration, off-site visits to other hospitals, and/or contact with vendors' previous clients. *Theme 2:* Vendor was chosen based on having the cheapest available EMR product.
Unique Themes Expressed by CEOs	**Unique Themes Expressed by CIOs**
Theme 1: Vendor was chosen based on negotiations to make the hospital a show site (a site where vendors can display and demonstrate their products to other hospitals)-which resulted in cost savings (discounts) and created incentives for the vendors to install their best products and provide their best services. *Theme 2:* Vendor was chosen based on the desire to avoid investing in an IT department (hospitals had remote access).	*Theme 1:* Vendor was chosen based on timeline for or length of implementation ("full roll-out" vs. stages) and training process. *Theme 2:* Vendor was chosen primarily based on the needs of the pharmacy and nursing staff (CIO previously worked in the pharmacy department, which works closely with the nursing staff).

Table 5: Expected Benefits of EMRs

Themes Common to Both CEOs and CIOs
Theme 1: The expected benefit was to improve patient care/safety by improving efficiency (data processing, bar coding, and timely use of data) and reducing medication, transcription, and order handling errors.
Theme 2: The expected benefit was to reduce lost charges through improving the accuracy and efficiency of capturing and processing charges.
Theme 3: The expected benefit was to create a paperless environment (electronic storage and retrieval of information), with the goal of reducing storage space.

Shared Themes among CEOs	Shared Themes among CIOs
Theme 1: The expected benefit was to implement a fully integrated system that would be accessible by all departments, which would improve efficiency and productivity (revenue).	*Theme 1:* The expected benefit was to improve staff accountability through efficient and accurate documentation. *Theme 2:* The expected benefit was to improve communication through implementation of a fully integrated system that would be accessible by all departments.

Unique Themes Expressed by CEOs	Unique Themes Expressed by CIOs
Theme 1: The expected benefit was to stay ahead of the curve pertaining to future federal mandates of EMRs.	*Theme 1:* The expected benefits were to improve accessibility of patient charts and ease of monitoring or collecting mandated reports. *Theme 2:* The expected benefit was to improve compliance with clinical guidelines. *Theme 3:* The CIO was unaware of the benefits expected by the implementation committee.

Table 6: Realized Benefits of EMRs

Themes Common to Both CEOs and CIOs
Theme 1: It is too early to quantify benefits, but in the future they hope to capture return on investment.
Theme 2: Despite a lack of official measurement and documentation, they assumed that their expected benefits were in fact realized. Thus, they assumed that they had realized expected benefits including improved documentation, medication reconciliation, patient safety, efficiency (process of care), access to and utilization of patient information, and capturing and processing of charges; increased patient numbers or revenues despite no significant changes in staffing; and some cost savings.
Theme 3: Staff resistance to change (e.g., becoming computer literate) has obstructed the hospital from realizing the full benefits of EMR/EHR systems.

Shared Themes among CEOs	Shared Themes among CIOs
None	*Theme 1:* The benefits realized are observed standardization of communication, improved patient monitoring, and improved staff accountability. *Theme 2:* The CIO was not directly involved in the measurement and documentation of benefits; therefore, it

	is difficult to officially comment on evidence of improvements.
Unique Themes Expressed by CEOs	**Unique Themes Expressed by CIOs**
Theme 1: The CEO perceived that it will be difficult to ever quantify benefits related to implementation of EMRs.	None

Health Information Technology Capability Survey Items

Among the 15 CAHs interviewed, six chosen vendors were identified. The most frequent vendors were Computer Programs and Systems, Inc. (CPSI) and Healthland (formerly Dairyland). Other specified vendors were Medical Information Technology, Inc. (Meditech), Keane, Healthcare Management Solutions, Inc. (HMS), and Practice Partners. The number of full-time equivalent (FTE) IT personnel varied among the 15 CAHs (see Table 1).

Most of the hospitals relied on external consultants or subcontractors to support the use of clinical system applications (46.7 percent to a small extent and 40 percent to a large extent). In contrast, few CAHs (20 percent to a small extent and 20 percent to a large extent) relied on application system providers (ASPs), which is a unique form of outsourcing through which a third-party entity manages and distributes software-based services and solutions to customers across a wide area network from a central data center. ASP services are different from typical outsourcing in that the ASP company holds the licenses to the software provided.

A quarter of the hospitals indicated that they were part of a system or network. Of these, half indicated that the system or network had no influence on their hospital's clinical system application purchasing decisions, and half indicated that the system or network had a moderate amount of influence on their hospital's clinical system application purchasing decisions.

Two CAHs indicated that they had a functional computerized provider order entry (CPOE) system, and four were in the process of installing CPOE. Six of the CAHs indicated that they had no plans to implement CPOE. Four CAHs were planning to implement CPOE but had not committed to a defined budget, and five had defined a budget and selected a vendor.

Three CAHs indicated that they had a functional clinical decision support system (CDSS), and two were in the process of installing a CDSS. Eleven CAHs indicated that they had no plans to implement a CDSS. Three CAHs were planning to implement a CDSS but had not committed to a defined budget, and one had defined a budget and selected a vendor.

Ten of the CAHs indicated that they had a functional clinical and financial data repository (retrospective reporting and decision support). Thirteen of the CAHs indicated that they had no plans to implement a clinical and financial data repository. One of the CAHs was planning to implement a clinical and financial data repository but had not committed to a defined budget, and one had defined a budget and selected a vendor.

Findings from the Follow-up Interviews

Reasons to implement EMRs. A common sentiment expressed by CAH leaders for their decision to implement EMRs was the desire to improve efficiency, timely access, and quality (Common Theme 1). However, many CAH leaders also viewed it as a necessary business strategy to remain viable (Common Theme 4) and improve financial performance (CIO Shared Theme 2). While some themes reflect external influences, such as perceived future federal mandates (Common Theme 3), other themes suggest that the decision was driven by internal forces, including the hospital's culture and desires of key administrative personnel and physicians to embrace HIT (Common Theme 2; CEO Shared Theme 1). Several hospital leaders expressed the desire to be competitive and stay ahead of the curve (early adopters) (CEO Shared Theme 1; CIO Shared Theme 1).

Reasons for choosing a particular vendor. Most CAHs first explored the possibility of working with the vendor that installed and maintained their financial package and other services (Common Theme 1). Second, most CAHs attempted to find the most affordable fully integrated EMR system that offered the best of both financial and clinical operations (Common Theme 2; CIO Shared Theme 2). Third, many CAHs looked for vendors experienced in working with small hospitals (CEO Shared Theme 1). CAH leaders engaged in a variety of efforts to find the most suitable EMR system, including an intensive

evaluation process by hosting on-site demonstrations, conducting off-site visits to other hospitals, and/or contacting vendors' previous clients (CIO Shared Theme 1). Once desirable vendors were identified, CAH leaders strove to find the most affordable product. To ensure affordability, some CAHs chose vendors based on the cost of ongoing support and training after implementation (Common Theme 4). CAH leaders engaged in these various search and evaluation processes to ensure that end users (clinical staff) would be satisfied (Common Theme 3).

Expected benefits of EMRs. Both the CEOs and CIOs desired a fully integrated system that would be accessible by all departments (CEO Shared Theme 1; CIO Shared Theme 2). A fully integrated system was seen as the "cure-all" that would improve quality of care, patient safety, communication, and efficiency or productivity (Common Theme 1). Other purported benefits of EMRs were to improve the accuracy and efficiency of capturing and processing charges (Common Theme 2), to reduce storage space occupied by paper documents by transitioning to a paperless environment (Common Theme 3), and to improve staff accountability through efficient and accurate documentation (CIO Shared Theme 1).

Realized benefits of EMRs. Most CAH leaders fell into one of two categories: 1) they admittedly lacked documented measurements to accurately or definitively demonstrate realized benefits (Common Theme 1), or 2) they lacked official documentation but nevertheless assumed that they had realized the expected benefits (Common Theme 2). Interestingly, some CAH leaders assumed that staff resistance to change hindered the hospital from realizing the full benefits of EMRs (Common Theme 3).

Discussion

The interviews with the CEOs and CIOs from the 15 CAHs in Iowa contribute to our knowledge of the perceived needs and benefits of EMR adoption in small rural hospitals. Although these interviews were limited to 15 CAHs in a single, predominantly rural state, the major themes are consistent with the limited previous research. To date, only a few studies have examined this sizable investment in smaller rural hospitals.[37–39] Thus, the findings greatly expand current knowledge given that the available literature overwhelmingly focuses on large, urban, and teaching hospitals that have implemented EMR or EHR systems.

The themes that emerge from the interviews reveal an interesting pattern regarding the extent to which the CEOs and CIOs at a given hospital expressed the same or different views. Across the four questions, approximately half of the major themes were common to both the CEO and the CIO, and half were not. General agreement might be expected, especially given the small size of CAHs and their limited administrative staff. However, this was not necessarily the case. The CEOs often expressed a larger perspective spanning the various facets of their hospital's finances and performance plus its position in relationship to other hospitals. In contrast, the CIOs were more likely to be concerned with ensuring end-user satisfaction with the daily operations of the HIT systems.

Reasons to Implement EMRs

The major themes that emerge from these interviews are consistent in many ways with the existing research. The Medical Records Institute (MRI) conducted a national survey of all sizes of hospitals on the needs for implementing EMRs.[40] The CEOs and CIOs in the current interviews touched on most of the commonly expressed needs. In general, most CAH leaders viewed EMRs as a tool enabling them to reduce healthcare costs and improve quality of care, patient safety, communication between departments, monitoring/collecting of mandated reports, and staff accountability through accurate documentation, similar to findings from large hospitals.[41]

Several other determining factors stand out as catalysts for adopting EMRs among CAHs. For example, some CAHs implemented EMRs only because they are part of a multihospital system. We have previously found that system affiliation is a particular driver for small hospitals because it affords them needed financial and human resources to support and maintain complex HIT.[42] Interestingly, given the relatively low rate of EMR adoption nationally, these 15 Iowa CAHs could be considered early adopters in the terminology of Rogers's theory of innovation diffusion.[43] We were struck by several CAH leaders' expressing their desire to stay ahead of the curve, be part of the wave of the future, and be competitive with larger hospitals. In some cases a single administrator or physician champion played a key role in pushing for change. Often the CAH leaders viewed EMRs as a necessary business strategy to remain viable and enhance financial performance. Despite limited knowledge of EMRs and compatibility of EMRs with their current care processes, a surprising number of CAH leaders felt that acquiring EMR technology was the *right thing to do* and that they *must do it*.

The ARRA of 2009 is designed to incentivize hospitals to adopt EMRs. The comments in these interviews suggest that the ARRA will be viewed as a reason to expedite implementation of EMRs and EHRs and thus will be added to the list of reasons, but it will not replace the themes expressed by these CAH leaders.

Reasons for Choosing a Particular Vendor

Chen and Skinner noted that along with the question of whether to adopt EMRs, small rural hospitals face the important question of what system to adopt.[44] To arrive at these decisions, they found that small rural hospitals go through an exploratory stage when providers develop a general attitude toward EMRs, followed by a specific investigation stage when providers begin to seriously consider adopting EMR systems. Consistent with this finding, relationships with existing vendors heavily influenced CAHs' final decision about which system to adopt.[45] In particular, the vendor that supported their financial system was often chosen if that vendor had an EMR module that could be added. And one of the most important rationales for selecting a particular vendor was the degree to which the end users (especially clinical staff) would be satisfied.

Also, current findings affirmed that vendor selection by CAHs is of necessity based on affordability.[46,47] Our study highlights various ways in which CAHs attempted to find affordable EMRs. Specifically, CAHs engaged in an intensive evaluation process by hosting on-site demonstrations, conducting off-site visits to other hospitals, and/or contacting vendors' previous clients. One CAH was able to negotiate being a show site where vendors could display and demonstrate their products to other hospitals. This resulted in cost savings (discounts) and created incentives for the vendors to install their best products and provide their best services.

Not surprisingly, some CAH leaders were particularly influenced by vendors that demonstrated experience with hospitals of similar size. Because of their limited resources, CAHs often selected a vendor based on the level of ongoing support and training. It is common for EMR vendors to provide training resources. CAH leaders also looked for evidence of post-implementation support for their EMR system and staff to remain compliant with new and emerging standards. One CAH's rationale for selecting a vendor was based on the implementation timeline; they preferred a "full roll-out" instead of a staged approach. One CAH chose a particular vendor because it was available through remote access and thus obviated the need to invest in a local HIT department.

The top three vendors chosen or expanded upon (from existing use as a financial system) for clinical use were CPSI, Healthland (formerly Dairyland), and Meditech. These three vendors have been certified by the Certification Commission for Health Information Technology (CCHIT) but have not been certified to provide EHR technology for meaningful use under ARRA.[48] Due to the recent and unresolved criteria of ARRA, it is difficult to assess whether these vendors were good choices or validate the robustness of these systems in regard to the new "meaningful use" definitions released on December 30, 2009, by CMS and ONC. The true test will be if these vendors pass this certification process.

Requirements under the "meaningful use" criteria include capturing information in a coded format, using information to track clinical conditions, implementing clinical decision support tools, and reporting clinical quality measures.[49] Most vendors, particularly vendors catering to smaller hospitals, have two major hurdles: 1) providing convenient reporting tools and 2) inclusion of clinical decision support tools.[50] Two-thirds of these CAHs indicated that they had clinical and financial data repositories operable or being installed and thus have the capacity to report data. However, only about a third of these CAHs reported having CPOE and a CDSS operational or being installed. Another area of concern for meeting the "meaningful use" criteria and obtaining a true EHR system is the ability to exchange information with physician practices, pharmacies, and other healthcare facilities. Thus, small hospitals are likely to have particular difficulty meeting the "meaningful use" criteria without significant capital investments and changes in workflow and operational procedures.

Expected Benefits of EMRs

The expected benefits expressed by the CEOs and CIOs often included improving efficiency, communication, quality of care, and patient safety.[51,52] In terms of improved quality and safety, the CEOs and CIOs mentioned expecting improved compliance with clinical guidelines and reduction of medication, transcription, and order handling errors. In terms of improving efficiency, they mentioned better data processing, bar coding, and timely use of data, reduction of lost charges through improving the accuracy and efficiency of capturing and processing charges, and reduced need for document storage space by transitioning to a paperless environment. Some of the specific expected benefits were not mentioned by the CEOs and CIOs

as factors in deciding to implement EMRs. This provides anecdotal evidence that these specific anticipated benefits of EMRs were not essential factors in their purchasing decisions.

Realized Benefits of EMRs

Interviews with CEOs and CIOs at these CAHs suggest that the actual benefits realized from EMRs are at best limited in comparison to the anticipated benefits. This discrepancy appears to occur because the CEOs and CIOs have concluded that it is too early, if at all possible, to measure the return on investment of EMRs. In attempts to align expected and realized benefits, most CAHs fell into one of two categories. The first group based their view of realized benefits largely on their expected benefits. Thus, despite the lack of official measurement and documentation of these effects, they believed that their CAH had realized improvements in documentation, medication reconciliation, patient safety, efficiency (process of care), access to and utilization of patient information, capturing and processing of charges, and patient numbers or revenues. Despite having similar expected benefits, the second group based their view of realized benefits on informal observation. Specifically, they observed that their CAH had improved standardization of communication, patient monitoring, and staff accountability. Even though their observations were not formally measured and documented, these leaders perceived these tangible benefits. They appeared to base these perceptions on the fact that all departments were on the same system, documentation and retrieval of information were facilitated, and the work of clinical staff could be traced back to individual identifiers.

Conclusions

A major trend extracted from these interviews is that the rationale for acquiring EMRs and the expected benefits of EMRs are not yet aligned with realized benefits. Thus, a group of small rural hospitals have invested considerable time, money, and human resources in implementing EMRs based on high hopes but have very little empirical evidence of benefits resulting from the commercial systems they have installed.[53]

In light of this evidence, two key questions arise:

1. Why did small rural hospitals (CAHs) install EMRs prior to ARRA?
2. Will small rural hospitals (CAHs) be able to install EHRs to meet the ARRA target dates, and if so, will there be a realized return on investment for the EHR implementation?

These questions are of importance considering that most hospitals of any size have yet to document the actual return on investment in EMRs.[54]

The ARRA will be a driving force for CAHs to implement EHRs meeting the "meaningful use" criteria in the years 2012 to 2015 to claim the incentives and avoid disincentives. Even though the 15 CAHs interviewed are ahead of the curve in implementation of EMRs, considerable work and capital investments remain for them to achieve full EHRs as defined by ARRA. IT staff at these hospitals indicated in discussions that they are struggling just to maintain the systems they have implemented and find it difficult to take on the challenge of implementing additional system modules such as CPOE. They also indicated that it is particularly hard to find IT staff in rural areas who have the clinical or healthcare knowledge to help with these implementations. The shortage of educated healthcare IT staff has been recognized, and ARRA stimulus funds through grants are just beginning to be offered to help educate HIT professionals to reduce this lack of resources.[55] Reaching the 2015 requirements for meaningful use may be a daunting task for hospitals that are just starting their EMR selection and implementation processes.

The reengineering of vendor systems to create health information exchanges (HIE) to achieve a true EHR system may even be more daunting. KLAS, a company that evaluates healthcare vendor systems, questions vendors' claims of their ability to truly exchange information with other vendors.[56] According to KLAS, the way clinical information systems are structured, stored, labeled, and shipped makes it very difficult for vendors to connect all of the discrete data elements. Those HIEs that have partially succeeded have chosen very simplified approaches and/or are sending clinical information from the same vendor's systems. Other concerns, such as financial viability of HIEs, security, privacy, and patient consent, still need to be resolved. Approximately 70 percent of the HIEs in existence are being financed through state or federal funds. Even if vendors can make the necessary changes, hospitals using these systems will need to perform necessary upgrades and implement new equipment to facilitate the exchange of information to fully meet the "meaningful use" requirements.

Thus, amid uncertainties of the value of EMRs, these 15 CAHs reflect the leading edge of a slow but steady transition to the use of EMRs. This costly transition gained widespread acceptance among these CAHs despite limited research or personal evidence indicating the effectiveness of the EMR systems they implemented. The ARRA will speed the acquisition of EMRs by critical access hospitals but also will present new hurdles through the requirements for meaningful use.

Acknowledgment

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Article citation: Mills, Troy R.; Vavroch, Jared; Bahensky, James A.; Ward, Marcia M. "Electronic Medical Record Systems in Critical Access Hospitals: Leadership Perspectives on Anticipated and Realized Benefits." *Perspectives in Health Information Management* (Spring 2010).