

Physician Champion Role in an Electronic Health Record Implementation,
a Case History

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Abstract

The electronic health record (EHR) is an array of computer applications that is being touted as a key patient safety, quality and hospital efficiency initiative. Due to the complexity of the health care environment, the implementation of an EHR can be challenging especially if health care providers, in particular physicians, are not supportive of the process. Physicians play a key role in the provision of health care and should be involved in all phases of the implementation process. Variations of EHR acceptance have been widely documented highlighting the importance of a well-planned implementation process. Theoretical frameworks, such as Roger's Science of Diffusion of Innovation, provide guidance on how process changes can be successfully incorporated into organizations and the physician champion role can be utilized as an extensive of the theory. To illustrate how an EHR implementation can employ the physician champion role to achieve widespread adoption, a case history of a 724 bed, private not for profit hospital will be presented.

The rest of this paper will be organized as follows: In the first section a review of the history of the EHR; in the second section, a discussion of barriers to implementation; in the third section, an overview of the Science of Diffusion of Innovation; in the forth section, the presentation of the physician champion role; in the fifth section a recommendation for the physician role in an EHR implementation; and in the sixth section, the case history of an actual EHR implementation.

Physician Champion Role in an Electronic Health Record Implementation, a Case History

The electronic health record (EHR) is an expansive term used to describe an array of computer applications that house an individual's pertinent medical information. The Institute of Medicine (IOM) further refined the characteristics of a "true" EHR in 1991. The envisioned elements were to include an electronic data capture for storage in a data repository; "real time" order entry and test results applications; electronic data interchange; clinical decision support for diagnosis and care management; performance reporting for internal use or reporting to external agencies as mandated or desired; and individual patient access to their personal records (Glandon, Smaltz, & Slovensky, 2008). Also in 1991, the IOM declared that EHRs were an "essential technology for patient care". After the release of the 1999 IOM follow up report, *To Err is Human*, national experts panels began advocating the adoption and use of EHRs in all health care settings (Kohn, Corrigan, & Donaldson, 1999). The IOM has updated the key capabilities of an EHR in 2003. The functionality is now to include a longitudinal collection of electronic health information for and about persons; immediate electronic access to person-and population-level information by authorized users; provides a knowledge and decision-support to enhance the quality, safety, and efficiency of patient care; and support efficient processes for healthcare delivery (Tang, 2003).

Historical Overview

Computers were first used to support management of patient information over 40 years ago (Shortliffe, 2005). The management of patient information is a fundamental process to health care delivery (Chaudry et al., 2006). Since that initial foray into computerized medical records, progress has been made towards establishing an electronic medical record for every individual (Sensmeier, 2009). When viewing the technological changes since the 1970's, adoption of

technology in healthcare in the United States has been much slower when compared to other societal elements (Shortliffe). Several countries, such as the United Kingdom and the Netherlands, have supported the EHR adoption due to their centralized, single-payor healthcare organizations (Anderson, Frogner, Johns, & Reinhardt, 2006; Shortliffe).

Though the limitations and safety concerns related to a paper patient record have been widely reported, the EHR has not been embraced as a technologic solution to improving U.S. health care (Chaudry et al., 2006). In 2004, the lack of EHR dissemination in the United States garnered national attention with then President Bush's public address to the American Association of Community Colleges. He outlined a plan for most Americans to have an EHR by 2014 as a cornerstone component to improve health care delivery in the United States (Sensmeier, 2009). According to a 2005 national survey, 37 percent of responding hospitals had elements of a core EHR in place (Glandon, Smaltz, & Slovensky, 2008). The adoption rate has been noted to be higher in large academic institutions (O'Neill, Talbert, & Klepack, 2009). The ante has been increased with the Federal Stimulus Bill enacted in February, 2009. Reimbursements will be reduced for hospitals who do not have an EHR by 2015 (Terhune, Epstein, & Arnst, 2009).

EHRs have been successfully implemented in the United States. Chaudry et al. (2006) identified four benchmarked institutions that comprised 24% of the reported EHR studies in their systematic review of the literature. The four institutions had EHRs that were multifunctional, included decision support, and were developed internally and incrementally over many years. Their research supported greater adherence to protocol-based care, a reduction in medication errors, and improved quality of care through clinical monitoring of aggregates of data. Mixed

results on improvement of efficiencies, cost and quality were noted in the few studies on the commercially available applications.

Not all EHR implementations can be deemed “successful” (Terhune, Epstein, & Arnst, 2009). Polack (2009) reported an EHR failure rate of 30-50% depending upon the source and definition of failure. Highly publicized cases have been published in respected journals such as the University of Pittsburgh Children’s Hospital article in December 2005 *Pediatrics* (Han et al., 2005). Patient deaths were reported to be doubled and care was delayed which they attributed to their five month old electronic system. Dr. David Kibbe, Senior Technical Advisor to American Association of Family Physicians called most large EHR implementations a “disaster” (Terhune et al.). Components of an EHR, such as computer physician order entry (CPOE) have also been extensively critiqued. Koppel et al. (2005) published in the *Journal of the American Medical Association* the creation of 22 new errors with the introduction of CPOE.

Sensmeier (2009) noted a successful EHR implementation is not about the technology, but more about change management theory. Shortliffe (2005) surmised technology is no longer a barrier to the effective use of information technology in healthcare. He clarified the barriers are related to either cultural, structural or failure to make the business case. The healthcare industry has a long history of preferring tradition over progress and is inherently risk-averse (Sensmeier, 2009). Berwick (2003) stated even with the rich history of scientific basis in healthcare, innovations disseminate slowly even with success at one location. Herzlinger (2006) identified six barriers or forces that can either drive or destroy innovation. Players, either the existence of hostile ones or the absence of helpful ones, can impede the spread of innovation. Threats to their power may be perceived with any change in the status quo.

Barriers to implementation

Physicians are a powerful player in healthcare, especially in a hospital setting. Traditionally, their role has been highly autonomous with the authority as the ultimate decision maker in clinical situations (Ash, Sittig, Campbell, Guappone, & Dykstra, 2006). Playing a pivotal role in healthcare, their sphere of influence supersedes their clinical responsibilities. In fact, physicians have also been recognized as being a crucial player to facilitate adoption of health information technology, including the EHR, independent of their employment by the healthcare institution (Anderson, Frogner, Johns, & Reinhardt, 2006).

Physicians' adoption or avoidance of the EHR impacts hospitals both in financial sector and quality of care. Physicians, especially those in private practice, perform a pivotal role in directing where their patients go for treatment. If a physician decides to renounce his privileges related to an EHR mandate, the hospital may experience a drop in revenue. Another quality of care issue is having a dual system for patient care ordering and documentation. Practitioners who access the patient record electronically are not aware of any paper documentation to aid in their decision making. Erroneous decisions of omission or commission can easily result. Therefore, physicians must be engaged and on board to support an EHR implementation.

The physicians in the United States have been hesitant in their support for health information technology (Anderson et al., 2006). As complex as today's medical environment, the rationale for their hesitancy is multifaceted. Barriers to a successful implementation range from organizational to personal. Shortliffe (2005) noted physicians have not embraced clinical information technology and even view it as a threat to their professional autonomy. Loss of autonomy was viewed to be one of the main reasons for physician discontent with healthcare institutions (Ash et al., 2006)

Ash et al. further (2006) delve into the issue of the perceived loss of autonomy and control as a shift in power. Power, defined as the ability to influence, is closely related to leadership, authority, and control. Power plays a key role in the accomplishment of tasks. The theories of organizational power are based on the works of French and Raven (1962.). The four different types of power defined were reward power, control of rewards one sees as valuable; legitimate power, based on position and mutual agreement; referent power, personal power based on liking and respecting someone; and information power, having access and control over information. Control is based on power, but also includes a component of monitoring and decision-making to alter a course. Considering the historical physician role as decision maker, power and control have been significant components of their function.

Ash et al. (2006) found three shifts in power patterns after the implementation of HIT in six healthcare institutions. Two used commercially available vendor systems and four used systems that were locally developed by institutions recognized by Chaudry et al. (2006) as benchmarks-the Regenstrief Institute and Brigham and Women's Hospital. The first power shift was a change in power structure through forced work distribution and mandated changes for safety pursuits. Work processes changes were often formalized as organizational bylaw and policy changes. The physician is now charged with not only deciding the course of treatment, but also must enter his decisions into a computer. Order set defaults and required elements must now be addressed by the physicians, lessening the practitioner's power to control his own practice. Many physicians find it demeaning and burdensome to enter their own orders, previously a secretarial job (Saathoff, 2005).

The second power shift change was shifts in control with a perceived loss of clinician control (Ash et al., 2006). Previously the physician could write orders and notes based on his

clinical judgment and expertise. After implementation of HIT, documentation templates and order sets with required elements demand adherence to guidelines, a shift of control away from the physician. Also noted by the authors was a subtle loss of control to other healthcare providers. Instead of the usual hierarchical physician-nurse relationship, the boundaries have changed due to the nurses' perceived expertise with the EHR, i.e. information power. As Mechanic (as noted in Ash et al., 2006) observed, control over workplace issues is extremely important to the physician, but is now eroding after EHR's implementation.

The third power shift according to Ash et al. (2006) was a shift in autonomy and a move towards coalitions. Decision-support is a perceived threat to the physician's autonomy. The physician's belief that they were in sole control of their practice of medicine has been shaken with the advent of order sets defining "best practices" and the ability to easily monitor adherence to the ascribed guideline. Though healthcare has a breadth of scientific knowledge as its basis, major knowledge gaps still exist in the determination of the best course for diagnostic studies and treatments (Berwick, 2003). Physicians often chaff at the requirement to blindly follow guidelines, deriding them as dehumanizing and as a "cookie cutter" approach to medicine (Shortliffe, 2005).

Other concerns shared by physicians as a possible interference with the physician-patient relationship (Shortliffe, 2005). Older physicians have often not been exposed to technology and may be reluctant to use the EHR (Polack, 2009). Some inexperienced physicians may feel threatened to learn how to use a computer, especially during patient encounters. The fear is their lack of computer expertise may be perceived by their patients to include their medical skills (Saathoff, 2005). Training to alleviate competency concerns can be counterbalanced with loss of

productivity during training, especially for those physicians in private practice (Shortliffe). A physician's time is his chief resource; uncompensated time can be impactful on the practice.

Despite the barriers to implementation, EHRs have been successfully deployed as noted earlier. The right balance of culture and technology has been espoused as vital criteria for significant EHR adoption (Halamka, 2006). Engagement of physicians is a key element to the dissemination of the new technology (Marx, 2009). A crucial theoretical framework that can aid in the change process is the science of diffusion innovation (Berwick, 2003). Utilization of a physician champion can be viewed as an application of this model and has been shown to be an effective mechanism to enhance cultural change and physician adoption rate of the EHR (Pollack, 2009). A brief discussion on the science of diffusion of innovation and physician champion role follows.

Science of Diffusion of Innovation

The study of how tactics to improve the dissemination of innovation has evolved in the social science domain over many years. Everett Rogers and Andrew Van de Ven are considered modern leaders in this science (Berwick, 2003). With the creation of his milestone text of *Diffusion of Innovations*, Rogers contributions to the innovation diffusion theory is widely recognized. A brief review of his theory will be presented as a framework for fostering an innovative change (Rogers, 1995). To achieve a successful dissemination of the innovation, Rogers has correlated three basic clusters of influence with the rate of the spread of the innovation. Those clusters are the perceptions of the innovation; characteristics of those who adopt the innovation, or fail to do so; and contextual factors, specifically involving communication and leadership.

Perception of the innovation can be a powerful predictor of the rate of change diffusion. Five properties of the change adoption are prominent in the determination the rate of diffusion. The most powerful is the perceived benefit of the change. To state it simply, individuals are more likely to adopt the change if they feel it will benefit them. Benefit has been defined to be the balance of risk versus gains while comparing the known status quo with the unknown consequences of the change. The more information individuals can ascertain about the known outcomes of the innovation, the more likely the change adoption occurs.

The second property of change adoption is the compatibility of the change with the individual's belief and value system. To speed the change adoption, the innovation must be felt to add value to the individual's needs. The third property is the complexity of the change, i.e. the simpler the innovation the quicker it will spread. A caveat to this property is in successful innovation diffusions, the original innovation reinvents itself into many different but related changes often to simplify the innovative process. Trialability or the means to pilot test the change before widespread implementation is the fourth property. The fifth property is observability or how easily viewable is the use of the change by others.

Personality traits of potential users of the innovation encompass the second cluster of innovation diffusion factors. Rogers has identified five groups of adopters. The earliest adopters are called innovators. Often with a fascination with new technology, they have a high tolerance of risk. Socially, they are not connected socially, and often called mavericks. The group makes up approximately 2.5% of the potential adopter group. The next group is the early adopters, comprising 13.5% of the total. This group is well respected as opinion leaders, and is embedded into the social networks. They confer with the innovators and select ideas for trial, having a risk tolerance to often trial many new innovations at one time. Often times, early adopters travel to

seek new opportunities to evaluate. Early adopters are often watched by the next group of adopters, the early majority. The early majority are 34% of the potential adopter group. They do not travel, but learn locally from their peers and are less risk tolerant. Physicians in the earlier adopter group are poised to trial new innovations that fit into their needs and belief system. The next third of the group are called the late majority. They follow the early majority, selecting to utilize the innovation once it becomes the status quo. The last 16% of the adopter group is called laggards, those vetted in the past and not looking to future possibilities.

The third cluster is based on organizational factors that support or hinder the diffusion. If leadership recognizes the value of the innovation, process steps can be deployed to enhance the diffusion. If the innovation is viewed to be desirable, the provision of financial support and social networking for the adopters can be invaluable to the diffusion.

To take the theoretical to the practical, Berwick (2003) provides seven rules to cultivate the diffusion of “good” changes in healthcare. Rule number one is to create a process to find sound innovations to champion. Ideas can be found in professional literature as a starting point. Rule number two is find and support innovators, often located outside the organization. Invest in early adopters is rule three. Provide time and resources for early adopters small scale trials and social connections with the innovators. Rule four is make early adopter activity observable through social channels. Trust and enable reinvention, create slack for change and lead by example are rules five through seven. The physician champion role can be viewed as the embodiment of Berwick’s rules.

Physician Champion Role

The physician champion role has been embraced as a strategic necessity during EHR implementation to convince colleagues of the potential benefit of HIT (Anderson, Frogner,

Johns, & Reinhardt, 2006). Paramount to the success of a major process change involves understanding the workflow to determine the potential benefits for the users. Physician leaders, in particular, were found to have the greatest ability to impact workflow changes of their peers. Sustained significant changes were only evident during the peer to peer interactions (Saathoff, 2005).

In addition, the individual's attitude toward technology has been determined to be a major factor in the decision to adopt and use technology. In fact, technology readiness has been found to be the strongest predictor of EHR adoption (Abdolrasulnia et al., 2008). As physicians feel comfortable with the EHR technology, they have demonstrated a greater adoption rate (Arsenault, Cudney, & Luchsinger, 2008).

Physician champions should be included during all the implementation phases. The inclusion has reported a positive effect on physician satisfaction and system success (Saathoff, 2005). A great opportunity is in the involvement on implementation specific teams. Successful implementations have reported the use of a multidisciplinary clinical group with oversight responsibilities for clinical decision support. This type of committee can help compensate for the individual physician loss of autonomy and power (Ash et al., 2006).

A physician champion's role can be challenging for the change process is not always widely embraced. As noted by Berwick (2003), individuals who "champion the spread of innovation must be prepared for resistance, even ridicule" (pg. 1974). Tactics may include outright refusal to a more subtle partial use of the technology (Pollack, 2009).

Based on pilot trials in Tasmanian and Northern Territory, Australia targeted local clinic physician champions as factors critical to the success of implementation of their national EHR, *HealthConnect* in 2004 (Department of Health & Ageing, 2004). The Australian take up model

anticipated leveraging the enthusiastic response of the physician champions or advocates to market the successful transition to their peers. The marketing of the successes was to encourage other providers to participate in *HealthConnect*. Australia developed the original model based on experiences in the United Kingdom with their own national EHR system.

Recommendations for Physician Role in an EHR implementation

EHRs can be a vital tool in the provision of patient care. Multiple organizations have successfully deployed EHRs, either components or an integrated system. A key challenge is for the end users to see EHRs as an asset in their busy clinical world (Shortliffe, 2005). Physicians, due to their decision maker function on the healthcare team, play a pivotal role in the determination of whether the EHR is an asset or a determinant to patient safety. Based on the review of literature, physicians can be a positive addition to an EHR adoption. Key strategies for inclusion of the physician in an EHR implementation model will be discussed followed by an actual case history of an EHR implementation in a hospital setting.

The first phase for physician involvement is the fostering of the culture of change. As noted previously, an HIT implementation causes drastic changes in workflows and relationships within an organization (Saathoff, 2005). The change can be perceived as a loss of physician autonomy, power and control (Ash et al., 2006) creating adversarial relationships or the hostile player which can kill innovation described by Herzlinger (2006). Hospital leaders must first engage a dynamic physician liaison to start the process. This individual should be a well respected member of the physician community and is well versed in local physician practices. Physicians are more likely to trust more local and well known leaders (Berwick, 2003), so they will be more receptive to their messages and work towards a common goal. Experience with an

EHR system would further enhance the credibility of the physician liaison and garner support for proposed process modifications.

As noted by Sensmeier (2009), communication is an important tool to utilize during an EHR implementation. Informal discussions on EHRs at Physician Division meetings, in the physician dining area, and lounges is a rudimentary first step in gauging interests, potential barriers and determining potential physician innovators and early adopters. The physician liaison must also actively recruit both formal and informal physician leaders to support the EHR. This role should report regularly to the hospital's Medical Board, providing literature and current research to support EHR implementations. The Medical Board, the highest formal physician leadership structure in a hospital, can prove to be strategically important for any subsequent required bylaw changes. The physician liaison must also negotiate with administration financial compensation for innovators and early adopters within the federal guidelines. Fiscal recognition of their sacrifice can further their engagement with the implementation process (Saathoff, 2005).

Identification of physician innovators and early adopters is crucial in the early phases of EHR implementations. Innovators may have had previous experience with an EHR system and can provide invaluable practical information on the system. Innovators can network with their fellow innovators to share their experiences with different systems. If the system is to be purchased, innovators would be a valuable asset on the decision team due to their technical expertise. If the system has already been purchased, innovators can be utilized for workflow testing and hardware selection.

Early adopters, once identified, can be the first wave of physician champions. They should be included in conversations with the vendors and designers to further cement their knowledge base. Early adopters should also be invited to become members of the EHR Physician

Steering Committee (PSC). Creating a coalition with decision making authority can mitigate the loss of control and power physicians may experience with the EHR implementation. This group should ideally be comprised of physician leaders of the major divisions in the hospital along with the Chief of Medical Staff. The physician leaders should also represent the diverse physician groups across the organization if it is an open hospital for physician practice and credentialing.

Having an open hospital for physician practice can add a complication to the EHR implementation. As non-employed physicians, this group has historically been treated as “guests” of the hospitals. They direct their patients to the facility, so they feel the hospital should be subservient to their needs. In addition, they often disregard hospital initiatives, feeling they do not apply to them. (Ash et al., 2006). This group of physicians can easily become hostile players as described by Herzlinger (2006).

As members of the EHR PSC, participation on the documentation and order set development group is crucial. The early adopters should be supported to travel to conferences, vendor demonstrations, and professional meetings where EHRs are discussed and garner proven development methodologies. Networking with peers can broaden their knowledge base plus form a social network of application users outside of their home healthcare system. Reaching to peers also aids the organization of learning from others’ mistakes, a common failure in EHR implementations (Halamka, 2006).

In addition, another responsibility of the steering committee is the development of physician training. With an in-depth knowledge of current workflow practices and exposure to the EHR application, committee members will be the most knowledgeable and can guide the creation of training material and schedules. Instruction should be tailored to meet the requirements of the physicians and is best provided in short, incremental segments (Arsenault,

Cudney, & Luchsinger, 2008). Web based training modules are great mechanisms to deliver the basic training in a self paced manner, followed by an instructor led class (Marx, 2009). Proposed training courses should be piloted by the PSC, offering targeted feedback to improve the physician training experience. Due to financial and time constraints, having physicians as instructors is not usually feasible. Early adopters can be mentors once initial training has been deployed by showing peers their developed documentation templates, order sets and devised shortcuts either in formal or informal sessions.

Since physicians have the ability to impact the practice of other physicians more significantly (Saathoff, 2005), the PSC would be charged with the creation of key project milestones such as dates for mandatory documentation and order entry by physicians. In addition to the compulsory dates, the committee also must develop a recommendation for addressing the “laggards” as identified by Rogers (Berwick, 2003). The group must decide how to address those who refuse both training and the utilization of the system after training, both will occur. The recommendation should be brought to the Medical Board for endorsement and communication well ahead of the actual dates. Considerations to be included when establishing the mandatory dates are the size of the entity, administrative support, experience of both clinical staff and physicians in any form of electronic documentation and the scale of the change. The larger and more complex the change, the more extended is the uptake of the innovation (Berwick, 2003).

With communication is crucial to the success of an EHR implementation (Sensmeier, 2009), the PSC must develop a plan to address sharing of implementation information to their peers. Vital information for inclusion in the messaging is how the end users benefit from utilizing the EHR, a tactic to reach the early majority physicians (Berwick, 2003). To reach out to physicians, especially those who are not employed by the hospital, requires a creative strategy.

The physicians are potential sources of ideas, for they know what catches their attention.

Multiple avenues must be explored and used, including faxes, letters to their offices and homes, emails and signage around the hospital (Marx, 2009).

The informal social networking is another great avenue that has been shown to be effective. Early adopters are watched by others, especially the next group to adopt the innovation the early majority (Berwick, 2003). PSC members should be encouraged to attend formal meetings such as specialty division meetings, but also discuss the EHR implementation in the physician lounges and dining halls. During these social exchanges, it is imperative to provide factual information of the process along with communication methods for questions and change requests. Continually adaption of the EHR application will provide benefits to all users, and usually focuses on simplifying the changes to appeal to the broad spectrum of users. As Berwick (2003) noted “To work, changes must be not only adopted locally, but also adapted locally” (pg 1974).

Physicians on the Steering Committee are also great resources for the identification of additional physician champions. Targeting opinion leaders and early adopters can accelerate the adoption of the EHR (O’Neill, Talbert, & Klepak, 2009). Ideally, each large physician group should have a physician recognized in this role. The champion can facilitate orders sets and documentation templates customization to meet the unique needs of each group and lessening time spent entering information into the system, a frequent criticism of EHR and CPOE implementations (Saathoff, 2005). Encouraging customization of order sets and templates also helps to reduce the unintended shift of power, control and autonomy documented by Ash et al. (2006).

Once the EHR has been deployed, the PSC will need to refocus their energies on creating the EHR as the status quo even before the mandatory deadlines. For example, an effective strategy to reach out to the specialty physicians is peer pressure. For example, generalists may refuse to use a certain consultant unless they document in the EHR. The late majority will increase their utilization of the EHR if it is perceived to be the standard of practice (Berwick, 2003). Constant and consistent messaging must accompany these phase of diffusion to keep the momentum going forward (Marx, 2009). The goal is to reach the “tipping point” (Berwick, 2003, p. 1973) of the diffusion, i.e. the time during the implementation where social forces keep the change from being stopped. At this juncture, the PSC and all members of the implementation team can begin the monitoring phase to ensure continued deployment and acceptance of the EHR (Ash et al., 2006).

Case Study, Texas Health Harris Methodist Hospital Fort Worth’s EHR Implementation

Texas Health Harris Methodist Hospital Fort Worth (THFW) is a 724 licensed bed privately owned not for profit hospital with over 1000 non-employed physicians on staff. It was founded in 1930 by Dr. Charles Harris in conjunction with the Methodist Church. Six additional local health care facilities were incorporated under the Harris name over the years, creating the Harris Methodist Health System. In 1998, the Harris Methodist Health System merged with several other local healthcare institutions forming Texas Health Resources (THR). Currently 14 hospitals comprise the THR system and it is one of the largest faith based healthcare systems in the country.

THFW has been widely recognized as a leader in quality healthcare. THFW has been chosen for 13 straight years as a Consumer Choice Award by the National Research Corporation and was named a Distinguished Hospital for Clinical Excellence by HealthGrades, a hospital

rating company based in Golden, CO. It has been accredited by The Joint Commission and has received Magnet Designation by the American Nurse Credentialing Center in 2005.

THR made the commitment in 2004 to implement an integrated EHR across the system entities. After an extensive evaluation of applications, Epic Systems was selected as the vendor. The decision was also made concurrently to deploy the Siemens' Admission, Discharge, and Transfer (ADT) system, Invision Gold, across the system. The Harris entities had utilized a home grown system called Advance, which was deeply embedded in the work processes of the entities.

Several key system decisions provide a high level framework for the implementation. First was the scale of the implementation. Epic application modules selected were Pharmacy, Medical Records, Ambulatory, Emergency Department, Clinical documentation including physician, Provider order entry, and Security. THFW already had implemented an electronic radiology system including an imaging system; laboratory system; a medical record scanning system that allowed viewing online of archived records; a Medical Management application; and nutrition applications. In addition, select specialty software systems; such as those used in Women's Services, Cardiology procedural areas, and Surgery; had previously been deployed. Two of the physician specialties, Anesthesia and Neonatology, had stand alone electronic documentation systems in use. So, THFW physicians had been exposed to components on an EHR but not to an integrated record.

The second system decision was related to security and training. Since patient information is the basis for healthcare decisions, all physicians could have access to the EHR to document progress notes when accessing the information at the hospital, balancing the perceived loss of information power Ash et al. (2006) described. To gain access remotely or to enter orders, training had to be completed. Web based modules were created for the initial training sessions.

An instructor led class was a requirement prior to order entry access. By contract with the vendor, all class room instructors had to complete a credentialing process developed by Epic.

The third decision related to the timeline of implementation. THFW was selected to be the fourth hospital implemented due to its size and complexity, definitely an advantageous position. The medical community in North Central Texas is small enough to allow social networking between physicians. The physicians had contact with peers at the entities slated for implementation prior to THFW. In fact the third entity to be implemented, Texas Health Harris Methodist Hospital Southwest was in close proximity to THFW and had a shared physician pool of mostly specialists. Several key members of the THFW PSC had completed their training and were utilizing the system for six months prior to the THFW Go Live.

Order Set development was coordinated by a central group. Representations from specialty groups from all the entities met to determine the basic evidenced-based elements of the order sets. The team was led by a physician who also continued to practice in an Emergency Department at one of the entities. Gaining consensus was a challenge since as Berwick (2003) noted gaps remain in the available scientific research. A unique entity version was created to accommodate variations in pharmacy formularies, lab and radiology capabilities. The application allowed individual users to save their own created custom versions of the order sets to speed adoption and gain efficiencies with the system.

Despite the system approach to the implementation, numerous local decisions remained that greatly influenced and led to a successful EHR deployment. The first profound entity decision was the selection of the position previously called physician liaison in 2007. A well respected local gastroenterologist Dr. B., who had started an EHR system in his group practice, was recruited to replace the retiring Vice President of Physician Relations. An expanded role was

devised to incorporate responsibility over physicians and health information systems. Having a respected physician along with being a hospital executive proved to be an asset to the project twofold. As a physician, he had insight into the importance of clinical input into the process and the challenges physicians experience during the transition from paper to electronic documentation. In addition his role as Vice President provided insight to the Hospital President and other executives on the contextual factors that can support and sustain the diffusion of the EHR at THFW (Berwick, 2003).

Dr. B. immediately began the process of developing a culture to support the EHR change process. One of his first steps was the identification of key players among the current physician staff. One of the first recruits was an Emergency Department physician Dr. T. who was historically was a maverick in thought and had many other characteristics of an innovator. The Emergency Department (ED) was acknowledged to be a crucial cog in the process. The ED is one of the busiest in the region and over 30% of all THFW's admissions are processed through the ED. The ED was also very cognizant of throughput, or how the patients move through their department. It had previously won a prestigious award from the Rochester Institute and *USA Today* for its ED redesign to quickly process and treat patients. The uncertainty of the change and the potential slowing down throughput was frequently discussed in numerous meetings. Dr. T. attended numerous Epic sponsored user groups meetings and eventually recruited to the THR team a physician who had developed the ED module which Epic had purchased. Dr. T. was also selected to be a member of the THR System Steering Committee, EHRIC, and was one of the first members of the THFW PSC members.

Dr. B. further recruited physician champions, both innovators and early adopters, to serve on the steering committee. The chair of the group was a general surgeon who had utilized an

EHR during training. He was also a well respected member of the physician community and was chair of the entity's Medical Record Committee. Twenty physicians were selected as committee members with each division and large specialty group represented and also the Chief of the Medical Staff. The members were not always the division chiefs, but were respected for their expertise. In addition, several of the members were technology savvy and had EHRs in their own offices. As mentioned previously, THFW had over 1000 physicians. Some physician groups were bound by contracts, such as the Anesthesiologists, Neonatologists, and a Hospitalists group; but the majority of the physicians are in private practice.

Stipends were arranged for attendance at steering meetings and expenses were paid for user group meetings and site visits. For example, a site visit was arranged with the Neonatologist to evaluate documentation in a Neonatal Intensive Care Unit at another healthcare system who had installed Epic several years previously. An important note is that physicians could not be paid a stipend to attend any training since they were not employees of the hospital. The PSC debated whether to offer incentives such as opportunities to win iPods or \$1,000 toward continuing medical education that were offered at other system hospitals. One hospital, to increase training attendance, held their classroom sessions at a local expensive steak house. The PSC voted unanimously not to "reward" what they considered unprofessional behavior, needing to be induced to do the "right thing".

The PSC met monthly starting the year prior to the implementation date of October 2008. The actual date of the implementation was a joint decision between the PSC, THFW's Project Steering Team and the THR Project Steering Team. A key component in the date selection was the conversion of the ADT system, the backbone of the financial system. Initially, the date was set to be the last day of September night to the first day of October to establish a clear conversion

date for the financial system. The estimation of converting existing patients to the new system was 30 hours. Based on the experience of the THSW conversion, the date was moved back to night of October 3rd to morning of October 4th. This date was also a Friday night. When looking at the statistics of ED visits, the time frame between Friday midnight and Saturday at 3:00 AM had a moderate amount of activity. Also a benefit was there was little outpatient and planned admissions during the weekend, so a lower volume of patients could ease the transition.

The decision was made the PSC regarding how to approach communication. The group felt most physicians “ignored” faxes, letters and most methods of formal communication. One of the members mentioned posting signage at the entrance to the physician parking lot was the most effective method. Every physician who entered the facility parked in this lot, so the sign above the key card was viewed by every physician each day at the facility. Additional banners were commissioned for main corridors, elevators and for physician lounges and dining halls.

The PSC also endorsed working lunch sessions with the physician support staff during the pre-implementation phase, another informal social networking session. Many of the committee members “dropped by” and brought peers to provide the initial exposure to the system. These sessions were well received. The support staff were able to show short cuts and practical benefits of the system, key for the early majority adopters.

The PSC was charged by the THFW Medical Board to determine the mandatory dates for clinical documentation and order entry. The first decision was to only implement non-compulsory physician clinical documentation on October fourth. Order entry training was decided to start four weeks later. Physicians were authorized to start order entry or CPOE once their CPOE training was completed. The physician clinical documentation was the first mandatory component with a date of April first selected. Physicians could continue to dictate

History and Physicals, Operative reports and discharge summaries. All other clinical notes were to be documented electronically, with the exception of the ED. Due to the integrated documentation in the ED, all orders and progress notes were to be electronic from the date of Go Live. The physicians requested that all progress notes be removed not only from the chart, but also from the unit. They felt providing the opportunity to document provided the noncompliant physicians a message that paper documentation is acceptable. The committee also requested a new blank white form be created for those instances where a clarification drawing was felt to be necessary or for an implant identification sticker.

The mandatory CPOE dates required a more lengthy discussion. The PSC was more aggressive in requesting all physicians comply with CPOE on one date, the Big Bang approach. After further consideration of support resources, a rolling date system was established based on patient location, not physician specialty. This method was felt to be more optimal so the clinical staff would know to look for orders electronically, avoiding confusion. Two units were selected to start compulsory CPOE starting on July 7th. After that date, every two weeks new units were included in the mandatory phase. The actual date for compulsory CPOE throughout the entity was September 28th, almost one year to the date after the initial Go Live.

As training and implementation progressed, the PSC put forth the recommendation to the Medical Board to not only require all physicians to be trained for credentialing and recredentialing, but to require utilization of the system for these processes. A difference of a word may not seem important, but this semantic change proven to be a necessity. THFW has experienced physicians who have completed all of their training reverting back to paper documentation and orders.

With the first notification of noncompliance, a member of the physician support team reached out to the physician to assess whether it was a training or behavioral problem. A letter was mailed from the Chair of the PSC, Dr. B. and the Chief of Medical Staff for those physicians who were trended not to be in compliance related to a behavioral choice. If the letter did not deter the behavior, the noncompliant physicians were engaged in conversations with either the Chair of the PSC or the Chief of the Medical Staff. Names were garnered during medical records processing and from nursing staff. Nurses were concerned about missing documentation in the paper chart. The phrase most often heard was “no one looks at the paper chart anymore”, so frequent emails were sent to Dr. B. identifying the noncompliant physicians.

Starting with the July 2009, physicians who requested to be recredentialed had to complete all phases of training. The PSC recognized that all physicians did not perform the same functions in the hospital, so a modified training scheme was endorsed. For example, radiology proceduralists do not admit or discharge patients but they do write orders. Other physicians who do not admit patients elected to change to an affiliate status, still members of the staff but not required to complete EHR training since they do not perform any patient care. Still with all the modifications, several specialists refused to complete their training. The Medical Board authorized a one time extension with the expectation of training completion. PSC members were enlisted to reach out to these physicians to encourage their training. At this time, no physician has been removed from staff for noncompliance of training.

Physician peer pressure from both PSC members and other physician champions greatly facilitated the adoption of the EHR. One of the hospitalists openly declared his support for the EHR and CPOE. He frequently shared in his network that the first two weeks were “painful”, but he would not go back to the paper system. He was able to modify the order sets to fit the

majority of his patients, so he viewed order entry as a time savings. He also refused to use any consulting physician if they did not utilize EHR, a powerful message to his peers. Utilization of the system became a crucial topic during the monthly PSC meetings. Social channels were frequently utilized to disseminate information the committee felt was crucial.

Physician champions became mentors to their peers, even outside of their group practices. Observations were shared with a PSC member showing another physician how to create their own documentation templates and share order set preferences. Several of the innovators discovered tools in the application that the THR designers were not aware were available.

The PSC members embraced a crucial role in the diffusion process, local adaptation of the product (Berwick, 2003). Passionate exchanges were often held between the PSC members and the THR design team. Often citing experiences with other EHR systems or their interfaces with peers, the PSC members would not accept “it can’t be done” or “Epic functionality does not allow that option”. A great example was how the No Information patient, a patient who requested that their name not be listed in the hospital directory, was displayed in Epic. The patient’s name would not be visible when viewing the census list of patients. To discover which patient was actually in the bed, the end user had to open the chart, an inefficient process with patient privacy issues. If the No Info status was not easily visible, a potential privacy breach could occur with an inappropriate release of information. One physician threatened to revoke his privileges at THFW over this issue. The designers were able to develop a satisfactory solution with the patient name visible with No Info listed below.

During the post implementation monitoring phase, a problematic physician behavior of misuse of verbal orders required PSC involvement. The physicians attempted to skirt the

mandate of CPOE utilization while not hand writing paper orders. Instead, numerous physicians would either in person or by phone would “dictate” to the nurse all the patient orders, thus requiring the nurse to enter the orders. For example, one physician electronically documented the progress note, and then asked the nurse for the phone number to the unit. Less than five minutes after the physician left the unit, the nurse received a phone call from the physician with a list of orders. The PSC was intolerant of this behavior, and recommended formal communication be sent to the involved physicians denouncing this practice.

THFW has now been “live” for one year on the EHR system. The PSC remains an engaged group and has had its membership expanded to include additional self appointed physician champions. Ongoing evaluation continues for noncompliance for the mandatory utilization of the EHR. Process metrics are often an inadequate measurement of the subsequent organizational culture change, but the Leapfrog metric of medication orders entered by CPOE was felt to be a strong indicator of physician engagement by the THR Project Steering team and THFW PSC. The first month of reported data was January 2009, two months after voluntary CPOE training, with 61% of all medication orders entered by CPOE, a remarkable number. Rates continued to climb during the year to a peak of 82% in October 2009, the first month of hospital-wide CPOE. (See Appendix). Efforts to increase CPOE compliance will continue, directed by the PSC.

Summary

An implementation of an electronic health record is the future of healthcare clinical documentation with the current defined federal mandate. Cultural and organizational changes result from the drastic EHR workflow modifications, potentially creating adversarial relationships between healthcare providers and the healthcare organizations. Engaging

physicians in all phases of the implementation process is crucial to the successful transition while maintaining optimal patient care. The physician champion role provides opportunities to identify the innovators and early adopters that will enhance the diffusion of the EHR innovation. In addition, creating a physician steering committee enables local control and adaptation of a complex conversion, requirements for a successful implementation. Creation of a physician administration liaison further enhanced the EHR acceptance at THFW, accelerating the innovation diffusion rate.

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Appendix THFW Medication CPOE Rates

