Electronic health record implementation success: lessons learned and best practice

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ABSTRACT

Well planned strategic information system implementation is essential for the successful implementation of any strategic information system. There are enormous financial and emotional implications for any failed strategic information system project. Failed information technology projects cost about $100-150 billion and are as a result of inadequate planning (Croteau and Bergeron, 2001; Hirschheim and Sabherwal, 2001; Jeffery and Lelivid, 2004). Considering the increasing investment in information technology, about $780 billion spent in information technology in USA alone (Jeffery and Lelivid, 2004), it becomes imperative that strategic projects that are important in achieving strategic business objectives of any organization must be carefully considered, planned and implemented. Electronic health record system (EHR) is one of those systems. A successful implementation of electronic health record system means having good implementation team and good change management.

Keywords: Electronic Health Record, Electronic Medical Record, Strategic Information Technology, Project Implementation, Patient care and management, EHR implementation.

INTRODUCTION

One of the priceless commodities of life is good health. Good health defines peoples' sense of well-being, their relationships with themselves and with others as well as how they handle and deal with daily responsibilities both at home and work. So when people get sick, they seek and go to the best possible health care facilities that are well-staffed with qualified and diligent healthcare professionals for treatment. When people go to these healthcare facilities to be treated, they trust that the healthcare professionals make the best diagnosis that they can possibly make and provide the best treatment plans. As humans, even in a well-staffed healthcare facility with well-qualified and diligent healthcare professionals, medical errors still occur. According to Roberg (2000) healthcare providers need better systems for patient care and management.

The use of information technology systems in the healthcare system is not new, studies have shown that information technology has been used in the healthcare system in patient care and management, but information has been in a decentralized and non-integrated fashion making the systems inefficient as health care providers have to look at the various systems for relevant patient and medical information (Borel and Rascati, 1995; Bates, Leape, Cullen, Laird, et. al, 1998, Bates, 2002). Electronic Health Record system (EHR) provides a centralized and an integrated depot of patient medical information from various healthcare specialties' sources thereby providing easy and portable access to enriched patient's health information to healthcare providers in a continuum of care. Electronic health record system elevates the use of information technology to a different level in patient care and management. This was the better support and better system that Roberg (2000) was looking for.

While Electronic Health Record (EHR) and Electronic medical Record (EMR) are used interchangeably, they are different. Electronic health record contains all the medical information/records (tests, results, prescriptions, etc.) of an individual from all of the individual's health care providers. This information is accessible by authorized care providers as well as by health and life insurance companies, government agencies as well as by researchers within the limits of the law. Electronic medical record on the other hand contains all the medical information of an individual on a particular occurrence of medical care in a particular healthcare facility and within a certain time frame. The EHR version accessed and managed solely by a patient is called Personal health record (PHR). Some of the major EHR vendors include Cerner, Epic, McKesson and Meditech.

Many articles have been written about the benefits of electronic health record system (EHR) in patient management (Bates, Leape, Cullen, Laird, et. al, 1998, Bates, 2002; Aarts and Koppel, 2009; Kelly, 2004), but none on how to successfully implement EHR. This article intends to address that gap.

LITERATURE REVIEW

Just as medical care has evolved through the prehistoric, ancient, medieval medicine to the renaissance and modern medicine, so have healthcare information technologies. Prior to 1870, healthcare facilities were mainly Non-for Profit in nature owned and managed by various religious denominations, Charity and municipal governmental bodies. They served the indigenes of the areas they were located in with personalized home visits and profitability was not a driving factor. As the need to make profits grew because of increase in medical technologies and

surgical techniques, proprietary hospitals that were managed and operated by physicians began to emerge, coupled with the increased urbanization and demand for hospital services by the middle and upper working classes (Starr, 1982). This increase in demand for hospital services also led to increase in demand for patient safety resulting in the use of technologies for patient care and management (Starr, 1982).

These technologies were in a decentralized fashion making the technology inefficient because of multiplicity of patient information in various sources and different retrieval sources leading to incomplete patient data and medical information (Borel and Rascati, 1995; Bates et la, 1998; Bates, 2002). The technology has evolved in EHR system to provide a centralized depot of patients' medical information from various healthcare specialties thereby providing easy access to patient information to authorized healthcare providers. The integrated pharmaceutical component of EHR system provides drug compatibility checks to avoid untoward patient's reactions. Looking at the various benefits that EHR system provides (Bates, 2000; Jha et. al. 2009; CMS.gov; Health IT.gov), there is no doubt that EHR system has become one of the most important technological advancement in patient care and management.

With the modern healthcare environment becoming a technology driven, but patient centric environment, it is expected that health care facilities should implement strategic patient care information system such as EHR system not only to enhance and provide better patient care and management which are very important, but also to gain social credence. This is important since an organization is viewed within the social constructs of its external environment, and for an organization to survive the organization must meet these constructs. For healthcare facilities, one of those social constructs is the implementation and use of EHR system.

While the benefits of an EHR system are not in doubt, it's wide spread implementation has been slow. Factors such as physicians' unwillingness to accept the change, the size, location and financial status of the healthcare facility, lack of qualified top administrators' patient care experience, lack of availability of staff with adequate clinical and information technology expertise and concerns about interoperability of the applications have been identified as reasons for the slow adaptation and even when implemented, not all the functionalities are utilized (Jha et. al.; 2009, Kelly, 2004; Furukawa, Ragu, Spaulding, & Vinze, 2006; Alexandra, Shields, Peter, Shin et al 2007; DesRoches CM, Campbell EG, Rao SR, Donelan K, Ferris TG, Jha A, et al, 2008; Jha et. al., 2009).

To expedite the implementation and use of electronic health record system, The Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted as part of the American Recovery and Reinvestment Act of 2009 to promote the adoption and meaningful use of electronic health records. The act stipulated financial incentives until 2015 to eligible providers, Medicare advantage organizations and hospitals for the adoption and the "meaningful use" of certified electronic health record technology. According to the act, prospective payment hospitals, including critical access hospitals (CAHs), are eligible to receive these financial incentives for achieving each stage of meaningful use core requirements (CMS.gov, HealthIt.gov).

Strategic information system is essential in the success and viability of any organization. Studies have shown that businesses that implemented strategic information in line with their specific business environment outperform their counterparts without such strategic information (Porter, 2001; Hartnono, Lederer, Sethi, and Zhuang, 2003). Any successful strategic information system project implementation goes beyond the purchase of the technology, it involves a good management practice that ensures that the technology will be strategically

aligned with both the internal and external business objectives (Henderson and Venkatraman, 1993Duncan, 1995; Mentzas, 1997Henderson, and Sifonis, 1988; Henderson and Venkatraman, 1993; Hirschheim, and Sabherwal, 2001; Philip, 2007; Hartono, Lederer, Sethi and Zhuang; 2003).

The choice of such strategic information system should therefore be based on its flexibility in its adoption, its connectivity to attach to any technologies both outside and inside the organization's technological environment, its compatibility with information sharing with other applications and its modularity in the addition, modification or removal of any technological component without any major disruption of the organization's objectives and functions (Duncan, 1995).

Electronic health record system has become one of those systems in the modern day healthcare environment. Its objectives must align with the business and operational strategic objectives which are the provision of good quality of patient care and management and it must also meet the technical attributes mentioned. With all the aforementioned, for it to be successfully implemented, it must be seen first as a clinical information tool and then as an information technology project to be championed and led by both clinicians and information technology professionals.

METHODLOGY

This study was qualitative in nature, and utilized a single case study research design. The study focused on the experiences, decision making processes involved in the choice of a particular EHR system, the implementation processes as well as lessons learned by Carle Foundation Hospital, a regional and nationally acclaimed hospital located in the Midwestern region of United States.

Carle is one of the nation's top cardiovascular healthcare facilities. It has DNV full Accreditation, as well as DNV Primary Stroke Center Accreditation. Carle is a designated level I trauma center as well as Level III Center for Perinatal Care by the Illinois Department of Public Health. Carle has the full DNV accreditation in addition to the following special designations:

- DNV Primary Stroke Center Accreditation
- Designation as a Level I Trauma Center and a Level III Center for Perinatal Care by the Illinois Department of Public Health
- Designation for Carle Hoopeston Regional Health Center as an Emergency Stroke Ready Hospital by the Illinois Department of Public Health
- Magnet Status for excellence in nursing care for Carle Foundation Hospital and Carle Physician Group
- Accreditation as a Chest Pain Center by the Society of Cardiovascular Patient Care
- Designation as a Lung Screening Center by the American College of Radiology
- Bariatric Surgery Center of Excellence by the American Society for Metabolic and Bariatric Surgery (ASMBS)
- Full accreditation for Inpatient Rehab, including Stroke Specialty, by the Commission on Accreditation of Rehabilitation Facilities (CARF); Brain Injury Specialty Certification
- Accreditation for AirLife by the Commission on Accreditation of Medical Transport Systems
- Certificate of Accreditation with commendations for the Carle Cancer Registry from the Commission on Cancer; Academic Comprehensive Cancer Program through 2017

- Emergency Department Approved for Pediatrics (EDAP)
- Sponsoring institution for an ACGME Accredited General Surgery Residency Program
- Other Notable Accomplishments (as of March 2015) include
- America's 100 Best Award™ (2 yrs. in a row)
- America's 100 Best Hospitals for Critical Care
- Top 5% in the nation for critical care, and top 10% in the nation for stroke, pulmonary, and gastrointestinal care, with Excellence Awards in all four specialties
- Distinguished Hospital Award for Clinical Excellence™ (3 yrs. in a row)
- Best Hospital by U.S. News & World Report – 2012-13, 2013-14, 2014-15
- Most Wired Award by Hospitals & Health Networks – 2012, 2013, 2014
- 100 Great Hospitals of 2014 by Becker's Hospital Review
- Innovation of the Year by the Illinois Critical Access Hospital Networks (ICAHN) for high school safe sex education programming (Carle Hoopeston Regional Health Center)

These achievements qualified Carle Foundation Hospital to be used as a case study. (http://carle.org/about/awards-accreditations.aspx)

DATA COLLECTION

Data was collected via face to face interviews of the participants. The participants were top management officers of the hospital involved in the implementation and transition to electronic health record system. The interview questions and discussions focused on the experiences, decision making processes in the choice of an EHR system, the implementation processes and the lessons learned.

ANALYSIS

EHR system search and choice

Henderson and Sifonis (1988) identified three phases for any successful strategic information system planning: Business strategy formulation, Information technology/systems strategy formulation and action plan and resource allocation phases

For Carle Hospital Foundation, while the need to have an electronic health record system was championed by the organization's top management due to patient safety and better patient management initiatives, the implementation and search task force team for an EHR system vendor was headed by Dr. William Schuh, the Chief Medical Information Officer. The committee comprised of nurses, pharmacists, physicians, IT executives and some administrators. According to Dr. Schuh, "the composition of the task force is vital in the selection as well as in the implementation. It is important to include at least a physician with clinical credibility who has earned the trust of his/her colleagues, because this physician has the ultimate task of selling the new system to his/her colleagues in addition to leading them through the implementation and transition period"

The goals for the task force were to identify and recommend an electronic health record system based on acceptable risks, benefits and features that align with strategic operational objectives of the facility which was to enhance patient safety, care and management. Among the search criteria were ease of use and comprehensiveness of the system, these according to Dr. Schuh were to ensure user friendliness and to have a system that will encompass all of the

facility's clinical workflow, capture all data including pharmaceuticals and present them to care providers irrespective of specialty. This is understandable considering that the primary purpose of an EHR system is information availability and access by health care providers to enhance better patient care and management.

While Dr. Schuh, Michael Sutter, the IT chief innovation offer and Kimberly Hall, the IT Clinical systems director all agreed that the choice of any electronic health record system must be based on physicians' workflow and therefore be physicians' driven and chosen by physicians, Michael Sutter cautioned this should not be norm and advised the involvement of all departments in a health care facility with a consolidated ambulatory and inpatient care in the decision process in order to make a suitable choice as opposed to just driven and chosen by physicians' in a clinic setting.

The other search criteria were flexibility and interoperability of the system. These were essential because it is important to customize the EHR system to fit each facility's unique workflow and be able to use any systems that fit that unique workflow, and still have the ability to interface with any other current clinical or further clinical systems that a facility chooses according to Dr. Schuh. Dr. Schuh suggested that the choice of an EHR system should not just be based on the current needs of the facility, but also on future objectives and directions of the facility and advised that facilities "pick an EHR system that could be used in ten years and beyond"

The choices of EHR system were narrowed down to 3 vendors. Sites visits were done on facilities using these vendors and various discussions were held with the respective vendors. After all considerations, EPIC EHR system was chosen for the facility. The reasons for this choice according to Dr. Schuh included EPIC's abilities to customize more features and provide more integrated solutions with different modules across the facility. In addition to these, Michael Sutter stated that EPIC's system vendor's good implementation processes, support apparatus and its abilities and willingness to work with its clients played great part in the choice as well. All these considerations are very vital to avoid failure or inadequate implementation and associated wasted resources and investments.

Implementation and transition journey

Once the decision to go with EPIC EHR system was made, Information technology/systems strategy formulation was undertaken to ensure that Epic's requirements were met by the facility. As Kimberly Hall puts it "current state analysis of the environment is very important. Without that there will be struggles with implementation and go live. So it is important to understand what the true current state is and all that are necessary to effect a successful change and not just to mock the environment". According to Michael Sutter, current state analysis is the key to good implementation; an implementation is as good as the understanding of what is being done. Michael Sutter cautioned "not to over expect that just because someone works in a department, the person knows and understands everything about the department or understand what is really done in the department" and advised the development of all possible scenarios and associated accurate work flow.

Studies have shown that underestimation of project cost, projects running above their budgets, resource constraints and technological constraints are some of the causes of failed information technology implementation (Ewuis-Mensah, 1997; Gottschalk, 1999; Kim, Jang, Lee and Cho, 2007; Lesca and Craon-Fasab, 2008). To avoid these pitfalls, such analyses were

carried out by Epic technical teams. Michael Sutter advised that a facility looking to implement an EHR system to look for a vendor that will go through the facility's current infrastructure and analyze its current information technology infrastructure to ensure that the information technology requirements are met, and if not met, determine what needs to change, the resources to effect the change as well as the resources to support the infrastructure.

Successful implementation of any strategic project involves change management. A study by Jha, DesRoches, Campbell et al (2009) indicated that for those hospitals with the means to implement EHR system, physician's unwillingness to use the EHR system accounted for 36% of the major barriers to implementation. To overcome this, Dr. Schuh, a physician was chosen to head the EHR system search and implementation in addition had the responsibilities of leading the physicians through the implementation and transition phases and was the point of contact for the physicians for EHR system clinical matters. Dr. Schuh advised that EHR system be seen as a clinical tool and not just an IT project and be headed by a physician with clinical credibility and who is able to convince and lead other physicians through the implementation and transition phases.

The implementation was done in phases. Good change and workflow management were important aspect of the Carle Foundation Hospital project implementation. To ensure smooth transition and change in clinical workflow; the changes had to be gradual and less noticeable. According to Dr. Schuh, it is important to address the question "how does one change the ways people practice without them perceiving the change as being too much or drastic? So the changes have to come gradually and one of the ways of doing that is to begin with tasks that are the least intrusive to a physicians' work flow and to have a built in familiarity because a little bit of familiarity helps one get further".

Maintenance of a hybrid electronic health record system was an important part of the implementation. While training is very important before go live, time has to be allocated for learning and getting used to the system as well as adjusting to the new ways of patient care and management according to Michael Sutter.

The pharmacy module was the first to go live because it was the least intrusive to a physicians' workflow and did not affect any of the physicians' workflow according to Dr. Schuh. Then other activities that physician may find very convenient to locate on the system such as labs, and bedside documentation were rolled in to the EHR system, so a physician can look at the system and see the medications, lab, Chart, nursing dispense chart and MAR over the medication. According to Dr. Schuh "It was a case of slowly getting your feet in the water at first then your legs later"

The ED department was the first nursing floor to go live with full Epic implementation. The ED was seen as a good place to begin because at that time it was the smallest unit and the belief was that it will be an easy transition according Dr. Schuh. So the decision was made to go with a full blown implementation. According to Dr. Schuh "It was a painful experience but we got through it". After several months post go live, all the ED patients were on Epic and the ED physicians were using Epic to documents and make notes saving lots of time. Since most of the physicians also see patients in the Emergency department, there was a little bit of comraderies and peer pressures for other units to start using EPIC to document and make notes". This hastened other departments to go live with Epic.

The Order entry was the last to be implemented. To implement order entry, order sets needed to change. All the order sets had to be consolidated and some were rebuilt. Several

customizations were also done to make the ordering processes convenient and easy for physicians and other care providers to use according to Dr. Schuh.

Carle Foundation Hospital uses 80-90% of Epic EHR system functionalities and Carle Foundation Hospital is currently certified in stages 1 and 2 of the Meaningful act according to Dr. Schuh and Michael Sutter. The secret to staying current and certified is not just having a certified electronic health record system, but having a certified electronic health record system, whose vendor is not only abreast with government requirements and regulations, but upgardes its systems to meet these requirements and regulations, according to Dr. Schuh.

LESSONS LEARNED

The success or failure of any business processes is not only predicated on the actions of top management and key decision makers of the organizations in achieving viability, competitive edge and sustainability of the organization's strategic objectives, but also on the need and the availability of enabling infrastructure.

A successful implementation of electronic health record system, in addition to the numerous benefits mentioned, has also become a recruiting tool for physicians by health care facilities. Physicians want to know if a health care facility has an EHR system and what system is being used in the facility, if a facility does not have an EHR system, a physician might not take a job in that facility, according to Dr. Schuh. It has become part of the recruiting speech to mention the EHR system used in facility during site visits by physicians according to Dr. Schuh.

Developing the right workflow and processes are essential

Electronic health record system although an information system, is a clinical tool to be used by physicians, nurses, pharmacist and other health care providers. It is vital to involve physicians, pharmacy, nursing divisions as well as other departments in its development and building as well before each rollout phase of the implementation so as to develop an efficient workflow piece and processes ahead of EMR implementation according to Dr. Schuh. As Dr. Schuh puts it "not doing so will result in an electronic version of a bad workflow and processes and we want to make electronic version of good workflow and processes"

Experienced clinical and IT professionals are essential

The difference between a failed and successful project implementation barring all information technology investment been the same is the presence and availabilities of skilled and knowledgeable staff. The lack of experienced staff members accounts for about 30% of failed EHR system implementation project (Jha et al, 2009) and the availabilities of skilled and knowledgeable staff result in better understanding of the processes involved and better dialog (Amadi and Born, 2013). For healthcare facility undertaking EHR system implementation, it is important that the implementation/task force committee be comprised of experienced clinical professionals that understand patient care workflow and experienced IT professionals who will help in terms of communicating the IT requirements, technical infrastructure needed to the non-technical members of the organizations as well as help in the development of the processes.

Effective and goal orientated communication strategy

Communication is an important ingredient for the successful implementation of any project. A good communication strategy and objectives must be part of the movement to EHR system implementation as this will provide clear understanding of the goals of the project, the business strategy and the future directions of the organization with respect to the EHR system. This will also provide set expectations as well as foster trust and mutual understanding and help to clarify any differences of perspectives among all the levels of management and personnel.

Adequate manpower and resource allocation

Adequate manpower and resource allocations are essential. In order to have the staff and resources needed, it is necessary to consult with the chosen EHR system vendor to determine the nature of staff and resources needed and to develop the budget based on the vendor's assessments and implementation regimen according to Michael Sutter. This will help in hiring processes and resource allocation as well as help to keep one on track and on budget according to Michael Sutter. The implementation team's members must be full time on the task force in order to focus and be dedicated to the team and project according to Dr. Schuh, Michael Sutter and Kimberly Hill. Continuity should be maintained after implementation. In order to achieve this, all three participants suggested the retention of the task force and implementation members.

Adequate training and support

Training and support are good ingredients for a successful implementation of EHR system implementation. Staff must be well trained and have good understanding of the vendor's application. While adequate staffing is important, continuous education and training are very important part of any implementation. Availability of support after implementation is also very important for the continuous success of any implementation. As Dr. Schuh puts it "users need to know there is someone to ask questions in addition to "how do I do this again" type of questioning until they get used to doing it correctly and on their own". Kimberly Hall advised the hiring and training of talented folks to increase needed manpower.

Implement in phases.

While sometimes the temptation is to go with full blown implementation, it is important to err on the side of caution and avoid painful experiences that will take months to fix. Implementation should be done in phases in order not to overwhelm staff members and create frustration. It is better to learn and apply the lessons learnt from one phase of implementation to another. This will also help in tailoring, adjusting trainings and in resources allocation.

Preach and institute Ownership

Organizational, departmental and individual ownership are integral parts of ensuring successful implementation and continuous improvement of an EHR system. While top management involvements are essential to the success of any strategic project, each functional

unit has to buy in and own the system. Adequate steps must be taken to involve all users of the systems in its implementation and roll out phases.
Lack of departmental and users' involvement and ownership could result in indifference and lack of project commitment both of which often lead to project failure. It is therefore important to communicate, emphasize and encourage departmental and individual ownerships, this would prevent situations like 'this other group is making us do this versus we are doing this for ourselves" according to Dr. Schuh. Also when consultants are used, Dr. Schuh advised to "make sure that internal staff members are the ones leading the project as one would always do better with internal staff members leading the way".

Avoid excessive customization and drastic change

While customization is great, it is important to avoid numerous customizations as these could lead to loss of some standardization and much interface modifications according to Dr. Schuh. While there is the urge to move to newest and latest technology and applications, it is important to know that the newest and latest technology and applications are not always the best. Michael Sutter advised facilities to keep tested and established technology and applications. While the debate on decentralized and centralized system goes on, it is advisable to consolidate on a single EHR system if an organization could meet 80% of its strategic objectives by having a single database since it would be cost effective according Michael Sutter.

Encourage and institute continuous organizational learning

Continuous adaptation and change management are essential for an organization to learn, grow and to benefit from any strategic project. Top management need to institute continuous organizational learning as a way to adapt to change. Dr. Schuh cautioned, "Once you are live that is not the end but the beginning of the journey. One has to look for new ways of doing things better". Dr. Schuh suggested making visits to other facilities that use the same EHR system to see what they do differently and learn from whatever experiences they have.

CONCLUSION

A failed project is a project that faced unforeseen complications that disrupt its smooth implementation, bringing its deadlines, costs, objectives and benefits for the organization into question (Lesca, and Caron-Fasan, 2008). The success of any project depends on careful planning and implementation and these must be customized to the specific organizational structure and uniqueness. It is therefore vital to avoid a "one size fits all" approach.

Implementation of any information technology no doubt directly and indirectly affect roles and responsibilities of each staff member and an organization's work flow, implementations of an electronic health record system is not different. Physicians' and other healthcare providers' receptivity and top management support are important in achieving success. Carle Foundation Hospital by understanding the importance of management involvement, organizational control of the implementation process, team members' credibility and competences and the spirit of continuous organizational learning provides a success lesson on EHR system implementation.

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