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Implementation Plan for EMR and Beyond

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Implementation Plan for EMR and Beyond

DNP Project

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Abstract

Change is never easy for anyone, but how we implement change can make the difference in how an innovation is accepted. Over the last two years, a small community hospital in California has introduced a new electronic medical record (EMR) to meet the requirements of meaningful use mandated by the Centers for Medicare and Medicaid (CMS) for all hospitals across the United States. EMRs are expected to improve quality in many areas, especially to improve outcomes, while safely reducing costs (U.S. Department of Health & Human Services, 2012). Adoption of EMR's is not optional, if facilities want to avoid penalties and continue operating. As a result, EMR's have been implemented in numerous healthcare facilities over the last decade.

However, implementation does not guarantee acceptance. Many organizations have tried to implement something new and failed. Healthcare facilities need to build implementation plans into their development of any new innovations. In particular, end users need to buy in and accept new system usability in order to improve compliance and employee satisfaction. Our EMR is being developed in stages, so our processes are constantly changing with requires fast transitions in the end user learning. We have moved through the first two stages and are moving into the third stage in the next few months.

This project describes an implementation plan for an electronic medical record development that we have used during our first two stages. The project plan has a strategic focus on end user acceptance of meaningful use guidelines that is sustainable for continued growth. The elements of this plan can be applied to other types of innovative change in healthcare.

Introduction

The last 50 years have seen healthcare evolve at a rapid pace. Healthcare today is challenged with ensuring patient safety is optimized while keeping patients satisfied and at the same time adapting to new systems that continue to evolve. Facilities need to ensure there is an implementation plan in place that can easily be followed. Review of the literature indicates that healthcare organizations need to better understand the social-cognitive dimensions of large-scale improvement and change as well as have more systemic approaches for management of such change (Perla, Bradbury, & Gunther-Murphy, 2012). Change is only possible if those affected have access to needed information and are actively engaged in the knowledge sharing necessary in order to practice (American Organization of Nurse Executives (AONE), 2012). In an effort to reframe change implementation, this project has been developed to share an implementation plan for electronic medical record development that will be sustainable for continued growth as we progress through not only the stages of meaningful use but through any type of innovation.

Background knowledge

As part of the American Recovery and Reinvestment Act (ARRA), the HITECH Act is specifically focused on healthcare agencies, health care plans and providers to structure a paperless national health information network using electronic medical records (EMR) (U.S. Department of Health and Human Services, 2012). According to the Healthcare Information and Management Systems Society (HIMSS), more than \$40 billion is available to assist healthcare agencies in meeting the required stages of EMR development before 2015 (2009). These monies are incentives that will be distributed to healthcare facilities as they show evidence of the expected seven stages of EMR implementation. In 2009, only 11.9 percent of hospitals had implemented this first stage of EMR implementation (Gold, McLaughlin, Devers, Berenson, &

Bovbjerg, 2012), although 70 percent of U.S hospitals were two steps or less away from having the health information technology (IT) applications necessary for this first stage (HIMSS, 2009). By the end of 2011, only 43.9 percent of facilities in the United States had completed stage three (HIMSS Analytics, 2012). While progress has been made, there is still room for improvement. The goal is with this legislative incentive, approximately 90% of physician offices and 70% of hospitals will adopt EMR's (Eclipsys, 2009). This is a laborious process, but will be duly compensated not only in financial benefit but improved outcomes.

Given the 2015 deadline of all system integration, it is essential that progress of EMR development is not delayed. Research has shown us that resistance to implementation of EMR has created delays or even failures in facilities (Lorenzi, 2004; McLane, 2005; Carroll, Owen, & Ward, 2006; Ovretveit, Scott, Rundall, Shortell, & Brommels, 2007; Beiter, Sorscher, Henderson, & Talen, 2008; Kumar & Aldrich, 2010). Since there are repercussions for failure to implement, we need to ensure acceptance.

Although all healthcare workers are affected, nurses in particular are impacted by any change in documentation methods, simply based on the sheer volume and the direct contact with patients and the entire interdisciplinary healthcare team. Since EMR implementation can be fraught with challenges such as unexpected delays, financial and time constraints and staffing issues and most notable, lack of nurse acceptance caused by a lack of buy in (Lorenzi, 2004; McLane, 2005; Carroll, Owen, & Ward, 2006; Ovretveit, Scott, Rundall, Shortell, & Brommels, 2007; Beiter, Sorscher, Henderson, & Talen, 2008; Kumar & Aldrich, 2010), it is essential to get end user buy in, especially among nursing.

When implementing new technology, these topics must be addressed. Equally necessary are having adequate resources on hand to ensure success. The right people need to be available at the right time, or the transition will not be smooth. With the evolution of health care and reduction of resources, recognition and correction of areas of improvement is essential (McConnell, 2005). Also essential is employee engagement, as the front line staff influence the overall care patients receive (Moody, Slocumb, Berg & Jackson, 2004; McConnell, 2005).

More importantly, the project fits into healthcare's own expectations of health care improvement nationally. In various publications (*To Err is Human, The Quality Chasm*) the Institute of Medicine (1999, 2001) has critiqued and recommended improvements for the quality of care we provide. As a nation, we spend more on healthcare per capita than any other first world country, but yet have poorer quality (Herzlinger, 2006). We fail to provide safe care that should be expected. In *The Checklist Manifesto- How to Get Things Right* (2010), Atul Gawande writes a commentary that the complexities of healthcare today obligates us to use checklists that technology readily provides to ensure the safe care of our patients. There are too many variables and no way other than standardization to ensure that all the possibilities are covered. EMR can help in this process. Gawande (2010) comments that computers already have increased our capabilities, so it is natural to assume that future evolutions will have an even more prominent role in patient safety. So many are resistive to EMR, which often have such things built in, and yet it could save a life with due diligence. Our patients deserve this, above all else.

Local Problem

Prior to the implementation of our new EMR, our facility has only met some of the governmental requirements of meaningful use, mainly due to our emergency department system

that has computerized physician order entry (CPOE) within their electronic medical records. Their system is a standalone EMR, and while it was beneficial for initial meaningful use attestation, it became problematic when we were required to have full integration of all systems.

The previous system of documentation and order entry was computerized, but failed to meet meaningful use standards. Several options were considered, as the deadline loomed. While we recognized the conversion to an EMR that met the CMS standards would be difficult, efforts could be made to circumvent and make the change more successful. It was also necessary that all the steps are met for meaningful use attestation, which would provide our continued government funding that would aide in further EMR development.

Another issue became apparent as government standards were further outlined is the EMR system we purchased was not initially certified to meet meaningful use standards. Certification of health IT assures purchasers and other users that an EMR, or other relevant technology, offers the technological capability, functionality, as well as meets all regulatory compliance for Health information management (U.S. Department of Health & Human Services, 2013).The IT department at the system level worked diligently with the EMR contractor to make the certification happen. Otherwise, our efforts would have been wasted.

Intended Improvement/ Purpose of Change

The overarching goal of this project is to develop and share an implementation plan for electronic medical record development that will ensure end user acceptance. Strategic focus is placed on tracking and communicating progress on issue resolution brought up by nursing during the implementation stages of meaningful use protocols, although any department can benefit from this process. There is an abundance of information on EMR applications, but detailed

action plans to guide healthcare agencies through the process of EMR implementation that increases acceptance are not generally available. The governmental expectation is that hospitals will have full EMR integration, but there is little regarding how to execute the conversion (Gold, et al., 2012). Given the urgency of need to meet meaningful use requirements, it is imperative we set up action plans to help the facility transition through the many stages needed to reach full potential. By defining the plan, the acceptance process will accelerate with each update, saving time and financial resources for better allocation. Feedback from early departmental implementation can be used to improve implementation to other departments. Sharing of this feedback can be very beneficial for any area going through some major transformation that will affect how people work that have not been involved with the EMR. Individual actions and/or responses can be influenced by the context of the environment in which they work and the agents guiding the change.

To achieve this goal, we needed to test the implementation of the EMR at multiple intervals to see if efforts put into place would achieve improved end user acceptance. Thus, the specific goal for the project was to improve baseline EMR usability scores through a series of strategic interventions between the build team, interested nurses and other staff, and information technology staff. Emphasis was placed on redesign of the EMR based on nursing suggestions. Issues were tracked using an EMR Issues Log reviewed by the clinical leader and nurse informaticist so information can be relayed to the appropriate party. Ancillary departments also had specific issues. Those issues that crossed over were managed within the interdisciplinary team.

The following AIM statement for the project identified the project expectations. By November 2013, the hospital nursing staff that were using the new EMR will show a 30%

improvement in EMR usability scores from baseline assessments done in November of 2012, measured with the System Usability Scale (SUS) (Appendix A) (Brooke n.d.). This is a validated survey by the Agency for Healthcare Research and Quality (AHRQ), posted for unrestricted access. It was created to assess IT development and adapted to meet our requirements. The SUS scoring gives an overall improvement of usability.

As it is anticipated that it would take several months to fully see the benefits of the EMR, reassessment occurred at regular intervals, coordinated with training periods as these times are the best opportunities for staff participation. This process will be ongoing as new stages are added in order to see the improvement from the implementation plan. Consideration needs to be given that some staff may take longer to adapt to the changes. The EMR issues log (Appendix C), developed by the EMR development team for easy identification of areas for improvement, will remain accessible on the units and used during the interviews as talking points, along with open ended questions developed by author (Appendix B) to clearly identify issues and establish goals with specific expectations for outcomes. Resolution of problem areas will be tracked and reported back to the administrative and ARCIS team.

Review of the Evidence

To appropriately understand the impact that EMR implementation has had nationally and internationally, it is essential to review the evidence. The literature review was conducted using the key words as individual terms and combination: implementation, nurse attitudes, electronic medical record, EMR, EHR and electronic health record. Using CINAHL Plus with full text, Medline, and Pub Med, as well as government health care websites, a plethora of articles using the key words were retrieved. Publication date was limited to five years. Several articles

retrieved shared one consistent theme of evaluation of EMR effectiveness, with focus on attitudes and satisfaction. For a summary of the evidence, please refer to the Evidence Table in Appendix K.

Sassen (2009) published a literature review that reflected nurse attitudes in the first decade of the 21st century, when EMR use was beginning. She states the “the importance of the nursing staff’s attitudes...cannot be underestimated” (p. 281). Several themes were addressed in the literature review: inattention to work flow of nurses, lack of training, lack of identifiable purpose and feelings of imposition. Nurses need to have a sense of security as they go through change. Early on, there was resistance that ultimately caused failure of some systems (Sassen, 2009). This resistance helped us understand the complexities of EMR implementation.

Maskey’s (2011) quantitative/qualitative research project explored the correlations behind the low level of usage and satisfaction of EMR. It also investigated the potential effects that reluctance to use EMR has on the level of patient satisfaction. Healthcare professionals were surveyed on 31 questions to identify key issues affecting EMR adoption. The eighteen respondents were then interviewed, to further explore the rationale for the response. Although the instrument was not validated for reliability, it was designed from previous models of EMR adoption with a focus on three concepts -perceived usefulness, perceived ease of use and self-efficacy. Using a 1 to 7 scale, with one being extremely unlikely and 7 being extremely likely, certain themes were identified. The author used triangulation to further isolate themes from the surveys and interview process. Limited use of EMR was caused by lack of resources, and resistance from key stakeholders such as patients, nurses and physicians. Maskey (2011) recommended training and onsite support for any EMR initiation to improve acceptance and usage.

Nurse attitudes and satisfaction perceptions towards computerized charting from pre to post implementation of new EMR was researched by Smith, Morris, and Janke (2011). In this quasi-experimental quantitative study, the authors evaluated attitudes and satisfaction separately. Nurse attitudes were measured with the Nurse Attitudes Toward Computers (NATC), a tool developed by Stronge and Brodt (1985) specifically to evaluate nurse attitudes to computers. The tool has been used and tested for reliability and validity in several other studies and found to be accurate. Satisfaction was measured by an author created tool that had not been tested, so reliability is questionable.

Of the possible 386 eligible nursing staff, 148 responded to pre implementation survey, while 119 responded to post implementation survey. The study found negative impact evidenced by the satisfaction mean decreasing from 58.76 to 49.16, with a Z score= -2.45. The nurse attitudes saw a similar negative shift - 57.84 to 52.37 (Z score= -4.11). For nurse satisfaction, the Cohen's d was 0.40 – indicating a moderate effect from implementation of EMR. This effect is statistically significant with P= 0.014. The Cohen's d for nurse attitudes – 0.52 – was a moderate effect as well. The P value was < 0.001. Smith et al (2011) acknowledged the short duration of the study may have marred the results. Nonetheless, it provided evidence that satisfaction is significantly influenced by technology and efforts must be made in the implementation process to gain acceptance of new systems.

In a longitudinal prospective cohort study, Beiter, Sorcher, Henderson, and Talen (2008), investigated the impressions that EMR demonstrations have on attitudes and needs. Their focus was to introduce EMR's through demonstrations and see if this method would improve the ability to gauge their attitudes toward the product. Physicians, office staff, nurses, and patients

participated. They attended two different demonstrations and were surveyed pre and post demonstration.

Beiter et al (2008) found there was significant improvement in attitudes and knowledge post demonstration across those surveyed. Using Wilcoxon signed-rank test, the authors were able to compare the participants' surveys pre and post. There was positive statistical significance in attitudes, knowledge and needs post the demonstration. This was significant as participants did not have hands on time with the system to really assess the usability; their general perception was favorable for EMR, regardless which one was being presented.

Chisolm, Purnell, Cohen, and McAlearney, (2010) conducted a longitudinal cohort study on clinical perceptions of an EMR during its beginnings. Using a convenience sample of staff from the department that started a new EMR, the researchers conducted surveys at three points during the first year of implementation.

Chisolm et al identified factors associated with clinical acceptance, and used those as benchmarks for research. Their primary focus was satisfaction Using Wilcoxon signed-rank test, the authors correlated the data retrieved from the surveys and bivariate relationships with satisfaction were assessed. Overall, the staff satisfaction was fairly strong, even one to three months after implementation. This study does show evidence of sustained attitude improvement, although there is little said about the process they took to achieve good outcomes.

Mills, Vavroch, Bahensky and Ward (2010) surveyed all the hospitals in Iowa for EMR interoperability within their facilities. Out of 70 respondents, 24 healthcare facilities were operational and were therefore chosen for a qualitative study on the rationale for choosing specific vendors and leadership perspectives on anticipated and realized benefits of EMR.

Using role-specific follow up interview questions designed by the research team and pilot tested, 10 chief executive officers (CEO) and 12 chief information officers (CIO) / IT directors were interviewed. A common theme for EMR implementation was the desire to improve efficiency, access and quality as well as to secure the financial funds available for reimbursement. . For these leaders, the benefits outweighed the expense. They also wanted to stay ahead to be competitive with the healthcare market.

Most respondents chose vendors based on usability, cost of ongoing support and training, affordability and end user satisfaction. Vendors who had previous experience with institutions of a similar size were preferred. The respondents were also looking to the future when choosing the vendor, to ensure the capability to meet meaningful use requirements is realistic

The most important expected benefit of the EMR for CEO and CIO alike was full access to patient record for all departments that would allow for simplified recording, reporting, and retrieval. Other expected benefits were improved ability to capture charges, regained storage space, and more accountability through accurate documentation.

For Mills et al (2010), the realized benefits were difficult to define, as most facilities did not identify measureable outcomes from EMR implementation. In addition, there also had not been enough time for an accurate return on investment in means of improvements in financial reimbursement, error prevention, and improved patient volumes. Research questions relating to senior management experiences were effectively answered but neglected to question the end users of the system. The expected benefits outlined by the CEO and CIO may or may not be realized at the bedside.

Kumar and Aldrich (2010), elicited perceptions of strategies to overcome barriers to EMR implementation, taken from lessons learned at other facilities. The authors evaluated EMRs

nationally using SWOT analysis. Strengths, weaknesses, opportunities and threats of electronic records were defined. Resistance of participants is listed as one of the threats that must be overcome. Using case studies of two recent EMR implementation attempts, interoperability challenges were reviewed. Comparison of a failed (Cedars-Sinai Hospital) and a successful Veterans Administration (VA) implementation exemplifies there are specific criteria for success.

Cedars-Sinai Hospital hurried to complete its EMR implementation and failed to achieve buy in from critical users prior to purchase and implementation. The implementation ultimately collapsed, losing \$34 million in the process. In contrast, the VA carefully planned their implementation, which included collaboration with IT and primary users. There are also was continued IT support and feedback sessions post implementation. Since implementation of their EMR that allows for improved oversight of patients health, the VA has demonstrated quality improvements in screening and follow up care.

Other countries have shared trials when it comes to EMR implementation and there are lessons learned there as well. In a qualitative study, Ovrereit, Scott, Rundall, Shortell, and Brommels (2007) compared two different implementations –one in Sweden (Karolinska Hospital) and another in the United States (Kaiser Permanente – Hawaii), in order to provide implementers with research based guidance about effective implementation. Through a series of interviews, retrospective and concurrent, the article provides a detailed description and comparison of two different implementations, deriving an implementation theory that encompasses practice-based initiatives. The data collected in Sweden followed the same timeline as the American implementation, however the data derived from the US study is retrospective, garnered from previous published research. Interviews were transcribed, coded and collated analyzed for themes, which were identified when four or more respondents described the same

items. The authors shared some practical advice for developing policy and implementations based on case study review. Successful implementation is dependent on the complexity and frequency of changes and that the decision about the system should be participatory.

Positive themes identified in both groups were timesaving, better workflow, more comprehensive records, increased perception of patient safety, and potential for development. Areas that needed improvement were time for development, ensuring training personnel are removed from clinical care, limited training times and increased overtime caused by additional training in addition to regular workload were all factors identified.

Nurses are not the only ones using EMR, and many facilities recognize that satisfaction with the system is not limited to them. User attitudes of medical receptionists were studied extensively in several Kuwait healthcare facilities (Al-Azmi, Al-Enezi, & Chowdhury, 2009). The primary purpose of the study was to evaluate the response of medical receptionists to the implementation process of a new EMR. Of 887 medical receptionists in the healthcare system, 400 were randomly chosen to participate in the study. There was an 80.5% response rate to the questionnaire.

Al-Azmi, et al (2009) used the user interaction satisfaction questionnaire (QUIS). Using the psychological test construction method, the tool has been tested for reliability, construct and empirical validity. It was translated into Arabic and then back translated by two faculty members fluent in both English and Arabic, to ensure validity, but the Arabic tool was used. Data were analyzed using SPSS. A chi-square test was performed to assess relational significance, and a Poisson regression used to identify independent correlates. Using a zero (no negative reaction) to six (strong negative reaction) scale, scores were categorized by overall user reaction, demographics and computer related experience. This data analysis was confusing, as the

numbers calculated were not easily matched to actual data points. The overall score was a combination of data from four different score points and they often had the same percentage. All could be nonreactive, while being very negative.

In the multivariate analysis, all independent background variables were compared to the overall user satisfaction. It was discovered that computer related experience was significant. Ease of data entry, with a coefficient of -0.630 (p -value: 0.000) and computer error frequency, with a coefficient of 0.631 (p -value: 0.028) were both notable correlates with computer related experience.

The authors noted that limiting themselves to medical receptionists prevented transferability for healthcare workers. However, this research shows that including staff who have some working knowledge of computers can make a difference, and will increase their responsiveness to the system implemented.

Top and Gider (2012) studied use, quality and user satisfaction at several Turkish facilities. This was a non-experimental study using a convenience sample of all nurses working on inpatient units at three facilities. Using an author developed questionnaire that was self administered, the focus was on user satisfaction. The study found significant relationships among the use, quality and user satisfaction. Most of the staff felt the EMR improved their quality of work and improve the safety for the patient.

The questionnaire tool was not validated, except through a brief pilot study to test questions, so it is difficult to assess its value. There was also limited mention of the EMR programs that were present in each facility, so it is hard to discern if all the facilities involved are at the same place in implementation. From the specific study responses, it can be assumed they

were not restricted to one facility. The study gave interesting information as to staff attitudes, but had little to say about the actual process of implementation.

Although the focus of the systematic review was to seek out literature on satisfaction of EMR, it has become apparent that the success of EMR lies not in the product. The reality is end users of hospital EMR systems need to be actively engaged in the development, implementation and evaluation to ensure understanding and satisfaction with new initiatives.

EMR implementation can result in failures as was the case at Cedars-Sinai Hospital in Los Angeles. The hospital hurried to compete with other hospitals and failed to achieve buy in from critical users prior to purchase and implementation. It ultimately collapsed, losing \$34 million in the process (Kumar and Aldrich, 2010). This literature also demonstrates reasons for failure and success that are directly tied with nurses and other healthcare professionals' response. Maskey (2011) defines that limited use of EMR was caused by lack of resources, and resistance from key stakeholders such as patients, nurses and physicians. Smith, et al (2011) showed a fairly moderate lack of satisfaction with EMR and in Kuwait, it was dependent on comfort level with computers (Al-Azmi, et al, 2009). None of these studies were reassuring to hospitals attempting to meet the edict laid out for them by government agencies to implement EMR systems by 2015. Solutions to improve acceptance need to be quickly adopted.

Theoretical Framework

Providing a framework for the implementation is necessary to ensure positive adaptation. Improved understanding of the process of innovation assists health care organizations to better guide the transitions necessary for continued practice. To ensure continuity of care and continued safe practice as well as stay competitive, health care professionals must be on the cutting edge of

technology and innovation. Change of any kind based on innovative ideas needs a foundation to work from. Expert change management scholar Rogers (2010) provides the framework of any activity with the innovation-decision process. This theory is adaptable to a plethora of settings, not just health care. It has been used by social sciences (Yates, 2001), to enhance adoption of media literacy programs in schools as well as creating different pathways for universal broadband access (Gulati & Yates, 2011). Given the broad spectrum, Rogers' theory is an excellent framework for a project that bridges healthcare and technology.

Rogers' theory provides a framework necessary to help create an implementation plan to ensure positive adaptation and to build a culture that accepts change easily. In his seminal work, *Diffusion of Innovations* (2010), Rogers clarifies the stages of diffusion of innovation as well as increasing understanding of workflow and prioritization. There are several interchangeable stages to guide the change process.. The change manifests itself in different ways in various cultures and fields and is highly subject to the type of adopters and innovation-decision process.

Diffusion of new ideas does not happen instantaneously, and sometimes not at all, despite the known benefits. People need to grasp the concept that is driving the change, before they can even consider it as an option. This is the knowledge stage, when people either recognize a need or see something that might have value to them and meets their personal and/or professional criteria. This is considered "selective perception". Rogers also states "innovation can lead to needs, as well as vice versa", which indicates a potential continuous wheel (p. 162). In the knowledge stage people will decide if the innovation is worth more in-depth perusal. Essential at this stage is to identify a change agent, someone who is keen on the product potential and respected by supervisors and peers alike.

Persuasion is the second stage in the innovation-diffusion process. Persuasion is an acknowledgement of the attitudes the end user has towards the innovation, and can be either positive or negative. The user becomes more intellectually involved in the change process, and makes conscious decisions that could affect the overall success of the project. This involvement can be collective or individual. However, just because the user feels favorable does not ensure success. Another factor that needs to be considered is that ideas on paper are not always feasible. Rogers defines this as the KAP gap, an acronym standing for knowledge, attitudes, and practice (p. 163). The knowledge and attitudes favor the innovation but for some reason, the program is not viable.

The decision stage is critical to the diffusion of innovation process. It is at this stage that a decision is made to adopt or reject the innovation. Often innovations are adopted provisionally, to assess if the end result is what is desired, but this is not always possible. Small samples are encouraged so the impact of failure is minimal. Users may reject the innovation at any stage, even after the decision to adopt. Rejection can either be active (adopting and then dropping it) or passive (never seriously considering adoption), and can be tied with cultural traditions and expectations.

Implementation brings the innovation to fruition. Up to this point, the innovation is conceptual, but implementation makes it a reality. This implementation process is not instantaneous. This can be a struggle for organizations, as each specialty area may have different priorities. It takes time and effort and may require multiple reinventions as the implementation evolves. Reinvention evolves as part of the growth process within individuals and organizations. Diffusion theorists recognize reinvention is a part of the process of implementation, and can

improve sustainability. Most users of new systems or designs consider the ability to reinvent a desirable quality in new initiatives that are introduced (Rogers, 2010).

Confirmation is the final stage where the user(s) seek reinforcement that the change has been diffused and is meeting the goals it set out to do. There may be some discontent with the end product that causes regret, and possibly rejection, even after implementation. Efforts can be made to prevent this from occurring, but it is not always possible.

A second key component of Roger's theory is his categorization of people or types of adopters. Classification of employees can often help identify where the focus of the work should be. There are five types of people involved in the change process – innovators, early adopters, early majority, late majority and laggards. Once the innovators, early adopters, and early majority have accepted the change, the late majority and laggards fall into line, as they are now the minority. Change is hard for the late majority and the laggards, but they do not have the influence to circumvent the change once it has the acceptance of others.

Methods

Ethical issues

The aim of the project is to implement change that meets the requirements for a quality project, not research. Approval as a quality improvement project was received from the University of San Francisco (USF). There is no intention of using the data for research purposes. USF's response to my submission is to be noted. "Your protocol (IRB Protocol #46) with the project title Implementation plan for EMR and beyond has been verified by the University of San Francisco IRBPHS as a Quality Improvement Project, and accordingly does not meet the definition of "research" at to 45CFR46.102(d). Your protocol is thus exempt from IRB review."

The author has also completed the module addressing research on human subject- NIH Web-based training course “Protecting Human Research Participants” with date of completion on 09/01/2012. There are no identifiable ethical issues or conflict of interest noted for this project. This project does not involve any conflict of interest.

Setting

The project will be conducted at Saint Louise Regional Hospital (SLRH). As part of the Daughters of Charity Health System (DOCHS), SLRH is a 93-bed acute care hospital offering a wide range of services to residents in both Santa Clara and San Benito counties. Services include critical care, diagnostic imaging, emergency services, general acute care: medical/surgical/pediatrics, maternal child health services, nuclear medicine, orthopedic and sports medicine, surgical services: minimally invasive surgery, and stroke care. As part of our Clinics & Specialty Services, we also offer a Breast Care Center, Cardiopulmonary Rehab, Community Health and Diabetes Education, De Paul Urgent Care Center, Health Benefits Resource Center and Wound Care and Hyperbaric Medicine. Located approximately 30 miles south of San Jose, SLRH has the busiest Emergency Department in the South Santa Clara County and CALSTAR emergency helicopter transport is available on the premises. In 2012, we had 3,400 inpatient discharges, 56,200 outpatient visits, 2,880 surgical cases, 720 deliveries, 27,000 emergency visits and 6,640 urgent care center visits. We have 544 associates and 218 credentialed physicians. In the context of our Mission and Vincentian Values, SLRH is to be the center for health and healing for our communities and to nurture the spiritual and physical well being of all.

As a system, DOCHS and SLRH are committed to “providing comprehensive, excellent health care that is compassionate and attentive to the whole person; body, mind and spirit” (DOCHS, 2011). In keeping with our mission of comprehensive care and as well as remain in good standing with regulatory authorities and governing bodies, DOCHS has elected to pursue all aspects of meaningful use. EMR implementation also ensures we meet expectations set out in the *Caring is our Calling* initiative of the California Hospital Association that strives to ensure all patients and families receive safe, high-quality care at their local community hospital (Caringisourcalling.org, 2011).

As a non-profit facility that in 2012, provided \$9.2 million in charity care to those in poverty in South Santa Clara County, the financial commitment by the system and our facility to developing a comprehensive EMR shows its commitment to its patients and the community. In light of our current financial situation, where we have posted a negative cash flow for the last two years, this is especially significant. But, SLRH is committed to the best in care for the community, which includes the most up to date technology. Given our financial situation though, the IT department researched thoroughly prior to investing in the EMR that we purchased. While many facilities are simply going with the most popular name brand in EMR, we have a product that is not only financially reasonable in cost, but also is certified and is committed to complete the stages of meaningful use, so we can potentiate full reimbursement.

The DOCHS and SLRH are also committed to its associates, and recognize them as our most valuable resource. Many associates live and work in the community and outlying areas, so it is important to get their buy in for new development. We are not only a small hospital, we are a small community, with our service area covering approximately 120 000 people. Our image is tied with the community we serve, so we want to make sure we provide the best care possible.

Planning the intervention

The project focus was determined after needs assessment was conducted that identified a plan for EMR implementation would benefit the facility for this specific project as well as any future innovations. The reality of long term EMR development inspired us to develop a process that can be replicated in the future.

When the EMR implementation project was first presented to the management team of the hospital, there was no set agenda or plan. There was no informaticist or project manager assigned to the facility, although there was some contractor support identified. As project development and management is a keystone for the Doctor of Nursing Practice program, I approached the Chief Nurse executive / preceptor about my involvement with the intent of improving end user acceptance. She agreed to my participation because leadership was needed on this project that would benefit the whole hospital. As Director of the largest department in the hospital, there was an early recognition that the EMR would affect my department greatly, and I wanted the department to have a part in the planning of the project. So, it was a natural transition for me to be assigned the role as clinical coordinator of EMR implementation.

The project team consisted of healthcare professionals, information technologists and physicians for the build and validation stage as well as ongoing support. Their roles are independent and yet intertwined. The commitment among this list of individuals varied. Their general responsibilities are defined below:

- Project Manager: Full time administrative leader already within the DOCHS system, tasked with the EMR project coordination and delegation of duties.

- Programmer: Full time to create the program, and will be contracted on an as needed basis for any updates etc. This individual will also need to coordinate with hospital/facility IT to ensure interface with existing EMR.
- Nurse Informaticist / Coordinator: Full time permanent (Registered Nurse, with clinical and IT experience, BSN preferred). The RN who fills the role is a clinical expert who has significant experience with informatics. She has a comprehensive understanding of the needs of the patient and healthcare population, as well as the end users. The RN is the champion for the project and coordinate with educators, public relations etc to promote the EMR
- Builders: Part time for 6-8 months during build and test phase (RN, MD, & Pharmacist). This team will build the product using only the bare essentials of the system. The basic assessments and tasks will be created and then tailored to unit specific needs. The team will be chosen from staff nurses working all three shifts (days, evenings, and nights); so that we create a product that will meet everyone's needs in regards to work flow. Hours may vary for the build team, depending on what stage of transition they are in and the need for adjustments. On average, they will be committed to 2 days / week for approximately six to eight months.
- Validators / Trainers: This team consists of additional front line staffs that validate the EMR for usability and accuracy prior to end user training. During each phase, this feedback will be essential to ensure the product meets as many of the end user specifications as possible. These staff members also will support the training for end users. There should be approximately eight to ten nurses per

department, with a goal of two to three per shift, so they can rotate during go live for end user support.

- Public Relations Coordinator: Resources already available at the facility, as it falls under the category of patient outreach and public relations.
- Information Technology (IT) Support: This position will be supported by the facility, as part of the EMR funding. The onsite IT team will coordinate interface with the EMR vendor to allow for crossover of information into the EMR. The hardware is purchased out of the system set budget, but IT should be able to help ensure that nursing and other ancillary have an opportunity to test the hardware prior to installation, to help them forecast what the future held. Demonstration equipment is scheduled to be set up in the IT department for about one month prior to purchase, for nursing and respiratory therapy to assess.

The informatics nurse will be established as the clinical coordinator for the project. The informatics nurse is a bridge between information technology (IT) and nursing, with an appreciation for the complexities of integration. The rest of the team is composed of a programmer contractually employed to build the program, clinicians from different areas of healthcare (pharmacy, nursing, physicians), additional trainers who represent the end users and the hospital publicity and IT teams. Providing a framework for the implementation and ensuring exposure and understanding is necessary to ensure positive adaptation. Engaging users in development of the product ensures a usable product that captures all the nuances of application and improves understanding and acceptance for all users. This is crucial for implementation, as they will become the project's biggest supporters. It will also ensure the product will be used to accurately record medications in a user-friendly manner, which is the overall goal.

Implementation of the project

Our initial knowledge of the EMR project was vague at best. One thing disclosed in the first few meetings was that the same EMR had been implemented at our sister facility, Seton Medical Center, and had failed miserably before the project was abandoned. While this abandoned project was not quite as expensive as the Cedars-Sinai attempt (Kumar & Aldrich, 2010), it still had a significant financial impact on the hospital system. This made me even more committed to create a way to ensure acceptance. Working with the nurse informaticist, who was on the team at the failed facility, we developed some processes that were necessary to increase staff acceptance. The specific steps of the project were:

- I. During the development phase, a small sample of bedside nurses (builders) were involved in development and testing of the end product, with frequent opportunity to change different aspects of EMR to ensure the system would be functional for patient care and safety. The builders were handpicked by the directors to ensure that we had people that not only were clinical experts, but comfortable with computer technology as well. For the most part, the directors chose well.
- II. A larger subset of bedside nurses (super users) tested the system for usability and functionality.
- III. End user training was completed by builders and super users (peer teaching) with opportunity for end users to practice during training sessions and on units post.
- IV. Post end-user training but prior to initiation of EMR system- Phase 1, baseline assessments of usability of system were conducted to evaluate perception of system usability prior to use.

- V. For the first two weeks of EMR implementation (ARCIS), three to four bedside nurses per shift are to be assigned as super users during conversion over to new system for all functions in the hospital to assist in usage of new system.
- VI. Six weeks post implementation of Phase 1, meetings with super users to assess problem areas and identify issues in need of improvement. This was an open discussion with four to six people, which included multidisciplinary representatives as needed. The discussion included issues raised in the issue log as well as questions posted in Appendix B.
- VII. In collaboration with nurse informaticist, analysis of responses for themes was conducted. The team documented areas for improvement and reported back to the end users routinely. This response was relayed to the individual reporting and general staff as needed. Some issues involved changes to be made to software, which were implemented with system updates.
- VIII. Eight months post implementation of Phase 1 (prior to Phase 2); System Usability Scale was re-administered to reassess usability of EMR. The data were analyzed for usability improvements and reported to administration, and a re-evaluation of the implementation plan was completed to determine if we should stay on current path.
- IX. Concurrently with re-administration of SUS, training completed on Phase 2 – Bar Code Medication Administration (BCMA) and updates to patient education.
- X. One month post implementation of Phase 2, System Usability Scale was re-administered to reassess usability of EMR. The data were analyzed for usability improvements and results reported to administration. Reevaluation of implementation plan to be completed to determine if the project would stay on the current path.

- XI. One month post implementation of Phase 2, meeting scheduled with interested users to assess the problem areas and identify issues in need of improvement.
- XII. In collaboration with nurse informaticist, analysis of responses for themes was conducted. Any changes that can be made for the betterment of the usability were completed.

Communication is also a key element throughout the implementation process. Noah (2011) recommends many different communication channels to be used to share the benefits of change as well as any relevant communication. Suggestions that were effective for our EMR implementation and are still ongoing are leadership modeling, use of print media and email.

Our leadership models confidence in the EMR by verbally encouraging our development team and the rest of the facility. A visible leadership presence during go-lives, acting as support from the sidelines was also appreciated.

To manage print media, we employed several newsletter type formats with updates and post them in prominent places. One sight for print media that seemed to guarantee visibility was employee bathrooms. We also posted general messages to the public in high traffic departments, as well as elevators and public bathrooms. Messages were sent out from administration and the work team.

Another addition that helps disseminate information is email, preferably that can be accessed internally and externally. Updates and issue resolution emails were sent out weekly for the first month, and monthly as needed post each stage. With each new change, the updates schedule can be adjusted to address that change. Some of the information sent out electronically should also be sent in print for the staff that are not as computer competent. Many nursing staff

requested home access so they could read at their leisure. The combination of all these methods proved successful, and we continue to use them.

Planning the study of the intervention

Planning the study of the intervention requires both organizational skills as well as flexibility. The project dates for go-lives and upgrades often changed, dependent on allocation of resources and financial support within the system. Our hospital competes with sister facilities that require their own upgrades and all this needs to be coordinated because we share computer networks making the timing a matter of guesstimates. In order to collect data efficiently and within the scope of my objectives, the study schedule shifted occasionally. Writing a timeline is beneficial to define and articulate the plan. After the first few date changes, specific dates were removed from the timeline to prevent confusion. The specific timeline of our EMR project is outlined in the Gantt chart (Appendix F), but the following information provides the sequencing of the data gathering interventions as listed below.

- I. The pre-survey is to be distributed prior to EMR training, to all nursing staff assigned to use the new EMR training was provided by their peers, from the build and super user teams). These nurses were educated on the study and the EMR issues logs.
- II. One week prior to go-live, EMR issues logs were distributed to each department. Staffs were instructed on location in person and email. The logs are slated to stay in place indefinitely. For the first three months, they were checked at least every day, then weekly. After each upgrade, the issues logs will be checked daily for the first few months to ensure concerns are captured.

- III. Six weeks post implementation of Stage I, the nurse informatics team and clinical leader will meet with interested super and end users to assess for additional problem areas and identify issues in need of improvement. This is an open discussion with no more than six people per group. Problem areas listed in priority for staff and this list will go to the development team for feasibility of change. One week post meetings, viability of changes reported to end users and administration. Changes that are possible are made.
- IV. Eight months post implementation of Stage I (prior to Stage II); the post-implementation survey will be distributed to bedside nurses to assess their acceptance of usability with the new EMR.
- V. One month post implementation of Stage II, the nurse informatics team and clinical leader will meet with super and end users from each department to assess for additional problem areas and identify issues in need of improvement, using the same questions from initial meetings. Adjustments to be made accordingly.
- VI. One month post implementation of Stage II, 2nd post-implementation survey will be distributed to bedside nurses to assess their perceptions of acceptance.

Methods of evaluation

The implementation plan and the effect on usability will be evaluated using the same tools at different stages of the EMR development. The System Usability Scale (SUS) (Brooke, n.d.) (Appendix C) was developed in response to a need to have some sort of method to compare usability across many different systems. It is applicable to evaluate any kind of industrial systems. It has been used in various research projects and industrial evaluations. Published by multiple venues, specifically by the U.S. Department of Health and Human Services (DHHS) as

recently as 2013, it is a validated survey posted for unrestricted access. This tool was distributed pre Phase I, 8 months post Phase I (and prior to Phase II), and one month post Stage II. The survey results will allow the hospital to see the results of the implementation plan, validating the specific efforts made to improve acceptance and ease transition.

The questions for the qualitative and issues review (Appendix B) were developed by the author, to create talking points for staff discussion. The questions are open ended, with specific topics. Once topics identified, staff will be asked to prioritize their preference of implementation of change. While the questions are helpful, they are only to facilitate discussion.

During meetings, the issues logs took precedence, as often there were recurring themes from multiple departments that were flagged by the issues logs. These were reviewed first, and started a dialogue to the point where additional questions were not necessary.

The meetings themselves also gave opportunity for feedback, as although they were unit specific, ancillary members such as pharmacy and laboratory also attended, and many issues that were addressed were multidisciplinary. Bringing together the clinical people into a meeting together allowed for uninterrupted time that was not available during work hours to work out solutions.

Communicating the conceptual framework with defined operational goals was necessary to guide the project. The theoretical framework and AIM statement were shared with the clinical leadership, as well as the informatics team. While Roger's theoretical foundation was not conveyed to the staff, the general premise of different adoption curves was, through informal discussion during training. The super users were made aware that adaptation and usability of any

new system is very personalized. This helped them be more patient during training, knowing that what is easy for them is not necessarily easy for others.

A comprehensive needs assessment was completed prior to developing the project. Using the SWOT analysis (Appendix E) format, strengths, weaknesses, opportunities and threats were analyzed prior to the start of the EMR implementation project.

Some predominant strengths were noted during the SWOT analysis. One of the major points is employee engagement. Having end users actively involved in the EMR implementation will improve overall compliance with system, as the process will be user owned. Bedside nurses are direct participants and have input in what is realistic and reflects actual practice. Nurses that have an active presence on the units influence the environment, especially if they are chosen from various shift rotations. This also provides continued peer support to ease the transition for those struggling and make the whole department run smoother. Many healthcare institutions across the country are currently in process or considering EMR implementation, but no one has outlined a step by step implementation plan that has been proven to improve nurse engagement to ensure successful transition to EMR. This project attempts to frame a process that is theoretically based, supported by clinical and financial outcomes that can ease these transitions.

As technology evolves and our current structures are challenged, change is inevitable and the process outlined can be applied to other situations to create a climate that embraces restructuring. Balancing the variables that are affected or are introduced can be a deciding factor in any transition (Awal, Klingler, Rongione, & Stephen, 2006) and will impact the future. Awal et al (2006) identified the value of having employees actively engage in shared agendas with

clear guiding values to help the employees understand the perspective of the whole and be part of the change, rather than be affected by a mandated course of action.

This project fits well within the expectations of the Institute of Medicine (IOM, 2010) for nurse involvement in changing health care. Nurses should be full partners, with physicians and other health care professionals, in redesigning health care in the United States. The IOM calls for nurses to be engaged in quality agendas, and introduction of a new EMR that improves documentation is an excellent example of a shared project that meets needs for the hospital and the nurses. The agency believes that nurses engaged in the future state of nursing directly impact the quality and safety of patient care today and in the future (IOM, 2010).

The SWOT analysis also identified a few weaknesses. Any change is fraught with challenges and EMR is probably one of the biggest. We recognized early that work flow would change, as paper reports and documentation ceased to exist. Focus on a nursing agenda could negatively impact other departments as they also are actively engaged in process changes created by the EMR. It is common to be overly focused on one's own department's needs, but hospitals are integrated environments that must coordinate and collaborate across departments. Although patients stay in patient care units, with a nurse assigned to them, they are constantly affected by the activities of other staff, such as laboratory technicians, therapists, and physicians who are all part of the patient's continuum of care. Still, it was essential to involve nursing in the transition of EMR.

There are many opportunities in creating an implementation plan based on engagement, especially as we look into the future. Structure in planning helps establish a shared agenda, so everyone knows what their roles are (Rogers, 2010). This can make future changes that occur

easier, as the team learns how to work together for a common goal. Making transitions more acceptable leads to greater success of innovations, which can reduce financial and clinical setbacks caused by disengagement. Leadership also has an opportunity to facilitate the process of reflection during the change process. Lessons learned can be powerful tools for any future implementation, to improve the process and the method. Given the extended length of the project, leadership can continue to evaluate efforts made of having a structured implementation plan over the passage of time. Healthcare is rapidly changing and we need to be prepared to adapt quickly to stay ahead.

One of the few threats involved in developing implementation plans that actively engage employees is fault finding, even if only perceived, blame could negatively affect others willingness to cooperate (Rogers, 2010). Still, the benefit of nurse involvement far outweighs the risk.

The financial incentives should be reviewed to assess if the cost of the product, wages, and hardware was recovered by the payment post attestation. As stated earlier, there are financial incentives offered to facilities that can attest to implementation of a certified EMR. The monies are distributed in stages, based on status of meaningful use the facility reaches. At SLRH, the cost of the product was mainly absorbed by the DOCHS system except for nominal fee, so there was little impact to our operating expenses. Our biggest expenses are labor and hardware. We did receive a reimbursement of \$1.6 million post our first attestation validation (Appendix L). Given that we have a budgeted operating loss for this fiscal year, this was a much needed infusion. In this area, we are successful. While the next stage of attestation does not have as high a payout, it is still a goal worth striving for.

Analysis

The survey data were reviewed after each distribution and scored by the author, using the instructions that accompany the SUS. SUS scores a composite number, representing an overall usability of the system being studied. A higher SUS score reflects the perception that the system is usable. The overall scores were compared to each subsequent survey to monitor changes in acceptance of the EMR.

The issues logs and the discussion logs from the post meetings were reviewed for themes by the nurse informaticist and the author. Some notable themes were use of short cuts by staff, lack of specialized documentation on regulatory compliance areas such as restraints that had to be activated in multiple places and so no one was documenting properly and medication administration issues. The EMR issues log was helpful in making changes to the system and mitigating risk.

Results

Program evaluation/outcomes

Since the inception of the project over two years ago we have had many trials. The project was not a simple process that we could just put in place. It involved many more interventions than we initially expected. The team was developed, assuming we would only need to refine a basic EMR that had already been initiated at a sister hospital. The time commitment of six months was based on using a skeleton template, but that changed when we learned that we had to build the whole EMR from scratch. While building our own system had advantages because we could personalize the EMR to our own facility specifications, it

unexpectedly required a lot of research into our facility operations and some intensive decision making.

The project results reflect our efforts, though not as well as hoped. One month post BCMA initiation, a third SUS survey was distributed to all nursing departments. Over the time since EMR initiation, usability scores have risen. Our initial usability score was 47/100 and it rose to 63.5/100, a 16.5% increase eight months post EMR implementation. While this increase does not seem to be much, it does indicate almost 17 more people for every 100 employees has now found value in the new system and in fact accepts it better. This acceptance has ramifications to every patient that is being cared for that individual that may have had to cope with staff bitterness and resentment during the changeover. A second survey was administered one month post BCMA, and there was not an increase, in fact there was a decline. The goal was for a 30% increase in usability, but that was not seen. There was a decline of 1%. The main reason for this is the lack of time to adapt to the changes in the EMR. For the purpose of this project, the survey was administered earlier than scheduled, one month post go-live of BCMA. It is important to note that one month was likely not enough time for the latest change to not only be accepted but embraced. We have maintained a usability improvement of 16% over the last eight months, so the EMR is still accepted. The usability assessments will continue, despite the end of the project, as we still have many phases to go to full realization of the potential of meaningful use. In addition to the usability scores, there were some observations over the last 18 months that are worthy of discussion.

Phase I

The project created an entire change in work flow for many people, not just bedside nursing staff. To fully understand the needs of the nursing departments, quality department and risk management, it was necessary for everyone involved to understand regulatory requirements and necessary components to ensure we still had reporting capability and clear, thorough documentation. This documentation also needed to meet standards expected for reimbursement.

Another critical component identified early on was the need for ancillary staff communication. The EMR we were developing was a combination of multiple systems that would have to integrate into a whole system. Laboratory, diagnostic imaging, admitting, medical records and nursing all had individual sections they were developing. So while the nursing component may work for nursing, it did not necessarily meet the needs of other departments and vice versa. This integration was very helpful to make sure that the EMR met all our needs prior to testing.

Any delays or major changes should be communicated clearly and quickly. It helps build trust, convey valuable information and ensure things run smoothly (Kline, 2007). Education and full disclosure of the positive and negative components of the EMR was paramount for staff to trust the product and the team of builders. In our case, the project start date was delayed by unforeseen circumstances. The EMR implementation delay caused staff disengagement as interest faded for those not actively building the product. For those still engaged, speculation about the delay led some to speculate that the EMR product was inferior. Damage control, especially with clear communication was necessary to address the concerns.

Promotional materials and communication tools that were present at inception were not updated with the changes, which needed to be addressed. Although efforts were made for

frequent updates to keep people informed, more communication was needed to keep staff interested and engaged in the project.

Education and full disclosure of the positive and negative components of the EMR is paramount for staff to trust the product and the team of builders, so a publicity/communication plan is built into the budget. Noah (2011) recommends many different communication channels to be used to share the benefits of change as well as any relevant communication. Providing peers as a support network was very beneficial. Innovators and early adopters were positioned to have maximum impact across the areas affected by change. Having the innovators/early adopters working alongside the late adopters provided positive examples of success and reduce frustration. There has never been an expectation that everyone was going to find the change easy. In fact, it was anticipated that some individuals may need additional guidance and support.

The clinical leader role of was challenging. Initially intended to be a very hands-on role, other job expectations took priority. This was problematic as the team was forced to become more independent when they were not necessarily ready for the responsibility. The administrative team allowed decisions making at the build team level, as our recommendations were based on current clinical practice. Ironically, allowing decisions to be made by the build team only helped more to establish end user buy in.

Despite having the build team make decisions about documentation, there were any items that needed to be addressed, to ensure regulatory and policy compliance. As the mediator between administrative and clinical practice, the clinical leader made many final decisions about required documentation. While this may seem autocratic, it also prevented any further delays. This approach worked well, as the nurse informaticist had someone to consult with, and since the

clinical leader was already a visible presence in the nursing units she was accepted by both the clinical and technical staff.

The super users were clinician volunteers from each department who would test the system and then serve as trainers. Assessing super user learning styles is an important consideration when developing this team. It is helpful to keep in mind that just because someone volunteers, it does not mean they are competent. Some of the volunteers were never able to support anyone else which made their training to be super users ineffective and inefficient. One advantage was that involving staff early increased user acceptance overall, which was a major focus of the implementation.

Training time was problematic in that we had limited space so many people were trained two months ahead of the initiation of the EMR. Staff who had been trained in the early weeks had forgotten much of what they learned as we got closer to go-live. Staff were encouraged to practice using the test database in the EMR and make themselves more comfortable with the process prior to go-live, but few took advantage of this opportunity.

Training also became a staffing issue. Because we had 10-15 people per department in training at any given time with both super and end users, staffing the departments became a struggle and the departments accumulated more overtime than was anticipated. We also did reassign training when staffs were needed for patient care.

Room design and hardware also needed to be reevaluated. There were enough computers for every patient room, but many staff were insistent in moving room to room with their computers. Room congestion became an issue so bedside tables were removed to make room for the workstations on wheels (WOWs).

Timing of initiation needed to be considered. We went live in December, right before holidays. Go-live had all the super users and vendor support present. Peer support was more accepted than vendor support, assumedly because of a higher comfort level with familiar staff members. Patient care was provided, albeit a little slower. But four days after initiation, the hospital census took a sharp upward trend. To provide care, we were forced to scale back on super user support from staff nurses. We still had vendor support as well as one staff nurse, but it was not enough. The staff trusted their peers more than the vendors and this overtaxed the super user. Super users became exhausted and asked to not work the role anymore. These requests led to a shortage of super user support which made other staff unhappy. We extended super user support from two to four weeks and brought in registry nurses to provide additional support. Consequently, the next phase of our EMR was strategically planned to avoid key calendar times.

The comfort level with the EMR varied among the people and teams involved in the project. Evening and night shifts seemed to do better converting to EMR, but the day shift struggled. The demographics may explain this difference. Our evening and night shift are younger, computer savvy professionals. Most of them had worked on EMR's during nursing school; even it was not the same one. They were familiar with the concept of the EMR. The day shift had many seasoned staff, some of who did not even own a computer. For them, the implementation of the EMR was a much more drastic change. Even though they were more challenged, they were also resilient.

Access to EMR issue logs and email, even after go-live was very beneficial. The staff was encouraged to use the EMR issues logs. The first weeks, the IT and nurse informatics support addressed approximately 20-25 issues a week. By the end of the three months, they were down to two to three a week. The logs were initially used for basic user operations issues such as

how to add new interventions to work lists, how to cancel a medication, how to correct a mistake in documentation. As time went on, the issues became broader and focused in issues such as improved discharge teaching, stroke education, and restructuring to electronic kardex. The sources of the requests were varied, but often the changes suggested were reasonable and more importantly feasible. The nurse informatics team worked on the theory that if one person wrote it as an issue, more were thinking it. Once they validated this was a common issue, she made applicable changes.. The EMR issues logs became valuable tools for collecting information about areas that needed to be addressed, as well as help us prioritize the issues so they could be handled appropriately. If the issue directly affected patient care, then it took priority than something that was a workflow issue.

There was also a need to focus on ancillary departments to improve the issues that affected all the departments. Laboratory and diagnostic imaging each hosted monthly meetings to address issues that had a hospital wide effect. These meetings also stimulated dialogue that improved not only the program, but also the understanding the challenges that each department was facing. After about three months, these meetings were no longer needed and issues were addressed as needed. .

Both the EMR issues logs and meeting outcomes were reported back by the informatics team to either the individual who reported it (if it was only an individual issue), the specific department or the whole clinical staff, depending on what the topic was. This was a great way to show the staff that even if they did not attend a meeting, or wrote about an issue, there was still progress being made. These updates were sent out by email, postings and sometimes by demonstrations.

Phase II

Phase II, initially slated for six months post, was delayed until October. This phase added in barcode medication administration (BCMA) and additional updates for patient education. Training was conducted using the same format. Some new faces emerged as computer leaders, which has improved even more the staff perception of the EMR. People who struggled in Phase I had greatly improved in their use and acceptance of the EMR.

Go-live of Phase II was much smoother than Phase I. We also had 24/7 nurse informaticist support scheduled for one week but due to high staff compliance and super user competence was only used for approximately four days. After that, the informatics team took call and could be easily reached any time. Staff found the new upgrades easy to use, a dramatic change from Phase I.

The EMR issues logs remained in place since the go-live phase, but were checked daily again for the first few weeks after Phase II. Issues were minimal, although the reporting of short cuts came to light again, as some nurses were not identifying their patients appropriately. Instead of rousing patients to check identification, nurses carried a second ID band on their computers so they could scan the patient without doing the five rights of medication safety. As the clinical leader, I rounded on all nursing units on all shifts to personally remind staff that this was not acceptable. Messages were also sent out by the informatics team.

The nurse informatics team started rounding on the nursing units at least once a week post initiation of the EMR and would show staff ways to improve their performance. This rounding was not planned but was a welcome addition. It was so appreciated, that the nurse informatics team now makes it part of their weekly routine.

Discussion

Summary

Since this was a large scale change that affected almost every department except the emergency room, it was monitored by the informatics team and leadership for over ten months, and monitoring still remains a priority at most levels.

As mentioned earlier, the build team selection was an arbitrary decision of the administrative team. While there was some thought to allow for volunteers among the staff, the build team was ultimately recruited by Directors and the administrative team for their high functioning clinical skill and ability to work as a team player. This was a decision that worked well. In the early stages, the process of building was fun and interesting, but as time went on, it became tedious and repetitive at times. It was a long process that required sustained interest to build the assessments and work list items from the bare bones of the software framework.

Overall, the second phase, while not as extensive, showed the effectiveness the action plan had on user acceptance. Having end users actively involved in development, testing and application is integral. But end user involvement in follow up is just as important. EMR issues logs and post meetings, as well as leader rounding encouraged the staff by affirming they have a voice in the operations and their opinion counts. Most of the changes that have been made in the system were a direct result of end user participation and involvement.

The project also demonstrated that the plan is replicable with even better results. This forecasts even easier transitions as we move forward through all the stages of meaningful use. The next opportunity is around the corner, as we adopt computerized physician order entry in spring 2014. Ironically, the staff is looking forward to the physicians being put in the same shoes as they were almost a year ago. The staff not only survived, they actually found they like the new

EMR. In anecdotal comments, many expressed they would not want to go back to their former method of documentation. While we did not achieve our initial projection of 30% increase in acceptance, we did maintain a significant increase overall and will continue to follow the EMR progression as it moves forward. This EMR still has many more changes pending, with healthcare technology changing faster than ever, and hospitals striving to keep up.

Relation to other evidence

As mentioned earlier, the literature does not have specifics in actual plans to follow to increase staff acceptance of EMR implementation. There are several books and articles about project planning, but none with a step by step plan for involving staff in future innovations. The focus seems to be more on what not to do. This plan is focused on what you can do to make a difference. There is literature supporting end user involvement and clarifying the purpose of technology.

The literature indicates one notable theme that needs to be ensured, establishing end user buy-in is a forerunner of success (Chisolm, Purnell, Cohen, & McAlearney, 2010; Noah, 2011; Gold, et al., 2012). Nurses' attitudes should be not underestimated and their opinions do matter (Sassen, 2009). Lessons learned at other institutions support some roles in implementation. Early in the EMR project, leadership should be actively engaged, especially nursing leaders (Scott, & Van Norman, 2009; Gold, et al., 2012). In organizational structures, champions are individuals that take everyone else through the rest of the developmental stages of a project and keep the rest of the group motivated to overcome resistance to change (Clemmer, 2012). Champions, such as our build team and clinical leader also play a significant role in the success of the implementation plan.

One of the biggest struggles for change to occur is the fact that people need to want it and see that it is going to benefit them (Rogers, 2010). Gold, et al. (2012) share what providers are most concerned about which includes the cost/benefit analysis short and long term, operational feasibility, professional norms, how it is going to affect them personally, and if it is necessary strategically for long term (Appendix H). It is essential for leadership to give the team that vision and create a shared agenda to improve acceptance (Chisolm, Purnell, Cohen, & McAlearney, 2010; Gold, et al., 2012; Noah, 2011). The frontline staff knew what benefits were being brought forth with the new product, but the ongoing communication provided clarification of the benefits of the product. This was essential to staff acceptance. Early in the project timeline, nurses and other end users should be informed of the premise behind the product. Months before EMR production started, the build team was identified and involved in early meetings. These frontline workers were empowered to look for areas of improvement and ensure retention of documentation components to meet unit and facility requirements. They also were encouraged to work interdisciplinary so they could offer input on areas that directly impacted each other.

Advancements in technology are imperative, especially as health care systems are saturated with complexities that can be difficult to recognize and even more difficult to correct (Clancy, Effken, and Pesut, 2008), so clinicians need to be prepared to work within this changing climate of healthcare. Nurses, in particular, have a significant role in advancing technology. Swick, Doulaveris, and Christensen (2012) remind us that nurses and ancillary staff need to step out of task oriented focus, and build a patient oriented experience that will only be enriched with technology. Evidence demonstrates that over time, documentation is faster and more accurate,

reflects the care given and more specifically, improved satisfaction with technology (American Nurses Association, 2009; Chisolm, Purnell, Cohen, & McAlearney, 2010; Top & Gider, 2012).

Barriers to implementation/limitations

The biggest barrier to the project was the constantly evolving timetable. While flexibility has its purpose and value, the delays in implementation only created a sense of wariness of the product. We were constantly rescheduling training, meetings and publicity. The staff lost confidence several times and we were constantly promoting the system. These delays made us adjust my project dates as well.

The physicians were hesitant to accept the new technology and it took longer for the physicians to start viewing the new EMR without help from the nurses. As clinical leader, I strongly encouraged clinicians to ask physicians on their support team for help because the nurses were also learning, and retrieving information for physicians was a burden on them.

As to the details of the project itself, my biggest frustration was those people who completed the surveys carelessly. The SUS survey is set up with alternating positive and negative questions. Some staff just marked the highest (or lowest) number, without carefully reading the content. This was recognized and for the third survey, they were specifically reminded of the scoring details.

The California Nurses Association union has been resistive to any changes that affect nursing work flow and over the last six months have developed a new protest tool specifically focused on technology objections. It is a venue in which the union members can document discrepancies or issues that have occurred in the EMR that have disrupted bedside care. It is essentially an issues log. While it is disregarded by the majority of RN staff, there are a few that have taken it seriously and document every event that occurs on the technology objection. To

circumvent this, we have our nurse informaticist attend the union supported professional performance committee for the last several months which seemed to have helped.

Interpretation

The most objective improvement noted was the increase of 17% among users perception of the usability of the system. The SUS scale scores an overall rating for each survey, and those surveys were averaged. There were some notable outliers, particularly with really negative responses, but since the survey was anonymous, it was impossible to assess the cause for the extreme negativity. Referencing Rogers (2010), these most likely are the laggards who were very reluctant to change systems.

The system has improved the accuracy of our documentation, ease of auditing, and improved patient safety with its many built in patient safety features. And most importantly, except for the first few days, when chaos seemed to rule, the patients are unaffected by the dramatic change. That is a wonderful accomplishment for our staff.

All the steps we worked through have shown that the process set in place works to improve acceptance, and it was gathered into a formal action plan to guide any EMR implementation. Taking all the work process together that have been accomplished over the last nine months, Development of a written action plan will aid in focus and organization of any new project. Actions plans or project planning are not new concepts, but most organized plans are broad and subject to interpretation (Burich, Casey, Devlin, & Ivanitskaya, 2006; Harris, Roussel, Walters, & Dearman, 2011). The intent of this action plan is to narrow down project planning into realistic, applicable steps for healthcare organizations to follow for EMR implementation. Literature strongly recommends a formal plan to ease transition and guide the transition (Burich

et al, 2006). Some key components were noted throughout this project that will be beneficial as we move forward to our next phase. It is important to establish who should be included in the early planning stages, and making sure that all parties are represented and welcomed at the table. Too often, team members who are far removed from the bedside make decisions that directly impact frontline staff. We purposely selected our build team from our staff nurses, and we did not randomly open the opportunity to any interested parties. The build team became crucial to the program development, but at times had to be tenacious to ensure they were doing right by their peers and the EMR. It was essential to give equal consideration to the ideas and concerns of the frontline team. This balanced consideration will improve the project acceptance. A phrase often heard in hospitals is 'Management has no idea what it is like at the bedside'. While this may or may not be true, it is crucial to give the end users a voice. It was helpful to share the conceptual and operational framework with the core team of builders and super users. Rogers' theory was especially relevant, as we had a mix of all types of learners and team was more patient with them, recognizing that each person was at a different level.

It is essential to outline project plan with established roles and expectations: This step clarified for the whole team what they are responsible for, and was very helpful to ensure deliverables were met. In healthcare, once a project goes live, it is difficult, if not impossible to go back, especially if affects patient care (Gresch, 2010). There is a high level of accountability that should be expected. The focus should also be to ensure change has minimal impact on the patient population, or if this is unavoidable, show the project in a positive light. Our build team knew what their purpose was, and were committed to developing the best program they could for their peers. The directors and clinical leader bridged the gap between administration and the

bedside. The only area that fell out was our communication methods, but after some discussions, this improved.

A structure of reporting was also reframed to clarify reporting responsibilities more clearly. The informatics nurse went directly to the clinical leader for decision making regards to program features. Financial and system integration, including meaningful use attestation was filtered through the Chief Operating Officer. A responsibility matrix is posted in Appendix J.

While the desire may be to accelerate the program to improve your performance, rushing a project may doom it. This occurred in our sister hospital in San Francisco, that attempted to rush into EMR, and the teams, especially the physicians, were not ready and the system promptly regressed back to the original process, and delayed the EMR implementation until everyone felt comfortable with the product. Our program implementation has seen several date changes in the first two stages, but although the delays were initially frustrating, they actually gave us time to perfect the project.

Objectivity was an important component for the individual departments who became very passionate about their own agenda and lost sight of the group goal. During integrative testing, when the patient moved through the various departments, the focus was on the patient, not on the end user. Translating that to real world was more difficult. When errors occurred, each department was quick to blame each other. Having the meetings to review the issues logs and collegially solve the problem deflected some of the frustration and gave people a clearer vision. They seemed more able to work together to improve the EMR functionality.

Appendix G offers a formal checklist for use during a change project. Working within this framework made the EMR transitions easier, and bedside staff were involved throughout the

process. This was a major goal that we focused on, and we were able to maintain the right people in place for the duration. Occasionally, new people emerged as EMR leaders, which only made the staff more accepting. The principles of Rogers' theory (2010) were seen, as the EMR became more accepted and the numbers of laggard staff decreased. Over time, these transitions will pave the way for each new innovation.

Conclusions

Success of EMR lies not only in the product, but in the process in which it is implemented. Organizations that accept the innovation-decision process to guide change and understand the complexities of the process will be better equipped to ensure success. While change is never a first choice, favorable staff attitudes and acceptance directly impacts the environment of care and makes the work getting there more rewarding. This paper is intended to help healthcare facilities ease the transition when change is forthcoming. Involvement of key staff, especially front line employees can ensure the change will meet their needs. This will ultimately affect those who are exposed to and given adequate opportunity to adjust the system will be more enthusiastic supporters. This process works well for the management and staff. There is no benefit for the management team to force change that has not had staff involvement onto them. It is a guaranteed disaster, and the repercussions will manifest long after the change has occurred. Trust lost is difficult to regain.

Staff can unintentionally sabotage the new EMR implementation if they are negative or even apathetic, so their support of the project is paramount. Favorable staff attitudes and acceptance directly impacts the environment of care and may ultimately affect patient outcomes, so healthcare organizations need to ensure the path toward full implementation is as smooth as

possible. Employees who are exposed to and given adequate opportunity to adjust the system will be more enthusiastic supporters. We have seen this to be true, with stronger usability scores across the EMR implementation. With buy in, employees will be stronger, more confident and successful. The most viable option is identify your stakeholders, invite them to the table, and include them in these critical changes.

Other information

Funding

As mentioned earlier, except for some shared labor expenditure, the project has been financially supported by our health system. This was a budgeted project, with the anticipation that it would meet meaningful use criteria for financial reimbursement. No hospital funds were provided for the purposes of writing the DNP Comprehensive.

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Appendices

Appendix A –System Usability Scale (SUS) (Brooke, n.d.)

Saint Louise Regional Hospital System Usability Scale

ARCIS - EMR

Please check the appropriate boxes (both sides)

	Strongly Disagree							Strongly Agree
1. I think that I would like to use this system frequently.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5
2. I found the system unnecessarily complex.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5
3. I thought the system was easy to use.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5
4. I think that I would need the support of a technical person to be able to use this system.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5
5. I found the various functions in this system were well integrated.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5
6. I thought there was too much inconsistency in this system.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5
7. I would imagine that most people would learn to use this system very quickly.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5
8. I found the system very cumbersome to use.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1		2		3		4	5

9. I felt very confident using the system.

1	2	3	4	5

10. I needed to learn a lot of things before I could get going with this system.

1	2	3	4	5

BACKGROUND INFORMATION

Position (Mark only one)

- Pharmacist/ Pharmacy Technician
- RN/LVN
- Respiratory Therapist
- PT/OT/Speech/Dietician
- Unit Clerk
- Other

Gender:

- Male
- Female

Experience in Organization:

- Less than 6 months
- 6-11 months
- 1-2 years
- 3-7 years
- 8-12 years
- 13-20 years
- 21 or more years

Age:

- 18-25
- 26-35
- 36-50
- 51-65
- over 65

Experience with computers:

- Minimal Experience (Web, Email)
- Moderate Experience (Word, Excel)
- Advanced Experience (Operating, Systems)

Appendix B –Questions for post implementation meetings

1. What is working well?
 - a. Medication pass
 - b. Documentation
 - c. Retrieval of information
 - d. Report (at shift change and between departments)

2. What needs improvement?
 - a. Medication pass
 - b. Documentation
 - c. Retrieval of information
 - d. Report (at shift change and between departments)

3. What are the top 5 priorities identified using the EMR Nursing Issues Log?

Appendix C: EMR Issues Log

Issue/Change Request Form

Date/Time: _____ Department: _____

User Name: _____ Call Back Number: _____

Patient Name and Visit #: _____

Issue Description:

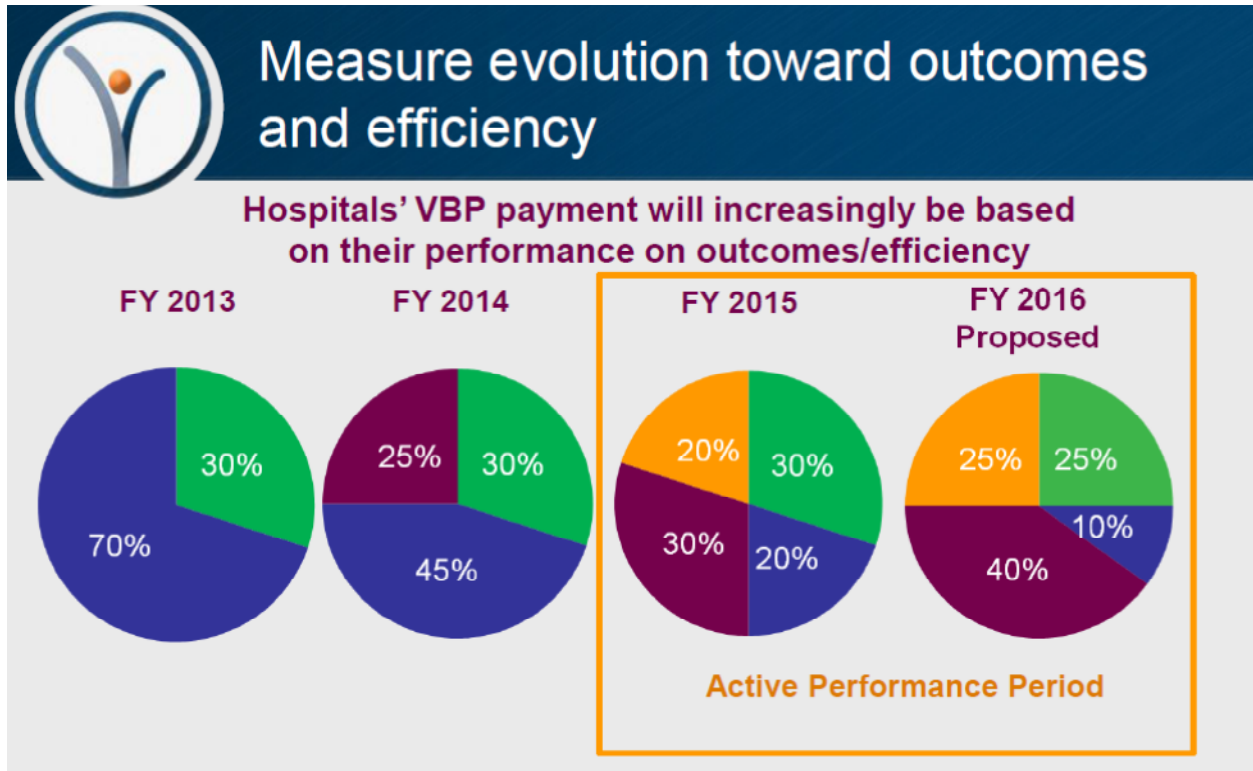
Informatics/IT use only:

Assigned to/Contact info: _____

Resolution/Comment::

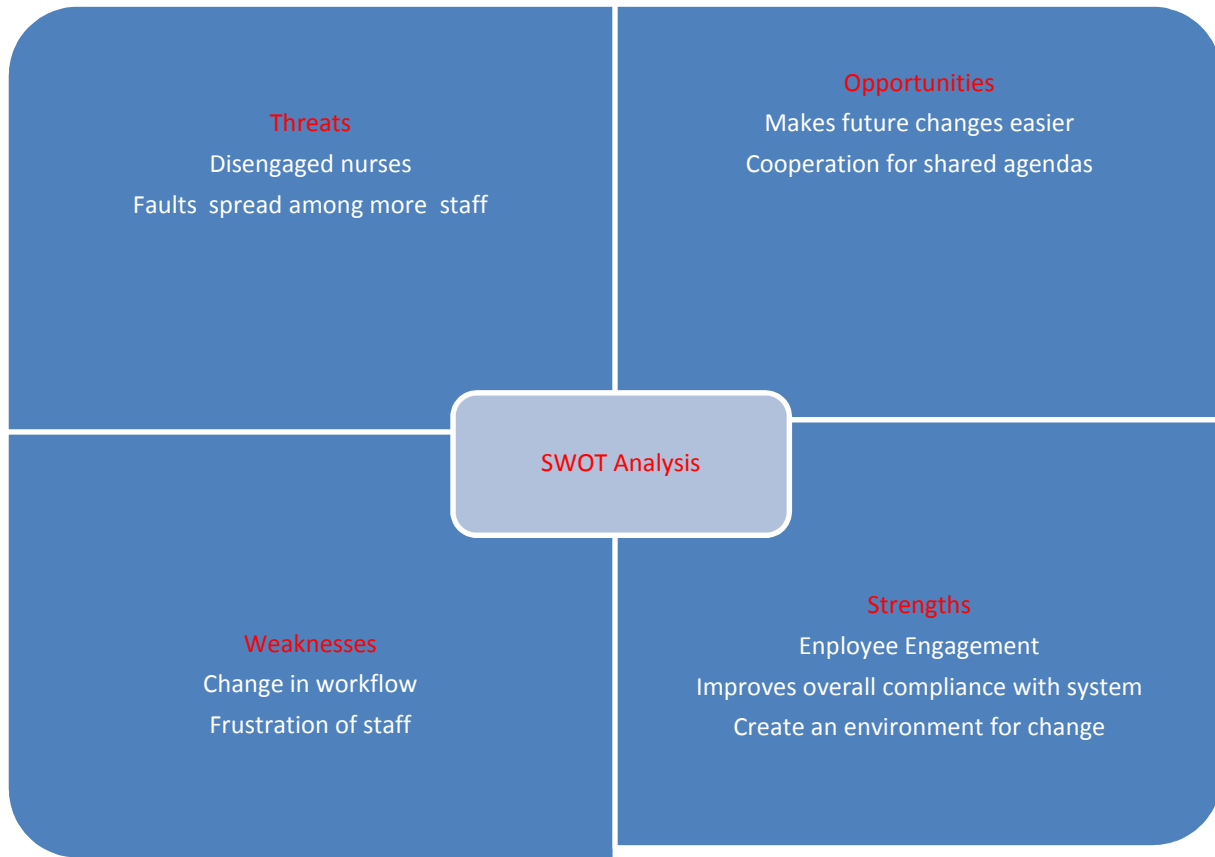
Resolved by: _____ Date/Time Resolved: _____

Appendix D- Value Based Purchasing



Reference: Daughter's of Charity Board of Quality report August 2013

Appendix E- SWOT Analysis of Development of Implementation Plan for EMR



Appendix G: Plan Checklist

Risk Analysis complete

First Steps

Needs assessment

Key stakeholders identified

First formal meeting

Goal defined

Pre meeting for goal alignment _____

Leadership clearly defined _____

Second meeting

Roles and responsibilities defined

Tasks assigned

Timeline outlined

Sub group development (if applicable)

Communication for start of project to all associates

Pre-survey distributed
 (due back at next meeting)

Third Meeting

Survey results turned in

Date confirmed for go-live (if applicable)

Issues Log Binders distributed

Subsequent meetings

Issue logs returned and concerns addressed

Verification of communication via email/flyers to alert for updates/Issues resolution

Validation of Change project meeting purpose

End user training (if applicable)

Product/Change ready for GO LIVE

Pre GO LIVE meeting

Confirmation Change ready
for GO-LIVE

Resources present to support
GO LIVE (ie: superusers)

Meeting space and
communication methods defined

All users trained

GO LIVE

Support networks present

Ancillary staff available if
needed, such as IT if
technological change

Rounding by leadership and
team to ensure smooth transition

Issues logs routinely checked
for any concerns, addressed
immediately if possible

Communication re: updates
and issues as needed

Meet with project team to
ensure all systems functioning

4 weeks post GO LIVE

Report back to leadership

Routine collection of Issues
logs of concerns- resolution as
soon as possible

Team meeting- focused
qualitative questions to improve
performance

3 months post change

Resurvey all end users and
assess acceptance of system

Appendix H

What Providers Care About In Choosing Electronic Health Records

<u>Area of concern</u>	<u>Specifics of concern</u>
Business case	Costs, offsetting revenue, up-front financing, cash-flow impact, long-term effect on bottom line under current and likely future payment models
Operational feasibility	Ability to integrate with current systems and practices, acceptance by staff, acceptance by patients, support by peers who will exchange comparable data
Professional norms	Relevance of embedded functionality, effects on quality of care, evolving standard of care Privacy and security of identifiable patient data and clinical care
Personal influences	Type of practice, specialty, age and anticipated remaining practice time, attitudes toward change and technology
Long-term strategic importance	Is change inevitable? Will electronic health records prove useful in the long term and support any anticipated changes in delivery? Is this the evolving standard of good care?

Reference: Gold M, McLaughlin C, Devers K, Berenson R, & Bovbjerg R. (2012).

Appendix I

Milestones and Deliverables

Timeline	Milestones	Deliverables
September 2011	Introduction of EMR	Selection of Key Stakeholders, including Build team
November 2011	Plan / Create software	Build team in place, Nurse informaticist hired formally
July 2012	Validation begins/Super user training. Integrated testing	Identification of Super users. Confirmation of system interface between departments
September-November 2012	End user training and pre survey	100% end users trained on system. Educated on issues logs and method for communication during go-live
December 2012	Go-Live Stage I	All systems converted to EMR. meetings with Super users and trainers three times a day and as needed for constant check in
January 2013	Post implementation meeting	Issues logs reviewed, open ended questions reviewed for process improvements
January 2013-June 2013	Software updates approx every 2 months	Changes made based on suggestions and issues brought up by informatics team and staff
June 2013	BCMA module built and tested	Super users validation
August 2013	Super and End user training	Updates on BCMA, Stroke educations and Care planning
October 2013	Go-Live Stage II	BCMA initiated. Other additions reinforced

Appendix J – Responsibility Matrix

Responsibilities	Administration	Clinical Leader	Nurse Informaticist	Build Team	Super - users	End Users	Directors
EMR Selection	3	1	1				
Communication paths	1,3	2	2				
Selection of Build Team		1,3	1				1
Development of EMR		2,3	1	1			
Testing of EMR		2	1	1	1		
Administration of Assessment		1	1				
End user training			1	1	1	1	
Go- live support	2	1	1	1	1	1	2
Post implementation evaluation		1	1				

1	Responsible	
2	Support	
3	Approval	

Appendix K – Evidence Based Table with appraisal

STUDY	METHOD	SAMPLE	INTERVENTIONS	VARIABLES	DATA ANALYSIS	OUTCOMES/RECOMMENDATIONS	APPRAISAL
Al-Azmi, S., Al-Enezi, N., & Chowdhury, R. I. (2009).	Quantitative	Convenience Sample 320 healthcare receptionists	Introduction of EMR	Independent: computer literacy, background Outcome: EMR functionality	Used SPSS, Chi Square test. Poisson regression for independent correlates	Positive attitude/Younger Age had better acceptance	Limited to clinic setting; data analysis was confusing; relevance minimal to acute care setting
Beiter, P, Sorscher J, Henderson C, Talen M. (2008).	Longitudinal Prospective Cohort Survey	Four populations in 2 groups- one MD, one nurses & patients 39 participants	Presentation of EMR demonstrations	Independent: role in health care background Dependent: Experience with functionality EMR demo	Wilcoxon signed rank test for initial pre and post Comparison using t-tests and Students t-tests	Improvement in attitudes, knowledge and needs at beginning, then stable. Demonstrations may improve attitudes on real time EMR	Prospective review of potential acceptance; difficult to assess real time acceptance
Chisolm, D., Purnell, T., Cohen, D., McAlearney, (2010)	Longitudinal Cohort Survey	Convenience Sample 71 clinicians from Emergency department	Introduction of EMR	Independent: general attitude toward technology Dependent: introduction of	X2 test with bivariate analysis; changes tested using Wilcoxon	Initial positive response with training and support	Limited to Emergency department (clientele unique and high

				EMR	signed rank test		turnover); Does recognize early perception can affect overall impression which was helpful
Kumar, S., & Aldrich, K. (2010).	Qualitative	Case Study	SWOT analysis for macro-perspective analysis	Difficult to define	Comparison analysis	Studies cost and benefits of EMR-recommend one universal system	Very helpful in how attitudes can affect acceptance (or not); anecdotal
Maskey, A. (2011).	Qualitative/Quantitative	Convenience Sample with Surveys & interviews	Implementation of EMR	Independent: clinicians already adopting EMR Dependent: EMR itself	Triangulation used to blend qualitative and quantitative for theme identification	Necessary to understand where the staff is with EMR. failure from lack of resources	Lessons learned from other facilities beneficial
McLane S. (2005).	Quantitative	Convenience sample 132 sampled. 44 returned; limited to one nursing unit	Implementation of EMR	Independent variable: self reported computer experience Dependent variable: EMR introduction	Survey evaluated with Crombach's alpha	Reasons for leaders to develop EMR	Findings were preliminary and could not be generalized to nursing staff overall; does use acute care nursing units-

							helpful
Mills, Vavroch, Bahensky, Ward (2010)	Qualitative	Convenience sample: all hospitals in Iowa- response of 70% hospitals	Comparison of CEO and CIO attitudes to EMR	Independent: Experience with technology Dependent: type of EMR	Role specific follow up questions: themes identified	Provides implementers suggestions for effective implementation	Identification of what expectations are from management but no end user buy in acknowledgment
Ovretveit, J., Scott, T., Rundall, T. G., Shortell, S. M., & Brommels, M. (2007).	Case Study Review	Comparison between two hospitals EMR development	X	X	Theme focus	Four primary drivers identified in the creating change	Lessons learned about importance of end user buy in
Rantz, M., J., Alexander, G., Galambos, C., Flesner, M., K., Vogelsmeier, A., Hicks, L.,... Greenwald, L. (2011).	Qualitative Analysis	Convenience Sample – Stratified Approach	Comparison of nursing homes with and without Implementation of EMR	Independent: Presence of EMR Dependent: user acceptance	Field interviews, observations, focus groups: emerging themes identified	X	Focus on nursing homes, not acute care facilities; overall improvement of acceptance with time

Smith, D., Morris, A., & Janke, J. (2011).	Quasi-experimental study	Convenience sample of 386 nurses from multiple units, 142 responses (38%)	implementation of EMR system and usability	Independent: Presence of EMR Dependent: user acceptance	Pre and post survey- SPSS 15.0 used , with validation with independent t-test and Mann Whitney U	The nurses felt their quality of work had improved	Short time between pre and post test but relevance strong as acute care
Top M, & Gider Ö. (2012).	Non Experimental	Convenience Sample- 200 nurses from three hospitals	Nurses views of EMR	Independent: Nurses attitudes Dependent: EMR implementation	SPSS 15.0 Comparisons made with ANOVA for interval scale variables	Most of the staff felt the EMR improved their quality of work and improved the safety for the patient.	Questionnaire author developed- questionable limited mention of type EMR programs present in each facility, hard to discern similarities b/t EMR

Appendix L – Cost Benefit Analysis

**Budget - EMR
Implementation**

Month/Year:

Fiscal year 2013

SUMMARY	ACTUAL	BUDGETED	OVER BUDGET	UNDER BUDGET	
<i>Total income</i>	1,600,000.00	1,600,000.00			By end of fiscal year 2013/2014
<i>Total expenses</i>	646,500.00	641,000.00	5,500.00		Start up fees
<i>Income less expenses:</i>	0.00	959,000.00		-959,000.00	
INCOME DETAILS	ACTUAL	BUDGETED	OVER BUDGET	UNDER BUDGET	NOTES
<i>Reimbursement Revenue</i>	0.00	1 600 000			Reimbursement from CMS for first attestation
<i>Total income:</i>	1 600 000				
EXPENSE DETAILS	ACTUAL	BUDGETED	OVER BUDGET	UNDER BUDGET	NOTES
<i>Product Cost</i>	237,000.00	240,000.00		3,000.00	Our portion of cost - 2013
<i>Labor- Clinical Leader</i>	0.00	0.00		0.00	Part of regular duties
<i>Labor- Nurse Informatics Dept</i>	205,000.00	180,000.00	25,000.00		Additional assistance needed
<i>Labor- Super users</i>	80,000.00	88,000.00		8,000.00	Reduction of Hours
<i>Publicity</i>	0.00	5,000.00		-5,000.00	Absorbed by facility operations
<i>Training</i>	124,500.00	128,000.00		-3,500.00	Some departments required less training
<i>Miscellaneous Expenses</i>	0.00	0.00			
<i>Total expenses:</i>	646,500.00	641,000.00	5,500.00		

Appendix M- IRB application

**University of San Francisco
School of Nursing and Health Professions
DNP Department**

DNP Project Approval: Human Subjects Protection

(Non-research Status Form)

Title of DNP Project: **Implementation plan for EMR and beyond**

Brief Description of Project: **Develop and share an implementation plan for electronic medical record development but that will be sustainable for continued growth as we progress through not only the stages of meaningful use but through any type of innovation**

Name of DNP Student: **Lori Katterhagen**

To qualify as a QI/ Process Improvement Project, rather than a research project, the criteria outlined in federal guidelines will be used: (<http://answers.hhs.gov/ohrp/categories/1569>)

This project meets the guidelines for a Quality Improvement Project as outlined in the Clinical Quality Improvement Checklist (attached)

This project involves research with human subjects and must be submitted for IRB approval

Comments:

Signature of DNP Committee Chair _____ (date)

Signature of DNP Program Coordinator _____ (date)

CLINICAL QUALITY IMPROVEMENT CHECKLIST *

STUDENT NAME: Lori Katterhagen

DATE: 12/11/12

DNP COMMITTEE CHAIR: Dr. Elena Capella

Instructions: Answer YES or NO to each of the following statements about QI projects:

Project Title:	YES	NO
The aim of the project is to improve the process or delivery of care with established/ accepted quality standards, or to implement change according to the agency Quality Improvement programs. There is no intention of using the data for research purposes.	X	
The specific aim is to improve performance on a specific service or program and is a part of usual care. ALL participants will receive standard of care.	X	
The project is NOT designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does NOT follow a protocol that overrides clinical decision-making.	X	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does NOT develop paradigms or untested methods or new untested standards.	X	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does NOT seek to test an intervention that is beyond current science and experience.	X	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	X	
The project has NO funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	X	
The agency or clinical practice unit agrees that this is a QI project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	X	
If there is an intent to, or possibility of publishing your work, you and your DNP Committee and the agency oversight committee are comfortable with the following statement in your methods section: <i>“This project was undertaken as a Quality Improvement Initiative at X hospital or agency and as such was not formally supervised by the Institutional Review Board.”</i>	X	

ANSWER KEY: If the answer to ALL of these items is yes, the project can be considered a Clinical Quality Improvement activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

* Used with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.