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Electronic Medical Record in the Simulation Hospital: Does It Improve Accuracy in Charting Vital Signs, Intake, and Output?

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ABSTRACT

ELECTRONIC MEDICAL RECORD IN THE SIMULATION HOSPITAL: DOES IT IMPROVE ACCURACY IN CHARTING VITAL SIGNS, INTAKE, AND OUTPUT?

The introduction of electronic health records has created a shift in the way nursing care is delivered (McBride, Delaney, & Tietze, 2012; Furukawa, Raghu, & Shao, 2010). A factor which heavily influences a nurse's ability to navigate and utilize EMR is adequate education in the use of computerized documentation (McBride, et al., 2012). There is an increased risk for error at the bedside without the correct knowledge and skills regarding EMR documentation (Kelly, Brandon, & Docherty, 2011). This skill should be introduced during the pre-licensure education of the nurse.

Two groups of associate degree nursing students attending a small community college in Northern California were examined to determine if introduction of EMR in the simulation hospital increased accuracy in documenting vital signs, intake, and output. The first group of students charted using paper- pencil during simulation; the second group used an academic EMR. Each group was evaluated during their preceptor rotation at two local inpatient facilities. Registered nurse preceptors provided information by responding to a 10 question survey regarding the use of student EMR documentation during the 120 hour preceptor rotation.

The implementation of the EMR into the simulation hospital, although a complex undertaking, provided students a safe environment in which to practice using technology and receive feedback from faculty regarding accurate documentation.

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ELECTRONIC MEDICAL RECORD IN THE SIMULATION HOSPITAL: DOES IT IMPROVE ACCURACY IN CHARTING VITAL SIGNS, INTAKE, AND OUTPUT?

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TABLE OF CONTENTS

Page

LIST OF TABLES iv
LIST OF FIGURES v
CHAPTER 1: INTRODUCTION 1
CHAPTER 2: LITERATURE REVIEW 11
CHAPTER 3: Methodology 15
CHAPTER 4: RESULTS 37
CHAPTER 5: CONCLUSION 52
REFERENCES (WORKS CITED) 57
APPENDICES 70
APPENDIX A: OPEN SOURCE EMR COMPARISON 71
APPENDIX B: ACADEMIC EMR COMPARISON 79
APPENDIX C: STUDENT CHART AUDIT 83
APPENDIX D: PRECEPTOR SURVEY GROUP 1 85
APPENDIX E: PRECEPTOR SURVEY GROUP 2 88
APPENDIX F: STUDENT SURVEY 92
APPENDIX G: STUDENT COMMENTS 95

LIST OF TABLES

Page

No table of contents entries found.

LIST OF FIGURES

Page

No table of contents entries found.

CHAPTER 1: INTRODUCTION

The face of health care in America is changing rapidly. Not since 1965 and the introduction of Medicare and Medicaid has the landscape shifted so dramatically (IOM, 2010). Nurses, at 3.1 million strong, need to be prepared to deliver safe, effective, and cost efficient care. The way in which this can be accomplished is by instilling competencies in the areas of patient centered care, teamwork and collaboration, evidence based practice, quality improvement, safety, and informatics (QSEN, n.d.; Buckner & Gregory, 2011).

The American Recovery and Reinvestment Act of 2009 included financial incentives for health care providers to adopt and provide meaningful use of electronic health records (Gardner & Jones, 2012; McBride, Delaney, & Tietze, 2012; Spencer, 2012; Guevara, Schwartz, Ladiere, & Sumrell, 2010; Taylor, Hudson, Vazzano, Naumann, & Neal, 2010). The implementation date, originally set by President George Bush for 2010, was extended for implementation until 2014 (Johnson & Bushey, 2011; Mahon, Nickitas, & Nokes, 2010). Nurses represent the largest number of health care workers and will be intimately involved as users of the new documentation technology (McBride, et al., 2012; Hwang & Park, 2011; Waneka & Spetz, 2010; Kossman & Scheidenhelm, 2008). A key component to the successful use of EMR is adequate education of the upcoming nursing workforce and the development of technology skills and competencies to effectively provide care that continues to be safe (Bowers, Kavanagh, Grecorich, Shumway, Campbell, & Stafford, 2011; Fetter, 2009).

The health care technology explosion has already begun. In 2009 just nine percent of eligible hospitals were using meaningful EMR, but by the year 2013 that number had risen to 80% (HSS Press Release, 2013). The target audience for

implementation is physicians and hospitals, with little focus on the need for nurses to understand and utilize the electronic documentation systems that have been installed (Furakawa, Raghu, & Shao, 2010; Waneka & Spetz; 2010). In the early phases of national Health Information Technology (HIT) planning, nurses were not part of the discussion (Walker, 2010). From this concern, the Technology Informatics Guiding Education Reform (TIGER) was developed. Because nursing represents the largest group of health care workers and provides round the clock care to patients, the use of EMR is an integral part of the nurses' daily routine (Stevenson, Nilsson, Petersson, & Johansson, 2013; Kelly, Brandon, & Docherty, 2011). Hospitals are still the primary workplace for nurses and as such, nurses have a substantial impact on information that affects patient outcomes (Waneka & Spetz, 2010; Kossman & Scheidenhelm, 2008). As the transition to electronic health documentation continues to evolve, nursing, as a group, must be active participants in shaping the use of EMR and become strategic players in the realization of this technology.

Nurses, as meaningful users, must accept the call and embrace technology (Gardner & Pearce, 2013; Walker, 2010). To this end, nursing education must keep pace with the changes in the hospital environment, provide adequate instruction on the proper use of this technology, and begin this training in the pre-license arena (Gardner & Jones, 2012; Spencer, 2012). Lack of adequate education on the use of EMR can lead to a decline in patient safety or increase the risk of medical complications (Buckner & Gregory, 2011; Furakawa, et al., 2010). For this reason, EMR education should begin during the pre-licensure education of the nurse.

In 2005 the Robert Johnson Wood foundation initiated the Quality and Safety Education for Nurses (QSEN, n.d.) competencies which address gaps in nursing

education with a focus on quality and safety (Buckner & Gregory, 2011; Lucas, 2010; QSEN, n.d.). One of the gaps identified is the use and preparation of pre-licensure students in the area of technology (Cronenwett, Sherwood, Barnsteiner, Disch, Johnson, Mitchell, Sullivan, & Warren, 2007). In 2006 the Technology Informatics Guiding Educational Reform summit was held in a first ever effort to integrate technology into nursing practice. One hundred nursing leaders came together to design a 10 year vision and 3 year global action plan, now known as the TIGER initiative (TIGER, n.d.). One key component of the action plan was for integration of informatics competencies into curricula and the nurturing of innovation in order to make this happen (Walker, 2010). According to the American Nurses Association Nursing Informatics Scope & Standards of Practice (2008), nursing informatics includes the use of technology to support all areas of nursing to improve the health of populations, families, and communities. To stay in line with the competencies as designed by QSEN, nursing students will need to learn about utilization of the EMR, including access at point of care, communication across the disciplines, and the strengths and limitations of using technology in the health care environment (Mahon, et al., 2010). Students should graduate from nursing programs with knowledge and skills to be deemed proficient in computer literacy including the use of technology in the clinical area (Bowers, et al., 2011).

Currently, the integration of this technology as part of the nursing education curriculum is limited (Gardner & Jones, 2012). Despite this need, nursing schools have relied on hospitals for training and education in this area. A key concept is the awareness that limited knowledge of health informatics technology (HIT) is a barrier for adoption and integration (Waneka & Spetz, 2010). Using informatics competencies in nursing education would ensure that future nurses would

understand the strengths and limitation of the electronic health record and would feel comfortable using it during patient care (Buckner & Gregory, 2011; Mahon, et al., 2010).

As technology has unfolded, nursing education methodology has come under increasing scrutiny (Fetter, 2009). The need to prepare future nurses to join a workforce that is progressively more reliant on technology has become increasingly the focus of academic discussion (Bowers, et al., 2011). It is necessary to bridge the gap between theory and practice; to do this modern technology must be used to complete this goal (Morgan, Cleave-Hogg, Desousa, & Lam-Mcculloch, 2006).

Restrictions in the clinical area, including increasing regulations, inability of students to access patient records, and dwindling clinical opportunities, have motivated nursing educators to utilize simulated clinical experiences as a teaching tool for clinical care (Bensfield, Olech, & Horsley, 2012; Schoening, Sittner, Todd, & 2006). Simulation can provide a safe environment for students to learn skills and gain confidence (Ogilvie, Cragg, & Foulds, 2011). The informatics competencies, as outlined by QSEN, are a natural fit for students already caring for either high fidelity or low fidelity simulators (QSEN, n.d.). Skills listed for this competency include EMR documentation and patient care planning in the EMR (Cronenwett, et al., 2007). The experience of simulation allows students to practice point of care documentation in real time, exactly as it is done in the hospital. It is the additional piece of the clinical picture that creates a realistic environment, mimicking the hospital in every way. Allowing students the opportunity to practice with this technology will ultimately increase their ability to relate to real patients because they will be able to focus, not on the technology, but on the person who is before them (Jones & Richards, 2013).

The need for educational reform and the quickly changing health care environment set the backdrop for a DNP project aimed at addressing the need for integration of electronic medical record instruction into the final semester of an associate degree nursing program. Informatics, specifically the accurate use of EMR, cannot be taught with the traditional methodology of classroom instruction. Nursing faculty must institute a hands-on, applicable approach to integrating technology into the curriculum so that students will chart meaningful data that is accurate (Lucas, 2010; Mahon, et al., 2010). Understanding of EMR and real-time patient data entry is an important competency for graduate nurses (Spencer, 2012; Bowers, et al., 2011). Because nursing care is provided 24 hours a day, the documentation by nurses provides a glimpse of the totality of care that patients receive (Green & Thomas, 2008). By transforming the current curriculum and adding informatics competencies, graduating nurses will be safe, knowledgeable, and prepared to provide complex care that includes use of technology (Preheim, Armstrong, & Barton, 2009).

Teaching in nursing has become more complex (Benner, Sutphen, Leonard, & Day, 2010). The reasons for this include lack of clinical sites, increased regulations on what students can do in the clinical area, and increased technology (Traynor, Gallagher, Martin & Smyth, 2010). All of these factors limit student access. Students must now have codes to deliver medications, access the EMR, and perform blood glucose point of care monitoring. There is little room for independent work as the student must either be accompanied by the instructor or primary nurse while employing these technologies. Because of this, nursing curriculum must be adapted to reflect the changes in the health care environment in order to prepare students for work after graduation (Waxman, 2010; Waldner & Olson, 2007). Incorporation of technology into the simulation hospital provides a

venue for nursing instructors to influence future nursing care and therefore impact clinical outcomes (Traynor, et al., 2010; Jenkins, Blake, Brandy-Webb, & Ashe, 2011). Documentation of nursing care assists nurses to continually evaluate and reflect about the care they are providing (Baille, Chadwick, Mann, & Brooke-Read, 2012; Kelly, et al., 2011; Mahon, et al; 2010). As nursing documentation moves to utilize electronic means, instructors will need to assist students in understanding how to navigate and integrate EMR into their practice (Gardner & Jones, 2012; Spencer, 2012).

The capstone project completed was to integrate EMR into the fourth semester simulation hospital of a rural associate degree nursing program and evaluate the effectiveness of this instruction on the performance of the student nurses in the clinical environment. This would be the first step in the integration of EMR technology which would assist the program in meeting the QSEN informatics competency.

For the past several years, the fourth semester students at a small community college in Northern California used paper-pencil charting for documenting the care they provide to complex simulated patients. When in the local hospital, paired with a preceptor for 120 clinical hours, they are expected to use the EMR currently in use at that facility. There is little to no practice time where the student can work with electronic documentation. Providing students with an environment that is low stress and mimics real world experiences can potentially provide a learning experience that is transferable to clinical practice (Jones & Richards, 2013; Haugen, 2012; Nickerson, Morrison, & Pollard, 2011). Pairing EMR use and practice with simulation provides the student an environment where it is safe to give care and practice information technology skills, all with no risk to patients (Morgan, et al., 2006). By practicing real life scenarios in such a protected

environment, the student can more easily incorporate the necessary competencies allowing them to create intuitive routines that are easily accessed during similar clinical experiences (Debourgh, 2011; Nickerson, et al., 2011; Baldwin, 2007).

Theoretical Framework

Storytelling has been part of education since long before there was the written word (Gazarian, 2010). People learn from telling and hearing stories (Stranieri & Yearwood, 2008). Narrative accounts provide the backdrop for what we know and how we process information (Schank & Berman, 2006). By hearing and reciting stories we store and process information in a different way. A narrative aids in helping students to remember by involving them in the action and reaction that is necessary (Starnieri & Yearwood, 2008). Much of the educational process begins with a narrative that is applicable to real life. To provide an education that goes beyond theoretical learning, instructors must create and make available stories that students participate in and will remember (Hsu & Moore, 2010; Schank, 2002). For a profession such as nursing, where intuitive thinking is required, using stories to provide the backdrop for learning is a natural transition. Narrative pedagogy provides a framework to develop reflective and interpretive thinking (Gazarian, 2010; Ironside, 2006; Schank & Berman, 2006) necessary to function as a nurse.

Limited clinical placements and lack of access have pressed nursing educators to consider additional learning activities to provide students with the opportunity to develop a deeper understanding and link the knowledge gained in theory with the clinical environment (Nielsen, Noone, Voss, & Mathews, 2013). This is where simulation has filled a gap between theoretical concepts and actual practice (Jenkins, et al, 2011; Morgan, et al, 2006). Creating realistic situations in simulation provides the basis of developing a story where the student plays a key

role, thus cementing the concepts learned during the enactment (Billings & Halstead, 2012; Baldwin, 2007). When the student is the major player in the scenario, the importance of their role cannot be overlooked. This is what leads the student to recognize the significance that they play in the care and well-being of the patient.

Cognitive Learning Theory provides the starting point at which one can begin to formulate the necessary ingredients to create effective simulations. This theory purports that learning is achieved through a variety of meaningful, appropriate experiences that allow the learner to discover concepts for themselves (Billings & Halstead, 2012; Butts and Rich, 2011). Learners perceive and store information differently when they are active participants. Because of this, the instructor must also be involved, recognizing how the learning is perceived and providing feedback and guidance so that adjustments can be made (Billings and Halstead, 2012).

Roger Schank (2002) has taken these constructs one step further in providing a framework for learning that is based on storytelling. Goal-based scenarios (GBS) focus on learning by doing; incorporating strategies that mimic the workplace and provide learners the actual hands on experience in story format to assimilate their learning (Schank & Berman, 2006). Instructors guide the student during the experience and provide feedback; turning the scenario into a story to be internalized and validating the understanding of the learner (Hsu & Moore, 2010). In the simulated hospital, where students are able to care for a patient who has a history and personality, the student is able to take the situation, relate it back to theory learned in the classroom, and later utilize the experience to provide more effective care to actual living patients (Stranieri & Yearwood, 2008). This is the idea that drives case based scenarios and cognitive learning theory; knowledge

gained through experience stays with a person far longer than learning for the sake of testing (Hawkins, Todd, & Manz, 2008). Providing this type of learning milieu allows students to practice concepts that will fine tune their communication and clinical skills (Morgan, et al, 2006). For stories to provide the knowledge that is necessary, students must interact with other players; the student must play a role that they intend to play in real life (Schank, 2002).

This is the heart of real learning: a setting that mimics the work experience, forces the students to think for themselves, and turns the teaching into a life lesson. The simulation hospital provides the perfect location to apply the educational theory of storytelling. In this way, the backdrop is set for the learner to become a capable practitioner. All of this can be accomplished in a supportive place, without fear of causing injury or death, where students are allowed to discuss their mistakes, process what has occurred, and reflect on what correction could have been made (Brewer, 2011; Kyle & Murray, 2008).

Since nurse educators have embraced the clinical simulation as part of the curriculum, students have shown an increase in confidence for subsequent clinical practice (Ogilvie, et al., 2011; Jarzemsky & McGrath, 2008). The gap between what one learns in the classroom and what one does during the clinical day can be lessened, as theory moves into the simulation environment and experiences can be paired with what is taught in the classroom. Students are able to assume care for high risk patients with complex problems and treatments, care for them in a setting which promotes learning, and go forward to practice effectively in the real world of nursing (Holland, Landry, Mountain, Middlebrooks, Heim, & Missildine, 2013; King, & Reising, 2011).

Nursing education must be dynamic in order to keep up with the amount of change happening in the world of health care. It is important for faculty to provide

experiences that prepare students for the quickly changing clinical environment (Ogilvie, et al., 2011; Schoening, et al., 2006). Incorporating educational theory by using effective simulation storytelling techniques will ultimately lead to new graduate nurses who are more confident in their practice and better equipped to provide the complex care necessary in the hospital today. The use of simulation to introduce EMR documentation provides a venue in which students can evaluate their decision making and how they recorded their care of the patient with no fear of harm (Baldwin, 2007). This enhances clinical performance by letting the student learn in a safe place, incorporate the necessary skills for practice, and obtain guidance from faculty as they participate in the unfolding stories of the simulation hospital (Ogilvie, et al., 2011; Traynor, et al., 2010; Schoening, et al., 2006).

CHAPTER 2: LITERATURE REVIEW

In the past ten years the need to incorporate technology into the nursing curriculum has been encouraged from several sources (Gardner & Jones, 2012; Spencer, 2012; Fetter, 2009). Hospitals and other health care agencies have been instructed to implement EMR by the year 2014 (Gardner and Jones, 2012; Kelly, Brandon, & Docherty, 2011; NLN, 2008). As that date approaches and more facilities convert to the electronic data record keeping system, nursing curriculum lags behind in adding this component as part of the instruction (Curry, 2010; Gardner & Jones, 2012; Spencer, 2012). Multiple factors come into play as the reason behind this disconnect, but lack of information technology (IT) skills on the part of faculty is a central component of this problem (Gardner & Jones, 2012; Spencer, 2012; Curry, 2010; Taylor, et al., 2010). Two studies indicate that nurses overall feel that they lack competency in computer applications and have had little to no formal education in this area (Fetter, 2009; Hywan & Hyeown, 2011). The integration of computer skills, including EMR, will be a necessary component of future nursing curricula (Spencer, 2012; Lucas, 2010; Fetter, 2009; Thompson & Skiba, 2008). Further, to fully integrate information technology, particularly EMR into the curricula, there should be a partnership between academia and clinical practice (Bowers et al., 2011; Lucas, 2010).

Research on the topic of EMR implementation, specifically in the simulation environment, is limited. Several searches of CINAHL, OVID, and Cochrane Library, using multiple combinations of terminology, resulted in only six studies which focused on use of EMR in the simulation setting. Several combinations of key words were used. The search terminology included Electronic Medical Records, Electronic Health Records and Simulation. Of the

six articles found that dealt directly with EMR implementation in the simulation environment, three focused on how to integrate EMR into the nursing curricula (Gardner & Jones, 2012; Spencer, 2012; Taylor et al., 2010), two were about partnering with health care systems to institute the EMR (Bowers et al., 2011; Lucas, 2010), and one discussed how to purchase and implement an EMR system (Curry, 2010). One additional article considered using case studies and then having the student chart the assessment findings and other pertinent data in the academic EMR (Johnson & Bushey, 2011). None of these studies focused on student learning as a result of EMR in simulation or patient outcomes improvement related to accurate EMR documentation. Two articles focused on student learning: one evaluated using an academic EMR in the clinical area, specifically in the home care environment, with a group of senior baccalaureate nursing students (Jones & Richards, 2013), and one article appraised graduate nurses' perception of their information technology competency (Fetter, 2009).

Six additional studies were located which focused on nurses' perception of EMR in clinical practice. Of these six, three literature reviews were found which discussed the electronic medical record based on nursing experience, how it affects nursing care, work efficacy, and quality outcomes for practicing nurses (Kelly, et al., 2011; Stevenson, et al., 2010; Thompson, et al., 2009). The other three studies examined nurses' perception of the EMR including satisfaction (Moreland, Gallagher, Bena, Morrison, & Albert, 2012), strengths and weakness of the EMR for documenting clinical events (Carrington & Effken, 2011), and patient safety (Stevenson & Nilsson, 2011). Only one study compared the documentation of EMR with paper pencil, with an emphasis on charting of pressure ulcers (Li & Korniewicz, 2013). This study suggested the use of simulation to improve wound documentation. A study that must be included for

consideration examined the nurse-patient relationship when an EMR was being used. The study focused on the patient, their feelings, and the impact that the computer has on the therapeutic relationship (Strauss, 2013).

Although the need for EMR integration has been clearly established (Walker, 2010), there are few resources or clearly defined plans that may act as a guide (Lucas, 2010; Taylor et al., 2010; Thompson & Skiba, 2008). There is evidence that suggests that the EMR will drastically change how nursing is practiced (Strauss, 2013; NLN, 2008). Therefore, studies on how this can be accomplished and the impact on patient outcomes must be undertaken.

The clinical environment is a place where nursing students have traditionally learned to practice (Nielsen, et al., 2013). With the lack of clinical placements, the changing regulations, and the acceptance of simulation as a learning methodology (Bensfield, et al., 2012; Jenkins, et al., 2011) the use of an academic EMR is a natural addition to the scholastic arena. Practicing in an environment where there is no harm to patients, students feel a decrease in stress and are able to develop and carry out important skills. The incorporation of EMR in simulation assists in meeting the QSEN competency requirements, and ultimately helps to integrate accurate documentation into the graduating students practice. Nurse educators can provide an opportunity for students to practice with technology in an academic environment. This is accomplished by using unfolding case scenarios and having the student chart in “real time” (Spencer, 2012; Jenkins, et al., 2011). Embracing the EMR and using stories to present this technology provides a perfect venue for nurse educators to prepare future nurses for practice in a technology rich health care environment (Spencer, 2012; Lucas, 2010). Developing competency enables the students to move comfortably into a client-centered, computer-focused workplace (Jones & Richards, 2013).

Nursing documentation is the story of the nurse-patient interaction (Plemmons, Lipton, Fong, & Acosta, 2012). When students incorporate the story of the patient and document that narrative, they think through, internalize, and interpret patient care (Bowers, et al, 2011; Ironside, 2006; Shank & Berman, 2006). To this end, the use of EMR in a simulation environment will assist students to a higher level of thinking, develop more accurate documentation, and increase efficacy in providing care (Taylor, et al., 2010). The lack of evidence that practice with EMR in a simulated environment could improve accuracy in charting lead to the development of this project.

CHAPTER 3: METHODOLOGY

At the inception of this project, there was no EMR in the simulation hospital. A few of the Associate Degree Nursing faculty at the College had tried to use another academic EMR without success. In two previous semesters, the students paid to use the software, but the program proved so cumbersome that the implementation was abandoned. Because of this experience there was little interest in using an academic EMR. Finding a program that would be easy to use, provide the necessary resources for students and faculty, and also be cost effective was necessary to reignite the curiosity of the faculty. To meet this need, the researcher first had to explore possible software that could be used in the simulation hospital. This step involved investigating the different types of EMR that were available. These EMR would be evaluated, compared, and presented to the faculty for consideration. The decision regarding which EMR to select had to be accepted by a majority of the associate degree faculty, as they would be the primary users. For true implementation into the curriculum to take place, nursing faculty must embrace the technology and feel comfortable not only using EMR but instructing students to proficiency (Spencer, 2012; Mahon, et al., 2010; Taylor, et al., 2010).

At the time of this project's conception, the simulation hospital was in its infancy, having just metamorphosed from a three bed unit to a fully functioning six bed unit. Paper health records were still being utilized and mimicked one of the local hospitals intermediate care documentation. This local facility had tried unsuccessfully to implement EMR and had returned to using paper-pencil. During the conversion of the simulation hospital to EMR, this facility also implemented a new electronic health record system. The other two major facilities

used for student clinical rotations had already converted to EMR, although each hospital uses different software. Students spend their entire second semester at one of the hospitals where they experience using Meditech, which has been in place for five years.

In the simulation hospital, all documentation was completed using paper-pencil. The lab values for patients had to be delivered by hand, communication with pharmacy was by telephone, and physician's orders were taken down on paper and transcribed to the medication administration record (MAR).

Choosing the EMR

Evaluating an appropriate choice in any new technology takes time and commitment (Weinstein, 2012). Having a strategic plan for the incorporation of new technology can provide a basis for choosing and incorporating the system for functional use (Pitcher, 2010; Green & Thomas, 2008). Ball, Weaver, and Kiel (2010) recommend the following five steps be used when creating a strategic plan: (a) define why the plan is being put in place, (b) assess how well the IT currently in place supports the existing needs, (c) develop the plan, (d) evaluate options to determine success, and (e) formalize how the strategic plan will be put into place. All too often these steps are disregarded and information systems are chosen for reasons of convenience or lack of knowledge of available products.

The decision to adopt an electronic medical record system into the simulation hospital was motivated by current health care practices. The mandate on hospitals and other health care agencies to implement an EMR system by 2014, coupled with the Technology Informatics Guiding Education Reform initiative has pushed nursing schools to consider methodologies for staying current in this area (Gardner & Jones, 2012; Fetter, 2009). It is important for student nurses to have the opportunity to develop competency in electronic charting during their education

(Fetter, 2009). For this to happen, an EMR must be selected, installed in the simulation hospital, and then used by the faculty to instruct and assist students in the acquisition of documentation skills.

Although the inclusion of a simulated EMR will benefit students, the complexity of choosing, implementing and using a system requires a clear analysis and a possible overhaul of current employee practices (Weinstein, 2012). Everyone who is affected must be committed to the system chosen, and administration needs to be aware of the time obligation and effort that will be required to make this a viable part of the curriculum (Pitcher, 2010; NLN, 2008). A key element to success was to enlist the support of the stakeholders; all involved faculty and the clinical skills lab coordinator, and then encourage feedback about how implementing this technology will impact the flow of work and/or the use of the simulation hospital (Curry, 2011; Pitcher, 2010). Simply putting a program in place is not enough to create a viable teaching tool. It is the inclusion of the faculty combined with their acceptance and enthusiasm that will ultimately determine the learning outcome of this new technology (Gardner & Jones, 2012; Curry, 2011; Taylor et al., 2010).

Using electronic documentation systems in hospitals is most widely accepted by nurses when the technology is useful and there is a perception that it is easy to use (Waneka & Spetz, 2010; Kossman & Scheidenhelm, 2008). This would be the same in the simulated hospital: nursing instructors and students will benefit the most from a system that is user friendly and provides the teaching-learning benefits that most improve student outcomes (Gardner and Jones, 2012; Hwang & Park, 2011).

The selection of an EMR should be based on several factors. These include ease of use, ability to adapt scenarios for optimum learning, and similarity to

systems used in the actual clinical environment (Weinstein, 2012; Curry, 2011; Eisenberg, 2010). Cost must be taken into account (Weinstein, 2012; Curry, 2011), whether the cost is borne by the student or the institution. Considering resources as an overall part of the strategic plan will assist in implementing a product that will be able to be utilized over the course of time (Ball, et al., 2010). The system chosen must be able to interface with the computers on wheels purchased by the school. Using an internet based system would allow the students to complete online learning assignments, view charts during class, and allow instructors to pull up data in class for teaching activities. This is an important aspect because it can allow instructors to bring together theory and clinical, thus assisting the student to transfer learning from the classroom environment to the work place (Schank & Berman, 2006).

Open Source verses Academic EMR

When considering possible EMR systems for the simulation hospital, there were two possible routes that could be taken. The first was using an Open Source software. This type of system is developed for use by anyone and is most often free (Webster, 2011). Four possible open source EMR's were reviewed (see appendix A). The top four were evaluated and presented to faculty. These include Hospital OS, developed by Thailand, VistA, developed by the Veterans Administration in the United States, OSCAR, developed by Canada, and GNU Health developed by a non-profit, non-governmental agency (Webster, 2011). Although created for hospitals or clinics, they are also in use by schools. These operating systems are free but must be modified in order to meet the scholastic needs of the students (Shah, Rajgor, Predhan, McCready, Zaveri, & Pietrobon, 2010). Each of the systems reviewed would need to be adapted to the needs of the

simulation hospital. This would be an added cost to the college, but would have no impact on the students.

The second consideration was to use an academic EMR. Few academic EMR systems have been designed (Curry, 2011). As of this writing, there are three that are offered by academic learning organizations. The first is SimChart, formerly known as Nursesquared, which is offered by Elsevier. A second consideration is DocuCare by Lippincott. Most recently SimEMR, created by an independent company of the same name, has been released. All of these programs are designed for use in nursing programs, which makes them academically friendly. Having been created for the purpose of education, it is easy for institutions and instructors to load the selected system and begin using it. Each system is designed to run on the internet, so the technology could be accessed in the classroom, in the simulation hospital, or as a homework assignment for the students (See Appendix B).

Faculty Readiness

In late May of 2012, as the faculty was preparing to leave for the summer, a representative for SimChart presented this product for consideration. The faculty had previously tried to implement Nursesquared with poor results. The time necessary to upload data and the poor accessibility of the information were greater roadblocks to adoption than any one realized at the time of purchase. The product was cumbersome for faculty when attempting to input patients and students found it difficult to navigate through the program. This product, although designed for schools, was a poor fit for the needs of the students and the simulation hospital and therefore was underutilized. For a product to be successful it must “fit” the need of the users (Eisenberg, 2010; Thompson, et al., 2009; Kossman & Scheidenhelm, 2008). Faculty, although enthusiastic about the idea of using EMR in conjunction

with simulation, did not have a clear vision of how these technologies would interface or complement each other. Faculty resistance to integration of EMR into the curriculum continues to be a troublesome stumbling block (Taylor, et al., 2010). The willingness of faculty at this institution to consider adoption of the EMR in any format shows a readiness that is not present in all schools of nursing (Gardner & Jones, 2012).

Although the faculty embraced the idea of an electronic health record in the simulation hospital, the work to develop and implement this project was a hindrance. Faculty feared spending many hours of preparation, developing patient scenarios, only to find that this program was as cumbersomeness as the one tried previously. Faculty from the first three semesters did support the instructors who would be piloting the electronic medical record, but wanted to see the outcome before embracing the technology themselves.

Decision and Implementation

Before the end of the spring semester in 2013, faculty agreed that DocuCare by Lippincott (DocuCare) would be the most sensible choice for the program. This was based on ease of use to create original scenarios, the 151 pre-loaded patients, and relatively low cost to students. The clinical skills lab coordinator was active in assisting the researcher to gather information and review possible EMR candidates for use in the simulation hospital. She was supportive of DocuCare and this assisted with the buy-in from faculty. To assist with the decision regarding choice of academic EMR, tutorials from each of the products considered were reviewed and links sent to all faculty. These tutorials assisted in the decision making and helped determine best fit.

During the summer, all faculty were provided access to the DocuCare software. Only the researcher and the skills lab coordinator actually used the

program, loading nine original patient scenarios into DocuCare for use in the fall semester. The co-instructor, who teaches in the simulation hospital, showed interest and as school approached spent time with the researcher in learning some basics about the program. Although the program was somewhat self-explanatory, the researcher spent a considerable amount of time reviewing the downloaded manual that accompanied the program. This was done prior to attempting to set up the first patient. The researcher was very familiar with the patient scenarios, having worked with them for some years before this, and also having assisted with their development. A patient was handpicked who would be simple to upload to the EMR. The first patient entered, Steven Joplin (Redd & Mountain, 2013), was chosen because of his diagnosis of pneumonia and his three medication orders, which could easily be transcribed.

At first consideration, entering patient data would seem like an easy task. While progressing through the different screens, the entire patient is created. This includes developing a patient history, admission data, primary disease process and in some cases a secondary disease process, physician admit orders and admission charting. Making sure that each event follows the correct time line can be complex. The researcher used event sheets (See Appendix G) that had been developed previously, which provided details regarding the patient scenario including lab values, vital signs, and physician orders. The event sheets represent the unfolding simulation and provide a framework for the scenario manager (operating the simulation patient and the control area). Over the course of June and July the researcher uploaded the remaining eight patients and created an orientation patient and exercise that could be used by faculty or student to familiarize themselves with the DocuCare program (see Appendix H).

First Survey Sent Out

A ten question survey designed to evaluate the accuracy of student charting was sent via email to 34 preceptors on August 11, 2013 (see Appendix D). The survey, which consisted of ten questions, asked the preceptor to evaluate the documentation competency of the preceptees from the previous semester which ended on May 24. The survey was sent every Sunday for the next four weeks. Preceptors were asked to respond before the closing date of September 10, 2013. This date was chosen due to the next clinical rotation, which would begin on September 16 and the researcher did not want the preceptors confused by who did what in which group. Of the 34 preceptors, 23 responded by the completion date.

Electronic Medical Record in the Simulation Hospital

The EMR was introduced to the students during the Sim Fair, an event that happens early in the semester, where students are provided the opportunity to practice clinical skills, review important clinical concepts, and work in areas where they feel deficient. The Sim Fair also provides a venue for instructors to see the clinical skills of students before they go to preceptorship and identify if students need remediation. During the Sim Fair students go into the simulation hospital for a 45 minute orientation. Students need adequate orientation to participate actively and fully in a simulation (Bensfield, et al., 2012). It is during this time that DocuCare, the EMR system chosen, was first presented to the students. A patient named Dierdre Manning was developed (see Appendix H). In addition to receiving report and learning to navigate through the different screens, the students were expected to complete a list of documentation activities based on the case scenario. This receiving of report, reviewing the chart, and completing the necessary charting was structured like the actual events that take place during the simulation experience. The researcher and the clinical skills lab coordinator

were available to answer questions as students worked through the documentation exercise. Students each received a sign on name and password which would be used in the Simulation Hospital but could also provide access for students at home.

On September 13, the EMR was to be used for the first time during an exercise known as Sim Eval. Each student is assigned to provide individualized care for a patient for1 hour. The unfolding patient scenario is presented by means of power point with changing slides providing patient information and updates. All the information the students would need to access was loaded into DocuCare and there were high hopes of simulating the hospital environment.

The first problem came when the students tried to access the system and could not remember their passwords or sign on accounts. This was followed by an inability to access the patient information because of a specific code that had not been pointed out to the instructors. Once these problems were solved it became evident that the students were so caught up in the EMR that they stopped paying attention to the patient. This phenomenon is addressed in the literature, especially when nurses are not comfortable with the technology (Kossman & Scheidenhelm, 2008). The instructors did not feel they were competent to teach the EMR, which compounded the focus on the computers. One of the computers accidentally came unplugged and shut off completely in the middle of the simulation and one of the computers malfunctioned and the screen turned yellow. The use of EMR in this simulation activity had to be abandoned and paper-pencil re-instated so the evaluations could be completed.

A few things became incredibly clear: (a) the instructors still had much to learn about using EMR; (b) students (although often digital natives, meaning they had lifelong exposure to technology) need more EMR practice in order to feel competent; and (c) in spite of the plethora of problems the technology held

promise. The most evident positive was that the software provided an easy way for instructors to go back, review charting, and leave feedback for the students. These setbacks, although frustrating, were not a deterrent and the instructors took them as lessons learned and prepared for the next attempt at using the documentation system. This would come just two short weeks later when the students began their regular clinical rotations. Built into these rotations are two six hour simulations where students care for an individual patient that entire time frame.

Six Hour Sims

Twice during the semester each student has the opportunity to attend a six hour simulation. The students participate in a marathon simulation as part of their regular clinical rotation. All of the students are rotated through the Sim Hospital and then the second Sim Eval takes place. The second opportunity to care for a patient in the Sim Hospital follows the Sim Eval. It was during these six hour simulations that the use of EMR really began to take shape. Many problems occurred during the first round of Simulation Hospital. Instructors realized that creating real time for the students was much more complex than was first understood. Making the stat lab value appear at the correct time was a trick that took much manipulation. There were basic errors with the program, among which included problems entering physician orders. In the hospital, the physician orders are entered and the medication information transfers over to the MAR. In DocuCare the medications had to be entered into the MAR and then they would show up in the doctor's orders tab. This meant that orders had to be entered into the medication record before they would show up in the physician's orders. This alone was quite confusing to students and faculty alike. Also, there was no designated place to record blood glucose monitoring, the vital signs did not show

up on the flow sheet, and real time did not seem to exist. Because of these difficulties, the instructors, on several occasions, considered abandoning the entire project.

A brief meeting was held in an effort to reduce the stress of using the EMR and to devise a method of use that would introduce the technology but with less frustration to students and staff. It was decided that for the first round of six students only half would use the entire DocuCare system for all of their charting. This included recording physician orders, using the medication record and documentation system, accessing lab values, writing a nursing note, recording vital signs and intake and output, and completing the nursing assessment. The other three students would use DocuCare to access lab values and all other charting would be done using paper-pencil. Backing off of the implementation of the EMR created an opportunity for instructors to become more comfortable and confident in using the documentation system.

For the second rotation through the simulation hospital, all six students were able to use the electronic documentation system. The instructors and the clinical coordinator had spent considerable time trouble shooting recurring issues so that they were more equipped to handle the inevitable challenges that occur when using EMR. The faculty was also more confident in their ability to guide the students through the process and understand how to best use the software. The atmosphere was less tense and glitches were met with “Just like the real hospital” instead of the panic of wanting to return to paper-pencil. The instructors and the skills lab coordinator compiled a list of issues which they sent to DocuCare for consideration. Students continued to focus on the computer and not the patient, but now faculty was more prepared for this phenomenon and was able to redirect the students to look at the patient, not just the information on the screen.

Final Surveys

As part of the usual follow up for the clinical class, a questionnaire about DocuCare was developed for students who completed the semester (see Appendix F). This survey was made available to students utilizing Moodle, the interactive educational platform used by the College. The students followed a link to surveymonkey.com where they completed a five question survey, with four of the questions being Likert scaled and one being open ended. All thirty students participated, although only 21 made comments on the final question. The survey opened on December 11 and closed on December 12. This survey provided useful information regarding the students' perception of using an EMR in the simulation hospital. The overall consensus was positive, which allowed the instructors to see the benefit in utilizing this technology. This agreement strengthened the perception that having the EMR as part of the simulation experience would only enhance the students' ability to function better in the actual hospital. Faculty presence and guidance in using the EMR during simulation can help transform the student from novice to competent in using electronic documentation (Mahon, et al, 2010).

The second survey for the preceptors opened on December 11 and stayed open for 30 days (see Appendix E). The survey was sent to 29 preceptors and 15 responded, although one did not complete all of the questions. The survey was sent by email with a link to the surveymonkey.com website. Reminders were sent every week for preceptors to complete the survey. Participation may have been affected by the holidays, which fell in the middle of the survey period.

Project Design/Type of Project

The project design chosen is correlational descriptive (Melynyk & Finout-Overholt, 2012). The goal is to determine if using an academic EMR will increase accuracy in student charting. Correlational studies seek to determine if there is a relationship between two or more variables, thus determining the strength and direction of the relationship (LoBiondo-Wood & Haber, 2006). Since so few studies have been done using academic EMRs, the study becomes descriptive in nature. It is a pilot study to determine whether an academic EMR utilized in the simulation hospital would affect the nursing students charting in the clinical facility. The study is cross-sectional in that the information was collected over two separate one month periods where the survey was available to the preceptors, thus looking at a group of people during a slice in time (Weaver & Goldberg, 2012; Boslaugh & Watters, 2008). This is in contrast to a longitudinal survey where subjects are studied over an extended period of time. For the study to have increased merit, more data, collected from additional semesters, would be necessary.

The selection of respondents was done by convenience sample. The students, who were only assigned to 120 hours of preceptorship during each semester, provided a limited sample for observation.

Setting

The study involved students at a rural community college located in Northern California. Following the implementation of the EMR in the simulation hospital, fourth semester students were evaluated in the areas of charting on vital signs and intake and output. A question about overall competency using EMR was included as part of the survey.

These students spent ten twelve-hour shifts with a registered nurse (RN) preceptor at one of two local facilities. One is an acute care hospital (facility A) and the other contains a long term acute unit (facility B). Both of the facilities use EMR for charting, although the acute care hospital uses Meditech and the long term care facility utilizes HospitalEMR.

The RN preceptors evaluated students from each semester; those who were using paper- pencil charting in the simulation hospital and those who used the academic EMR during the simulation rotation. The focus was on the student's ability to chart vital signs, intake and output. The same questionnaire was distributed for each semester, with only the final question being changed to determine how many preceptors completed both questionnaires. These RN preceptors helped to identify trends in charting and whether students had an increased competency in documentation using the EMR compared with students who only used paper-pencil in the simulation hospital.

Population and Sample

A convenience sample was used. The RN preceptors used in the study do have to meet the requirements of the California Board of Registered Nursing (BRN) qualifications to become a preceptor. These include: (a) an active clear license issued by the board, (b) clinically competent, and meet the minimum qualifications specified in section 1425(e), (c) employed by the health care agency for a minimum of one (1) year, and (d) completed a preceptor orientation program prior to serving as a preceptor (CA BRN, 2014).

The study also involved students at a rural community college located in Northern California. Following the implementation of the EMR in the simulation hospital, fourth semester students were evaluated in the areas of competency charting vital signs, intake, and output.

The participants include three groups: (a) the fourth semester faculty introduced and utilized the electronic medical record in the simulation hospital, (b) the fourth semester students in the Spring and Fall semesters of 2013 who participated in simulation and preceptorship, and (c) the RN preceptors at two local facilities who evaluated students' use of facility EMR during the preceptor rotations. The supervision and support of student practitioners is essential to the development of proficient nurses (Casey & Clark, 2011). For this reason, the RN preceptors were chosen to evaluate the clinical documentation of the student nurses.

The researcher will compare the results of the evaluations done by the preceptors regarding the student use of EMR. By comparing the two sets of results, indicators of improvement may be present. Areas of weakness may be identified as well. These RN preceptors may assist in identifying trends in charting and whether students have an increased understanding of how to chart using the EMR. Demographics of the preceptors will also provide information on who is evaluating the students, including length of time the preceptor has been an RN, how long the nurse has been a preceptor, and the amount of years the preceptor has been using an EMR.

The preceptor sample, although by convenience, was carefully chosen. Participants had to meet the requirements as listed above, which influenced the selection of candidates to receive the survey. Although the preceptor sample is small (38 total participants) it is better to have a well qualified sample than a larger sample that did not fit the profile (Shifflett, 2012).

The sample students were also selected by convenience. Thirty students from each of the two semesters were participants in the study. Thirty students from the Spring 2013 semester did not have access to EMR while participating in the

simulation experience, the thirty students from the Fall 2013 semester had at least some time using this technology.

Investigative Techniques

Documentation completed during simulation was always collected. Students were required to document on all patients that they care for during the six hour simulation. This includes physician orders, medication administration, frequent vital signs, intake and output, assessment information, and nursing notes. During the spring semester of 2013 (Semester 1), the documentation was analyzed by completing a random sampling of ten charts. The analysis reviewed student charting of vital signs and intake and output. Vital sign documentation is a crucial function that nursing is responsible for and can be riddled with errors (Fieler, Jaglowski, & Richards, 2013).

Fifteen random charts completed using paper-pencil documentation were sampled to see if charting on vital signs, intake, and output was complete, partially complete, none completed, or not applicable (when the patient is nothing by mouth- this applies to oral intake only) (Appendix C). Blood pressure was the only category where students charted consistently. This was followed by respirations. Students were not proficient in paper- pencil charting during simulation in the areas of pulse, temperature, oral intake, IV fluid intake, or output. There were many places documentation was absent, indicating that students had not completed the appropriate charting.

In August of 2013, the first questionnaire was sent to the preceptors who participated by having students in the previous spring semester (Semester 1). Students completed their preceptor rotations, which concluded May 20. The focus of this questionnaire was on the students who completed their preceptorship during Semester 1.

The introduction of EMR into hospitals in this Northern California County has occurred for the past five years. None of the three major facilities use the same system, although all systems have some similarities. Students have many levels of computer competency, but the expectation is that they will chart accurately on the records in each of these facilities. Students spend time during the second semester of the program at an inpatient hospital (facility A) that uses Meditech, the EMR in use by the facility. Students are oriented to the EMR at the beginning of the semester in a three hour training. Orientation to EMR is provided at the long term acute care facility (facility B) in two hour sessions, prior to the beginning of their preceptor rotation. Before the students from Semester 2 were expected to use the EMR for documentation in the simulation hospital, an orientation was provided. This orientation consisted of coming into the simulation hospital for 45 minutes, during which time the students received a brief report and were shown how to use certain equipment. Each student was able to work at a computer station and use DocuCare for the assignment provided. Each student was given an orientation sheet (Appendix H) which provided them directions for completion of the orientation exercise. One faculty member and the clinical skills lab coordinator were available to provide guidance and answer questions. Students were informed that they could use the EMR at home as a guide or reference.

Following the completion of the clinical rotation, December 2013, the same questionnaire was sent to the preceptors at both facilities. The questionnaires were open for the same amount of time and the weekly email reminders were also the same as the first group. Students were also asked to complete a questionnaire about their experience using DocuCare.

Instrumentation

Since the topic of EMR in simulation is not well documented, no tool was available for use in this project. A ten question tool was designed to collect the input of the preceptors regarding student use of EMR (See appendix D and E). The first five questions were designed to collect information about the preceptors. Question one requested categorical information and questions 2 through 5 were ordinal scaled. Questions 6 through 9 were Likert scaled and requested the preceptors provide information on their perception of the student's documentation. The tools were exactly the same, except for question 10 which asked the first group of preceptors if they planned to be preceptors in the fall. For the second preceptor survey, the last question asked whether they had filled out the previous survey. This gave an indication of how many preceptors would potentially participate in both of the surveys.

The instrument was designed to study the relationship between accuracy of charting, and the use of paper-based versus EMR documentation in the simulation setting. The use of EMR in the simulation hospital is the independent variable because it is the factor that changed. The dependent variable, what was being measured, was the student accuracy using the EMR in the acute care facility. The main question being sought was whether there is a statistically significant difference between the mean competency level of fourth semester nursing students who use paper pencil charting during simulation and those who use an electronic medical record for documentation during the simulation hospital experience.

The instrument was provided to participants using the surveymonkey.com website. Each question was scored based on information provided by the preceptors. A ten question survey was sent to preceptors of two separate groups. The questions evaluating student use of the EMR were in Likert scale format. The

Likert scale is one of the most common types of questionnaire used in human subject research (Boslaugh & Watters, 2008). The survey featured four choices: never accurate, occasionally accurate, usually accurate, and always accurate (see Appendix D and E). Providing an even number of selections for a survey is known as "forced choice" since the respondent is unable to be neutral in their selection (Boslaugh &Watters, 2008, p.19).

Question one asked for the facility where the preceptor worked. Question ten was different for each questionnaire. The first group was asked if they planned on continuing in the preceptor role for the next semester and the second group was asked if they participated in the first survey. These two questions contained data that was categorical, although it was used as demographic information only.

The survey was tested by allowing several nurses to review for basic understanding. It was also evaluated by a committee of doctorate level nurses for content and clarity. Changes were made based on input from several different individuals to increase clarity of the questions.

Reliability can be measured by Chronbach's alpha which provides a measure of internal consistency (Cronk, 2008). The intraclass coefficient was chosen because of the repeated measure of the same test (Shifflett, 2012). The Chronbach's alpha score of .879 shows internal consistency and stability as indicated by consistency of using the test score over time. This is a measure of data collected from two different surveys and tests for internal consistency. The closer the number is to 1, the more reliable the measure. See table below.

Table 1. RELIABILITY

Cronbach's Alpha	N of Items
.879	7

SPSS, version21

The standard error of measurement (SEM) must be considered in this study as the testing method was through observation (Shifflett, 2012; Boslaugh & Watters, 2008; Jaeger, 1993). As the sample size increases the error decreases so in a study with a small sample estimating confidence intervals is important in determining reliability (Boslaugh & Watters, 2008). The standard error of measurement when calculated is .334 which indicates a good SEM (Shifflett, 2012). This shows consistency of the observations in relationship to the data.

An additional factor which contributed to internal consistency was that the patients in the simulation hospital did not change. The patients that the students charted on, whether using paper-pencil or EMR, stayed the same for their diagnosis, treatments, and medications. The other constant was the adjunct personnel in the simulation hospital. The instructors and adjunct faculty were all the same during the two different semesters.

The internal validity could have been affected by the bias of the participants. Nurses as a whole, want to do what is right, since nursing has ethical and moral underpinnings and the action of the nurse directly affects patient outcomes (Stevenson & Nilsson, 2011; IOM, 2010).

Data Collection

The method of collection was by internet survey using a tool designed on surveymonkey.com. The questionnaire was sent to all 34 preceptors from the Semester 1. Of these, 23 responded. The same survey was sent to the second group of preceptors (Semester 2) on December 11, 2013. There were 29 preceptors who received the email with the link for the survey. Of those contacted, 15 responded. For both groups the survey was sent by email. Only those preceptors with an email address were contacted. Each time the survey was sent out, the preceptors were given thirty days in which to respond. Subsequent

emails with the link were sent out every week encouraging the participation of the preceptors.

At the end of Semester 2, the 30 students who used EMR charting in the simulation hospital were also surveyed regarding their perception of the experience (see Appendix F). All thirty students in the class received the link to surveymonkey.com via the online classroom platform and all thirty responded to the survey.

Data Analysis Plan

Statistical analysis was performed using SPSS version 21 for Windows. The significance level was set at an alpha of 0.05. Descriptive statistics were used to describe sample characteristics. Internal consistency of the preceptor survey questionnaire was determined using Chronbach's alpha. To check for errors, frequency distribution tables were run on data collected (see Appendix K). Normality and homogeneity of variance was tested to determine the correct non-parametric test (Shifflett, 2012). Because the data did not meet the assumptions for an independent t test, Mann Whitney U was used to compare differences (Cronk, 2008, Weaver & Goldberg, 2012). Practical significance was examined and effect size calculated. Finally, sample size necessary and power was established using g-power software.

Ethical Consideration

The study protocol was approved by California State University, Fresno. Additionally, the two facilities where the preceptors were located gave permission for the study, even though neither of them had an organized review board. The college also granted permission and provided support of implementation of the EMR into the simulation hospital. Participation of the preceptors was voluntary.

Students participated in the simulation hospital as part of the standard coursework for the class.

There are no potential risks to either the preceptors or the students. They were asked only to provide information regarding their perceptions. All surveys, completed through surveymonkey.com, were anonymous. No identifying information was requested. Informed consent for the preceptors was provided in a paragraph located at the beginning of the survey (See Appendix J).

Summary

The project consisted of several steps beginning with the research and implementation of the EMR into the simulation hospital and concluding with the responses from the RN preceptors. This process involved moving from paper-pencil in the simulation hospital to EMR and the evaluation of the accuracy in student's charting during the preceptor rotation.

CHAPTER 4: RESULTS

The questionnaire was sent to preceptors at two different local facilities; Facility 1, an acute care hospital and Facility 2, a long term acute care. A total of 34 preceptors at the two facilities were contacted during the first round of data collection. Of those 23 who responded, 13 were from Facility 1 and 10 were from Facility 2. During the second round 29 questionnaires were sent out and 15 preceptors responded, 8 from Facility 1 and 7 from Facility 2.

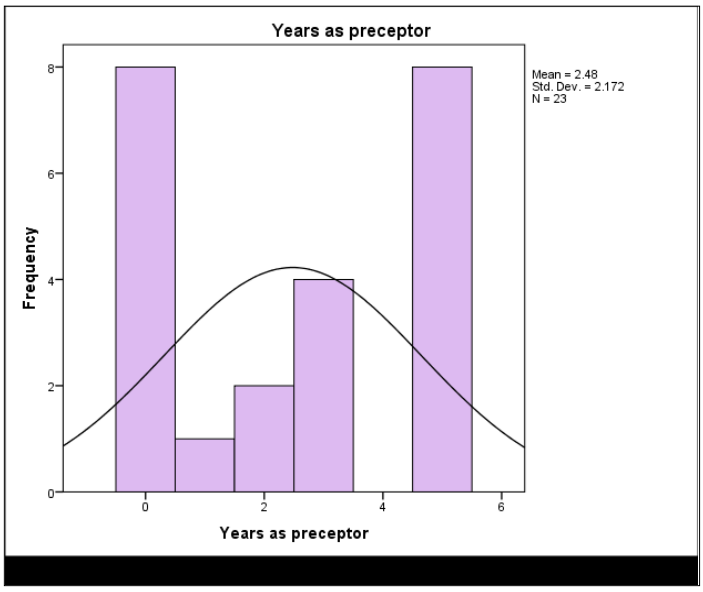
Statistics and Data Analysis

The study used a correlational descriptive design and examined the relationship (Fineout-Overholt & Melnyk, 2011) between the use of EMR in the simulation hospital and student accuracy in charting vital signs during the preceptorship rotations at the hospital.

The descriptive statistics used were for ordinal data, since all of the questions but two fall into this category (Boslaugh &Watters, 2008). For this study, rank was assigned to determine the competency of the students when using EMR.

Item 1 was categorical and determined facility of employment. The distribution is fairly equal with 55% of the participating preceptors working at Facility 1 and 45% employed by Facility 2. Students are assigned equally to the two facilities but number of preceptors varied depending on several factors. Nurses from the two facilities were almost equally represented. Of the total responding preceptors, 21 (55%) were from Facility 1 and 17 (45%) from Facility 2.

Items 2 through 4 discuss the characteristics of the nurse including how many years they have been nursing (item 2), how long they have been a Shasta College preceptor (item 3), and their current proficiency with EMR



(item 4). Figure 1. YEARS AS PRECEPTOR

Nurses were asked to disclose how long they had been working as a registered nurse. For a nurse to qualify as a preceptor they must have been working for at least one year (BRN, 2014) so less than one year was not considered as a valid option. The categories were 1 to 3 years, 4 to 6 years, 7 to 9 years, 10 to 15 years, and sixteen or more years. These results were considered cumulatively as well as by facility (Appendix L, table 1). The majority of preceptors had only been a nurse for 1 to 3 years. The total for this category is 15 (40%); with 8 of the nurses from Facility 1 in this range and 7 from Facility 2. This is reflective of local practice, with many hospital nurses having less than five years experience in nursing. The next two categories of significance were the 7to

9 years and 16 years or more with both of these groups at 16%. For the other categories, the groups of 4 to 6 and 10 to 12 years held 10% and the smallest group was 13 to 15 years which came in at 8%.

Nurses responding had been College Preceptors for a length of time ranging from less than 1 year up to 5 years (item 3). Of those who responded, the majority (34%) had been a preceptor for five years, the next largest group (29%) had been a preceptor for one year.

The following represents the nurses' time spent working with EMR. The highest percentage of nurses, 38%, had worked with EMR for 2 years, followed by 23 % of nurses using EMR for three years. The mean time spent working with the EMR was 2.13 years.

Nurses then rated themselves on their current proficiency with EMR based on a ranked Likert scale which included: still learning, fairly competent, competent and very competent (see table below). None of the nurse preceptors felt like they were still learning, which is an advantage for the students.

Table 2. PRECEPTOR EMR PROFICIENCY

Semester	Fairly Competent	Competent	Very Competent
Preceptor Respondent Spring 2013	9%	35%	56%
Preceptor Respondent Fall 2013	0%	46%	54%

How often nurses reviewed charting with students is another component of the survey. Nurses from each group responded to how often they checked the students' charting and how often they spoke to the students' about their charting. One survey respondent from Semester 2 did not answer any of the questions

pertaining to the students charting. The following tables represent the answers to items 6 and 7 of the preceptor survey (Appendix D and E).

In the spring semester, when students were still using paper pencil charting in the simulation hospital, 96% of preceptors checked the students' charting several times a day. In the fall semester, when students were using EMR in the simulation hospital, preceptors checked several times a day only 82% of the time (item 6). The question was also asked how often the preceptors spoke with the students about the charting (item 7). This interaction could guide the students in their use of the EMR while on the clinical units.

In the fall, while students were using EMR in the clinical area, the amount of times that preceptors spoke to students regarding their charting decreased. In the spring, while students were using paper-pencil in the simulation hospital, 91% of preceptors spoke with students multiple times a day about documentation compared with only 64% speaking to students about their charting in the fall. This drop could be related to the students being more comfortable with EMR due to their exposure in the simulation hospital.

In the following table from Semester 1indictes on the vertical access the number of preceptors reporting. The choice of accuracy is reported as always accurate, usually accurate, and occasionally accurate. Preceptors did not choose the never accurate indicator.

The chart below is representative of the Semester 2. The preceptors indicate that student accuracy in blood pressure, pulse, temperature, and respiration showed only miniscule changes. The most obvious changes were in IV fluid intake, oral intake, and output. According to the preceptor responses, the students who used EMR in simulation showed an increase in accuracy while charting in these areas in the clinical facility.

The data regarding the preceptor's perceptions (item 8) will be analyzed using Mann Whitney U . As evidenced by the frequency distribution tables below, the distribution is skewed to the right and therefore is negatively skewed (Shifflett, 2012). Mann Whitney U is a non-parametric test used to compare two unpaired groups when the samples do not have Gaussian distribution and therefore is appropriate for use with this data (Weaver & Goldberg, 2012).

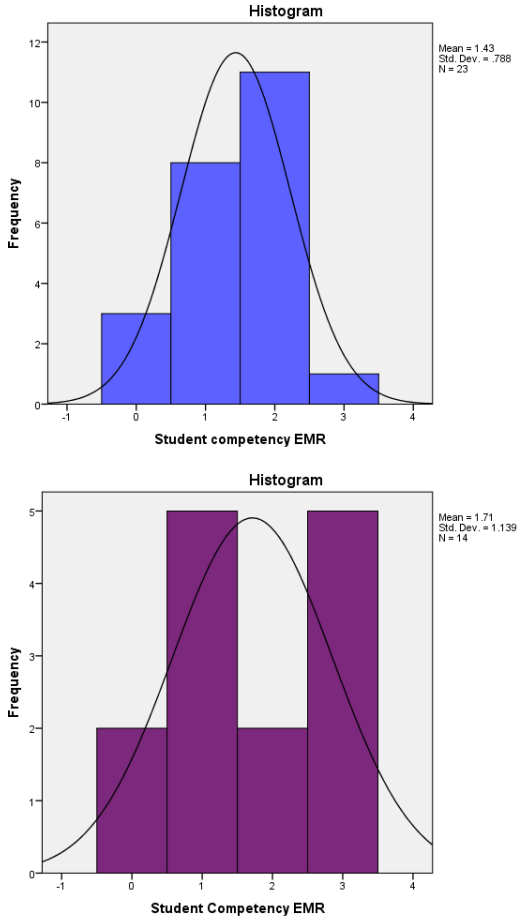


Figure 2. STUDENT COMPETENCY EMR

The blue graph represents the first evaluation by the preceptors and the purple graph represents the second evaluation. The blue graph provides an almost

Gaussian distribution showing that the students represent a fairly normal distribution of competency using the EMR. In the second graph, after EMR was introduced in the simulation lab the distribution is bimodal, as evidenced by the two larger peaks (Jaeger, 1993). This can be caused by the introduction of a new methodology (Midas &Statit, 2012). There was a decrease in those rated as competent and an increase in students rated fairly competent.

The Chi Squared test has been used to check for significance of competency by facility.

Table 3. CHI-SQUARED TEST

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.453[a]	3	.484
Likelihood Ratio	2.814	3	.421
Linear-by-Linear Association	.245	1	.620
N of Valid Cases	23		

a. 7 cells (87.5%) have expected count less than 5. The minimum expected count is .39.

Tables at SPSS, version 21.

Table 4. CHI-SQUARED TEST 2

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.833[a]	3	.120
Likelihood Ratio	7.387	3	.061
Linear-by-Linear Association	4.131	1	.042
N of Valid Cases	14		

a. 8 cells (100.0%) have expected count less than 5. The minimum expected count is 86.

Tables at SPSS, version 21.

Combined students from fall and spring separated out by facility:

Table 5. BY FACILITY

Facility		Value	df	Asymp. Sig. (2-sided)
A	Pearson Chi-Square	3.500[b]	4	.478
	Likelihood Ratio	4.499	4	.343
	Linear-by-Linear Association	2.484	1	.115
	N of Valid Cases	8		
B	Pearson Chi-Square	4.667[c]	4	.323
	Likelihood Ratio	5.545	4	.236
	Linear-by-Linear Association	.000	1	1.000
	N of Valid Cases	6		
Total	Pearson Chi-Square	9.100[a]	9	.428
	Likelihood Ratio	8.067	9	.527
	Linear-by-Linear Association	1.645	1	.200
	N of Valid Cases	14		

a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is .14.

b. 9 cells (100.0%) have expected count less than 5. The minimum expected count is .25.

c. 9 cells (100.0%) have expected count less than 5. The minimum expected count is .17.

Tables at SPSS, version 21.

Table 6. SEMESTER 1
EMR COMPETENCY

N	Valid	23
	Missing	0
Mean		1.43
Median		2.00
Mode		2
Std. Deviation		.788

Table 7. SEMESTER 2
EMR COMPETENCY

N	Valid	14
	Missing	1
Mean		1.7143
Median		1.5000
Mode		1.00[a]
Std. Deviation		1.13873

a. Multiple modes exist. The smallest value is shown

Confidence levels for Semester 1 and Semester 2 were calculated. The 95% confidence interval for Semester 1 is based on the mean of 1.43 is 1.02 to 1.84. The 95 % confidence interval based on a mean of 1.714 for Semester 2 is .94 to 2.48. In examining the two levels, Semester 1 is much closer together indicating that this level is more accurate than the one for Semester 2. This infers that the estimate for the mean is more precise in the first sample (Boslaugh & Watters, 2008). The relatively large span for sample two indicates that there may be other factors that influenced the second group, including small sample size (Weaver & Goldberg, 2012).

The Mann Whitney U test was used comparing Student EMR Competency. This test is used for two unpaired groups when the sample are not Gaussian and do not meet the parametric assumptions for the independent t-test (Weaver & Goldberg, 2012). This test is used to determine whether there is a significant difference in the means.

Table 8. RANKS

	Student competency EMR	N	Mean Rank	Sum of Ranks
Student Competency EMR	fairly competent	6	7.00	42.00
	competent	6	6.00	36.00
	Total	12		

Table at SPSS, version, 21.

Table 9. STATISTICS

	Student Competency EMR
Mann-Whitney U	15.000
Wilcoxon W	36.000
Z	-.500
Asymp. Sig. (2-tailed)	.617
Exact Sig. [2*(1-tailed Sig.)]	.699[b]
Exact Sig. (2-tailed)	.797
Exact Sig. (1-tailed)	.398
Point Probability	.165

a. Grouping Variable: Student competency EMR

b. Not corrected for ties.

Table at SPSS, version 21.

Effect Size

$$\Psi = \frac{1.43 - 1.71}{.788} = .355$$

The two means are used and the standard deviation from the control group is used for the denominator (since the standard deviations are not the same) (Weaver & Goldberg, 2012). The effect size is just slightly above small as small is considered

.30 (Shifflett, 2012). The correlation between the two tests does not show significance by the small effect size. This could be directly affected by the small sample size. Less than 30 in each group decreases the credibility of the findings.

Kendall's Tau will provide the correlation coefficient and describe the strength and direction of the variables (Shifflett, 2012).

Table 10. CORRELATIONS

			Semester 1 Students competency EMR	Semester 2 Student competency EMR
Kendall's tau_b	fall 2013 Students competency EMR	Correlation Coefficient	1.000	.262
		Sig. (2-tailed)	.	.283
		N	14	14
	spring 2013 Student competency EMR	Correlation Coefficient	.262	1.000
		Sig. (2-tailed)	.283	.
		N	14	23

The correlation coefficient is .262. This coefficient is low and indicates little relationship between the competency level of the students using paper –pencil or those using EMR in the simulation hospital.

Power

The computed power for this study was only .311 (used Gpower software). Power conveys how well the statistical test does with regard to detecting a differences relationship. For this to be of significance, power would need to be .80 or higher. The influencing factor for this power is low sample size. To have significant power the sample size would need to be 105 participants in each group. The total sample size was only 38, which falls short of the necessary number.

Discussion

This study was a small scale introductory pilot study. The limited placement sites in which there are preceptors and the small geographical area affected the number of participants and therefore the outcomes. There is little research on the use of EMR in the academic setting coupled with limited knowledge on the relationship between EMR application and patient outcomes.

Age of students was not part of the survey and maybe should have been considered, as digital natives tend to fare better with EMR use (Baillie, et al., 2012). The bimodal distribution could have occurred if the second class was split in the following way: one segment of younger students who were already comfortable with technology and then a group of older students who did not feel as competent with using EMR.

The study does, however, provide a baseline from which future studies could be designed. This pilot experience could provide a beta test for future consideration of the use of EMR in the simulation environment and its impact on documentation in the clinical area. For the study to have increased statistical significance, the researcher would need to continue to survey the preceptors in an effort to gain further information. In addition, student learning may increase as the faculty become progressively more adept at using DocuCare, discover its additional functions, and work with the parent company to make improvements that create an even more realistic documentation tool. As the faculty members develop their own informatics skills, they will be better equipped to educate students (Mahon, et al., 2010).

Another influencing factor would be the establishment of this technology in all four semesters of the program and not just in the final semester, as limited access is one factor that may deter acceptance of EMR (Johnson & Bushey, 2011;

Hinton, 2010; Lucas, 2010). By utilizing the electronic documentation throughout the program, students would have the opportunity to develop informatics competency (Gardner & Jones, 2012; Fetter, 2008). This is a necessary and expected skill set for graduating nurses (Baillie, et al., 2012; Spencer, 2012) The difference between using classroom technology and health care electronic documentation must be recognized and incorporated into the present curriculum (NLN, 2008). By assisting students to understand the nuances of accurate and descriptive charting while using the EMR, nurse educators can guide students while making the move toward using technology in every aspect of health care delivery (Taylor, et al, 2010). The charge has been set forth for nursing education to pick up the baton, be prepared for this new methodology in charting, and support students to develop the necessary skills to function as graduate nurses in a technology rich environment (Gardner & Jones, 2012; Johnson & Bushey, 2011; Hinton, 2010; Lucas, 2010; Taylor et al., 2010; NLN, 2008).

Although the study shows no statistically significant results, the students themselves indicated that the use of EMR in the simulation hospital was constructive, necessary in all four semesters, and when queried, indicated significantly more positive comments about the experience (Appendix G). There is a need for students to interact and receive faculty input regarding how, when, and where to document vital patient information (Gardner & Jones, 2012; Lucas, 2010; Mahon, et al., 2010,).

The student chart audit from Spring 2013 (Appendix C) which was completed while students were still using paper-pencil in the simulation hospital, indicated that of the fifteen charts audited, the problem areas were Temperature, IV fluid intake, Oral Intake, and Output. Blood pressure, pulse and respirations had less than 20% incomplete charting. These areas correlate with the indicators from the

preceptors, where students had most difficulty in accurately charting IV fluid intake, Oral intake, and Output. Auditing of documentation for student using the academic EMR in the simulation hospital was anecdotal, as each chart was reviewed during the simulation experience. Instructors worked closely with students as each was learning to navigate the new technology. As a follow up to EMR implementation an audit on the new technology should be completed.

Limitations

The study, by its very nature, has several limitations beginning with the small number of participants. The school, partly because it is in a rural location, is also undersized and the number of preceptors used in a semester rarely exceeds 15 at each facility. The community itself is small and often people know each other outside of school or work. Although the study stated its anonymity, the fear that someone knows what was reported could be very real.

The survey was given twice to the preceptors. Preceptors can change from one semester to the next, but often they stay stable. It is not surprising that sixty percent of the preceptors responded to both questionnaires. This can be an influencing factor and create a bias in the way an individual responds (Shifflett, 2012).

The small sample size makes it difficult to generalize the results. The amount of nurses who function as preceptors is small and the sample size used in this study is limited. To be generalizable the sample size would need to be increased. One participant did not complete the section of the survey that asked if the preceptor had reviewed the student's charting, spoken to the student about their charting, or any of the questions that scaled the accuracy of the student charting. One reason for this may be that the nurse preceptor did not check the students charting, felt this was neglectful, and therefore skipped those questions. Nurses

have a desire to be diligent and do not want to appear negligent of their expected duties. In this way, any of the nurse preceptors could have stated that they were checking on the charting so as not to appear careless.

This study contained several biases beginning with the selection bias. The researcher did not select the sample at random but chose a population with particular characteristics (Weaver & Goldberg, 2011). The subjects surveyed were preceptors for the college thus they had to be registered nurses, have worked at the facility for one year, and have attended a preceptor training class. Because of this bias, conclusions about the general population cannot be made. This is considered a precise but biased sample. The sample, although biased, is considered homogeneous because there are similar characteristics in respect to the extraneous variables relevant to the study (LoBiondo-Wood & Haber, 2006).

Another bias that may be present is volunteer bias. Preceptors had to not only volunteer to be preceptors but also had to voluntarily respond to the survey which was sent as a link to their email. There may be problems because volunteers are often fundamentally different than the overall population (Shifflett, 2012). In addition, there is a risk for social desirability bias, where the respondents taking the survey may try to answer questions in a way that puts themselves in a favorable light (Boslaugh & Watters, 2008).

This study would need to be continued over a longer period of time to provide credibility. Because the EMR program was so new, none of the instructors possessed real proficiency in this area. Often, during the simulation, learning was taking place for the teachers as well as the students. As the instructors become more adept at using the program they will be better equipped to guide students in accurate charting. This guidance would help the students to develop confidence and knowledge about the use of EMR and this would be transferrable to the

clinical area. The lack of long term follow up is a limitation to the generalizabiity of the results (Melynyk & Finout-Overholt, 2012). At this time, the current instructors in the fourth semester plan to continue to ask students about their perception of DocuCare but there is no plan for continued formal evaluation of EMR use by the preceptors.

CHAPTER 5: CONCLUSION

Implications for Nursing Practice

Nursing education is in a state of flux as it strives to meet the changing expectations of the nursing workplace (Bensfield, et al., 2012; Garnder & Jones, 2012). New methods of instruction, especially in the area of informatics, must be considered as the care of patients is evolving (Rajalahti & Saranto, 2012). Technology is part of this great progression, especially since it is a core competency put forth from the IOM (Bensfield, et al., 2012; Mahon, et al., 2010). Students must develop competency in the area of informatics because it directly influences the other competencies necessary to function as a nurse (Mahon, et al., 2010). Medicine will continue to lean on technology, using documentation and the data collected, to determine cost savings in health care and best practices (Thede, 2008). Nurses, who spend so much time with patients, must be able to navigate the common technology and utilize the electronic medical record to not only provide safe and accurate care to patients but to document actions and outcomes related to that care.

The goal of nursing education, in the area of informatics, is to produce technology-savvy nurses who can use informatics equipment to provide safe, patient-centered, quality care that is based in evidence (Lucas, 2010; NLN position statement, 2008) To accomplish this goal, education, which begins in the pre-licensure arena, will need to be implemented (Hwang & Park, 2011). This study moves forward the concept of creating a simulated hospital and equipping it with an academic EMR, which allows students the freedom to develop technology skills unencumbered by the fear of harming a patient (Jones & Richards, 2013). Understanding the impact of EMR on nursing documentation may be enhanced when comparing paper-pencil charting to the use of this technology (Carrington &

Effken, 2011). More research is needed in this area to determine the effect of EMR use on patient care, outcomes, and nursing documentation.

Student nurses need time to process and assimilate all that they are learning so that when they are practicing independently they will use good judgment and clinical reasoning that is reflected in accurate documentation. Clinical reasoning guides nurses as they assess, incorporate, and document information that affects patient care (Simmons, 2010). Students need guidance to develop effective reasoning in order to put into practice what has been learned (Gonzol & Newby, 2013).

Providing nursing students with feedback from faculty, guiding them in their charting practices, and having them evaluated by precepting nursing closes the loop, assuring that nursing education does not happen in a vacuum (Mallette, Loury, Engelke, & Andrews, 2005). This sentiment was made clear by the end of the semester survey results provided by the students who used the EMR in the simulation hospital (see Appendix F and Appendix G). It is of note that 100% of the students felt that having the instructor available to help with DocuCare clarified some questions they had about charting.

The students using EMR in the simulation hospital felt that it provided direction and assistance in charting, although a small percent reported that it was not applicable to the clinical environment. The responses indicating that use of EMR was not applicable in the clinical area may be from students who did not have the opportunity to use the EMR in the simulation hospital until the last week of the semester and by this time they had already completed the preceptorship experience. In using an electronic EMR in the simulation hospital, students are provided with the bridge between theory and clinical which increases confidence and overall success (Ogilvie, et al., 2011). This enables the student to feel more

comfortable and possibly ask more questions during the clinical rotation. Immediate feedback from instructors can assist the student to develop clinical reasoning and influence their ability to perform clinical skills (Traynor, et al., 2010).

The ongoing relationship with the preceptors and the continued use of an academic EMR in the simulation hospital could produce additional data that could identify other issues that were as yet unknown (Malette, et al., 2005). The use of the academic EMR, coupled with faculty feedback, may enhance the confidence level of the novice nurse as they move forward into the workplace. Providing the safe environment, where mistakes are not fatal, allows the student to figure out how to chart, what to chart, and when to chart in relationship to patient care (Jones & Richards, 2013). This practice time should be reflected in an increased proficiency at the bedside.

To meet the QSEN requirements there must be a method to evaluate use of informatics during the nursing program. This is part of the competency based program centered on Knowledge, Skills, and Attitudes (QSEN. n.d.). The competencies clearly list the use of EMR in documentation and patient care (Hwang & Park, 2011). As faculty and students continue to assimilate the use of EMR in the simulation hospital, the evaluation of this technology will need to become part of the Simulation Evaluation, which is currently done twice during the semester. Students will need to show that they are able to access, navigate, and accurately chart on the assigned patient in order to demonstrate proficiency in this area. In order for students to develop competency in the area of informatics, EMR documentation should be integrated throughout the semesters. At present, only the final semester at the College is actively using the EMR in simulation and the classroom. The slow pace at which clinical information systems are integrated

into curriculum is reflective of many programs nationwide (Gardner & Jones, 2012; Lucas, 2010; NLN, 2008). For students to be ready to join the current workforce, with the ever increasing use of technology, nursing curriculum must keep pace (Gardner & Jones, 2012; Bowers, et al., 2011; Fetter, 2009).

Conclusion

Medical facilities across the country were mandated to institute an electronic health record by 2014 (Gardner& Jones, 2012). The future of medical documentation is found in the continued use of the EMR (Eisenberg, 2011; Furakawa, et al., 2010; Lucas, 2010; Green & Thomas, 2008). The change in documentation will continue to take place as more facilities adopt EMR and the role of EMR use expands. Technology will continue to transform the way nursing care is delivered (McBride, et al., 2012; Cipriano, 2011; Lucas, 2010) and nursing education must begin this transformation during pre-licensure instruction. The learning curve for EMR use is sharp and demanding (Taylor, et al., 2010). Up to this point, limited education has been provided to transition from paper documentation to the EMR, with nurses themselves perceiving they are lacking in these skills (Hwang & Part, 20011).

Informatics competencies have been established as a necessity for nurses (QSEN, n.d.; Rajalhti & Saranto, 2012; Spencer, 2012; Hwang & Park, 2011; NLN, 2008). Nurses will use technology with increasing frequency in the future (Bower,et al., 2011) and will need adequate preparation to demonstrate proficiency in patient care and accuracy in documenting that care (Furakawa et al., 2010). Because of this, continued education and assessment of accuracy in documentation will be necessary. Educators must incorporate informatics at all levels of nursing curriculum (Gardner & Jones, 2012). By engaging students in active learning, using real life patient care scenarios, and providing the

opportunity to practice, students will assimilate informatics into their practice and be prepared for new and emerging technologies (Curry, 2011; Lucas, 2010; Fetter, 2007).

Nurses spend the most amount of time at the bedside where accuracy affects patient safety and outcomes (Stevenson & Nilsson, 2011; Waneka & Spetz, 2010: Kossman & Scheidenhelm, 2008). Education at all levels to assure understanding of informatics technology, including EMR, is of paramount importance (Gardner & Jones, 2012; Ironside & Sitterding, 2009). Determining the best way to provide education and establishing whether there has been understanding of how to use EMR will affect patient care and outcomes on all levels (Li & Korniewicz, 2013). Introducing EMR to pre-licensure nurses while they are still students and giving them the opportunity to practice in the safe environment of simulation provides an excellent venue to develop the confidence for application in the actual clinical area.

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APPENDICES

APPENDIX A: OPEN SOURCE EMR COMPARISON

Appendix A: Open Source EMR Comparison

Category	Hospital OS	VistA	OSCAR	GNU health
Usability	Positive per user survey: "user friendly", "open minded", "efficient services", "satified customers."	Very powerful program. Mimics many other EHR programs. Works as a hospital system or clinic. Also used in Mental Health clinics.	Rated "high ease of usability." Intuitive interface.	Electronic Medical Record; Hospital information system, health information system
Set-up	Hospital OS Server can be installed on Linux, Hospital OS Client can be installed on **Windows XP, 7, MacOS,**	Download and go. Can be customized.	Download and go. Can be customized.	Linux and Debain

	Ubuntu			
Cost	Wait for it……FREE!	Free.	Free. But customization may cost $$ and consultant support.	Completely free: Non profit, non government electronic heath record
Reliability	Should be very reliable, The server uses Linux operating system and PostgreSQL as the database, the client software is developed by using Java and it can be used with Windows 98, ME, 2000, XP & Linux which are all	Very reliable. Adopted by many hospitals. Latest version cannot be run on Mac.	Rated as highly reliably.	Adopted by International Institute for Global Health. Received the FSF award for Social Project 2011. Higher reliability.

	extensively tested for reliability.			
Category	**HospitalOS**	**VistA**	**OSCAR**	**GNUhealth**
Hardware maintenance and support	Not applicable, the user would maintain client and server hardware.	Can be run on Windows or Linux.	Can be run on Windows, Apple or Linux workstations, laptops and tablets.	Not applicable. There is support for installation and questions but client maintains on their own.
Flexible Templates	The Hospital OS system incorporates several flexible templates designed for	Customizable.	Templates are customizable.	Customizable

	patient registration, screening, diagnosis, ordering, appointments, pharmacy, radiology, laboratory, ED and trauma, inpatient care and billing.			
Patient information - transferable	Patient information is transferrable and exportable using an SQL database. Hospital OS is HIPAA-compliant.	Yes.	Yes.	Links to systems worldwide, patient creator and physician creator.
Lab	Yes	Yes.	Lab	Links to the

Integration			downloads, tables, graphs.	patient chart and the financial center. Choose the test you need, get the results online
Category	**HospitalOS**	**VistA**	**OSCAR**	**GNUhealth**
Medication administration	A pharmacy system includes basics such as allergy checking, label printing and billing. No medication administration technology	A pharmacy system which includes medication administration technology.	E-prescribing and medication admin.	Create and send prescriptions, track medications, in house pharmacy dispensary support

	per se, system functions to document administration only.			
Clarity	Seems very simple and clear.	This system is powerful and easy to sue. Demo available.	Demo shows an easy to navigate EMR	Screen shots appear easy to use.
Sharing between disciplines	Yes, information sharing between medicine, nursing, pharmacy, radiology, laboratory and billing to name a few.	Yes.	Can download lab data; send secure messages to patients and colleagues	Information between disciplines including physician, nurses, laboratory services, pharmacy, and billing.
Billing	Yes	Yes.	Comes with	Yes, billing

			a built in billing module.	is included.

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APPENDIX B: ACADEMIC EMR COMPARISON

Category	Docucare (Lippincot)	SimChart (Elsevier)	SimEMR (Pocket Nurse)
Usability	Internet based	Internet based	Internet based
Set-up	Minimal; preloaded 151 patients		
Cost	49.99 per student per semester; able purchase for six month increments	73.00 per student per semester	Annual fee for schools per student. Example is 89.00 per student for 10 students. Sliding scale.
Flexible Templates	Instructor customizable	Instructor generated	Instructor generated
Patient information – transferable	150 downloadable, customizable case studies	Case study generator	Some case studies available.
Lab Integration	Lab Values with references included	Yes.	Yes.

Medication administration	Yes. This features is currently being upgraded to include a medication scanning system	Yes. Has medication scanning capacity.	Yes. This product interfaces with Demo Dose. I asked about a package deal but didn't receive a clear answer.
Additional resources	Pharmacology support	Clinical decision support	I & O, x-ray, ekg, MAR, Lab, PT/OT
	Care plan support	My clinical for use with hospital patients	Must admit patient or the information goes into cyberspace.
	Corresponds to Laerdol Case studies	Create care plans for each hospital patient	
	1000 images that are downloadable		
Review	Allows you to see what the student has charted at that time. Able to view charting, making corrections, and return to charting.	This allows you to input patient information from the hospital.	Cut and paste scenarios that you have built. Has an implication for discharge planning.

	Student can review feedback from instructor.		
Security		Completely secure	

APPENDIX C: STUDENT CHART AUDIT

Location: College Simulation Hospital
Date: Spring Semester 2013
Class: REGN 34
Type of Charting: Paper/pencil

Student Number	**BP**	**Pulse**	**Resp**	**Temp**	**Oral Intake**	**IV fluid**	**Output**
1	C	P	P	P	NA	C	P
2	C	C	C	C	NA	N	N
3	C	C	C	C	C	P	P
4	C	C	C	C	N	N	N
5	C	C	C	C	NA	C	C
6	C	C	C	C	N	N	P
7	C	C	C	N	N	C	C
8	C	P	C	P	NA	C	C
9	C	C	C	C	C	C	C
10	C	C	C	P	N	C	C
11	C	C	C	P	C	C	N
12	C	C	C	C	C	C	C
13	C	C	C	P	NA	P	N
14	C	P	P	P	NA	P	N
15	C	C	C	C	NA	C	C
Percent incomplete	**0**	**20%**	**13%**	**47%**	**50%**	**40%**	**53%**

Key: C = Complete; P = Partial; N= None NA = not applicable or NPO

APPENDIX D: PRECEPTOR SURVEY GROUP 1

Appendix D: Preceptor Survey Group 1

1. Employment

   Vibra Northern California Shasta Regional Medical Center

2. Number of years you have been a registered nurse:

   1-3 4-6 7-10 11-15 16+

3. Number of years you have been a Shasta College preceptor

   >1 year 1 year 2 years 3 years 4 years 5 years

4. Number of years you have been using an Electronic Medical Record program at your facility.

   >1 year 1 year 2 years 3 years 4 years 5 years

5. Rate your competency level in using the electronic medical record.

   Still learning fairly competent competent very compentent

6. While functioning as a preceptor how often did you review student charting on the electronic medical record?

   Once each day the student was present

   Multiple times each day the student was present

   Every other day the student was present

   Once each week the student was present

   Once during the preceptorship of the student

   Never

7. While functioning as a preceptor how often did you speak with students about their charting on the electronic medical record?

   Once each day the student was present

   Multiple times each day the student was present

   Every other day the student was present

   Once each week the student was present

   Once during the preceptorship of the student

   Never

8. Rate the documentation accuracy of the students you precepted on the following:

Blood Pressure	never accurate	occasionally accurate	accurate	always accurate
Pulse	never accurate	occasionally accurate	accurate	always accurate
Temperature	never accurate	occasionally accurate	accurate	always accurate
Respirations	never accurate	occasionally accurate	accurate	always accurate
IV fluid Intake	never accurate	occasionally accurate	accurate	always accurate
Oral intake	never accurate	occasionally accurate	accurate	always accurate
Output	never accurate	occasionally accurate	accurate	always accurate

9. Overall, how would you rate the competency of the Shasta College student in using the electronic medical record?

   Still learning fairly competent competent very competent

10. Do you plan on being a Shasta College preceptor next semester?

Yes No

APPENDIX E: PRECEPTOR SURVEY GROUP 2

Appendix E: Preceptor Survey Group 2

1. Employment

   Vibra Northern California Shasta Regional Medical Center

2. Number of years you have been a registered nurse:

   1-3 4-6 7-10 11-15 16+

3. Number of years you have been a Shasta College preceptor

   >1 year 1 year 2 years 3 years 4 years 5 years

4. Number of years you have been using an Electronic Medical Record program at your facility.

   >1 year 1 year 2 years 3 years 4 years 5 years

5. Rate your competency level in using the electronic medical record.

   Still learning fairly competent competent very compentent

6. While functioning as a preceptor how often did you review student charting on the electronic medical record?

   Once each day the student was present

   Multiple times each day the student was present

   Every other day the student was present

   Once each week the student was present

   Once during the preceptorship of the student

   Never

7. While functioning as a preceptor how often did you speak with students about their charting on the electronic medical record?

Once each day the student was present

Multiple times each day the student was present

Every other day the student was present

Once each week the student was present

Once during the preceptorship of the student

Never

8. Rate the documentation accuracy of the students you precepted on the following:

Blood Pressure	never accurate	occasionally accurate	accurate	always accurate
Pulse	never accurate	occasionally accurate	accurate	always accurate
Temperature	never accurate	occasionally accurate	accurate	always accurate
Respirations	never accurate	occasionally accurate	accurate	always accurate
IV fluid Intake	never accurate	occasionally accurate	accurate	always accurate
Oral intake	never accurate	occasionally accurate	accurate	always accurate
Output	never accurate	occasionally accurate	accurate	always accurate

9. Overall, how would you rate the competency of the Shasta College student in using the electronic medical record?

Still learning fairly competent competent very competent

10. Were you involved in the first round of evaluation?

Yes No

APPENDIX F: STUDENT SURVEY

1. How many times did you access Docucare in the Simulation Hospital?
   No times
   One time
   Two times
   Three times
   Four times

2. How many times did you access Docucare at home?
   No times
   1-2 times
   3-4 times
   5 times or more

3. For the following items report your perception of using Docucare in the Simulation Hospital.

I was able to find the lab values.
Strongly Disagree Disagree Agree Strongly Agree

I was able to document the nursing assessment.
Strongly Disagree Disagree Agree Strongly Agree

I was able to document the vital signs.
Strongly Disagree Disagree Agree Strongly Agree

I was able to document the intake and output.
Strongly Disagree Disagree Agree Strongly Agree

I was able to document the medications administered.
Strongly Disagree Disagree Agree Strongly Agree

I was able to document the physician's orders.
Strongly Disagree Disagree Agree Strongly Agree

I was able to document in nursing notes.
Strongly Disagree Disagree Agree Strongly Agree

4. Based on your experience respond to the following statements.

I would recommend continued use of Docucare in the Simulation Hospital.
Strongly Disagree Disagree Agree Strongly Agree

I found using Docucare helped me to chart in the clinical environment.
Strongly Disagree Disagree Agree Strongly Agree

I felt the instructors were available to help me with Docucare.
Strongly Disagree Disagree Agree Strongly Agree

Having the instructor help me with Docucare clarified some questions I had about charting.
Strongly Disagree Disagree Agree Strongly Agree

5. Use this box to provide any other feedback about using Docucare in the Simulation Hospital.

APPENDIX G: STUDENT COMMENTS

These are the comments gleaned from the end of the semester survey given to the students who used DocuCare in the simulation hospital. Twenty one out of the thirty students made additional comments in the final open ended question. They are grouped into themes.

Positive comments

- Best program we have used so far.
- Enjoyed it.
- Excellent system, easy to use. Nice addition to the sim lab.
- I think it is a beneficial system that would be an asset to all the semesters.
- I thought DocuCare was very helpful and made the experience feel more real.
- Being new/unknown it was harder to get help by some of the personnel. It was GREAT, I loved how easy it was to use and I wouldn't go to anything else.
- I liked it, just need practice (two students submitted the same comments).
- Please use DocuCare in all four semesters!
- Great tool (two students submitted the same comments).
- Good tool to have in Sim. Better than Meditech.
- This was a very positive experience and I learned much from using it.
- I think it is a good experience preparing us for electronic charting in the hospital.
- I enjoyed the program. I wish if you entered the doctor’s orders of medication it would go to the emar. The clock time was off for I's and o's.

- I was one of the very early round of students to be offered DocuCare so my use of it was limited. What I did get to see and use of it was very helpful. It looks like an amazing program that really will help in the future.

Negative comments

- Just to have it work during the first sim. Having it available in the last week did not help with preceptorship.
- Would like to see less information needed for the physical assessment
- Pre-use student tutorial in a classroom setting would be very helpful in using DocuCare.
- I wish we could have taken a day to just roam through DocuCare.
- Only thing I did not care for was out in new orders.

Appendix H: DocuCare Orientation

Patient Name: Diedre Elaine Manning

Report: This is a 57 year old female admitted for acute cellulites left lower leg. She works as an OR nurse at SIM Memorial Hospital and after three long shifts in the operating room where she forgot to wear her supportive stockings she developed redness, swelling, and and open weeping sore on her leg. She has a history of hyperlipedimia, high blood pressure, and varicose veins.

Admit Orders:
CBC, Chem Panel, C&S left leg wound
Lopressor 10 mg q day
Thyroid .25 mcg per day
Low fat diet
Up as tolerated
IV N.S .09% TKO
Begin antibiotics following C and S results
She is on I and O with her IV running at 20 cc per hour. The C and S sent to the lab and results are pending. Left a message for MD to order IV antibiotics.

Interact with the EMR by completing the following tasks:

1. Identify previous visit for complete history
2. Review current diagnosis and treatment options using the help icon
3. Check for current lab values
4. Review orders and add to MAR as necessary
5. Add to the assessment by inputting the following information:
   Neuro: Alert and Oriented x 3
   Cardiac: Edema L lower leg
   Capillary refill <3 sec
   Skin color: using helps write a description of cellulitis
   Respiratory: WNL
   GI: enter diet
   GU: Voiding, clear, yellow urine - 400 ml previous 4 hours
   Musculoskeletal: Pain @ 5out of 10 – left leg
   Weight bearing – unsteady, using walker for stability
   Keep left leg elevated
   Mental Health: Slightly depressed and grumpy
   Pain: 5 out of 10
   Integumary: Braden Scale
   Chart wound

MD has ordered antibiotics from his computer at home. Move orders from chart to MAR.

Appendix I: Simulation Event Sheet

Patient Name: Murial Graves
Sim orientation
DOB: 02/23/1928

Patient Medical Record Number: MR# f097669 Acct# 20098349
Patient Diagnosis: Pneumonia, altered mental status

Patient History: This is an 83 year old female who resides in residential care. She is currently a DNR whose daughter is durable power of attorney for health care. She is in the hospital to treat her pneumonia.

She has a history of CAD and gout and is on the following medications: Allupurinol 300 mg po q day, Digoxin .125 mg po qd, and Coreg 6.25 mg bid, Lorazapam 0.5 mg q 6 hr prn anxiety.

Night Nurse report: 87 y/o female, admitted for pneumonia, who was very confused in the night and became combative. Currently in restraints, has crackles bilaterally, productive cough with rust- colored sputum, and has been diaphoretic. She is scheduled for a Chest X-Ray and sputum culture this am. Current v/s: HR – 84, R- 28 T- 38 C (100.4 F), BP 140/90. SpO_2 is 87% on room air.

Laboratory Values: Laboratory data on admission was significant for a hemoglobin of 9 gm/dl, hematocrit 25.1%, platelets 137,000, WBCs 32,600 (86% polys, 9% bands).

ABG's Ph: 7.32, $PaCO_2$ = 53 , HCO_3 = 24

IV infusions and medications: IV of NS 0.9% @ 75 /hr
Clinidamyacin 600 mg IV piggyback q 8 hr not started yet

Sim Orientation Assistant: Play several roles
Off going RN: give Night Nurse report
Dr. Püter: Give these orders when asked:

- Titrate oxygen to keep sats> 92%
- Hold Digoxin (when given level)
- Potassium replacement IV per protocol
- Mucomyst breathing treatment per RT
- Type and cross and then transfuse one unit PRBCs

Lab Tech: deliver labs

Pharmacy Tech: deliver meds

Appendix J: Preceptor Informed Consent

Please complete the following questions based on your experience with the Shasta College preceptees during the Fall semester of 2013 (September through December). There should only be one answer per question.

Your decision to complete and submit this survey constitutes your informed consent. The results will remain anonymous.

Thank you for your help in evaluating the documentation of these students. Your feedback will help to enrich our curriculum and make the program stronger.

If you have any questions please email me at cmountain@shastacollege.edu.

Thank you, Carel Mountain

Appendix K: Frequency Distribution Tables

Question 1: Facility

Facility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	21	55.3	55.3	55.3
	2.00	17	44.7	44.7	100.0
	Total	38	100.0	100.0	

No errors detected.

Question 2: Years RN

Years RN

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	15	39.5	39.5	39.5
	2.00	4	10.5	10.5	50.0
	3.00	6	15.8	15.8	65.8
	4.00	4	10.5	10.5	76.3
	5.00	3	7.9	7.9	84.2
	6.00	6	15.8	15.8	100.0
	Total	38	100.0	100.0	

No errors detected.

Question 3: Years Preceptor for Shasta College

Preceptor years

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	11	28.9	28.9	28.9
	1.00	4	10.5	10.5	39.5
	2.00	3	7.9	7.9	47.4
	3.00	5	13.2	13.2	60.5
	4.00	1	2.6	2.6	63.2
	5.00	13	34.2	34.2	97.4

	6.00	1	2.6	2.6	100.0
	Total	38	100.0	100.0	

No errors detected.

Question 4: Years working with EMR

Years EMR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	5	13.2	13.2	13.2
	1.00	5	13.2	13.2	26.3
	2.00	15	39.5	39.5	65.8
	3.00	9	23.7	23.7	89.5
	4.00	1	2.6	2.6	92.1
	5.00	3	7.9	7.9	100.0
	Total	38	100.0	100.0	

Question 5: How competent in this preceptor with EMR

RN Competency with EMR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	fairly competent	2	5.3	5.3	5.3
	competent	16	42.1	42.1	47.4
	very competent	20	52.6	52.6	100.0
	Total	38	100.0	100.0	

No errors detected.

Question 6: How often did you check student charting?

Review charts with students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once each day	3	7.9	8.1	8.1
	multiple times each day	34	89.5	91.9	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Question 7: How often did you speak with students about their charting?

Speak to students about charting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once each day	7	18.4	18.9	18.9
	multiple times each day	30	78.9	81.1	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Question 8: Accuracy of charting: **Likert Scaled Items**

Blood pressure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	usually accurate	16	42.1	43.2	43.2

	always accurate	21	55.3	56.8	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Pulse

		Frequency	Percent	Valid Percent	Cumulative Percent
	usually accurate	14	36.8	37.8	37.8
Valid	always accurate	23	60.5	62.2	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Temperature

		Frequency	Percent	Valid Percent	Cumulative Percent
	usually accurate	15	39.5	40.5	40.5
Valid	always accurate	22	57.9	59.5	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Respiration

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	usually accurate	16	42.1	44.4	44.4
	always accurate	20	52.6	55.6	100.0
	Total	36	94.7	100.0	
Missing	System	2	5.3		
Total		38	100.0		

One respondent did not answer this question.

IV fluid intake

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	usually accurate	26	68.4	70.3	70.3
	always accurate	11	28.9	29.7	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Oral Intake

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	occasionally accurate	4	10.5	10.8	10.8
	usually accurate	29	76.3	78.4	89.2
	always accurate	4	10.5	10.8	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		

Total		38	100.0		

One respondent did not answer this question.

Output

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	occasionally accurate	1	2.6	2.7	2.7
	usually accurate	27	71.1	73.0	75.7
	always accurate	9	23.7	24.3	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Question 9: Overall competency of students with EMR.

Student competency with EMR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	still learning	5	13.2	13.5	13.5
	fairly competent	13	34.2	35.1	48.6
	competent	13	34.2	35.1	83.8
	very competent	6	15.8	16.2	100.0
	Total	37	97.4	100.0	
Missing	System	1	2.6		
Total		38	100.0		

One respondent did not answer this question.

Question 10 – survey 1. Will you be a Shasta College preceptor next semester?

SC preceptor next semester

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	17	44.7	73.9	73.9
	yes	6	15.8	26.1	100.0
	Total	23	60.5	100.0	
Missing	System	15	39.5		
Total		38	100.0		

Question 10- survey 2. Did you complete the previous survey?

Previous survey

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	9	23.7	60.0	60.0
	no	6	15.8	40.0	100.0
	Total	15	39.5	100.0	
Missing	System	23	60.5		
Total		38	100.0		

Tables at SPSS, version 21