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Utilizing TIGER Competencies to Improve Informatics Practice

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Utilizing TIGER Competencies to Improve Informatics Practice

Comprehensive DNP Project

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Abstract

Nursing Informatics (NI) is quickly becoming an essential part of nursing. From the classroom, to the bedside, and to the boardroom, nurses across the nursing continuum are expected to use NI in their practice with the hopes of delivering better quality care to their patients. However, the training and education of NI provided to all levels of nurses is unable to keep up with the pace of technology. This project seeks to improve the NI competency of the nursing workforce at a pediatric hospital through an educational course using NI competencies identified by the Technology Informatics Guiding Educational Reform (TIGER) Initiative (2009). The value of this project is that it addresses the gap in NI education and competencies at a 265-bed pediatric hospital and creates a NI curriculum that is relevant, timely, and teaches nurses the essential skills to use NI to provide quality care and become a driver of patient quality outcomes.

Key words: nursing informatics, informatics, TIGER, competencies, education

Introduction

Background Knowledge

The field of Nursing Informatics (NI) requires nurses to move beyond the standard nursing model and integrate computer science, information management, and cognitive science into the nursing process to create a field of study that will have a profound impact on healthcare delivery. The American Nurses Association's (ANA) defines NI as:

A specialty that...[communicates] data, information, knowledge, and wisdom in nursing practice. NI supports consumers, patients, nurses, and other providers in their decision-making in all roles and settings. This support is accomplished through the use of information structures, information processes, and information technology (2015, p 1-2).

NI has become an integral part of nursing science in the past decade. However, NI was essential from the very beginning of formal nursing science. Florence Nightingale recognized the potential power of NI to improve the quality of patient care. She “called for standardized clinical records that could be analyzed to assess and improve care processes and patient outcomes” (Ozbolt & Saba, 2008, p. 199). Nightingale's early recognition of the important role of NI would be fully realized with the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 (HealthIT, 2015) and the publication of the Technology Informatics Guiding Education Reform (TIGER) Initiative (2009). In addition, the Institute of Medicine of the National Academy's Future of Nursing report (IOM, 2010) calls for nurses to not only become equal drivers of health policy, but to also create an atmosphere of continuous learning.

The HITECH Act, the TIGER Initiative, and the IOM's report serve as a clarion call for nurses to transform into more active participants in gathering and critically analyzing clinical

data. With a better understanding and use of NI, nurses can use those data to radically alter the delivery of patient care and elevate the quality to a degree undreamt of by Nightingale.

According to the National Council of State Boards of Nursing (2016), over half the national nursing workforce is over the age of 50. According to Hwang et al (2011) nurses over the age of 50 tend to score lower on computer proficiency tests than younger nurses. These nurses are considered “digital immigrants”: nurses who did not grow up with technology and learned to use it later in life (Byrne, 2012, p. 42). Undergraduate nursing students, who tend to be younger, are considered “digital natives”; they grew up using the internet and smartphones (Byrne, 2012, p. 42). These students have been found to be more adept at basic computer skills; but they have had little exposure to healthcare informatics systems (Choi & De Martinis, 2012).

New graduate nurses report that the NI education they received was inconsistent, taught by instructors that demonstrated a diminished understanding of NI, and the NI skills taught in these classes did not transfer well to the workplace (Bembridge, Levett-Jones, & Jeong, 2011). This disparity in computer skills and NI in both new graduate and experienced nurses puts not only patients at risk for delayed or suboptimal care, but also places another stressor on nurses who are expected to demonstrate improved patient outcomes by using an EHR system. With the HITECH Act’s Meaningful Use (MU) provisions requiring healthcare organizations to demonstrate they are using EHR in a meaningful way to improve patient care, the onus is on the health system and nurses, to learn how to become more efficient users of EHR.

As of April 2015, 95% of eligible hospitals in the United States have implemented or upgraded their EHR (Office of the National Coordinator for Health Information Technology, 2015). With such widespread adoption rates, nurses today will encounter some form of an EHR no matter where they work. It is essential that they have the necessary tools and can demonstrate

competencies necessary to perform their job duties, and have the ability to take those informatics skills and apply them to meet the challenge of improving quality care effectively and efficiently.

Local Problem

The project took place at a 265 bed, not-for-profit, Magnet-certified pediatric hospital in the Central San Joaquin Valley of California (referred to as “the organization” throughout this paper). The organization utilizes the MEDITECH Client/Server 5.66 EHR system for their inpatient departments and the Emergency Department. The organization’s Clinical Informatics (CI) Department consists of four full-time and two part-time nurses who audit patient charts, identify incomplete and erroneous documentation, maintain and update clinical nursing documentation. The Clinical Education (CE) Department is responsible for creating and disseminating education to the 1,000 nurses throughout the organization. The Nursing Informatics Council (NIC) reviews and approves any change proposals and revisions to the nursing clinical documentation. The members of the NIC consist of twenty nurses from the various patient care areas in the organization. The Clinical Informatics Workgroup (CIW) is a clinical stakeholder group with representatives from the Laboratory, Imaging, and Pharmacy departments, and Ambulatory clinics, as well as four physicians representing the hospitalist, intensivist, hematology/oncology, and surgical medical groups. The CIW serves as the change management body of the EHR.

The organization has two prescient EHR initiatives occurring within the next two years. The immediate initiative is an incremental upgrade to the current inpatient EHR system from Meditech ClientServer 5.66 to 5.67 in June 2016. This incremental EHR upgrade will add new functionality and change current workflow processes for all healthcare providers and ancillary departments. The long term initiative is to transition the entire organization to a single EHR

platform. Currently, the organization is utilizing two independent EHR systems between their inpatient care areas and ambulatory clinics. This has created a parallel medical record for patients who are seen in the organization's specialty clinic and inpatient care areas. This dual EHR environment has necessitated a lengthy change management process and maintaining a consistent patient record has become difficult. The move to a single EHR platform is seen as a way to address the widening practice gaps between the ambulatory and inpatient care areas. A single record for each and every patient at the organization will potentially ensure that vital and critical information is communicated effectively across all care areas that interact with that patient. Nurses serve as the frontline personnel to not only the patient, but to their clinical documentation.

The organization will be experiencing a large amount of change and the nursing workforce will be the largest group impacted. This gap in NI competency will only be exacerbated in the coming months and years due to the organization's short and long term EHR initiatives. Giving nurses the proper tools and competencies to manage this change effectively will not only prepare them for the organization's EHR initiatives, but will allow them to effectively use technology for the rest of their careers.

The organization employs over 1,000 nurses with a variety of NI exposure and competency. The average age of the nursing workforce at the organization is 41 years, and 61.4% of the nurses have a Bachelor of Nursing degree (C. Coakley, personal communication, March 1, 2016). The organization's last EHR initiative was in 2010 when they implemented full clinical documentation for physicians and nurses, and computerized order entry for their all their inpatient care areas. There are no formal written NI competencies at the organization nor are there any education plans in place that specifically addresses NI competencies at the organization

or department level. During new employee orientation, nurses are given a brief overview of the various computer systems used by the organization such as email and self-scheduling programs.

Currently, clinical documentation education is done at the bedside, with the new employee's preceptor. This at-the-bedside training consists of clinical documentation, care planning, order entry, medication administration, and medication reconciliation. Once orientation is complete, nurses are assessed on the timeliness and accuracy of their clinical documentation annually during their performance review. There is no formal remediation course if a nurse is found to have deficient NI competencies. The CI nurses handle issues with clinical documentation on an individual basis. Currently, the organization utilizes email updates to disseminate updates to EHR functionality and clinical documentation.

With such monumental changes in motion in the short and long term, NI competency will be essential to not only nursing success, but to the success of the organization as well. Training over 1,000 nurses with varied levels of NI competency and without guiding principles or frameworks will potentially lead to a difficult EHR transition and may endanger the organization's short and long term goals of providing improved patient care.

Intended Improvement

The aim of this project is to improve NI competency by developing, implementing, and evaluating a NI curriculum for organization's nursing workforce. The TIGER Initiative's NI competency set is the guiding framework for curriculum development. The upcoming EHR initiatives over the next two years necessitates that the organization prepare an appropriate education plan to improve NI competencies throughout the nursing workforce to create more well-informed and efficient nurses now and into the future. With this proposed training plan in place, the organization can begin to educate and address NI competency gaps in preparation for

the EHR transition. Nurses who complete the class should be able to demonstrate an increase in self-reported proficiency in NI competencies identified by TIGER Initiative. See Appendix A for a complete list of TIGER NI competencies.

Review of the Evidence

A review of the literature using the CINAHL, PubMed, EBSCO, and ScienceDirect databases was conducted prior to the start of the project. Key words used in the searches included: nursing informatics, nursing informatics competencies, education, and curriculum development. The main purpose of the literature review was to examine what has been done by others in the development and implementation and evaluation of nursing informatics competencies in nursing education. The search returned 18 studies between the years 2011 and 2016. The research articles were assessed on their quality using the Johns Hopkins Nursing Evidence-Based Practice Research Evidence and Non-Research Rating Scales (Dearholt & Dang, 2012). Articles were selected based on their contribution to the study and advancement of NI competencies in nursing education. See Appendix B for the Literature Review Summary. Literature on EHR and its effect on patient safety as well as professional development for older nurses were also sought out to provide background information.

NI competencies. NI competencies has received much attention in the last decade. Since the passage of the HITECH Act in 2009, nearly 95% of the hospitals in the United States has upgraded or implemented some form of EHR (Office of the National Coordinator for Health Information Technology, 2015). Although EHR systems have been readily adopted across the nation, the same cannot be said for the level of NI proficiency among the nursing workforce. Many nursing experts have developed and validated their own set of NI competencies, each with

their own set of priorities. However, there is little consensus on a standardized set of NI competencies (Gonçalves, Wolff, Staggers, & Peres, 2012).

Staggers, Gassert, and Curran published the first major set of NI competencies in 2001. They created their list by integrating computer skills with nursing skills and a focus towards the bedside nurse. Their competency list spanned four levels of practicing nurses: Beginner, Experienced, Informatics Nurse Specialist, and Informatics Innovator (Stagger et al., 2001). The same research group also validated their competency list by submitting their 305 competency list to an expert panel of advanced-degree nurses who had at least 5 years of NI practice experience. Three rounds of Delphi study were needed to arrive at 285 NI competencies with greater than 80% agreement (Staggers, Gassert, & Curran, 2002). This set of NI competencies has gone on to serve as the basis for other NI competencies.

The next set of NI competencies came from the TIGER Collaborative. Comprised of nursing stakeholders, this group's vision was to develop NI as the method to improve nursing practice, education, and patient care delivery (TIGER, 2009). Their model is comprised of three areas: basic computer competencies, clinical information literacy, and clinical information management. Each of these three areas aligns with other internationally recognized governing bodies. Basic computer competencies align with the International Computer Driver's License (ICDL) Foundation, a certifying body that provides structured computer educational courses (ICDL, 2016). Clinical information literacy competencies align with the information literacy competency standards set by the American Library Association (TIGER, 2009). Clinical information management competencies align with two groups: The International Computer Driving License for Health and Health Level Seven, a not-for-profit standards developing body for the retrieval of electronic health information (HL7, 2016).

Component of the Model	Standard	Source (Standard-Setting Body)
Basic Computer Competencies	European Computer Driving License	European Computer Driving License Foundation www.ecdl.org
Information Literacy	Information Literacy Competency Standards	American Library Association www.ala.org
Information Management	Electronic Health Record Functional Model – Clinical Care Components International Computer Driving License – Health	Health Level Seven (HL7) www.hl7.org European Computer Driving License Foundation www.ecdl.org

Figure 1: TIGER NI Competency Model (TIGER, 2009)

Schleyer, Burch, and Schoessler (2011) described the organic creation of a set of NI competencies in an acute care organization. This organization recognized the knowledge gap between bedside nurses' perceptions of NI and the relationship to improve patient care. Working over a three-year period, the organization overhauled their professional development program to define clinically relevant informatics competencies and implement them across their professional development (Schleyer et al., 2011). The organization created a work group that blended the Data-Information-Knowledge-Wisdom framework with Benner's Novice to Expert nursing model to create a set of NI competencies that could easily integrate into the existing nursing professional development system.

Nagle et al (2014) created a set of NI competencies that could quickly be integrated with the Canadian Association of Schools of Nursing (CASN) curriculum standards. These entry-to-practice set of NI competencies was first proposed by the Competency Development Workgroup by reviewing established NI competencies from the TIGER Initiative, Staggers et al (2001), the Canadian Nurses Association, the American Association of Colleges of Nursing (AACN), and the College of Nurses of Ontario (Nagle et al., 2014). The workgroup arrived at 30 competency statements, which were then submitted to nursing stakeholders at a national symposium.

Through this collaborative effort, the NI competencies were organized into three headings:

Information and Knowledge Management, Professional and Regulatory Accountability, and Information and Communication Technologies (Nagle et al., 2014). The researchers found that the level of engagement from the stakeholders helped build consensus around NI competencies and awareness to integrating those competencies into the nursing curriculum was essential.

Chang, Poynton, Gassert, and Staggers (2011) created a set of NI competencies for nurses in Taiwan. The authors identified that Taiwan hospitals and medical centers have state-of-the-art technology installed, but the nurses lacked the requisite NI competencies to utilize those systems effectively (Chang et al., 2011). Starting with the Staggers et al (2001) NI competencies, an initial list of NI competencies was given to 23 nursing educators and 9 nurse administrators across 39 nursing schools and 15 medical centers/hospitals (Chang et al., 2011). After three Delphi rounds, 318 out of 323 NI competencies reached a consensus of 97.8%. A total of 45 new competencies were added to the list, reflecting newer technologies available to nurses. With this master NI competency list, Taiwan nursing schools and organizations can now integrate a standardized education plan around NI competency and prepare nurses for improved NI utilization at a national level.

NI in nursing education. Although many authors and experts have created NI competency lists, there are still opportunities for these NI competencies to be integrated into the nursing curriculum. De Gagne, Bisanar, Makowski, & Neumann, (2012) conducted a literature review between 2000 and 2010. After reviewing 19 studies, they found a “lack of consensus between computer, technology, and information literacy” was present in the nursing curriculum (2012, p. 677). They go on to recommend that basic computer skills be a pre-requisite for incoming nursing students, and that higher order NI skills such as knowledge of simulation software, databases, and healthcare information systems should be obtained by the end of a

baccalaureate program. Such early exposure to these skills during their nursing education will better prepare new graduate nurses for the technology-rich workplace.

Tellez (2012) suggests that utilizing the change management process from the field of Information Technology (IT) could be a way to quickly enact change to nursing curriculum. The change management process utilizes five phases: assessment, feedback, strategy development, implementation, and reassessment (Tellez, 2012). Using this style of change can help nursing educators rally support from the nursing faculty and create change at a pace that keeps up with the pace of technology.

Choi and De Martinis (2013) surveyed 289 nursing students using a self-assessment of nursing informatics tool. The results showed that nursing students in both undergraduate and graduate programs rated themselves as competent in basic computer knowledge, clinical informatics attitude, and wireless device skills (Choi et al., 2012). In other study by Choi (2012) three groups of students in pre-licensure, Registered Nurse (RN) to Bachelor of Science (BSN), and Accelerated BSN programs were asked to assess their level of NI competency. Choi found that the pre-licensure and RN-to-BSN students had a significant difference in their overall NI competency, and that the students felt they were lacking in competency in the applied computer skills and Clinical Informatics role (Choi, 2012).

An additional study conducted by Choi and Zuker (2013) asked 132 DNP students to rate themselves on NI competencies. Students from the post-MSN and post-BSN tracks were assessed in three areas: computer skills, informatics knowledge, and informatics skills. The researchers found that DNP students, regardless of their track, did not rate themselves as competent in any of the three informatics areas (Choi et al., 2013). The findings from all three

studies suggest that there is still room for improvement in developing curriculum that addresses NI competency growth throughout the nursing curriculum.

Shiffitt and Effken (2012) recommend that threading informatics through an educational program in innovative and creative ways will better engage nursing students in developing a foundation of NI competency that they can use in the workplace. They recommend that DNP programs offer more than just a single informatics course, and integrate NI into clinical and nonclinical coursework to better reflect the way informatics is practiced in the workplace.

Stephens-Lee, Lu, and Wilson (2013) described a project in which NI could be threaded into a baccalaureate nursing program. The authors examined one Canadian BSN program and mapped the TIGER (2009) NI Competencies together. The BSN program nursing model was comprised of five abilities-based outcomes: Knowledge and its Application, Skills of Analysis/Critical Thinking, Communication, Professional Identity and Ethics, and Social Justice/Effective Citizenship (Stephens-Lee et al., 2013). The authors and nursing educators found that many of the basic computer competencies outlined by the TIGER Initiative were well covered prior to program entry. Clinical information literacy and clinical information management skills could be taught by having students examine a case study, paying specific attention to how patient data is entered and interpreted. This practical application would closely mirror the expectations of the workplace and give nursing students the opportunity to actualize NI concepts.

Borycki, Frisch, Kushniruk, McIntyre, and Hutchinson (2012) described an innovative double degree Master's program in Nursing and Health Informatics. The authors partnered with the Schools of Nursing and Health Information Science at the University of Victoria, Victoria, British Columbia to create a three-year distance learning program that combined classroom

learning and cooperative education experiences in developing health information systems to better solidify didactic learning with the practical world (Borycki et al., 2012). This program has garnered much attention from prospective nurses who see the value in developing both advanced nursing leadership skills with a focus on healthcare informatics.

Beckham and Reidford (2014) describe the development of a novice-level informatics course for the noninformaticist specialist nurse. The design of the course was based on the AACN informatics standards. During the course, the authors found that student often failed to understand the individual role they placed in information determination (Beckham et al., 2014). To better engage the students, the instructors used a variety of instructional methods: asynchronous online coursework, group assignments, case studies, and online peer discussion (Beckham et al., 2014). The authors found that skill rehearsal played in integral part in helping the students translate concepts taught in class to the practical setting. While nursing education is adapting and integrating NI and NI competencies into their curriculum, there still are approximately 3 million nurses working at the bedside that have had a varied level of exposure to NI and NI competencies.

NI at the bedside. Addressing this gap in NI competency in the nursing workforce can also have some measurable benefits. Remus and Kennedy (2012) identified that nursing leaders can help lead organizations to better utilize technology to help healthcare organizations make better informed decisions and create a knowledge-driven healthcare system. Creating a set of NI competencies that address the specific needs of nurse leader and executives could have a downstream benefit to improving other NI competencies that are essential for the bedside nurse practicing today.

Hwang and Park (2011) surveyed nursing groups at two teaching hospitals in Korea and found that the level of NI competency in both groups rated themselves as below average. The nurses rated themselves as proficient in basic computer skills, but below average at higher level NI competencies such as knowledge management, information management, and clinical information systems (Hwang et al., 2011). The lack of confidence in NI competency among these nurses demonstrates that nursing educators need to integrate NI into the curriculum during school and in the workplace in order to develop a workforce ready to use technology appropriately and successfully.

EHR and Patient Safety. Since the rapid adoption of EHRs by the healthcare industry, much attention has been given to the effects that EHRs have on the quality of patient care. Rinner, Grossman, Sauter, Woltz, and Gall (2015) examined the effect EHRs had on drug-drug interactions (DDI), duplicate warnings, and their effect on patient safety. After analyzing over 27 million prescriptions between 2006 and 2007, the researchers found that severe DDI warnings would have been detected on 20% more patients when utilizing an EHR (Rinner et al., 2015). An increase in DDI warning indicates that EHR functionality can help care providers in identifying more patients at risk for DDI and thus negative patient outcomes.

Reed, Huang, Graetz, Brand, Hsu, Fireman, and Jaffe (2012) examined the staggered implementation of an EHR across 17 medical centers and found that the implementation of an EHR improved the rates of medication treatment and follow-up care in a high-risk patient population with diabetes. They found that after EHR implementation, patients received more intensive care and tracking, which ultimately led to a reduction in their HgbA₁C and LDL-C levels (Reed et al., 2012).

Enriquez, Lemos, Parikh, Simon, Thomas, Wang... and Das (2015) compared three groups of patients treated at facilities with full, partial, and no EHR systems. The patients treated at facilities with a fully implemented EHR had fewer heparin overdosing errors, a higher incidence of receiving guideline-recommended care, a lower risk of major bleeding, and a lower risk of mortality (Enriquez et al., 2015).

Kutney-Lee and Kelly (2011) surveyed 16,352 nurses across 316 hospitals in 4 states and found that nurses reported that poor patient safety and quality indicators happened less frequently in the presence of a basic EHR. Nurses working with an EHR report a perception of increased efficiency and knowledge of their patients and their readiness for discharge (Kutney-Lee et al., 2011). This study underlines the synergistic relationship between EHRs and the nurses who use them in improving patient care.

Artur Ferreira de Sousa, Teresinha Marcon Dal Sasso, and Couto Carvalho Barra (2012) conducted a literature review of 64 studies and found that EHRs built with standardized language and nursing terminologies can help with improving the quality of patient care. Those EHRs without standardized nursing language were found to be deficient in describing meaningful patient data (Artur Ferreira de Sousa et al., 2012). By involving nurses in the creation of nursing specific data points, the EHR can develop into a system that supports an improved practice environment, patient satisfaction, patient results, and nursing efficiency (Artur Ferreira de Sousa et al., 2012).

Focusing on improving NI competencies has measurable benefits for nurses, but organizational culture and success can also benefit from improved NI competency. Lin, Hsu, and Yang (2014) described in their survey of 454 nurses, that nursing NI competency had a direct influence on an organization's success. The researchers found that improving NI

competencies will have a greater impact on a successful EHR implementation than a well-constructed EHR system (Lin et al., 2014). The implications of this study indicate that focusing on developing NI competencies in the nursing workforce will create a positive feedback loop by improving EHR documentation and improve the quality of patient care.

Professional development and older nurses. Within the organization, the average age of the nurse is 41 years old (C. Coakley, personal communication). Special attention must be paid in developing educational courses that acknowledges the different learning styles of nurses based on their age. Lammintakanen and Kivinen (2012) surveyed 653 nurses and found that the nurses had different learning practices related to their age. Younger nurses (< 39 years old) were more eager to share their knowledge with others, while older nurses (> 51 years old) sought out more solo opportunities to learn (Lammintakanen et al, 2012). The challenge for organizations is to engage all nurses, regardless of age, in obtaining the necessary NI competencies to perform their duties effectively and efficiently.

Poole, Poell, and Cate (2015) interviewed 21 nurses from three age groups and found that their learning needs changed in accordance with their age. In the middle age group (ages 37-48) were primarily concerned with balancing their work-life with their personal-life; while older nurses (ages 54-61) wanted to maintain their level of work and had clear, explicit learning goals (Poole et al., 2015). What is important is that professional development also take into account the various educational needs of their nurses with respect to age. The one common theme between all age groups was the desire to learn activities to improve the daily patient care, extra tasks, and other job roles (Poole et al., 2015).

In an earlier study, Poole, Poell, and Cate (2013) examined nurses' and managers' perception of continuing professional education for both older and younger nurses. After

interviewing 22 nurses and 10 nurse managers, the researchers described six differences in the professional development of younger vs older nurses: (1) level of focus, (2) creating possibilities to leave the bedside, (3) ambitious young nurses, (4) same resources, different requirements, (5) ceiling in courses for older nurses, and (6) social status and self-esteem (Poole et al., 2013). The nurses and managers also identified three drivers of professional development across the ages: purpose, level of formality of learning activities, and scope of development (Poole et al., 2013). Much like the previous study, the researchers suggest that educational offerings need to be varied those three areas to engage nurses from across the age spectrum.

Conceptual and Theoretical Frameworks

Data-Information-Knowledge-Wisdom. The Data-Information-Knowledge-Wisdom (DIKW) theory of nursing science is the guiding framework for this project. Expanding upon the work done by Blum (1986) and Graves and Cocoran (1989) on the Data-Information-Knowledge theory of NI, the DIKW theory has been widely adopted by the NI community and formally by the ANA NI Scope and Standards of Practice (Matney, Brewster, Sward, Cloyes, & Staggers, 2011; ANA, 2015). The DIKW is a hierarchy of metastructures: Data, Information, Knowledge, and Wisdom (Matney et al., 2011; ANA, 2015). The theory defines data as the smallest unit within the framework. They are products or representations of observable “objects, events, and their properties” (Matney et al., 2011, p. 7). Information is placing discrete units of data within a context. Knowledge is the synthesis of information into relationships. Wisdom is the ethical use of Knowledge to solve problems (Matney et al., 2011). The DIKW formalizes the critical thinking concept taught.

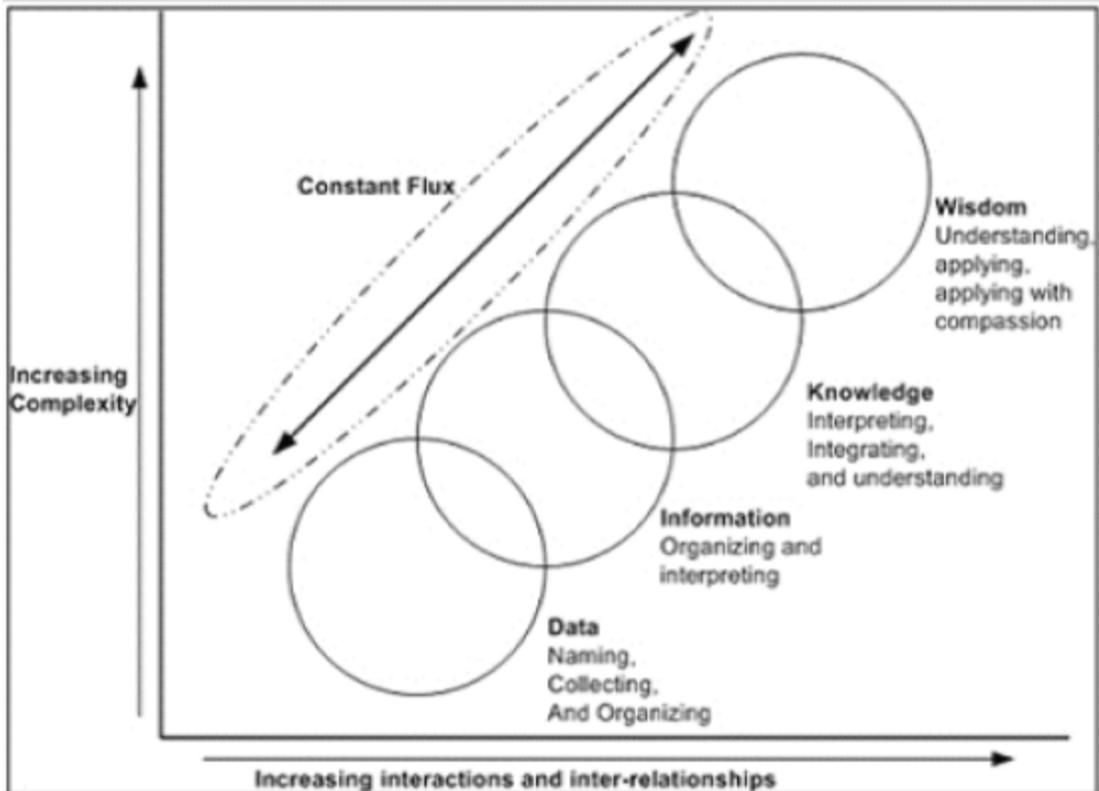


Figure 2: DIKW Framework (Matney et al, 2011)

Translating the DIKW to the bedside, the nurse analyzes and contextualizes data from the EHR and uses their knowledge of related EHR systems to plan patient care that is personalized and respects the wishes and preferences of the patient; all while leveraging the ability of the EHR to present and analyze patient data at a level that would be undoable in the paper chart era. The course curriculum in this project seeks to enlighten students to the interplay between the metastructures of Data, Information, Knowledge, and Wisdom and how the EHR serves as not only a data repository, but also a tool to help them make better patient care decisions throughout nursing school and reinforced at the bedside.

Attention Relevance Confidence Satisfaction (ARCS) theory. In addition to the DIKW model, Keller's ARCS theory can help describe the framework for providing the course content in an engaging and relevant manner. Keller's model consists of four aspects: attention,

relevance, confidence, and satisfaction (Gatti-Petito, Lakatos, Bradley, Cook, Haight, & Karl, 2013). The learner's motivation to learn can be improved by engaging these four aspects.

According to Keller (2010), capturing a learner's attention involves leading students to focus on stimuli related to learning objectives. Relevance means taking esoteric topics and adapting them to the learner so they become personally invested in learning.

Learner confidence with the learning topics are potentially increased with successful application of concepts taught; and satisfaction is achieved when learning is reinforced through a positive learning experience (Gatiti-Petito et al, 2013; Keller, 2010). Capturing the learners' attention includes presenting clinical problems encountered by the nurses in the course of their day. One example includes documenting an IV insertion, site assessment, and IV infiltration. Many of the nurses in the organization cite IV documentation as a source of frustration. This workflow is highly relevant to the nurses since they document IVs multiple times a day. The CI and NIC nurses also note that IV documentation is a chronic and persistent issue with the staff as evidenced by erroneous and incomplete IV documentation identified during chart audits. Providing solutions to improve IV documentation such as presenting the correct documentation workflow and having students demonstrate that workflow can help to improve nurses' confidence and satisfaction when they have to document an IV assessment. The nursing workforce is comprised of various traditional and non-traditional staff with a variety of technology exposure that presents a unique challenge for nurse educators (Min, Khin, Razak, & Xia, 2014). Using the ARCS model in tandem with the DIKW framework can help describe the main components that motivate adult learners and provide a guide to shape complex NI ideas into engaging and relevant topics. By combining the two learning frameworks, complex NI topics

and clinical information management competencies will be taught in an engaging method to stimulate older nurses to retain these concepts and help them become more comfortable with NI.

Methods

Ethical Issues

Utilizing the ANA's Code of Ethics for Nurses (ANA, 2015) as a starting point, nurses need to consider the challenges to patient information and privacy presented by a world that is increasingly becoming interconnected and online. For example, Provision 2 of the ANA's Code of Ethics state that the "primary commitment is to the patient" (ANA, 2015, p.49). With the rise of EHRs, the nurse's commitment to the patient now includes considering the implications of patient data collection in an interconnected, electronic world. This includes maintaining the privacy and security of all patient health information from others, including other healthcare providers who have no legal right to a patient's records.

The nurse now needs to be more vigilant in accessing patient information in an electronic world. According to the United States Department of Health and Human Services Office of Civil Rights, there were 21 breaches in 2015 that affected more than 76,000 patient records (2016). With the rise of social media, nurses must understand the legal and ethical implications of posting pictures and videos of patient information. Cronquist and Spector (2011) state that such violations of a patient's privacy can result in punitive damages and disciplinary action from federal and state regulatory agencies. Not only are individual nurses held potentially liable for breaches of patient information, but organizations can also be held liable. The largest case to date involves the New York and Presbyterian Hospital and Columbia University settling with the U.S. Department of Health and Human Services for \$4.8 million dollars for failing to adequately secure patients' medical information (The U.S. Office of Health and Human Services, 2014).

In a world of instantaneous information retrieval, nursing beneficence, or the act of taking positive action to help others, is done at the speed of a mouse click. With an EHR, the nurse has the ability to view trends and patterns at an instantaneous speed. Using this wealth of patient information allows the nurse to quickly identify early signs of deterioration and activate the healthcare team to intervene sooner, providing a better patient outcome.

Utilizing EHRs for early identification and tracking of serious conditions, such as hospital-acquired pressure ulcers, patient falls (Dowding, Turley, & Garrido, 2012) and pediatric-specific conditions such as supracondylar fractures, cleft lip/palate, and voiding dysfunction (Carberry, Landman, Xie, Feeley, Henderson, Fraser Jr., & Fraser, 2016), can provide nurses with vital information sooner and can help guide practice to improve patient outcomes, improve the quality of patient care, and shorten hospital stays. As the coordinator of care, the nurse is especially positioned to be the first responder to critical information and dramatically influence the patient's clinical course. However, without better awareness of NI and the role that it plays in clinical decision-making, the nurse cannot realize their full potential as an active driver of patient care.

Nonmaleficence, or the avoidance of harm or hurt, can be improved through the use of clinical decision support (CDS) that is embedded in many of the EHRs in use today. One example of this CDS is when a nurse uses medication scanning to administer medication. If any one piece of that medication administration is incorrect (i.e. wrong patient, wrong medication, wrong time, wrong route, etc.) then the nurse is alerted to that fact. Without a strong foundation in NI, the nurse could choose to ignore those warnings, due to alert fatigue or distrust of the EHR, and administer that medication anyways, resulting in an adverse drug event and potentially cause harm to the patient.

NI and EHRs cannot only help individual patients, but whole patient populations as well. Utilizing NI and EHR empowers nurses to enact justice, or the fair and equal distribution of resources, on a larger scale. Through tracking patients and their nursing utilization, organizations can utilize their resources more effectively and efficiently in real time. For example, in the Emergency Department, tracking patient arrival times can help lead to staffing plans that respond to patient surges and can help the staff care for their patients more efficiently by providing the sufficient staff to cover the influx of patients, decreasing wait times, and improving patient throughput. Another example is integrating standardized nursing care terminologies, data models, and information structures into the EHR. By doing this, researchers and nursing can exact data to improve patient care not only at the local level, but at the global stage as well (Keenan, 2014; Westra, Latimer, Matney, Park, Sensmeier, Simpson, & ... Delaney, 2015). Utilizing this Big Data approach can help organizations distribute their care effectively, efficiently, and with the most impact.

Setting

The project took place at a 265-bed pediatric hospital located in the Central San Joaquin Valley of California. This pediatric hospital is a not-for-profit, independent, Magnet-certified, teaching hospital that serves 12 counties ranging from the central coast, through the central San Joaquin Valley, to mountain areas of California. The organization has 265 licensed inpatient beds, the Emergency Department sees over 100,000 patients annually, and has over 30 pediatric subspecialty clinics. There are seven inpatient care areas in the organization, each with its own unique patient population. The care areas consist of a pediatric intensive care unit (PICU), a neonatal intensive care unit (NICU), a hematology/oncology care area, an inpatient rehabilitation

care area, and three medical/surgical units divided by diagnoses (respiratory, pre- and post-surgical, and general medical).

The organization currently uses the Meditech ClientServer 5.66 EHR platform for inpatient and Emergency Department clinical documentation; the ambulatory clinics are utilizing the Athena EHR platform. Nursing care planning, patient clinical data order entry, medication administration, blood administration, physician documentation, and discharge planning are fully electronic. Moderate clinical decision support is utilized, but is limited to physician functions like medication order entry, drug-drug interactions, drug-allergy interactions, and standardized order sets. New nurse employees go through basic computer training during new employee orientation consisting of instruction on how to log onto the computer, accessing email, and accessing the organization's intranet portal.

Clinical documentation education is currently done at the bedside with the new employee's preceptor. Each preceptor must complete an 8-hour class focused on the art of preceptorship, but there is no formal training for preceptors on NI competency. There are currently no policies in place addressing NI competencies. EHR education updates are disseminated via email to the nursing staff on a monthly basis. Employees are assessed on the timeliness and accuracy of their documentation as part of their annual performance review. However, there is no formal remediation or classroom time available to nurses to improve or remediate their NI competencies. Thus, there appears to be little consistency in the quality of instruction in NI competency.

The organization's CI department is comprised of four full time and two part time nurses. The CI department oversees maintenance of the nursing clinical documentation within the EHR. The CI nurses work with the Internet Technology Services (ITS) department's Clinical

Applications group in designing and building clinical documentation screens to meet the various needs of the organization and specialty units at the organization. The CI nurses work in tandem with the CE clinical educators in creating educational materials for the monthly updates.

Updates include changes to nursing practice and/or clinical documentation to reflect a missing process, gaps in policy/nursing practice, or introduce new EHR functionality.

The CI nurses are also tasked to review charts that have come to the attention of other departments such as Revenue Integrity, Patient Quality and Safety, or Executive Practice Council. The CI members are part of the Nursing Informatics Council (NIC), a nursing council that is comprised of nursing representatives from each of the inpatient care areas at the organization. This council reviews and discusses requests to create or change clinical documentation. The CE department at the organization is comprised of six nurse educators who coordinate, plan, and implement the nursing educational offerings.

The nursing workforce at the organization have worked with the current EHR system since 2010. Prior to that time, only the Emergency Department fully utilized an EHR for nursing documentation, computerized order entry, and medication administration. Inpatient documentation was done on paper charts, with the exception of medication administration, which was done using an electronic medication administration record. With the transition to an EHR in 2010, the inpatient nurses have become accustomed to working in the electronic environment, but there are still many opportunities to improve NI competency among the nursing workforce. The nursing workforce has made many strides in improving the quality of their documentation, but many nurses still complain that the quality of their patient care has diminished since moving to the electronic world. They feel that they spend too much time worrying about running from

task to task, having a cursory knowledge about their patient, and are frustrated with the complicated EHR system.

In response to this frustration, nurses come up with workarounds: alternate or parallel processes that have the potential to create duplicative or erroneous documentation, or even create a situation where a patient could be harmed. The CI nurses and NIC members help with correcting these workarounds by addressing issues on an individual basis or by emailing just-in-time educational bulletins to the staff, but problems still persist.

Planning the Intervention

The aim of this project is to improve NI competencies of the organization's nursing workforce through the development, implementation, and evaluation of an NI curriculum developed amongst a team of interested stakeholders by March 30, 2016. The curriculum utilized the TIGER NI competencies as a guiding framework. The intended outcome was that nurses will feel more knowledgeable about how to use the EHR and therefore have increased their NI competency. The goal of this project was to improve inpatient nurses' NI competencies by the end of the course as demonstrated by improved NI self-assessment scores. NI competency was tracked via two self-assessment surveys administered pre- and post-class. By being better and more efficient users of the EHR, nurses can create patient-centric care plans and be more informed about the individual care needs of their patients. By becoming more competent in NI, they can see clinical documentation not as a task, but as a tool to create a more holistic patient history and medical record.

In 2010, the organizational structure did not see the importance of CI as a separate department from ITS. It was not until 2012 that the organization implemented CI into the organizational structure. The project certainly would have faced a more chaotic environment had

it taken place during this period of organizational uncertainty. Without the organization's EHR initiatives, the focus on improving the nursing workforce's NI competency would have not have been one of the major focus points of the organization. This additional time also allowed the author to gain more experience in the field of clinical and nursing informatics and to experience firsthand the application of NI at the bedside.

Project budget. The budget for the project and pilot class was \$4,120. The project budget included the preparatory work from the project author conducting research, literature review, project planning, and working with the CI nurses in developing the lesson plans (34 hours total), and as the lead instructor for the class (2 hours). The total expense for the project author is \$2,160 (36 hours x \$60/hour). The three CI nurses spent eight hours between planning meetings with the project lead in curriculum development and attending the technical dress rehearsal for a total of \$1,440. The initial student enrollment was four students. For the pilot phase of the project, the average paid time per student is estimated at \$50 per hour for a total of eight hours of instruction time. The total amount for student education was \$800 (4 students x 2 hours education time x \$50/hour). Funds for each student came from their home department's education budget.

One ITS staff person was needed for creating training patients in the TEST version of the EHR, a separate and parallel EHR system used for training and testing purposes. This person would be responsible for creating a practice patient for each student to document on during the class. The ITS staff person would enter medications for the nurses to administer, reported home medications for medication reconciliation, and enter clinical nursing and physician documentation for the current and past visits for the nurse to review. The time spent performing

this activity was estimated at two hours at \$60 an hour. Total ITS support would be two hours for a total of \$120 (2 hours x \$60/hour). See Appendix C for Project Budget.

Cost/Benefit analysis. A cost/benefit analysis was conducted to describe the potential benefits relative to the cost of the project. Although the project budget was small, the benefits of implementing this intervention across the organization would be beneficial in helping the organization meet the core requirement of the HITECH Act, avoid financial penalties associated with adverse drug events, and decrease nursing overtime.

As an example of how increasing the NI competency of the nursing workforce could affect/effect the organization's "bottom line", as part of the HITECH Act, organizations who use an EHR system must demonstrate to the Centers for Medicare and Medicaid Services (CMS) Department that they are utilizing EHR in meaningful way to receive financial incentives. Meaningful Use (MU) represents one of the "most profound opportunities...to document and quantify the value of nurses' critical thinking" (Simpson, 2011, p. 83). MU is divided into 3 stages and Stage 2 of MU is a set of sixteen required core measures and ten additional menu objectives, of which the organization can select three to submit data to CMS (CMS, 2012). The organization has successfully completed attestation to Stage 1 of MU and will be ready to submit data for Stage 2 of MU by the end of FY2016.

One of the required core objectives for Stage 2 is to demonstrate that the organization performs medication reconciliation on greater than 50% of their patients and failure to meet the threshold of any of these actions makes the organization ineligible for financial incentives. The financial incentive for the organization can range from a base amount of 2 to 6.3 million dollars. Additional funds are added to the base amount by calculating the organization's Medicare Share of patients and a Transition Factor based on the when the organization first received MU

payments (CMS, 2016). The maximum financial incentive is 6.3 million dollars for meeting Stage 2 MU.

Nurses play an integral role in the medication reconciliation process. At the organization, the nurses collect home medication information: last taken date and time, and dose of the patient's home medication, discontinue old or expired prescriptions, and flag any home medications for further review by the physician. Home medication information collected by the nurse flows to the physician's electronic documentation where they would reconcile the home medications prior to discharge. This workflow was initiated at the organization in January 2016 in preparation for attestation to Stage 2 MU later this year.

Currently, the organization's medication reconciliation compliance for nurses is 30% of all patients. At this compliance rate, the organization would fail to meet the core requirement of medication reconciliation being performed on 50% of all patients. With the initial rollout of medication reconciliation, there was an increase in compliance during the first month of the rollout. Education and Super Users (SU) were deployed for the first month to educate and help staff with any issues. However, after the SU and support went away, nursing compliance has steadily decreased to a level below the MU threshold. The organization has addressed compliance with focused reeducation, but this addresses the symptoms and not the root cause of the decline in compliance.

Improving NI competency would potentially help the nurses utilize the EHR and increase their medication reconciliation compliance to meet Stage 2 MU and help the organization meet the criteria necessary for financial incentives. So by nurses becoming more competent in NI there is a hope that they in turn would be able to improve and meet the medication reconciliation goal and thereby obtain Stage 2 MU funding (up to over 6 million dollars) for the organization.

Understanding of course that there are multiple variables that will impact the success or failure of meeting Stage 2 MU requirements.

In addition to the potential financial incentives of meeting Stage 2 MU, there are other more day to day tangible benefits from improving NI competency. According to the Agency for Healthcare Research and Quality (AHRQ), adverse drug events (ADE) occur at a rate of 51 per 10,000 discharges (AHRQ, 2011). The cost of an ADE can range from \$3,511 for a preventable ADE up to \$8,116 for a life-threatening ADE (Hug, Keohane, Seger, Yoon, & Bates, 2012). As the administrator of most medications, the nurse is the last check against a medication error. However, an EHR does not absolve the nurse from the responsibility of critically thinking about the medication they are about to administer.

Solely relying on the EHR to ensure error-free medication administration has set up nurses, clinicians, and organizations for potential failure (Linsky & Rogers, 2014; Moore, Artmitage, Wright, Dobrzanski, Ansari, Hammond, & Scally 2011). By improving NI competency, nurses hopefully would be able to think more critically about the systems they use every day to administer medications and that increased awareness could prevent an ADE. The organization had 490 preventable ADEs in FY 2015 (C. Kozub, personal communication, April 20, 2016). By having a better understanding of how to use the technology to their benefit, the reduction of 49 preventable ADEs across the organization ($\$3,511 \times 49 = \$172,039$) would help to offset the cost to train the staff ($1,000 \text{ nurses} \times \$50/\text{hour} \times 8 \text{ hours} = \$400,000$).

With better NI competency, the organization will see an improvement in the accuracy and timeliness of nursing documentation. The organization currently uses some nursing documentation for charge capture. Currently, if nurses omit or forget some of that documentation, the organization loses the ability to bill for that procedure or medication

administration and could potentially miss reimbursement for that day or even the whole patient stay. In addition to improved nursing documentation, nurses will potentially become more efficient at their job by extracting information from the EHR more efficiently than before. The time gained from this efficiency could be used to provide more patient-centered care and improve the quality of nursing care.

There is also the potential with better efficiencies in practice to achieve a reduction in nursing overtime (OT). The organization pays, on average, \$1.87 million in nursing over time annually. If nurses were more efficient with their time, as demonstrated by utilizing the EHR more efficiently after taking the course even a small 10% decrease (\$187,000) in nursing overtime across the organization would be a positive financial impact to the organization's bottom line.

With improving NI competency among the nurses, the organization is poised to realize significant financial incentives and avoid penalties. In total, the cost to implement this educational program throughout the organization is estimated to cost \$523,600. This amount is divided into two categories, development and implementation. The one-time development costs include the research and planning time by the project author and CI nurses (4 nurses x \$60 hour x 60 hours = \$3,600) and the cost to have ITS staff to load patient data into the EHR is estimated at \$30,000 (\$60/hour x 250 hours). Implementation costs include student education time and instruction time. It is estimated that 125 classes of eight students each will be needed to train all the organization's nursing workforce. The cost to educate all 1,000 nurses in the organization is \$400,000 (1,000 nurses x \$50/hour x 8 hours) and instructional time for the project author is \$30,000 (\$60/hour x 500 hours).

Potential benefits include meeting Stage 2 MU criteria for a financial incentive between 2 and 6.3 million. Reducing the preventable ADE incidence by 10% annually could save the organization up to \$172,039 plus the reduction in nursing overtime of \$187,000 annually, the organization could realize significant savings with a minimal investment. See Appendix D for Cost/Benefit Analysis.

Responsibility/accountability. The project author maintained responsibility and accountability of meeting all project tasks and milestones. During the design phase of the project, the project author consulted with the CI group to select relevant TIGER NI competencies and to create the lesson plans for the pilot study. The project author was the responsible party to submit the lesson plans to both the CI and CE departments for approval. Once approval of the lesson plans was obtained from both departments, the project and lesson plans were presented to the NIC and the CI nurses were again consulted in revising the lesson plans with the suggestions of the NIC.

During the Implementation phase of the project, the project author was accountable and responsible for providing course objectives to the CE department to post the class on the organization's education system. Advertisement content for the pilot course was created by the project author and the CI nurses were consulted and approved the document. The CI Director was kept informed of the project's process during both the Design and Implementation phases. Pre-class surveys were created, electronically distributed, and analyzed prior to the class by the project author. The results of the survey were utilized to make adjustments to the curriculum to ensure appropriate content was covered for future implementations of this curriculum. The instruction of the class was done by the project author.

Class evaluations and post-class surveys were administered and analyzed by the project author. The CI Director was informed of the results of the class and further discussions were held to use the curriculum in the upcoming SU training for the EHR upgrade in April 2016. After consulting with the CE department, this education plan will not be utilized for the EHR upgrade planned for June 2016 as education plans for the EHR upgrade were already created and approved by the CE department prior to the design and implementation of this project. However, there are plans to submit this curriculum and for the larger EHR platform upgrade in two years. This two year timeline will allow for the organization to become familiar with the new EHR platform and tailor the curriculum to reflect the workflow and functionality of the new EHR platform. See Appendix E for Accountability/Communication Matrix.

Implementation of the Project

Project timeline. Assessing the project's progress was accomplished by creating a GANTT chart with project milestones. See Appendix F for GANTT chart. After consideration by the HLI department, this project was deemed to be an evidence-based change in practice project. Soon after, the author contacted the CI and CE departments to discuss the implementation of the project and plan a date to hold the training sessions. Both the CI and CE departments expressed enthusiastic support for the project. Approval for the project was granted by both the CI and CE departments. See Appendix G for the organization's Letter of Support.

Meetings with this workgroup were conducted between October 2015 and January 2016. During this time, planning sessions were held with the CI nurses to assess the degree of NI education needed by the nursing staff. This group was the project content workgroup and was led by the project author. It was integral to the project to include the CI nurses; combined they bring over 70 years of clinical experience and they can provide a more nuanced approach to the

EHR and can have a dual perspective of a nursing informaticist and that of a bedside nurse. They work closely with bedside nurses and know firsthand the frustrations the nursing workforce feels in interacting with the EHR.

The first task was to identify essential TIGER NI competencies to guide the curriculum. All of the TIGER NI Competencies were reviewed by the project content workgroup. From the initial 303 TIGER NI Competencies, 47 were found to be essential by the workgroup. Each of the NI competencies was selected based on their relevance to the nursing workflow across all care areas in the organization. After coming to agreement on the NI competencies, the project author drafted two lesson plans, one covering basic computer competencies and information literacy competencies (Lesson Plan I), and the other covering clinical information management competencies (Lesson Plan II).

The CI nurses provide invaluable insight and perspective to the unique needs of each department and provided a holistic view of the course content. They identified opportunities to improve NI competency across the whole nursing workforce, irrespective of patient care area. This made the lesson plans more generalizable to the large nursing workforce and focusing on global NI competencies would help the nurses be adaptable to the dynamic technological environment.

Lesson Plan I served as an introduction to basic computer competencies and gives the nurses the tools to better navigate the organization's unique information system. The only other time nurses are trained on the information system was during new employee orientation. There is no formal class at the organization that offers training or remediation in basic computer competencies for the nurses. Learning outcomes for Lesson Plan I included:

- Demonstrate how to navigate Windows: open, close, and resize application windows

- Demonstrate appropriate methods of logging off, shutting down, and restarting the computer
- Demonstrate on how to create, move, edit, and copy a text file on the local machine
- Demonstrate how to move files from local machine to the network drive
- Identify computer security practices
- Demonstrate management of single sign on credentials
- Demonstrate how to select and connect to network printer
- Demonstrate how to search for Policies and Procedures, Just-in-Time training materials, Discharge Instructions using the intranet
- Demonstrate how to conduct a literature search using a database

Each learning outcome aligns with at least one TIGER NI competency in the basic computer competencies and information literacy domains. These outcomes were selected by the project workgroup as essential for the nursing workforce to function efficiently at the organization. Students were expected to demonstrate competency of these skills during the class utilizing return demonstrations. This allows for the student to turn didactic information into practical knowledge through immediate application of the skills taught (Gatiti-Petito et al, 2013; Keller, 2010).

Lesson Plan II covers navigation of the organization's EHR. Learning objectives for this class included:

- Demonstrate how to navigate the EMR and locating pertinent assessment documentation using the Care Activity, Order History, and Other Reports
- Demonstrate how to view, sort, and manage order list by Service Date

- Demonstrate how to review and demonstrate efficient workflow when starting an IV, assessing the site, charting infiltration, and documenting in IV Spreadsheet
- Demonstrate how to review approved order sources, walk through how to order a medication and nursing order. Have one student demonstrate how to order a medication based off a physician's written order
- Demonstrate appropriate method of adding a reported medication, discontinue an expired prescription, flag a reported medication for physician review
- Discuss barriers to timely documentation, review methods to improve documentation in an efficient and timely manner, provide egregious examples of chart audits and late documentation

Each of these objectives aligns with at least one TIGER NI competency in the clinical information management domain. Students were expected demonstrate learning objectives by return demonstration to the class by performing a simulated patient handoff using the EHR in front of the class. This hands-on approach helps the students summarize the concepts taught in class and creates linkages in a supportive, safe environment. See Appendix H for lesson plans and Appendix I for class handouts.

Draft lesson plans created by the workgroup were submitted to the CI and CE departments at the end of January 2016 for review and approval. Both departments granted approval of the lesson plans the beginning of February 2016. The CI director recommended that the project be presented at the February NIC meeting to inform the NIC members of the class and to gather any suggestions as to the topics that may not have been addressed within the original workgroup. There was a healthy level of discussion amongst the group about the current

state of NI competency among the nursing staff. Many of the themes identified by the CI workgroup were echoed in the NIC comments.

One common theme between both groups was that the general nursing workforce has a diminished appreciation of clinical documentation and its importance to the nursing process. The nursing workforce sees clinical documentation as a hurdle or just a task to complete. They are not able to think holistically about the patient's medical record and see that the EHR can provide a wealth of patient-centric information that can be valuable to providing informed nursing care for their patient. Simple documentation such as IV insertion and assessment are missed or incomplete. The Patient Safety and Quality committee actively monitors IV infiltrations and part their data set comes from the nursing documentation. Incomplete or missing IV documentation inhibits process improvement and places the patient at increased risk for an unusual occurrence. Concerns like these were integrated into the Lesson Plans with approval from the original workgroup and CI director.

ITS support and reservation of the Technology Learning Center (TLC) was done at the end of the third week of February. It was identified that one ITS person would be needed to create a group of practice patients for students to document on in the test system. Each practice patient would include home medications for nurses to reconcile, IV medications and orders to perform, as well as past medical visit history in the EHR for nurses to search. Once practice patients were entered into the system and dress rehearsal was conducted with the CI nurses to identify any technical issues and content revision. This was conducted the second week of February and there were minor revisions to the lesson plans, mainly around flow and presentation of materials.

Course objectives were given to the CE department to publish to the organization's education website and the pilot course was open to the entire inpatient nursing workforce at the beginning of March 2016 for a class date of March 16, 2016. An advertisement for the pilot study was posted to the organization's intranet homepage and the nursing directors of the inpatient care areas sent an information email to their staff advertising the class. Four students were enrolled at the end of the open enrollment period. Pre-class surveys were emailed to the enrolled students. The survey was a modified TIGER based NI self-assessment survey based on the work by Hunter, McGonigle, and Hebda (2013). Response to the pre-class survey was 100% (n=4). After the class, post-survey evaluations were emailed to students and the response rate was 100% (n=4). Course evaluations were conducted immediately after the course and submitted to the CE department.

Planning the Study of the Intervention

Gap analysis. A gap analysis was conducted with the CI director to map the future and current state of NI competencies within the organization. Currently, the nursing workforce has an overall negative or ambivalent attitude towards clinical documentation; the CI nurses have many examples of erroneous or late documentation that affects financial reimbursement or fall outside of organizational policy. Nurses see clinical documentation as just another task in their worklist and they pay little attention to the data they are entering. In the future, it is the hope that nurses will think of themselves as a contributor to the patient record by thinking critically of the information they are entering into the EHR. After meeting with the CE department, it was decided that a two-hour session would be manageable for both a first class and not overwhelm the students with new information during the stressful winter census period. The two-hour

session also would make it easier for nursing administrators to approve education time, since education budgets were finalized for FY2016.

At the organization, nursing education time is budgeted as paid time each year and those budget requests for FY2016 were made a year ago. This budget includes mandatory education like basic life support classes, department “core” classes that cover the various diagnoses and nursing care in each care area, and some hours are left for nurses to pursue elective courses for their professional development. This NI curriculum would be part of this elective group of nursing education. There is potential to make this education mandatory for all nurses in preparation for the larger EHR platform transition in the next two years. Another identified gap is that nurses are not leveraging the EHR as it was intended. Many nurses find it difficult to extract useful patient data and do not utilize nursing-specific functionality that would make their job easier or more efficient. The NI competent nurse would be able to efficiently extract patient-centered data from the EHR and can demonstrate to others how their clinical decision making is influenced by the data they are pulling from the EHR.

Currently, there are no guiding NI competencies utilized at the organization. A majority of the nurses did not have any formal NI education and have developed their own individual workarounds in the EHR. These varied and inconsistent NI habits need to be addressed by education the nursing workforce to a standard and validated set of NI competencies. The TIGER Initiative’s NI Competency set is a nationally and internationally recognized as a rigorous set of NI competencies. Using this set of NI competencies would give the nurses a standard and consistent set of competencies that would help them be better users of EHR. See Appendix J for Gap Analysis.

Work breakdown structure. The project was divided into three phases: Design, Implementation, and Evaluation. The author was responsible for coordinating with the CI nurses in developing the lesson plans and submitting them to the both the CI and CE departments for approval. The CI nurses and the NIC members provided feedback on the lesson plans during the February meeting and those suggestions were included in the final lesson plans that were submitted to the CI and CE departments.

The Implementation phase consisted of reserving the TLC and submitting a course outline to the CE department to publish on the organization's education site. Once on the site, an advertisement was published to the front page of the organization's intranet to garner interest for the class. Students were emailed a link to the self-assessment survey of NI and all students completed the survey prior to the class.

Evaluation of the project took place one week after the class. A NI self-assessment survey was electronically distributed to the students. The response rate was 100% (n=4) after two weeks. Results and evaluation of the course will be discussed in the Results section. Class evaluations reviewed and discussed with the CI Director. See Appendix K for Work Breakdown Structure.

The initial strategy for the project was to create, implement and evaluate a class curriculum based on TIGER NI competencies and measure the improvement of NI competencies through a self-assessment survey before and after the class. The anticipated outcome was that students would demonstrate an increase in their self-assessment scores after taking the class. The goal was to have them take lessons learned in the class and apply it to their daily workflow. After a week of applying their new skills, a post-survey would be administered to see if students improved in their self-assessment of their NI competencies.

The project author served as the project lead and champion of change. As an employee of the organization, the project author has had the opportunity to be part many of the organization's EHR initiatives. This EHR initiatives included the Emergency Department (ED) EHR new platform upgrade in 2009, the inpatient care area transition to an EHR in 2010, ED physician electronic documentation and dictation project in 2012, the inpatient EHR upgrade in 2014, and medication reconciliation project in 2016. The project author has also served on many of the organization's informatics-based committees such as the NIC, CIW, and ED Optimization workgroups.

This early exposure to healthcare informatics has made the project author aware of the importance that a clinical perspective brings to the field of healthcare informatics and the importance of NI. Without that clinical perspective, EHRs can hinder nursing workflow and make it more difficult for nurses to document accurately and efficiently (Förberg, Johansson, Ygge, Wallin, & Ehrenberg, 2012; Wang, Hailey, & Yu, 2011; Kohle-Ersher, Chatterjee, Osmanbeyoglu, Hochheiser, & Bartos, 2012). In the various roles in the organization, the project author has seen firsthand the difficulties and frustrations nurses have with using the EHR on a daily basis. Many informal workarounds exist in the organization, leading to an overall diminutive NI competency level. It is the goal of this project to improve the overall NI competency of the nursing workforce through a structured and validated curriculum.

The organization's current EHR upgrade initiative made it conducive to implement the project at this time. Many resources in the organization have begun to shift their focus on implementing the new EHR by June 2016. This includes SU and nursing education and ensuring that nurses are prepared and ready for the EHR upgrade. The organization is also preparing to attest to Stage 2 MU. One of the core measures of Stage 2 MU requires medication

reconciliation, a function that requires nursing interaction. Currently, nurses are not meeting the goal set forth by CMS for reimbursement. This project will help nurses become better active participants in EHR use and help the organization succeed at both initiatives.

Methods of Evaluation

SWOT analysis. A SWOT analysis was conducted during the design phase of the project to assess the current state of the organization prior to the project. Strengths, weaknesses, opportunities, and threats to the project were assessed by the project author, the CI nurses, and CI director. See Appendix L for SWOT Analysis.

Strengths. Enthusiastic support from both the CI and CE departments was given to this project and contributed to the successful planning and implementation of this project. The CI nurses bring a broad nursing perspective that helped focus the curriculum on relevant NI competencies that the nursing workforce could readily use in their daily practice. Although there is a lack of consensus among the nursing community around NI competencies, the TIGER Initiative's set of NI competencies have been viewed as one of the more rigorous set of NI competencies in the literature. The TIGER Initiative's set of NI competencies were developed over a three year period as part of a collaborative effort among nursing educators and nursing stakeholders (TIGER, 2009). Their set of 303 NI competencies are also validated from other independent, standard-setting organizations such as the International Computer Driver License organization, the American Library Association, and Health Level Seven (TIGER, 2009). Using these set of NI competencies provides a high level of rigor and validity to the learning objectives and outcomes.

In addition to providing a standardized and validated NI education framework, the curriculum could be used to teach the upcoming Super User (SU) group that will help with the

EHR upgrade in June 2016. With every past upgrade, the organization solicits volunteer nurses to learn the new changes in the system and become part of the SU group. The SU group is highly motivated, independent group of learners and has demonstrated good teaching skills. With this project, nurses could refine their basic computer competencies and improve both their clinical information literacy and clinical information management skills in time for the EHR upgrade.

This would make them better role models to the rest of the nursing workforce on how to integrate NI into their workflow to become more active users of NI and provide better patient care. This curriculum could also be continued by the organization and be one of the permanent elective course offerings like basic life support and pediatric advanced life support. The classes could also be used to help nurses advance their professional development and utilized in their clinical ladder.

Weaknesses. Weaknesses of the project include the timing of the class, single class offering, the nurses' attitude towards clinical documentation, and inconsistent EHR education among the nursing workforce. In addition to these weaknesses, the rapid pace of technology innovation in EHR systems, the attestation to Stage 2 MU, the lack of consensus of a standard set of NI competencies, competing EHR initiatives within the organization, and the cost prohibitive nature of ICDL training were identified as threats to this project.

The organization sees a large increase in the average daily census annually between late October and early April. This is primarily due to the rise in bronchiolitis and other respiratory illnesses that affect the vulnerable pediatric population. The organization is at or near capacity in all care areas between the months of October and April. Nursing resources are also impacted with the winter census with increased patient acuities and increased stress levels among the

nursing staff. Many educational offerings and electives are not scheduled during the winter months due to the focus on patient care; which makes it difficult to advertise to staff and pique their interest when they are feeling at their most overworked and overburdened. Student enrollment was less than ideal ($n = 4$), but due to the EHR upgrade in June, it was decided amongst the group that the class would still be conducted regardless if the class did not meet the desired enrollment number. Having only one class offering also was another weakness of the project. Ideally, offering more classes at different times to accommodate the flexible nursing schedule would increase participation.

It was also identified by the CI workgroup that nurses see clinical documentation in a negative light. They approach documentation as just another task and that it provides little value in helping them provide care to their patients. Anecdotally, nurses find that they are afraid to move around in the system, that the EHR is a nebulous area that they get lost in, and they have difficulty extracting any useful information from the EHR. Another concerning theme from the nursing workforce is the difficulties they have in documenting completely and accurately.

One of the stumbling blocks is the high level of complexity around documenting a simple nursing procedure. For example, when a nurse inserts a peripheral IV, they are required to document three different assessments in the EHR spread across two modules. If they need to remove that IV, there are two or three required assessments to document. Such convoluted workflow is often ignored or incomplete, leading to an inaccurate medical record and incomplete data for tracking quality care indicators.

Compounding the nurses' frustration is the lack of basic computer competencies within the nursing workforce. There is little education given to the staff on how to navigate the computer system at the organization. Many nurses lack the skill to troubleshoot simple computer

issues like a frozen or stuck program. When they run into problems they are quick to contact the IT helpdesk which takes them away from patient care.

The current state of NI among the nursing staff is inconsistent. Many nurses have not had a formal NI class or training during the nursing education. They have had to come up with their own de novo NI skills at the bedside. The nursing workforce has also become numb to the amount of changes to the EHR that they stop thinking critically about clinical documentation and see documentation as just another task to complete. Many of the nurses in the organization have difficulty utilizing the EHR in a meaningful way. Searching for extracting data from the EHR system is not something the nurses are accustomed to in the organization and see it as another barrier to leaving on time.

Opportunities. This project aligns with the larger national initiative of transitioning the nation's healthcare to one that is EHR-based. With the HITECH Act and MU, the organization is financially incentivized to utilize EHR as the documentation tool of choice for the foreseeable future. By improving the NI competency among the nursing workforce, this project potentially helps the organization meet MU criteria not only for Stage 2, but Stage 3 MU as well. Looking beyond the HITECH Act, healthcare is now moving towards utilizing Big Data, as a driver for improving evidence-based medicine and improving the quality of patient care (Keenan, 2014; Westra, Latimer, Matney, Park, Sensmeier, Simpson, & ... Delaney, 2015).

Although the short educational time was seen as a weakness to the project, it was also an opportunity to address poor basic computer competencies that have festered in the organization. Many of the nurses not only find the EHR difficult, but they also have difficulty performing basic computer navigation and troubleshooting skills. For a "digital native", moving around the

computer is second nature, but for “digital immigrants” having to navigate in a foreign environment adds another level of stress that can be easily remedied with guidance.

Threats. A major threat to the project is the organization’s competing EHR initiatives such as the EHR upgrade initiative and the transition to a single EHR platform for both the inpatient and ambulatory care areas. The EHR upgrade is planned for June 2016 and the transition to a single platform is scheduled for 2018. Both these initiatives are budgeted and in the planning stages. Resources and staff are being allocated to these initiatives. Many resources from the CI, CE, and ITS departments are preparing education and training time towards these two initiatives. Although this project’s scope was small, it would still require dividing some of the CI nurses and ITS resources from these EHR initiatives to work on this project.

One financial threat to the project is high cost of and limited access to the ICDL training modules. ICDL is an educational program and certifying body that requires students to be educated at an ICDL accredited test center. There are no certified test centers in the state of California. Due to this large hurdle, it was decided that basic computer competencies be addressed during the class. This would help remediate inconsistent computer practices already in effect in the organization. As a result, the lesson plan was weakened by the needed to take time away from other EHR topics, such as clinical information literacy and clinical information management, to include time to discuss basic computer competencies.

The project is also threatened by the rapid pace of technological advancement happening in the larger healthcare informatics world. The current platform the organization utilizes was created in 2009 and lacks many of the standard functionality of more current EHRs. Technology such as device integration, wireless device support, robust clinical decision support, and evidence-based clinical documentation support are standard in many of the current EHR

platforms on the market. Although the organization has upgraded the platform every two years, those upgrades were incremental and were software fixes and provided little in the way of essential EHR functionality that have proven to improve patient care.

The lack of a global set of NI competencies was also identified as a threat to the success of the project. Currently there is a lack of consensus among nursing and nursing educators regarding which NI competency list to use (Gonçalves, Wolff, Staggers, & Peres, 2012). This has led to many nurses lacking consistent background training on essential NI skills and competencies. The NI competencies developed by the nurse may have come from informal sources such as repeating preceptor habits, through informal communication channels among nurses, or personal workarounds that may not comply with the organization's policies and procedures.

Return on investment. In assessing the financial implications of this project, a return on investment (ROI) plan was created to assess the benefits of implementing this quality improvement project in the future. ROI can be divided into two types: development and implementation costs. The development costs of the project are one-time costs incurred during the design phase of the project. The development cost of this project include the research time by the project author, the time to work with the CI nurses in developing the curriculum, and creating the training patients and materials for the class. Implementation costs are the related to the activities essential to run the process improvement. These activities include enlisting ITS support to create and load patient data, reserving the TLC and time spent administering and analyzing the student self-assessment surveys.

To implement this process improvement across the organization will increased cost from the pilot study. Total cost for an organization-wide implementation is estimated to cost

\$523,600. Lengthening instruction time to eight total hours would allow for sufficient time to address basic computer competencies and clinical information literacy in one classroom sitting. Another four hour block of instruction time would address clinical information management skills. The cost of this education time for all nurses is \$400,000 (1,000 nurses x \$50/hour x 8 hours). Instructional and ITS support costs would also increase to \$60,000 each (125 classes x 8 hours x \$60/hour). Planning and research conducted by the project author and CI nurses would remain the same at \$3,600.

The ROI of this process improvement project occurs as immediately as the end of calendar year 2016 and could potentially net the organization between 1.8 and 6.1 million dollars, depending upon MU factors. Stage 2 attestation of MU can occur in any 90 day period ending on the calendar year (CMS, 2016). Meeting Stage 2 MU can result in a financial incentive between 2 million and 6.3 million dollars. Although Stage 3 MU financial incentives have yet to be finalized, there will still exist an opportunity for the organization to receive a financial incentive for Stage 3 MU in 2017 and nurses will play an increasingly integral role in helping the organization meet this goal.

Other factors that affect the ROI of this project are related to nursing process and efficiency. The ROI of EHR use and NI competency is difficult to quantify in financial terms. Helton, Langabeer, DelliFriane, and Hsu (2012) recommend that EHR investments should “focus less on costs and more on the extent to which these [EHR] investments promote improved labor efficiency” (p. 55). In their study, Helton et al (2012) found that labor efficiency decreased with the increasing complexity of the EHR system. This was attributed to the “mismatch between technology and work processes (Helton et al., 2012, p. 56). However, with the improvement of

work process via the strengthening of NI competencies, this mismatch could be decreased and nursing efficiency increase.

One assumption is that by improving NI competency among the nurses, there is an increase in nursing efficiency. By improving nursing efficiency, nurses can utilize that time by providing improved patient care. Nursing efficiency can also be measured by a reduction of nursing OT. If all nurses were able to reduce their OT by 10%, it could save the organization \$187,000 annually in OT costs (\$1.87 million in OT x 10% reduction in OT = \$187,000). This improved efficiency could continue or even improve annually, outlasting the financial incentives of MU.

Another assumption is that by improving NI competency among the nursing workforce will improve EHR utilization as evidenced by a reduction in ADEs. By using the EHR effectively and efficiently, nurses have the potential to decrease medication administration errors and reduce the ADE rate of the organization. A small decrease in the ADE rate by 10% could help the organization financially by reducing penalties associated with these errors ($\$3,511/\text{ADE} \times 49 = 172,039$).

Welton and Harper (2015) also examined the nursing care as a value-based financial model. In discussion with chief nursing officers, nurse informaticists researchers, consultants, software vendors, nursing faculty and health economists; the group recommended that nursing financial models consider nurses not as a monolithic group of care providers, but quantifying the care they provide should include factors such as time, skill, risk to patient, risk to provider, and severity of illness (Welton et al., 2015). In the era of EHRs, nursing care can be quantified by extracting data from nursing clinical documentation. By improving NI competencies, the

outcome could be increased nursing efficiency and more time back to the nurse to in turn spend more time with the patient or using that time to provide care for another patient.

Although there exists a paucity of data relating nursing efficiency, clinical documentation, and EHR use; there exists an opportunity in the near future to better examine the effects EHRs and technology will have in improving the nursing efficiency once nurses are routinely using EHR as seamlessly as they use their smartphone. Further research is needed on quantifying nursing care in the EHR paradigm. See Appendix M for Return on Investment table.

Analysis

The anticipated outcome was that students would improve their self-assessment of NI competency after taking the course. Student NI competency would be quantified using a self-assessment survey provided to the students pre and post-class. Student class evaluations would be used to assess the qualitative effects of the intervention. Student NI competency was assessed using a modified survey tool from Hunter et al (2013) that specifically addresses the TIGER NI competencies. The NI assessment tool developed by Hunter et al (2013) underwent three rounds of validation by the researchers and two separate groups of nursing informatics specialists. The tool demonstrated moderate content validity scores in each of the three competency areas (2013, p. 74). The survey tool was modified by the project workgroup as to remove duplicative or similar items and to personalize the survey with terms used by the organization. The survey was electronically distributed to students 3 days prior to the class. A post-class survey was electronically distributed to the students one day after the class. The response period for the post-class survey was one week. See Appendix N for Survey Tool.

Analysis of survey scores was done using basic statistical analysis in Microsoft Excel. The survey was written and administered using the Google Forms online service. This service

records the responses to survey questions responses for both surveys were exported to a Microsoft Excel spreadsheet. Basic statistical analysis was done to obtain the average class score for basic computer competencies, clinical information literacy, and clinical information management. Evaluation of student learning was assessed by comparing students' NI self-assessment scores pre-and post-class. Students were asked to rate their level of proficiency on a four point scale: 1 – beginner, 2 – comfortable, 3 – proficient, and 4 – expert.

	Pre-class	Post-class	% difference	Effect Size
Basic Computer Competencies	3.53	3.96	12	0.51
Clinical Information Literacy	3.31	3.84	16	0.72
Clinical Information Management	3.12	3.71	18	0.87
Total Averages	3.29	3.83	16	0.66

Table 1: NI self-assessment survey results, pre and post-class

The average age of the students was 38 years old and the average nursing experience was 11 years. No student reported having an informatics course during their ASN or BSN coursework. The high self-assessment scores could be attributed to the large body of NI experience from 75% of the students. The self-assessment scores for the one non-informatics nurse is potentially a better representation of the NI competency of the nursing workforce at the organization. This student rated themselves as comfortable with basic computer competencies ($m = 2.14$), and clinical information literacy ($m = 2.12$); and a beginner with clinical information management ($m = 1.07$).

The response rate to the post-class survey was 100% ($n=4$). The post-class response group demonstrated an increase in their self-assessment of NI competency by 18% when compared to pre-test self-assessment scores ($m = 3.83$, $SD = 0.24$). Basic computer competency

increased 12% ($m = 3.96$), clinical information literacy competencies increased 16% ($m = 3.84$), and clinical information management skills increased 18% ($m = 3.71$). The one student who did not have any prior informatics experience demonstrated a significant increase in their self-assessment scores. After taking the class, this nurse had a 121% increase in their self-assessment of NI competency. This student rated themselves as proficient at basic computer competencies ($m = 3.95$, 92% increase), clinical information literacy ($m = 3.75$, 78% increase), and an expert at clinical information management ($m = 3.9$, 247% increase).

Although this the sample size was small ($n = 4$), effect size was calculated to determine the effectiveness of the class. Effect size was calculated to be $d = 0.66$, which is considered a medium effect size (Sullivan & Feinn, 2012). A confidence interval was also calculated to determine the significance of the survey results. The See Appendix O for Survey Responses.

Results

Program Evaluation/Outcomes

Student NI competencies were assessed during the class by having students demonstrate NI competencies in front of the class. Summative return demonstrations integrating multiple lesson topics were done with students demonstrating order entry, PIV documentation, and accessing the EHR for prior data. This technique to immediately assess NI competency retention was invaluable to reinforce complex documentation workflows and to create a positive, supportive learning environment consistent with the ARCS learning framework.

Survey results from the students showed a statistically significant increase in self-reported NI competency, even amongst nurses with prior NI experience. The 16% increase in self-assessment scores demonstrates that the project goal and outcome of improving NI competencies among the pilot group were met. Self-assessment scores between pre- and post-class surveys improved by two standard deviations, indicating a statistically significant

improvement in self-reported NI competency. What is promising is the increase in self-reported confidence of the one staff nurse. Their improvement in NI competency shows that the topics and lessons covered in the class can help increase nursing confidence in using the EHR efficiently.

One-on-one follow up with the four students was conducted by the project author and each of the students interviewed appreciated the need for the class and each expressed that they described the class as having a positive impact on their job performance. They also stated that they felt that they could use the EHR more efficiently after taking the class. They reported that they felt more confident in reviewing existing documentation and workflow (especially around IV documentation and order entry), using new methods of searching the EHR for patient data, and have a deeper understanding and appreciation for the clinical documentation and how the organization makes decisions based, in part, on the clinical documentation they are entering into the EHR. The level of engagement from students was high as well. The class rated their experience in the class as “exceptionally well...resulting in a greater level of knowledge, more efficient training”.

The implementation of the project enjoyed support at all levels, from the CI nurses to the CI and CE departments. Without the close collaborative effort in developing the lesson plans to reflect the needs of the bedside nurses, the project would not have been as successful. Support from the CI and CE departments made it possible to implement the project with the CI nurses’ support and input during their EHR upgrade activities.

The initial project plan was to conduct two, four hour classes; however, due to scheduling conflicts with other CE courses and room availability, the length of the pilot study was reduced to a single, two hour class. This short education time was initially thought to be insufficient to

cover a large amount of content, but the restrictions on instruction time helped focus the NI competency selection and lesson plans to include only those TIGER NI competencies essential to the workflow of the organization's nurses.

The single class offering also excluded potential students who wanted to take the class, but could not due to scheduling conflicts. The project author received several emails from potential students stating that they were interested in the course, and were asking for future course offerings. Having multiple offerings of the course would have provided a larger group to study and a more accurate representation of the nursing workforce at the organization. Splitting the content of the class into two offerings: basic computer competencies and clinical information literacy competencies in a single class and clinical information management in another would allow for more instruction time for both lesson plans. Dividing up the classes into two would also allow non-clinical nursing staff that work away from the bedside to improve their basic computer competencies and clinical information literacy competencies would be of great benefit to them as well as the bedside nurses.

With the positive results from this pilot group, it would have been beneficial to integrate the topics and teaching techniques to the current education being offered to nurses in preparation for this year's EHR upgrade. However, the CE department declined to include this information in their curriculum due to time restraints and educational plans had already been approved by stakeholders.

One unexpected change was the improvement of NI self-assessment scores of those students who had prior NI experience. Initially, it was assumed by the project author that those nurses who had prior NI experience would rate themselves as expert in a majority of the categories, limiting any room for improvement. The results of their self-assessment scores was

promising and indicate that NI is just more than computer experience, and that even nurses with NI experience can improve after taking this course.

Future steps is to develop an education plan with the CI and CE departments to offer this class in the next fiscal year. With the findings and results from this pilot group, the curriculum will be split into two, four hour classes: basic computer competencies and clinical information literacy/clinical information management competencies. Currently, nursing departments are planning education budgets for FY2017. This class would be part of the budget proposal for the CI department since the majority of the resources utilized will come from this department. Although the next EHR upgrade will occur in two years, this provides ample time to improve NI competencies amongst all the organization's nurses.

Discussion

Summary

The aim of this project was to increase the NI competencies of nurses through a learning intervention. Students rated themselves higher in NI competencies after taking the course, with an average increase of 18% in their self-assessment scores. Regardless of prior NI experience, all nurses reported that they found the course to be informative and provide information that would improve their clinical documentation.

The project's strengths included utilizing a robust and validated set of NI competencies developed by some of the most innovative and respected NI nurses. The collaborative effort between the project author and CI nurses also created a focused curriculum that presented information that was vital, essential, and useful to the students. Organizational support also created a supportive and encouraging environment for this project to take place and although the timing during the winter months made it difficult, the chronicity of the project prior to the organization's EHR upgrade will help establish a verified curriculum that will bolster the NI

competency of the nurses not only for this incremental EHR upgrade, but for the larger platform transition in two years' time.

Difficulties of the project include the limited instruction time, the single class offering, and small student size. Increasing the instruction time would have allowed for more topics and NI competencies to be covered during the class. Multiple class offerings could have allowed more students to enroll in the class and thereby increasing the generalizability and power of the results.

Important lessons learned was that a structured classroom intervention is beneficial in increasing nursing confidence and competency in using the EHR. The organization currently updates the staff passively, through email updates and website announcements. Although this method reaches each of the 1,000 nurses in the organization, it does not ensure that the nurses comprehend the information. Using a classroom intervention allows students the time to practice NI skills in a safe and supportive environment.

This project underscores the importance that an advanced practice nurse can bring to elevating the quality of nursing care. The role of the nurse informaticist is quickly gaining traction in healthcare organizations as they transition to full EHR use. The nurse informaticist sits at the nexus point of traditional nursing care and information systems (ANA, 2015). Using a validated set of NI competencies, such as the ones developed by the TIGER Initiative, can serve as a framework in developing nurses to better use EHR effectively and efficiently.

Relation to other evidence

This project recognized a gap in the NI education of the nursing workforce as reported by many in the literature (Choi, 2012; Choi & De Martinis, 2013; Choi & Zucker, 2013; and Hwang et al, 2011). This project puts into practice the recommendations of the TIGER Initiative and

other authors (Shuffit et al., 2012; Stevens-Lee et al, 2013; Tellez, 2012) by creating and implementing NI education for those who need it the most: bedside nurses. Like Rajalahti et al (2014) found in their study, nurses who completed this course improved their NI competency and feel better prepared and confident to use the EHR as a tool to make better clinical decisions and provide improved patient care.

Like Schleyer et al (2011), this intervention created a nursing curriculum that translated the NI framework of DIKW and applied it to the nursing process. This started with a collaborative effort between the project author and the organization's CI nurses and resulted in a robust curriculum that addressed the most prescient EHR concerns of the nursing workforce. Improving NI competencies can not only benefit the nurse, but also increase the organization's success with the upcoming EHR initiatives as identified by Lin et al (2014).

The classroom environment allowed nurses to take NI concepts and competencies and integrate them into their own personal practice. Beckham et al (2014) identified that nurses could not demonstrate or recognize the connection between NI concepts and their own personal practice. Through the use of innovative education technology such as the smartboard in the TLC, the students were able to see and practice firsthand NI concepts and learn how to better integrate those concepts into their own workflow.

Barriers to Implementation/Limitations

Project barriers span three levels: organizational, departmental, and individual. The broader organizational barriers included logistical support with booking classroom time and audiovisual resources. The TLC was recently remodeled with a state-of-the-art projector and large touchscreen. This made it the ideal classroom to teach and have students interact with the computer in a new novel way. However, competing educational classes made it difficult to find

dates with the original planned instruction time. In response, the pilot study was reduced from eight instructional hours to just two. Department barriers included financial and employee development issues. Strained financial budgets were a critical barrier to overcome since departments would incur increased education time for their employees. Directors and managers may find it difficult to find value in improving nursing informatics competencies into an established clinical improvement ladder that rewards traditional clinical skills over informatics competency.

If integrated into the nursing professional development hierarchy, NI, as part of a nurse's clinical ladder, could provide a financial and professional incentive for nurses to improve their NI competency. Integrating these classes into an already full schedule, paying for nurses to complete extracurricular education is a difficult proposition for directors on a limited budget. Clinical educators' time and collaboration could be a factor due to their obligations to other projects and their education plans for their departments were already planned from FY2015 through and including FY2016.

Organizational barriers were overcome by eliciting support from the CI and CE departments early in the project planning stages. Involving the CI nurses in developing the curriculum and having the NIC nurses as subject matter experts helped to make the curriculum relevant to the bedside nurse by addressing their concerns with using the EHR system. With support of the CE department, the project author was able to have priority booking of the TLC room which was essential to creating a more immersive and interactive environment. Having the TLC negated the need reserve additional audiovisual equipment and student laptops, which

The CI director was also very instrumental in communicating to the Patient Care Division leadership (consisting of the Chief Nursing Officer and the directors of the patient care areas)

that this class was being developed to help nurses become more competent in using the EHR system efficiently. Having their support would make it easier for nurses to get their education requests approved to take this course. Many nurses expressed anxiety over the coming upgrade and the CI and NIC nurses informally advertised the class through group emails and word-of-mouth.

Limitations of the project include the small student size and limited education time. The students who enrolled in the class were not as representative of the nursing workforce as the author would have liked. Baseline NI competencies for the entire nursing workforce was not gathered prior to the start of the project due to multiple barriers and might have been useful in determining the generalizability of the student group. The single class offering also limited the number of possible students who could attend, and having additional class offerings would have increased the pilot group and would have given more weight and power to the results. Offering the class in the middle of the winter census was also a barrier to obtaining a larger student sample size. However, if the class were delayed to take place after the winter census, ITS and clinical resources would have been difficult to acquire due to the incremental EHR upgrade and the organizational need for the CI, CE, ITS, and nursing departments to focus on training the staff in preparation for the upgrade in June 2016.

Interpretation

Showing a statistically significant improvement in NI competencies was demonstrated, the cost to implement this project to educate all 1,000 nurses would be half a million dollars. The soonest that the organization could implement this project is next year, which would be an opportune time before the tectonic shift in EHR platforms occurs. Strengthening NI competencies prior to a large EHR initiative would help nurses prepare for the change in EHR

technology and give them the tools that make them better users of EHR, regardless of EHR vendor.

Improving NI competencies among the nursing workforce can also provide significant ROI to the organization. By leveraging the EHR system and performing medication reconciliation more consistently, the nurses can play an integral part in helping the organization meet Stage 2 MU, resulting in a possible financial incentive of \$6.3M at the end of 2016. Improving the NI competency of the nurses can also help them realize the potential to reduce medical errors at an organizational-wide scale, if just 100 ADEs were prevented annually, the organization could save a substantial amount. The increased nursing efficiency could also benefit the organization in decreased OT costs. A decrease of even one hour in nursing overtime per nurse due to increasing the efficiency of the nurses could result in another savings of \$75,000 annually.

This project highlighted the importance of the role CI nurses have in developing systems and processes that elevate their fellow nurses in NI competencies. With a holistic understanding of the patient record and systems used to maintain that record, nurses can make better informed clinical decisions about the effectiveness of their care, reference information quickly and efficiently, and be a more active participant in the care of their patient. The use of a validated set of NI competencies ensures that the students are trained to a standard that has been set by not only the nursing community, but by organizations that have been recognized as standard-bearers in the healthcare informatics world.

Future steps are to continue with developing a course curriculum to specifically address basic computer competencies and NI competencies at the organization. Recommendations include lengthening the class instruction time to one or two days to allow more time to discuss

basic computer competencies and spend more time working through basic clinical documentation strategies. The additional time would allow for improved discussion of topics and give students time to integrate new skills with existing workflow in a supportive class setting. Combining topics in basic computer competencies and clinical information literacy into a separate four hour course would benefit those nurses who are at a beginner and comfortable level increase their comfort and proficiency with navigation and troubleshooting skills, naturalizing these “digital immigrants” into “digital natives”.

Although approval for a stand-alone NI curriculum has not been approved for next year, there are other avenues to implement the findings of this project into the current incremental EHR upgrade initiative and new employee onboarding process. Currently, mandatory nursing education about the EHR upgrade are underway. Clinical information management competencies could be integrated into the EHR upgrade curriculum as a way to quickly and efficiently improve NI competencies while remaining cost neutral for the organization since they are already have budgeted these hours for education.

Basic computer competencies and clinical information literacy competencies could be easily integrated into the new employee orientation as well. This integration of NI competencies into the new employee orientation would help to improve foundational NI competencies prior to learning clinical documentation. The pilot group found that many of the basic computer competencies and clinical information literacy competencies helpful in developing a proficiency in using the computer that translated to more confidence in clinical documentation. By developing basic computer competencies and clinical information management competencies from the beginning will give new nurses the foundational tools they need to be successful at navigating the EHR and provide quality patient care.

Conclusions

This project had an overall positive effect on the NI competencies of the nursing workforce at the organization. NI competency is garnering increased attention from the organization due to two key EHR-based initiatives taking place in the next two years. By demonstrating that a classroom intervention can be successful at improving NI competencies, the way forward for the organization to address this gap in nursing practice is clear. Even nurses with prior NI experience improved in their NI competency by the end of the class. Improving NI competencies for nurses who have had little experience in dealing with EHRs would begin to realize the goals of the TIGER Initiative of enabling nurses to deliver safer, more effective, more efficient nursing care.

The implications for practice are that although a majority of the nurses working at the bedside did not have a formal NI education, it is possible to train nurses to utilize EHR effectively and efficiently using a structured classroom intervention. Doing so would help nurses improve workflows, ensure that documentation is more accurate and complete, and help nurses efficiently extract patient-centered information. Future plans for this intervention include formally submitting a request to the organization to include eight hours of instruction for the fiscal year. With the increased class time, it will be necessary for the workgroup to develop new lesson plans to include more NI competencies that were not addressed in the original project.

The results of the intervention align with the project author's own experience in NI. The project author's experience with NI was also done informally and independently. Upon enrollment in the Doctorate of Nursing Program, it was evident to the project author that to grow further in NI competency, a more structured learning environment was essential. This was reflected in the results of this project. All but one of the students had prior NI experience, and

with this educational intervention, all the students reported an increase in their NI competency. With the coming EHR initiatives, nurses in the organization would benefit greatly from improving their NI competency to be more efficient users of EHR and improve the depth of their own knowledge to provide personalized and family-centered patient care.

Implications for patient care is unknowable at this point in time. Further research is needed to understand how EHRs affect the nursing process and workflow. Obtaining a valid measure of nursing care and its relation to patient outcomes is also needed. In this new paradigm of Big Data, nurses will need to take a more active role in defining their role in developing and interpreting that Big Data and demonstrate to the public what nurses have known all along, that nurses provide an invaluable level of care to their patients and that they are the major drivers of patient outcomes. Only through using this new tool of EHRs effectively can nurses begin to quantify their contribution to patient care.

Other Information

Funding

There was no need identified for funding of this quality improvement project. The cost of this program was folded into current organizational positions held by the CI nurses and IT resources. Students were compensated by their nursing departments from their home department's education budget.

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Appendix A – List of TIGER NI Competencies

1. Basic Computer Competency	
1.1 Hardware	
1.1.1. Concepts	
	1.1.1.1 Understand the term hardware.
	1.1.1.2 Understand what a personal computer is. Distinguish between desktop, laptop (notebook), tablet PC in terms of typical users.
	1.1.1.3 Identify common handheld portable digital devices like: personal digital assistant (PDA), mobile phone, smartphone, multimedia player and know their main features.
	1.1.1.4 Know the main parts of a computer like: central processing unit (CPU), types of memory, hard disk, common input and output devices.
	1.1.1.5 Identify common input/output ports like: USB, serial, parallel, network port, FireWire.
1.1.2 Computer Performance	
	1.1.2.1 Know some of the factors that impact on a computer's performance like: CPU speed, RAM size, graphics card processor and memory, the number of applications running.
	1.1.2.2 Know that the speed (operating frequency) of the CPU is measured in megahertz (MHz) or gigahertz (GHz).
1.1.3 Memory and Storage	
	1.1.3.1 Know what computer memory is: RAM (random-access memory), ROM (read only memory) and distinguish between them.
	1.1.3.2 Know storage capacity measurements: bit, byte, KB, MB, GB, TB.
	1.1.3.3 Know the main types of storage media like: internal hard disk, external hard disk, network drive, CD, DVD, USB flash drive, memory card, online file storage.
1.1.4 Input, Output Devices	
	1.1.4.1 Identify some of the main input devices like: mouse, keyboard, trackball, scanner, touchpad, stylus, joystick, web camera (webcam), digital camera, microphone.
	1.1.4.2 Know some of the main output devices like: screens/monitors, printers, speakers, headphones.
	1.1.4.3 Understand some devices are both input and output devices like: touch screens.
1.2 Software	
1.2.1 Concepts	
	1.2.1.1 Understand the term software.
	1.2.1.2 Understand what an operating system is and name some common operating systems.

	1.2.1.3 Identify and know the uses of some common software applications: word processing, spreadsheet, database, presentation, e-mail, web browsing, photo editing, computer games.
	1.2.1.4 Distinguish between operating systems software and applications software.
	1.2.1.5 Know some options available for enhancing accessibility like: voice recognition software, screen reader, screen magnifier, on-screen keyboard.
1.3 Networks	
<i>1.3.1 Network Types</i>	
	1.3.1.1 Understand the terms local area network (LAN), wireless local area network (WLAN), wide area network (WAN).
	1.3.1.2 Understand the term client/server.
	1.3.1.3 Understand what the Internet is and know some of its main uses.
	1.3.1.4 Understand what an intranet, extranet is.
<i>1.3.2 Data Transfer</i>	
	1.3.2.1 Understand the concepts of downloading from, uploading to a network.
	1.3.2.2 Understand what transfer rate means. Understand how it is measured: bits per second (bps), kilobits per second (kbps), megabits per second (mbps).
	1.3.2.3 Know about different Internet connection services: dial-up, broadband.
	1.3.2.4 Know about different options for connecting to the Internet like: phone line, mobile phone, cable, wireless, satellite.
	1.3.2.5 Understand some of the characteristics of broadband: always on, typically a flat fee, high speed, higher risk of intruder attack.
1.4 ICT in Everyday Life	
<i>1.4.1 Electronic World</i>	
	1.4.1.1 Understand the term Information and Communication Technology (ICT).
	1.4.1.2 Know about different Internet services for consumers like: e-commerce, e-banking, e-government.
	1.4.1.3 Understand the term e-learning. Know some of its features like: flexible learning time, flexible learning location, multimedia learning experience, cost effectiveness.
	1.4.1.4 Understand the term teleworking. Know some of the advantages of teleworking like: reduced or no commuting time, greater ability to focus on one task, flexible schedules, reduced company space requirements. Know some disadvantages of teleworking like: lack of human contact, less emphasis on teamwork.
<i>1.4.2 Communication</i>	
	1.4.2.1 Understand the term electronic mail (email).
	1.4.2.2 Understand the term instant messaging (IM).
	1.4.2.3 Understand the term Voice over Internet Protocol (VoIP).
	1.4.2.4 Understand the term Really Simple Syndication (RSS) feed.

	1.4.2.5 Understand the term web log (blog).
	1.4.2.6 Understand the term podcast.
<i>1.4.3 Virtual Communities</i>	
	1.4.3.1 Understand the concept of an online (virtual) community. Recognize examples like: social networking websites, Internet forums, chat rooms, online computer games.
	1.4.3.2 Know ways that users can publish and share content online: web log (blog), podcast, photos, video and audio clips.
	1.4.3.3 Know the importance of taking precautions when using online communities: make your profile private, limit the amount of personal information you post, be aware that posted information is publicly available, be wary of strangers.
<i>1.4.4 Health</i>	
	1.4.4.1 Understand the term ergonomics.
	1.4.4.2 Recognize that lighting is a health factor in computer use. Be aware that use of artificial light, amount of light, direction of light are all important considerations.
	1.4.4.3 Understand that correct positioning of the computer, desk and seat can help maintain a good posture.
	1.4.4.4 Recognize ways to help ensure a user's wellbeing while using a computer like: take regular stretches, have breaks, use eye relaxation techniques.
<i>1.4.5 Environment</i>	
	1.4.5.1 Know about the option of recycling computer components, printer cartridges and paper
	1.4.5.2 Know about computer energy saving options: applying settings to automatically turn off the screen/monitor, to automatically put the computer to sleep, switching off the computer.
1.5 Security	
<i>1.5.1 Identity/Authentication</i>	
	1.5.1.1 Understand that for security reasons a user name (ID) and password are needed for users to identify themselves when logging on to a computer.
	1.5.1.2 Know about good password policies like: not sharing passwords, changing them regularly, adequate password length, adequate letter and number mix.
<i>1.5.2 Data Security</i>	
	1.5.2.1 Understand the importance of having an off-site backup copy of files.
	1.5.2.2 Understand what a firewall is.
	1.5.2.3 Know ways to prevent data theft like: using a user name and password, locking computer and hardware using a security cable.

		<i>1.5.3 Viruses</i>
		1.5.3.1 Understand the term computer virus.
		1.5.3.2 Be aware how viruses can enter a computer system.
		1.5.3.3 Know how to protect against viruses and the importance of updating antivirus software regularly.
		1.6 Law
		<i>1.6.1 Copyright</i>
		1.6.1.1 Understand the term copyright.
		1.6.1.2 Know how to recognize licensed software: by checking product ID, product registration, by viewing the software license.
		1.6.1.3 Understand the term end-user license agreement.
		1.6.1.4 Understand the terms shareware, freeware, open source.
		<i>1.6.2 Data Protection</i>
		1.6.2.1 Identify the main purposes of data protection legislation or conventions: to protect the rights of the data subject, to set out the responsibilities of the data controller.
		1.6.2.2 Identify the main data protection rights for a data subject in your country.
		1.6.2.3 Identify the main data protection responsibilities for a data controller in your country.
		2.1 Operating System
		<i>2.1.1 First Steps</i>
		2.1.1.1 Start the computer and log on securely using a user name and password.
		2.1.1.2 Restart the computer using an appropriate routine.
		2.1.1.3 Shut down a non-responding application.
		2.1.1.4 Shut down the computer using an appropriate routine.
		2.1.1.5 Use available Help functions.
		<i>2.1.2 Setup</i>
		2.1.2.1 View the computer's basic system information: operating system name and version number, installed RAM (random- access memory).
		2.1.2.2 Change the computer's desktop configuration: date & time, volume settings, desktop display options (color settings, desktop background, screen pixel resolution, screen saver options).
		2.1.2.3 Set, add keyboard language.
		2.1.2.4 Install, uninstall a software application.
		2.1.2.5 Use keyboard print screen facility to capture a full screen, active window.

	<i>2.1.3 Working with Icons</i>
	2.1.3.1 Identify common icons like those representing: files, folders, applications, printers, drives, recycle bin/wastebasket/trash.
	2.1.3.2 Select and move icons.
	2.1.3.3 Create, remove a desktop shortcut icon, make an alias.
	2.1.3.4 Use an icon to open a file, folder, application.
	<i>2.1.4 Using Windows</i>
	2.1.4.1 Identify the different parts of a window: title bar, menu bar, toolbar or ribbon, status bar, scroll bar.
	2.1.4.2 Collapse, expand, restore, resize, move, close a window.
	2.1.4.3 Switch between open windows.
	2.2 File Management
	<i>2.2.1 Main Concepts</i>
	2.2.1.1 Understand how an operating system organizes drives, folders, files in a hierarchical structure.
	2.2.1.2 Know devices used by an operating system to store files and folders like: hard disk, network drives, USB flash drive, CD-RW, DVD-RW.
	2.2.1.3 Know how files, folders are measured: KB, MB, GB.
	2.2.1.4 Understand the purpose of regularly backing up data to a removable storage device for off-site storage.
	2.2.1.5 Understand the benefits of online file storage: convenient access, ability to share files.
	<i>2.2.2 Files and Folders</i>
	2.2.2.1 Open a window to display folder name, size, location on a drive.
	2.2.2.2 Expand, collapse views of drives, folders.
	2.2.2.3 Navigate to a folder, file on a drive.
	2.2.2.4 Create a folder and a further subfolder.
	<i>2.2.3 Working with Files</i>
	2.2.3.1 Identify common file types: word processing files, spreadsheet files, database files, presentation files, portable document format files, image files, audio files, video files, compressed files, temporary files, executable files.
	2.2.3.2 Open a text editing application. Enter text into a file, name and save the file to a location on a drive.
	2.2.3.3 Change file status: read-only/locked, read-write.
	2.2.3.4 Sort files in ascending, descending order by name, size, type, date modified.
	2.2.3.5 Recognize good practice in folder, file naming: use meaningful names for folders and files to help with recall and organization.
	2.2.3.6 Rename files, folders.
	<i>2.2.4 Copy, Move</i>
	2.2.4.1 Select a file, folder individually or as a group of adjacent, non-adjacent

	files, folders.
	2.2.4.2 Copy files, folders between folders and between drives.
	2.2.4.3 Move files, folders between folders and between drives.
	<i>2.2.5 Delete, Restore</i>
	2.2.5.1 Delete files, folders to the recycle bin/wastebasket/trash.
	2.2.5.2 Restore files, folders from the recycle bin/wastebasket/trash.
	2.2.5.3 Empty the recycle bin/wastebasket/trash
	<i>2.2.6 Searching</i>
	2.2.6.1 Use the Find tool to locate a file, folder.
	2.2.6.2 Search for files by all or part of file name, by content.
	2.2.6.3 Search for files by date modified, by date created, by size.
	2.2.6.4 Search for files by using wildcards: file type, first letter of file name.
	2.2.6.5 View list of recently used files.
	2.3 Utilities
	<i>2.3.1 File Compression</i>
	2.3.1.1 Understand what file compression means.
	2.3.1.2 Compress files in a folder on a drive.
	2.3.1.3 Extract compressed files from a location on a drive.
	<i>2.3.2 Anti-Virus</i>
	2.3.2.1 Understand what a virus is and the ways a virus can be transmitted onto a computer.
	2.3.2.2 Use anti-virus software to scan specific drives, folders, files.
	2.3.2.3 Understand why anti-virus software needs to be updated regularly.
	2.4 Print Management
	<i>2.4.1 Printer Options</i>
	2.4.1.1 Change the default printer from an installed printer list.
	2.4.1.2 Install a new printer on the computer.
	<i>2.4.2 Print</i>
	2.4.2.1 Print a document from a text editing application.
	2.4.2.2 View a print job's progress in a queue using a desktop print manager.
	2.4.2.3 Pause, re-start, delete a print job using a desktop print manager.
	3.1 Using the Application
	<i>3.1.1 Working with Documents</i>
	3.1.1.1 Open, close a word processing application. Open, close documents.
	3.1.1.2 Create a new document based on default template, other available template like: memo, fax, agenda.
	3.1.1.3 Save a document to a location on a drive. Save a document under another name to a location on a drive.

		3.1.1.4 Save a document as another file type like: text file, Rich Text Format, template, software specific file extension, version number.
		3.1.1.5 Switch between open documents.
	3.1.2 Enhancing Productivity	
		3.1.2.1 Set basic options/preferences in the application: user name, default folder to open, save documents.
		3.1.2.2 Use available Help functions.
		3.1.2.3 Use magnification/zoom tools.
		3.1.2.4 Display, hide built-in toolbars. Restore, minimize the ribbon.
7.1 The Internet		
	7.1.1 Concepts/Terms	
		7.1.1.1 Understand what the Internet is.
		7.1.1.2 Understand what the World Wide Web (WWW) is.
		7.1.1.3 Define and understand the terms: Internet Service Provider (ISP), Uniform Resource Locator (URL), hyperlink.
		7.1.1.4 Understand the make-up and structure of a web address.
		7.1.1.5 Understand what a web browser is and name different web browsers.
		7.1.1.6 Know what a search engine is.
		7.1.1.7 Understand the term Really Simple Syndication (RSS) feed. Understand the purpose of subscribing to an RSS feed.
		7.1.1.8 Understand the term podcast. Understand the purpose of subscribing to a podcast.
	7.1.2 Security Considerations	
		7.1.2.1 Know how to identify a secure web site: https, lock symbol.
		7.1.2.2 Know what a digital certificate for a web site is.
		7.1.2.3 Understand the term encryption.
		7.1.2.4 Know about security threats from web sites like: viruses, worms, Trojan horses, spyware. Understand the term malware.
		7.1.2.5 Understand that regularly updated anti-virus software helps to protect the computer against security threats.
		7.1.2.6 Understand that a firewall helps to protect the computer against intrusion.
		7.1.2.7 Know that networks should be secured by user names and passwords.
		7.1.2.8 Identify some risks associated with online activity like: unintentional disclosure of personal information, bullying or harassment, targeting of users by predators.
		7.1.2.9 Identify parental control options like: supervision, web browsing restrictions, computer games restrictions, computer usage time limits.
7.2 Using the Browser		
	7.2.1 Basic Browsing	
		7.2.1.1 Open, close a web browsing application.
		7.2.1.2 Enter a URL in the address bar and go to the URL.

	7.2.1.3 Display a web page in a new window, tab.
	7.2.1.4 Stop a web page from downloading.
	7.2.1.5 Refresh a web page.
	7.2.1.6 Use available Help functions.
	<i>7.2.2 Settings</i>
	7.2.2.1 Set the web browser Home Page/Start Page.
	7.2.2.2 Delete part, all browsing history.
	7.2.2.3 Allow, block pop-ups.
	7.2.2.4 Allow, block cookies.
	7.2.2.5 Delete cache/temporary Internet files.
	7.2.2.6 Display, hide built-in toolbars.
	<i>7.2.3 Navigation</i>
	7.2.3.1 Activate a hyperlink.
	7.2.3.2 Navigate backwards and forwards between previously visited web pages.
	7.2.3.3 Navigate to the Home page.
	7.2.3.4 Display previously visited URLs using the browser address bar, history.
	<i>7.2.4 Bookmarks</i>
	7.2.4.1 Bookmark a web page. Delete a bookmark.
	7.2.4.2 Display a bookmarked web page.
	7.2.4.3 Create, delete a bookmark folder.
	7.2.4.4 Add web pages to a bookmark folder.
	7.3 Using the Web
	<i>7.3.1 Forms</i>
	7.3.1.1 Complete a web-based form using: text boxes, drop-down menus, list boxes, check boxes, radio buttons.
	7.3.1.2 Submit, reset a web-based form.
	<i>7.3.2 Searching</i>
	7.3.2.1 Select a specific search engine.
	7.3.2.2 Carry out a search for specific information using a keyword, phrase.
	7.3.2.3 Use advanced search features to refine a search: by exact phrase, by excluding words, by date, by file format.
	7.3.2.4 Search a web based encyclopedia, dictionary.
	7.4 Web Outputs
	<i>7.4.1 Saving Files</i>
	7.4.1.1 Save a web page to a location on a drive.
	7.4.1.2 Download files from a web page to a location on a drive.
	7.4.1.3 Copy text, image, URL from a web page to a document.

	<i>7.4.2 Prepare and Print</i>	
	7.4.2.1	Prepare a web page for printing: change printed page orientation, paper size, printed page margins.
	7.4.2.2	Preview a web page.
	7.4.2.3	Choose web page print output options like: entire web page, specific page(s), selected text, number of copies and print.
	7.5 Electronic Communication	
	<i>7.5.1 Concepts/Terms</i>	
	7.5.1.1	Understand the term e-mail and know its main uses.
	7.5.1.2	Understand the make-up and structure of an e-mail address.
	7.5.1.3	Understand the term short message service (SMS).
	7.5.1.4	Understand the term Voice over Internet Protocol (VoIP) and know its main benefits.
	7.5.1.5	Understand the main benefits of instant messaging (IM) like: real-time communication, knowing whether contacts are online, low cost, ability to transfer files.
	7.5.1.6	Understand the concept of an online (virtual) community. Recognize examples like: social networking websites, Internet forums, chat rooms, online computer games.
	<i>7.5.2 Security Considerations</i>	
	7.5.2.1	Be aware of the possibility of receiving fraudulent and unsolicited email.
	7.5.2.2	Understand the term phishing. Recognize attempted phishing.
	7.5.2.3	Be aware of the danger of infecting the computer with a virus by opening an unrecognized e-mail message, by opening an attachment.
	7.5.2.4	Understand what a digital signature is.
	<i>7.5.3 E-mail Theory</i>	
	7.5.3.1	Understand the advantages of e-mail systems like: speed of delivery, low cost, flexibility of using a web-based e-mail account in different locations.
	7.5.3.2	Understand the importance of network etiquette (netiquette) like: using accurate and brief descriptions in e-mail message subject fields, brevity in e-mail responses, spell checking outgoing e-mail.
	7.5.3.3	Be aware of possible problems when sending file attachments like: file size limits, file type restrictions (for example, executable files).
	7.5.3.4	Understand the difference between the To, Copy (Cc), Blind copy (Bcc) fields.
	7.6 Using e-mail	
	<i>7.6.1 Send an e-mail</i>	
	7.6.1.1	Open, close an e-mail application. Open, close an e-mail.
	7.6.1.2	Create a new e-mail.
	7.6.1.3	Enter an e-mail address in the To, Copy (Cc), Blind copy (Bcc) fields.

	7.6.1.4 Enter a title in the Subject field.
	7.6.1.5 Copy text from another source into an e-mail.
	7.6.1.6 Insert, remove a file attachment.
	7.6.1.7 Save a draft of an e-mail.
	7.6.1.8 Use a spell checking tool and correct spelling errors.
	7.6.1.9 Send an e-mail, send an e-mail with a low, high priority.
	<i>7.6.2 Receiving e-mail</i>
	7.6.2.1 Use the reply, reply to all function.
	7.6.2.2 Forward an e-mail.
	7.6.2.3 Save a file attachment to a location on a drive and open the file.
	7.6.2.4 Preview, print a message using available printing options.
	<i>7.6.3 Enhancing Productivity</i>
	7.6.3.1 Add, remove message inbox headings like: sender, subject, date received.
	7.6.3.2 Apply a setting to reply with, without original message insertion.
	7.6.3.3 Flag an e-mail. Remove a flag mark from an e-mail.
	7.6.3.4 Identify an e-mail as read, unread. Mark an e-mail as unread, read.
	7.6.3.5 Display, hide built-in toolbars. Restore, minimize the ribbon.
	7.6.3.6 Use available Help functions.
	7.7 e-mail Management
	<i>7.7.1 Organize</i>
	7.7.1.1 Search for an e-mail by sender, subject, e-mail content.
	7.7.1.2 Sort e-mails by name, by date, by size.
	7.7.1.3 Create, delete an e-mail folder.
	7.7.1.4 Move e-mails to an e-mail folder.
	7.7.1.5 Delete an e-mail.
	7.7.1.6 Restore a deleted e-mail.
	7.7.1.7 Empty the e-mail bin/deleted items/trash folder.
	<i>7.7.2 Address Book</i>
	7.7.2.1 Add contact details to an address book. Delete contact details from an address book.
	7.7.2.2 Update an address book from incoming e-mail.
	7.7.2.3 Create, update a distribution list/ mailing list.
	2. Clinical Information Literacy
	All practicing nurses and graduating nursing students will have the ability to:
	1.* Determine the nature and extent of the information needed
	2.* Access needed information effectively and efficiently
	3.* Evaluate information and its sources critically and incorporates selected information into his or her knowledge base and value system
	4. Individually or as a member of a group, use information effectively to

	accomplish a specific purpose
	5. Evaluate outcomes of the use of information
3. Clinical Information Management Competencies	
	Concepts
	Verbalize the importance of Health Information Systems to clinical practice
	Have knowledge of various types of Health Information Systems and their clinical and administrative uses
	Due Care
	Assure Confidentiality of protected patient health information when using Health Information Systems under his or her control
	Assure Access Control in the use of Health Information Systems under his or her control
	Assure the Security of Health Information Systems under his or her control
	Policy and Procedure
	Understand the Principles upon which organizational and professional Health Information System use by healthcare professionals and consumers are based.
	User Skills
	Have the User Skills as outlined in direct care component of the HL7 EHR model (see below: Using an EHR, the nurse can:) which includes all of the ECDL-Health User Skills of Navigation, Decision Support,
	Using an EHR, the nurse can:
	Identify and Maintain a Patient Record
	Manage Patient Demographics
	Capture Data and Documentation from External Clinical Sources
	Capture Patient-Originated Data
	Capture Patient Health Data Derived from Administrative and
	Interact with Financial Data and Documentation
	Produce a Summary Record of Care
	Present Ad Hoc Views of the Health Record
	Manage Patient History
	Manage Patient and Family Preferences
	Manage Patient Advance Directives
	Manage Consents and Authorizations
	Manage Allergy, Intolerance and Adverse Reaction Lists
	Manage Medication Lists
	Manage Problem Lists
	Manage Immunization Lists
	Interact with Guidelines and Protocols for Planning Care
	Manage Patient-Specific Care and Treatment Plans
	Manage Medication Orders as appropriate for her scope of practice
	Manage Non-Medication Patient Care Orders
	Manage Orders for Diagnostic Tests
	Manage Orders for Blood Products and Other Biologics

		Manage Referrals
		Manage Order Sets
		Manage Medication Administration
		Manage Immunization Administration
		Manage Results
		Manage Patient Clinical Measurements
		Manage Clinical Documents and Notes
		Manage Documentation of Clinician Response to Decision Support Prompts
		Generate and Record Patient-Specific Instructions
		Manage Health Information to Provide Decision Support for Standard Assessments
		Manage Health Information to Provide Decision Support for Patient Context- Driven assessments
		Manage Health Information to Provide Decision Support for Identification of Potential Problems and Trends
		Manage Health Information to Provide Decision Support for Patient and Family Preferences
		Interact with decision Support for Standard Care Plans, Guidelines, and Protocols
		Interact with decision Support for Context-Sensitive Care Plans, Guidelines, and Protocols
		Manage Health Information to Provide Decision Support Consistent Healthcare
		Management of Patient Groups or Populations
		Manage Health Information to Provide Decision Support for Research Protocols Relative to Individual Patient Care
		Manage Health Information to Provide Decision Support for Self-Care
		Interact with decision support for Medication and Immunization Ordering as appropriate for her scope of practice
		Interact with decision Support for Drug Interaction Checking
		Interact with decision Support for Patient Specific Dosing and Warnings
		Interact with decision Support for Medication Recommendations
		Interact with decision Support for Medication and Immunization Administration
		Interact with decision Support for Non-Medication Ordering
		Interact with decision Support for Result Interpretation
		Interact with decision Support for Referral Process
		Interact with decision Support for Referral Recommendations
		Interact with decision Support for Safe Blood Administration
		Interact with decision Support for Accurate Specimen Collection
		Interact with decision support that Presents Alerts for Preventive Services and Wellness
		Interact with decision Support for Notifications and Reminders for Preventive Services and Wellness

		Manage Health Information to Provide Decision Support for Epidemiological Investigations of Clinical Health Within a Population.
		Manage Health Information to Provide Decision Support for Notification and Response regarding population health issues
		Manage Health Information to Provide Decision Support for Monitoring Response
		Notifications Regarding a Specific Patient's Health
		Access Healthcare Guidance
		Interact with Clinical Workflow Tasking
		Interact with Clinical Task Assignment and Routing
		Interact with Clinical Task Linking
		Interact with Clinical Task Tracking
		Facilitate Inter-Provider Communication
		Facilitate Provider -Pharmacy Communication
		Facilitate Communications Between Provider and Patient and/or the Patient Representative
		Facilitate Patient, Family and Care Giver Education
		Facilitate Communication with Medical Devices

Reference: The TIGER Initiative (2009). Informatics competencies for every practicing nurse: Recommendations from the TIGER collaborative. Retrieved November 11, 2015 from <https://s3.amazonaws.com/rdcms-himss/files/production/public/FileDownloads/tiger-report-informatics-competencies.pdf>

Appendix B – Literature Review Chart

Author/Date	Design	Sample Size	Findings	Evidence/Quality Level
Borycki et al. (2012)	Descriptive	N/A	Described the creation of a double degree Master's program in nursing and health informatics	V-B

Beckham et al. (2014)	Descriptive	N/A	Design of a novice-level informatics course for leadership, NP, and nurse educator nursing programs.	IV-B
Chang et al. (2011)	Descriptive	32	Created and validated a master list of NI competencies by surveying nurse educators and administrators. Three Web-based Delphi rounds were conducted and 318/323 met with > 60% agreement and 45 new competencies were added.	IV-B
Choi, J. (2012)	Survey	131	Three groups: traditional pre-licensure, RN to BSN students, and accelerated BSN students were asked to self-assess their level of NI competence. The RN-BSN and accelerated BSN groups rated themselves higher in NI competencies than pre-licensure students. This study highlights the opportunities for nurse educators to enhance nursing curriculum.	V-B
Choi et al. (2013)	Survey	289	Survey of 289 nursing students from undergraduate and graduate nursing programs measuring their NI competency across three areas: basic computer skills, clinical informatics attitude, and wireless device skills. Graduate students reported slightly higher scores than undergraduate students.	III-B
Choi et al. (2013)	Survey	132	DNP students were asked to self-assess their level of NI competence. Their competency scores were higher than their undergraduate and MS counterparts. This study recommends that NI be better integrated into the nursing curriculum	IV-B
Hwang et al. (2011)	Survey	350	Researchers surveyed two teaching hospitals on the level of nursing informatics competency. Found that basic computer skills and NI competencies could be better integrated in nursing curriculum.	IV-B

Lin et al. (2014)	Survey	454	Nursing informatics competencies have a greater effect on organization than computer system successes and have a larger effect on organizational success.	IV-B
Nagle et al. (2014)	Descriptive	N/A	Created a set of entry-to-practice NI competencies for Canadian Schools of Nursing	IV-B
Rajalahti et al. (2014)	Quasi-experimental, Survey	124	Surveyed nurse educators on their NI competencies pre- and post-implementation nursing documentation development project. They increased competency in their Information Management and Literary competencies post-project	III-B
Rinner et al. (2015)	Retrospective	1 million patients	Patient safety is increased via more frequent DDI warnings being presented to the provider. These increased warnings caught 30% more patients when compared to the control group	II-A
Schleyer et al. (2011)	Process Improvement	One hospital system	Created a strategic initiative to increase NI management skills throughout a single hospital organization.	V-B
Shuffit et al. (2012)	Opinion	N/A	Recommend that informatics be threaded throughout the DNP curriculum and a more systematic integration of NI during clinical and nonclinical coursework would better prepare DNP to provide improve patient care.	V-B
Staggers et al. (2001)	Opinion	N/A	Creation of 302 NI competency list that spans four tiers.	IV-A
Staggers et al. (2002)	Survey	N/A	Validate a master list of NI competencies that were vetted by expert panel. 280/305 NI competencies were validated with a > 80% agreement level.	IV-B
Steven-Lee et al. (2013)	Survey	N/A	This project sought to better align the TIGER Initiative's NI educational outcomes with a baccalaureate program.	V-B

<p>Tellez, M. (2012)</p>	<p>Opinion</p>	<p>N/A</p>	<p>BSN programs would benefit from integrating informatics in their curriculum. Alignment with the IOM Report, NLN, AACN, TIGER, and QSEN should be followed for a comprehensive view of the NI role.</p>	<p>V-B</p>
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Rating Scale Reference: Dearhold S., & Dang, D. (2012). Johns Hopkins nursing evidence-based practice: Model and guidelines (2nd ed.). Indianapolis, IN: Sigma Theta Tau International.

Appendix C – Project Budget

	Hourly Rate	Hours	Qty	Total
Project Lead	\$60	36	1	\$2,160
CI Nurses	\$60	8	3	\$1,440
Students	\$50	2	4	\$400
ITS Support	\$60	2	1	\$120
Project Total Budget				\$4,120

Project funds were provided by the students' home department; ITS support was provided as in kind as part of their regularly assigned job duties.

Appendix D – Cost/Benefit Analysis

Costs				
	Item	Cost	Quantity	Total
Development	Project author (research, planning, and curriculum development)	\$60/hour	36 hours	\$2,160
	CI nurses (3 nurses) (curriculum development)	\$60/hour	8 hours	\$1,440
Implementation	Project author (instruction time)	\$60/hour	1,000 hours	\$60,000
	Students' education time (1,000 nurses)	\$50/hour	8,000 hours	\$400,000
	ITS support	\$60/hour	1,000 hours	\$60,000
Total Cost				\$523,600
Benefits				
Meeting Stage 2 MU				\$2.0M-6.3M
Cost savings of avoiding an ADE		3,511/ADE	49	\$172,039
Decrease in nursing OT by 10%		1.87 million	10%	\$187,000
Total Benefits				\$2.35M-6.65M

Appendix E – Accountability/Communication Matrix

1. Informatics Core		
1.1 Design		
	1.1.1. Lesson Planning	Responsible Party
	1.1.1.1 Review TIGER Competencies	Mark (A, R), CI nurses (C)
	1.1.1.2 Identify relevant TIGER competencies for organization	Mark (A, R), CI nurses (C)
	1.1.1.3 Identify NI gaps at the bedside	Mark (A, R), CI nurses (C)
	1.1.1.4 Draft lesson plan	Mark (A, R), CI nurses (C)
	1.1.1.5 Submit to CI and CE for approval	Mark (A, R), CI nurses (I)
	1.1.1.6 Present approved lesson plans to NIC	Mark (A, R), CI nurses (I)
	1.1.1.7 Integrate NIC feedback into lesson plans	Mark (A, R), CI nurses (C)
1.2 Implementation		
	1.2.1 Post class offering to organization's intranet for signup	Mark (A, R), CI nurses (I), CI Director (I), NIC (I)
	1.2.1.1 Provide course outline to CE for posting	Mark (A, R), CI nurses (I), CI Director (I)
	1.2.1.2 Provide advertisement content to ITS for announcement posting	Mark (A, R), CI nurses (I), CI Director (I)
	1.2.2 Email pre-class survey to students	Mark (A, R)
	1.2.3 Conduct class	Mark (A, R), CI nurses (I)
1.3 Evaluation		
	1.3.1 Email post-class survey	Mark (A, R)
	1.3.2 Analyze and compare pre- and post-class survey results	Mark (A, R)
	1.3.3 Present findings to CI and CE Departments	Mark (A, R), CI Director (I)

R = Responsible
A = Accountable
C = Consulted
I = Informed

Appendix G – Organization Letters of Support

To:

University of San Francisco
DNP Program

2130 Fulton Street
San Francisco, CA 94117

January 31, 2016

RE: Kwun Ying (Mark) Fung

To Whom It May Concern:

I am writing a letter of support at the request of Mark Fung, who is completing his DNP project at Valley Children's Healthcare.

I have known Mark for a number of years in his role as an Emergency Department Nurse and through his works in our Nursing Informatics Council. Mark has proven to be very ambitious and have the unique understanding of informatics from a bedside nurse perspective. It is my pleasure to support Mark in his project of developing an informatics core course. I desire to sponsor Mark in this endeavor and assist him in any possible way to make this project a success.

Please do not hesitate to contact me for any questions or concerns.

Sincerely,

A handwritten signature in black ink, which appears to read "Patricia Lindsey". The signature is fluid and cursive.

Patricia Lindsey, MSN, RN, CNS,
CPN Manager, Clinical Education
Valley Children's Healthcare
plindsey@valleychildrens.org
(559) 353-8112



University of San Francisco
Doctorate of Nursing Practice Program
2130 Fulton Street
San Francisco, CA 94117

January 31, 2016

RE: Kwun-Ying (Mark) Fung, DNP Candidate

To Whom It May Concern,

I am writing this letter in support and at the request of Mark Fung, a DNP candidate of USF. Mark has focused his project on the area of nursing informatics here at Valley Children's Hospital.

Mark has been an active participant in the establishment and ongoing development of the nursing informatics organization at Valley Children's over the last five years. During this time frame Mark has evolved in his informatics role from unit-based "super-user" supporting updates and new initiatives to Nursing Informatics Council representative bringing the Emergency Department perspective to the dialogue when the council is navigating process improvement and workflow design. At present, Mark is the Informatics Support RN for the Emergency Department.

In this role, Mark works with the nursing team as well as the providers to facilitate better use of the tools offered within the electronic medical record (EMR) resulting in improved patient care processes, quality and safety. Additionally, Mark is a member of the Clinical Informatics Workgroup (CIW). This interdisciplinary team collaborates regularly to assess and facilitate system change management with an eye towards patient safety, clinician workflow impact, and education/communication. It has been through these activities that Mark identified an opportunity to develop an informatics core class supporting nursing competency development related to technology and leveraging the principles of QSEN.

I see Mark's initial work as a starting point in further developing nursing informatics competency within our organization. He is dedicated to using his knowledge to broaden the expertise of the nursing organization here at Valley Children's and I happily endorse him in his pursuit of his DNP.

Please do not hesitate to contact me should you have any questions or concerns.

Kind Regards,

A handwritten signature in blue ink that reads "Denise Zeitler".

Denise Zeitler, MBA, BSN, RN, PMP

Director, Clinical Informatics Valley Children's Healthcare
dzeitler@valleychildren's.org (559) 353-7341

Appendix H – Lesson Plans

Lesson Plan I

LESSON TITLE: Basic Computer Competencies
COURSE: Informatics Core
LENGTH: 30 mins
TIME: 1000-1030
METHOD: Demonstration
DESCRIPTION

This section introduces students to basic computer competencies as outlined by the International Computer Driver’s License organization. Skills include basic computer navigation and troubleshooting; computer file creation and manipulation; and computer security practices.

LEARNING OBJECTIVES

At the end of the lesson the participant will be able to:

Objective	TIGER Competency
Demonstrate how to navigate Windows: open, close, and resize application windows	2.1.4.2
Demonstrate appropriate methods of logging off, shutting down, and restarting the computer	2.1.1.1 2.1.1.2 2.1.1.3 2.1.1.4
Demonstrate on how to create, move, edit, and copy a text file on the local machine	2.2.2.2 2.2.2.3 2.2.2.4 2.2.3.2 2.2.3.6 3.1.1.1 3.1.1.2 3.1.1.3
Demonstrate how to move files from local machine to the network drive	2.2.4.2 2.2.4.3
Identify computer security practices	1.5.2.1 1.5.2.3 7.5.2.1 7.5.2.2 7.5.3.3
Demonstrate management of single sign on credentials	1.5.1.1 1.5.1.2
Demonstrate how to select and connect to network printer	2.4.1.1 2.4.1.2
Demonstrate how to search for Policies and Procedures, Just-in-Time training materials, Discharge Instructions using the intranet	7.3.2.2 7.3.2.3

Demonstrate how to conduct a literature search using a database	7.3.2.4
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PRE-LESSON ASSIGNMENTS

Prior to the lesson the learner will:

1. Complete online self-assessment survey of nursing informatics
-

LESSON OUTLINE	LEARNER ACTIVITIES	TIME	METHOD
Introduce the unique computer system at Virtual Desktop Image	Students will demonstrate how to log off and disconnect from the session and verbalize the difference between the two actions. Students will also demonstrate how to reset the physical computer and properly shut down the workstation.	0800-0805	Demonstration
Managing Single Sign On credentials	Learn how to reveal passwords and change passwords using the SSO application	0805-0807	Demonstration
Creating and managing a text document	Create a text document using Word, create a copy, move the copy onto the network drive, and how to attach file in an email	0807-0815	Demonstration, return demonstration, have students create and share documents with each other
Computer security and privacy practices	Discuss best practices of computer security, discuss recent security breaches, discuss best practices for managing security credentials	0815-0817	Discussion
Conduct a literature search	Demonstrate search for policies/procedures, and Just-in-Time training materials. Demonstrate how to conduct a literature search using the EBSCO database. Have one student demonstrate a literature search using a topic of interest to them.	0817-0825	Demonstration, example literature search using topic from students
Connect to a network printer	Demonstrate how to search and connect to a network printer	0825-0830	Demonstration, return demonstration

RESOURCES

International Computer Driver's License Organization - <http://icdlusa.org/>

LEARNER ASSESSMENT

At the end of the lesson, the students shall be able to:

- Restart and reboot computer using appropriate routines
- Identify situations of when to disconnect vs log off virtual session
- Computer security skills: password management, protecting patient personal health information
- Creating and editing a text file
- Moving text file to network drive

COURSE AUTHOR/COORDINATOR

Kwun Ying Mark Fung, RN, MSN, AACNS-P

Lesson Plan II

LESSON TITLE:	Informatics Management
COURSE:	Informatics Core
LENGTH:	90 mins
TIME:	1030-1200
METHOD:	Demonstration and return demonstration
DESCRIPTION	

This section introduces students to utilizing the electronic health record (EHR) not only as a place to enter nursing documentation, but as a tool to access critical patient information to provide a better quality of care to the patient that is individualized to the patient and their condition.

LEARNING OBJECTIVES

At the end of the lesson the participant will be able to:

1. Demonstrate how to navigate the EMR and locating pertinent assessment documentation using the Care Activity, Order History, and Other Reports
2. Demonstrate how to view, sort, and manage order list by Service Date
3. Demonstrate how to review and demonstrate efficient workflow when starting an IV, assessing the site, charting infiltration, and documenting in IV Spreadsheet
4. Demonstrate how to review approved order sources, walk through how to order a medication and nursing order. Have one student demonstrate how to order a medication based off a physician's written order
5. Demonstrate appropriate method of adding a reported medication, discontinue an expired prescription, flag a reported medication for physician review
6. Discuss barriers to timely documentation, review methods to improve documentation in an efficient and timely manner, provide egregious examples of chart audits and late documentation

PRE-LESSON ASSIGNMENTS

Prior to the lesson the learner will:

1. Demonstrate proficient basic computer competencies
-

LESSON OUTLINE	LEARNER ACTIVITIES	TIGER COMPETENCY	TIME	METHOD
Access patient EMR system	Navigate EMR and locating pertinent assessment documentation using the Care Activity, Order History, and Other Reports. View, sort, and	<ul style="list-style-type: none"> • Manage patient history • Manage results • Manage patient advance directives • Manage 	0830-0850	Demonstration

	manage order list by Service Date.	<p>consents and authorizations</p> <ul style="list-style-type: none"> • Facilitate inter-provider communication • Interact with clinical workflow tasking • Interact with clinical task tracking 		
IV insertion, assessment, removal, and IV spreadsheet	Review and demonstrate efficient workflow when starting an IV, assessing the site, charting infiltration, and documenting in IV Spreadsheet.	<ul style="list-style-type: none"> • Capture patient-originated data • Manage medication administration • Manage health information to provide decision support for standard assessments • Manage health information to provide decision support for patient context-driven assessments 	0850-0920	Demonstration, student return demonstration on touchscreen
Order entry	Review approved order sources, walk through how to order a medication and nursing order. Have one student demonstrate how to order a medication based off a physician's written order	<ul style="list-style-type: none"> • Manage medication orders as appropriate for their scope of practice • Manage non-medication patient care orders • Manage order sets • Interact with 	0920-0940	Demonstration, return demonstration with each student on touchscreen

		<p>decision support for medication and Immunization ordering as appropriate for their scope of practice</p> <ul style="list-style-type: none"> • Interact with decision support for patient specific dosages and warnings 		
Medication reconciliation	Demonstrate appropriate method of adding a reported medication, discontinue an expired prescription, flag a reported medication for physician review	<ul style="list-style-type: none"> • Manage medication lists • Interact with decision support for medication recommendations • Facilitate communication between provider and patient and/or the patient representative 	0940-1000	Demonstration, return demonstration on touchscreen
Time management of documentation, medical-legal implications	Discuss barriers to timely documentation, review methods to improve documentation in an efficient and timely manner, provide egregious examples of chart audits and late documentation	<ul style="list-style-type: none"> • Assure Confidentiality of protected patient health information when using health information systems under his or her control • Assure access control in the use of health information systems under 	0930-0935	Discussion

		<p>his or her control</p> <ul style="list-style-type: none"> Assure the security of health information systems under his or her control 		
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RESOURCES

International Computer Driver's License Organization – <http://www.icdlusa.org>

TIGER Initiative – <http://www.himss.org/professional-development/tiger-initiative>

Health Level Seven – <http://www.hl7.org>

LEARNER ASSESSMENT

At the end of the lesson, the student will be able to demonstrate:

Giving report in the SBAR format utilizing the EHR

Navigating the EHR for patient data, reports, and past medical history

How to document IV insertion, management, removal, and IV intake and output of maintenance fluid using the IV Spreadsheet

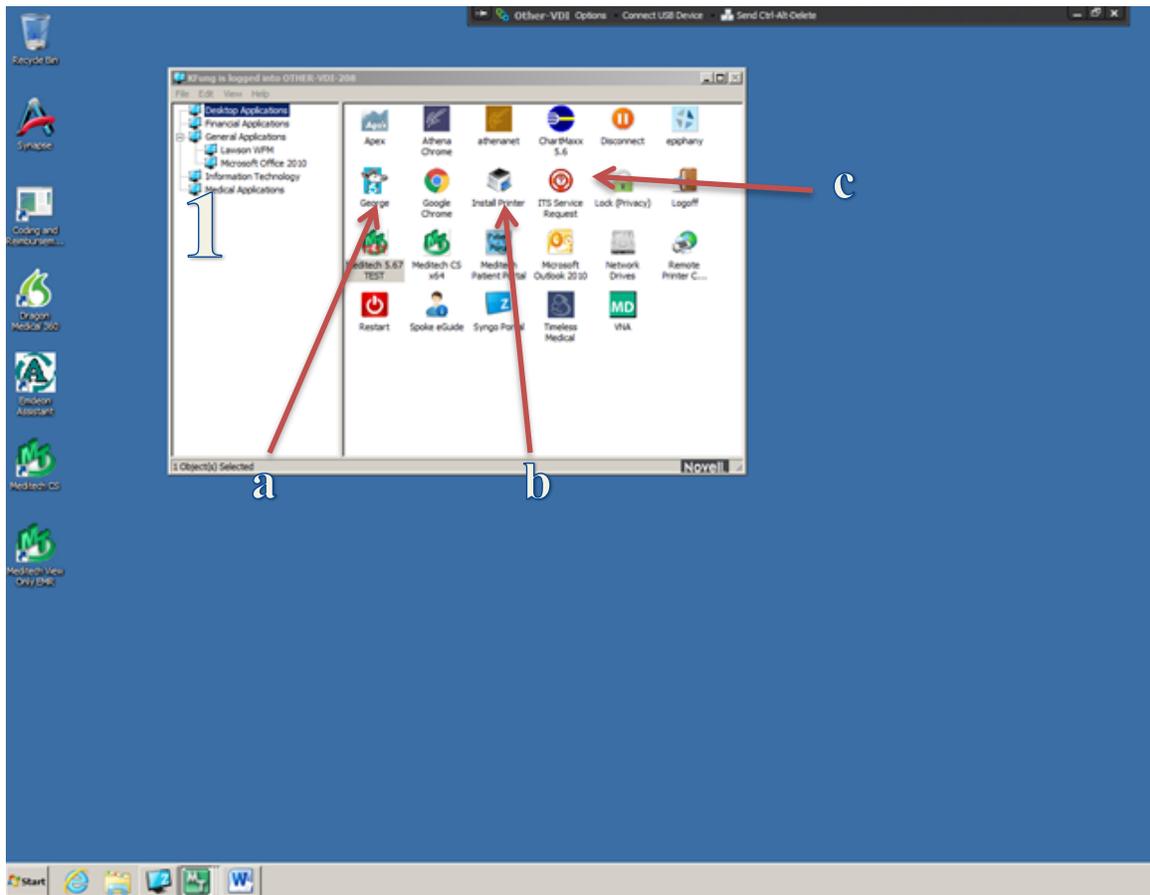
Complete the Self-Assessment of Nursing Informatics survey

COURSE AUTHOR/COORDINATOR

Kwun Ying Mark Fung, RN, MSN, AACNS-P

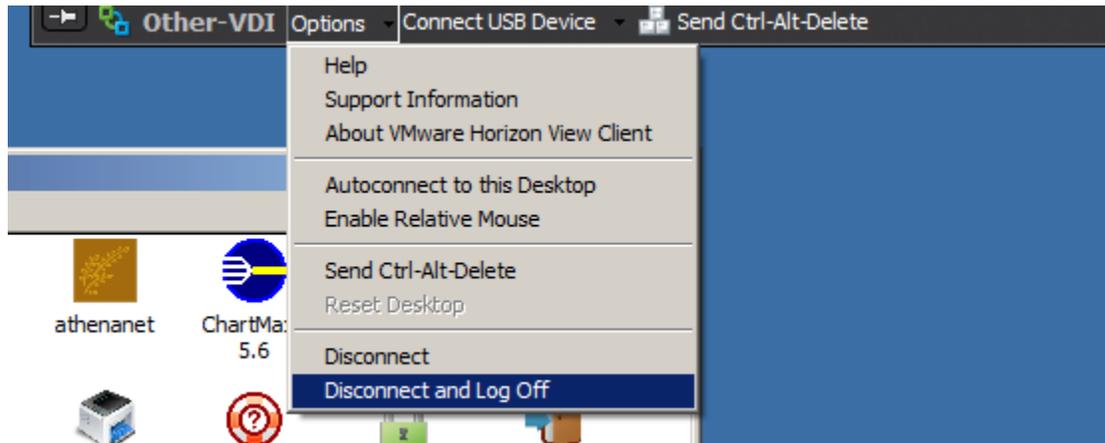
Appendix I – Class Handouts

Desktop



1. ZENworks - This is where you can find most of the daily programs you'll use
 - a. Meditech – clinical documentation
 - b. Microsoft Outlook 2010 – email
 - c. Network drives

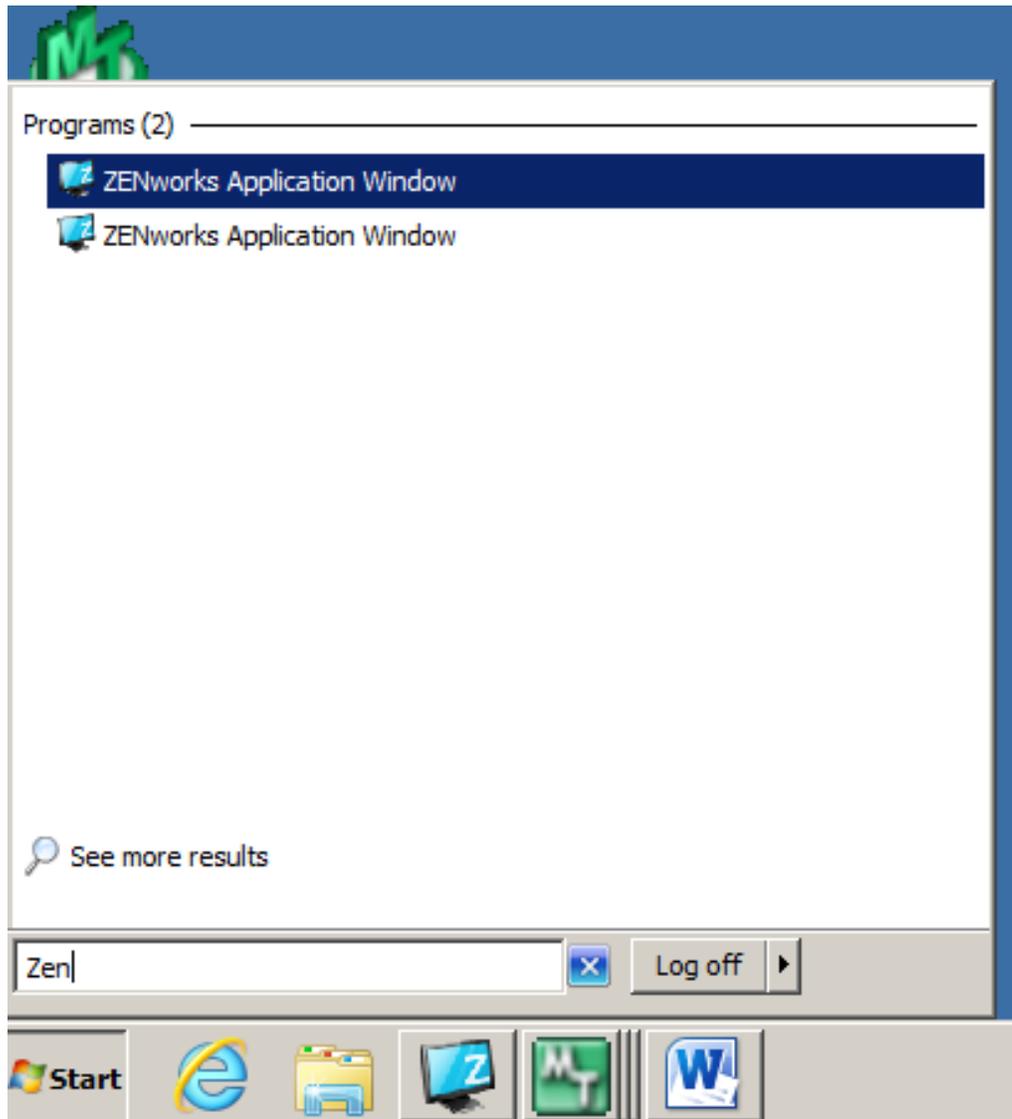
Disconnect and Log Off



At the top of the screen, you can pull down the VDI bar to access more functions

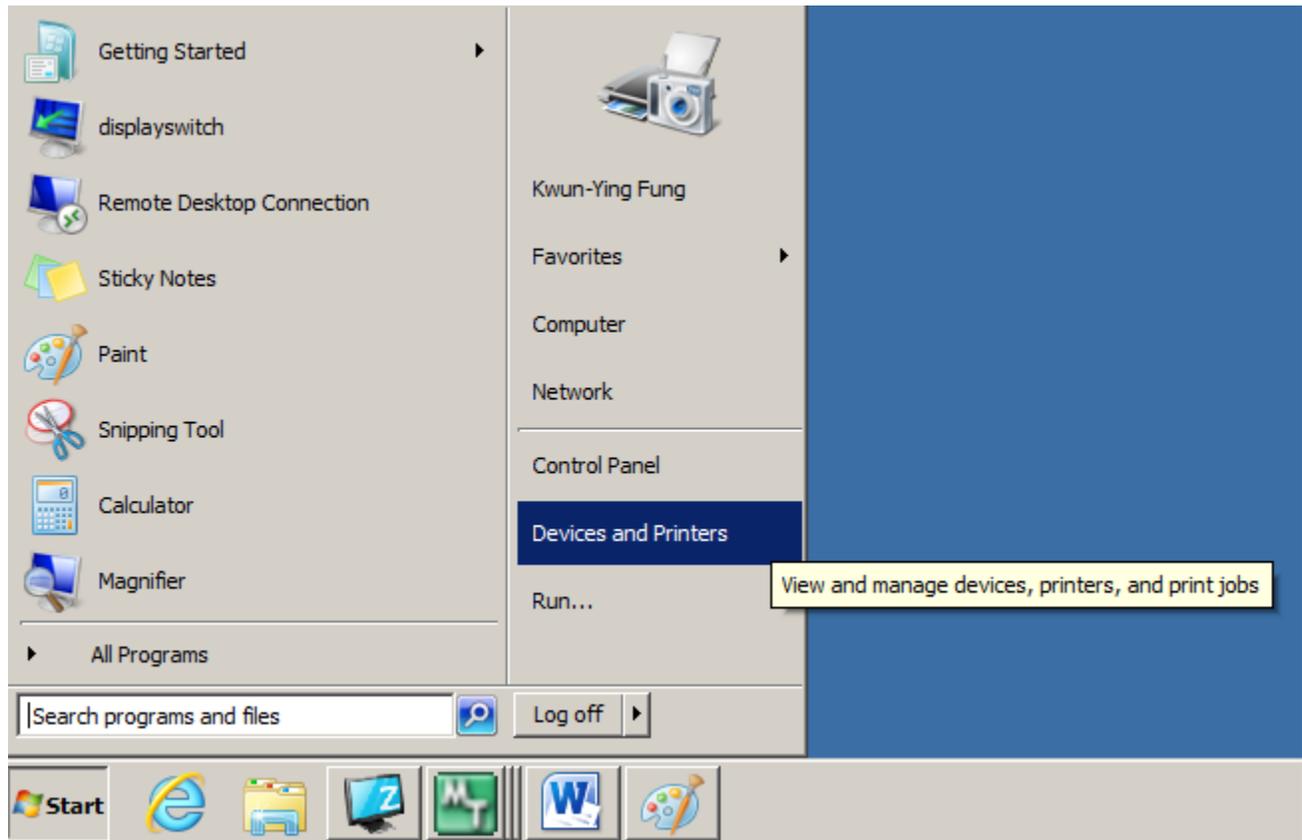
1. Disconnect – suspend your current session, you will not lose any information
2. Disconnect and Log Off – this will end your current session and you will lose your work.
Use this when you are having computer issues such as:
 - a. General slowness
 - b. Missing programs
 - c. Failed print jobs

Start Button/Program Search

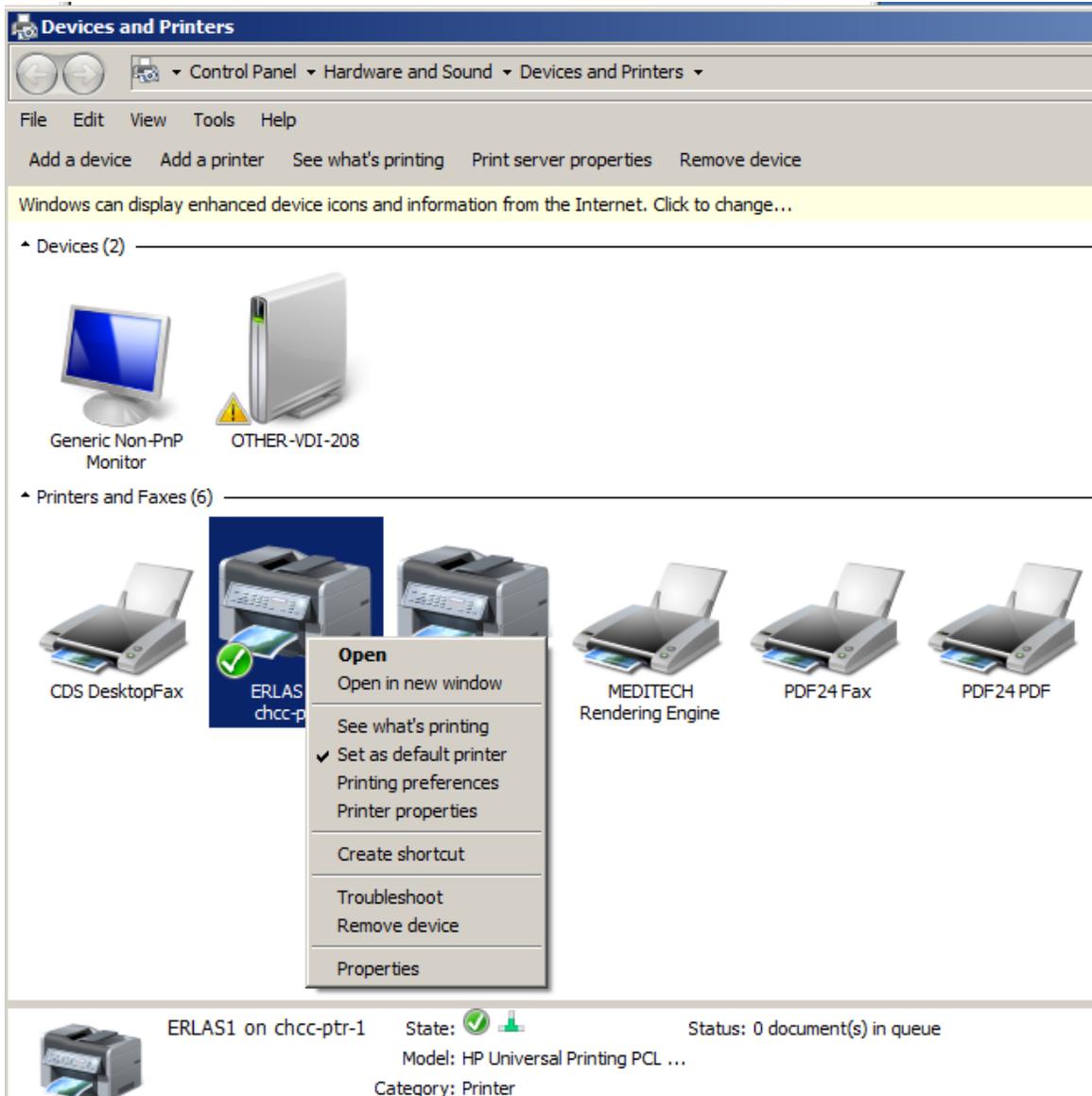


Click here to bring up the search field. If you lose the ZENworks application window, you can bring it back by using this method. You can also search for other programs here

Set Default Printer

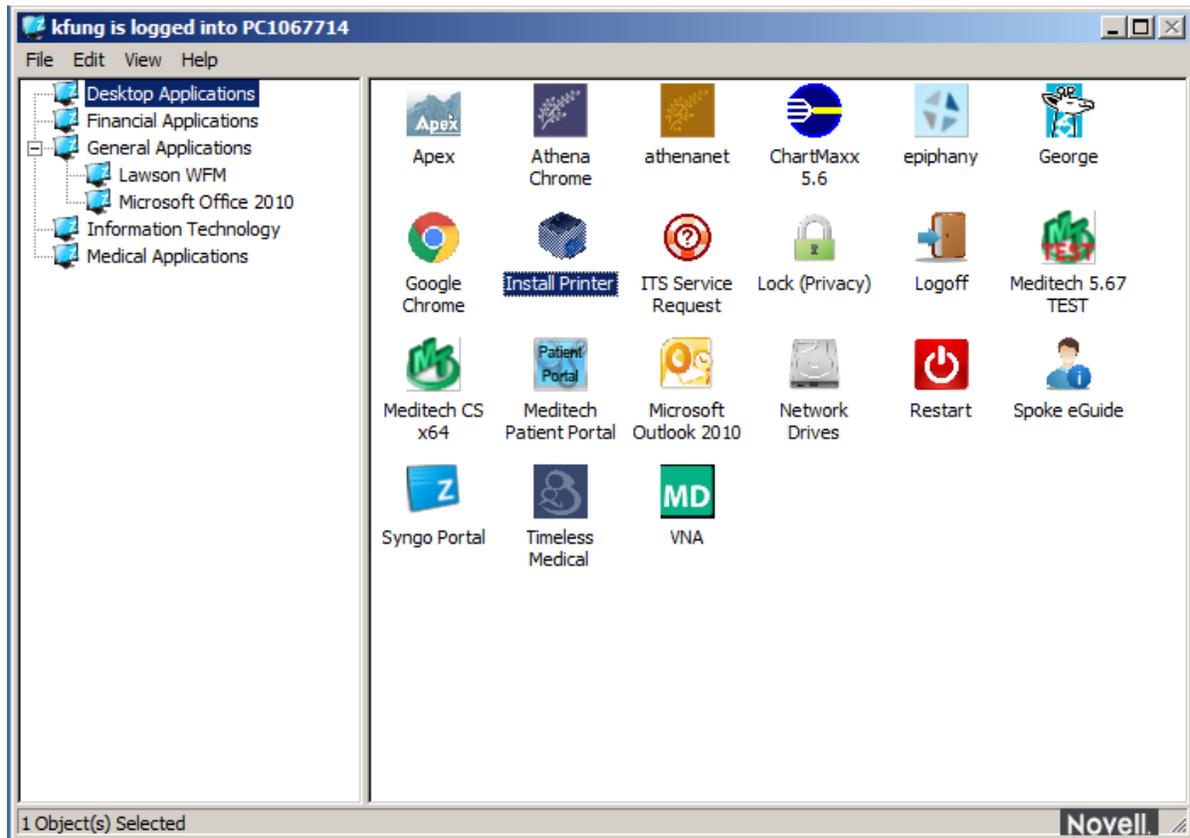


1. Click the Start Button
2. Navigate to the “Devices and Printers”

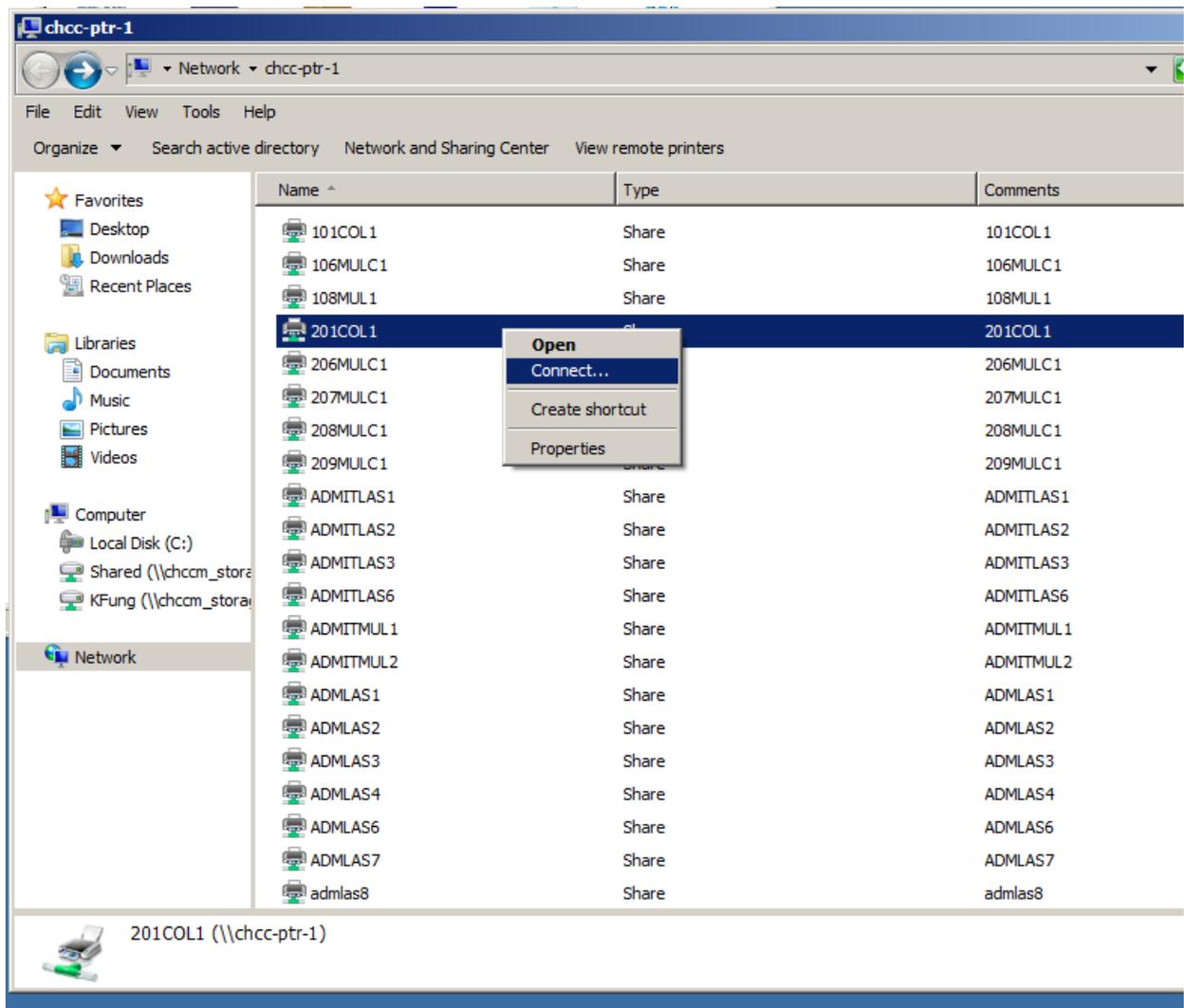


3. This window shows you the current connected printers
4. Right click on the printer to and click “Set as default printer”
 - a. You will see a check mark next to the default printer

Add a Network Printer

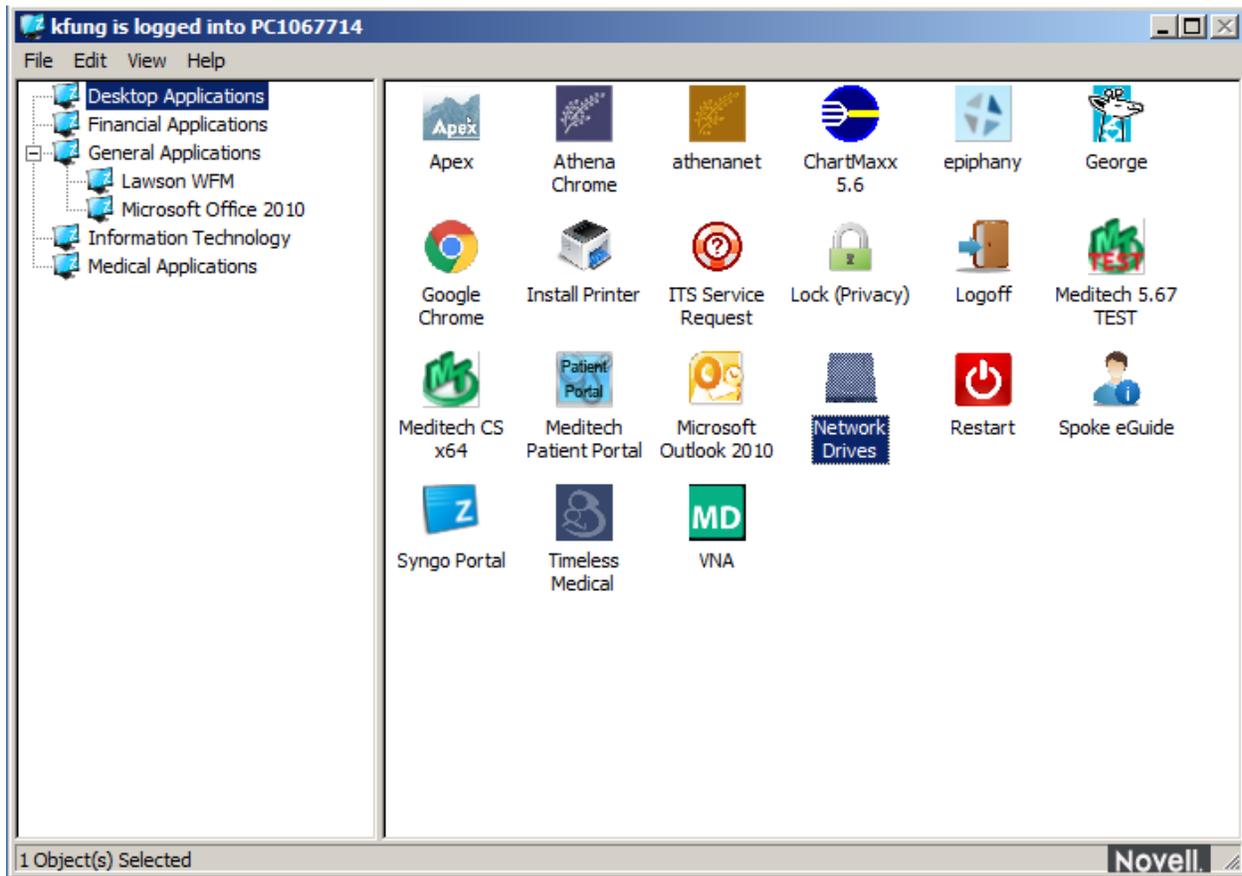


1. To add a network printer, click the “Install Printer” icon in ZENworks

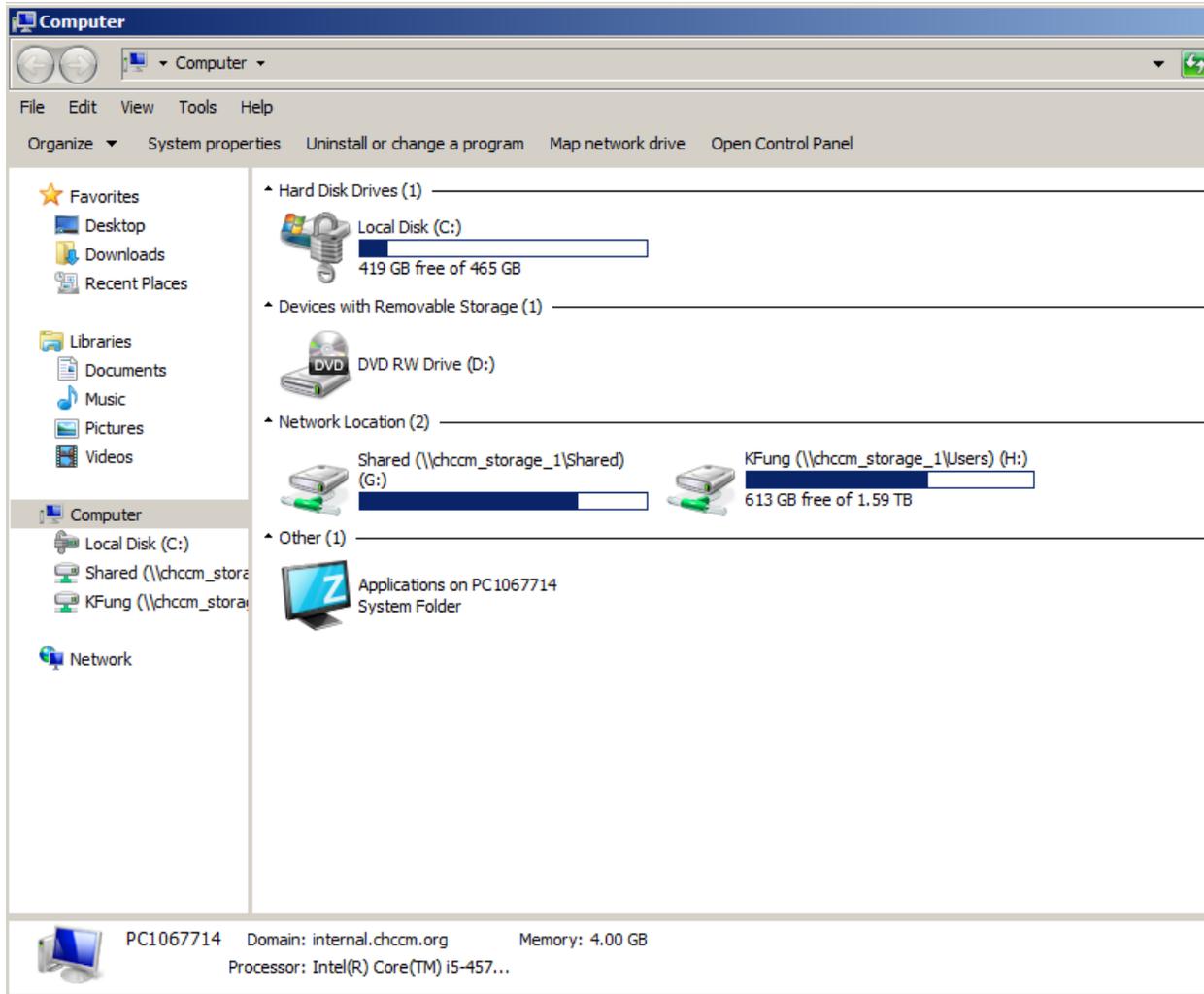


2. Select the printer you wish to add
3. Right click and select "Connect"
4. Select the printer as default using the Start Button/Printers & Devices routine shown above

Network Drives



1. Click on "Network Drives"



2. This window shows you your
 - a. Shared Drive (G:) – this is the organization’s network drive. You will find your department forms and documents.
 - b. Your personal drive (H:) – this is your personal drive where you can save files for later viewing. **Always save files to this personal drive if you want to access them later.**

Policies and Procedures



1. From the George Page, hover over “Library”
2. Select “Search Policies and Procedures”

<ul style="list-style-type: none"> • George Home Page • Medical Library Services <ul style="list-style-type: none"> • Request Form • PedHearth • Book Collection • Journal Collection • Family Resource Center • Medical Library Website >> • Literature Searches <ul style="list-style-type: none"> • Clinical Key • Clinical Key For Nursing • Visual Dx • MicroMedex User Name: MORE Password: TOOLS • EBSCO • PubMed • Red Book User Name: aapredbook Password: redbook1 • UpToDate Online • Cochrane Library • Natural Standard 	<p>Department Policies</p> <ul style="list-style-type: none"> ▣ Department <p>Organizational Policies</p> <ul style="list-style-type: none"> ▣ Administration ▣ Advanced Practice ▣ Clinical Nutrition ▣ Diagnostic Testing ▣ Dietetic Services ▣ ECLS Program ▣ Emergency Response Plans ▣ Environment of Care ▣ Human Resources ▣ Infection Control ▣ Information Management ▣ Laboratory ▣ Medical Staff ▣ Medication Management ▣ Patient Rights ▣ Patient Safety ▣ Provision of Care ▣ Record of Care 	<p>Document Indexes</p> <ul style="list-style-type: none"> • Clinical Education • Discharge Instructions • Equipment Manuals • Forms • Orders • Pathways • Patient And Family Education • Employment Posters
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3. To access Just-in-Time education, click on the “Clinical Education” link at the far right

Clinical Education

[-Back To Index](#)

☐ Just in Time Education

- AccuMax Quantum Bed System
- APEX Parenteral Nutrition
- Asthma Protocol MDI Administration And Cleaning
- ATC Call Lights
- AthenaText
- Bed To Bed Move With Z Slide Sheet
- Bed To Bed With Hovermatt
- BioPatch
- Bladder Scanner
- Blood Product Administration
- Broviac Dressing Change
- C Collar Patient Log Roll
- C Collar Rigid Collar Application
- Call Light System
- Central Line Blood Sampling- Double Stopcock
- Changes To The Bronchiolitis Pathway
- Chest Tube Chamber Change
- Chest Tube Drainage Sampling
- Disposable Safe Patient Handling Items
- Drager Caleo Isolette
- Drager Caleo Isolette Informational Picture
- DVT Prophylaxis Pump
- Giraffe Isolette
- Giraffe Isolette Instructional Picture
- Golvo Bed To Chair

4. From this screen, you can find all the Just-in-Time education material for procedures

Literature Searches

<ul style="list-style-type: none"> • George Home Page • Medical Library Services <ul style="list-style-type: none"> • Request Form • PedHearth • Book Collection • Journal Collection • Family Resource Center • Medical Library Website >> • Literature Searches <ul style="list-style-type: none"> • Clinical Key • Clinical Key For Nursing • Visual Dx • MicroMedex User Name: MORE Password: TOOLS • EBSCO • PubMed • Red Book User Name: aapredbook Password: redbook1 • UpToDate Online • Cochrane Library • Natural Standard 	<p style="color: #C00000;">Department Policies</p> <ul style="list-style-type: none"> ▣ Department <p style="color: #C00000;">Organizational Policies</p> <ul style="list-style-type: none"> ▣ Administration ▣ Advanced Practice ▣ Clinical Nutrition ▣ Diagnostic Testing ▣ Dietetic Services ▣ ECLS Program ▣ Emergency Response Plans ▣ Environment of Care ▣ Human Resources ▣ Infection Control ▣ Information Management ▣ Laboratory ▣ Medical Staff ▣ Medication Management ▣ Patient Rights ▣ Patient Safety ▣ Provision of Care ▣ Record of Care 	<p style="color: #C00000;">Document Indexes</p> <ul style="list-style-type: none"> • Clinical Education • Discharge Instructions • Equipment Manuals • Forms • Orders • Pathways • Patient And Family Education • Employment Posters
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1. From the Search Policies and Procedures section, note the Literature Searches section
 - a. Several databases are available to you for searching current research literature
 - i. EBSCO – nursing and health sciences research and journal database
 - ii. PubMed – database of medical research and journals
 - iii. UpToDate online – database of the most current EBP and peer-reviewed research

2. Click on EBSCO

The screenshot shows the EBSCOhost search interface. At the top, there is a navigation bar with links for 'New Search', 'Publications', 'CINAHL Headings', 'Cited References', and 'More'. Below this, the search bar contains the text 'Searching: CINAHL with Full Text' and a link to 'Choose Databases'. There are three search input fields, each with a 'Select a Field (optional)' dropdown menu. The first field is empty, and the second and third fields have 'AND' selected in their dropdown menus. To the right of the search bar are 'Search' and 'Clear' buttons, along with a help icon. Below the search bar, there are links for 'Basic Search', 'Advanced Search', and 'Search History'. The main content area is titled 'Search Options' and is divided into two sections: 'Search Modes and Expanders' and 'Limit your results'. The 'Search Modes and Expanders' section includes radio buttons for 'Boolean/Phrase' (selected), 'Find all my search terms', 'Find any of my search terms', and 'SmartText Searching'. There are also checkboxes for 'Apply related words', 'Also search within the full text of the articles', and 'Apply equivalent subjects'. The 'Limit your results' section includes checkboxes for 'Journal titles held by Medical Library', 'References Available', 'Full Text', and 'Abstract Available'. It also has a 'Published Date' section with dropdown menus for 'Month' and 'Year', and a 'Publication' text input field. There are also input fields for 'Author' and 'English Language', and a checkbox for 'Peer Reviewed'.

3. Enter your search keywords

4. You can also refine your search by year, Full Text access, English language, etc

Order Management



1. From the EMR, click on the Order History button on the right hand side
2. Order History section you can sort by Service Date by click the Service Date column

Order Date	Order Time	Service Date	Service Time	Ordered By	Category	Procedure	Status
4/6/16	08:49	4/6/16		TEST	LAB	BILIRUBIN PANEL	Cancelled
4/6/16	09:10	4/6/16		TEST	LAB	HIV (< 2 YRS OLD) 1 ...	Cancelled
3/30/16	13:56	3/30/16	13:55	TEST	RAD	CHEST AP	Active
3/30/16	13:56	3/30/16		TEST	LAB	CBC NO DIFF (HEMOGRA...	Cancelled
3/15/16	13:38	3/15/16	13:35	DUBBELS	ADMISSIONS	Admission	Active
2/3/16	10:33	2/3/16		DUBBELS	DIET	Misc Diet	Active
12/28/15	16:05	12/28/15	16:00	PETTERSSON	NUR	Treatment Transfer O (07,...	In Process
					NUR	Ambulance MD Cert St (ONE...	In Process
12/17/15	13:06	12/17/15	13:04	DUBBELS	ADMISSIONS	Admission	Active
12/17/15	09:48	12/17/15	09:48	DUBBELS	DISCHARGE	Discharge Patient	Active
11/20/15	10:17	11/20/15		Faux	DIET	Renal Diet	Cancelled
11/20/15	10:23	11/20/15		DUBBELS	DIET	Renal Diet	Complete
11/20/15	16:39	11/20/15	16:38	Faux	RCP	NICU Avea VG	In Process
11/20/15	16:32	11/20/15	16:30	DUBBELS	RCP	NICU Avea VG	Cancelled
11/20/15	16:24	11/20/15	16:20	Faux	RCP	NICU Avea VG	Cancelled
10/28/15	16:44	10/28/15	17:00	DUBBELS	PHA	Acetaminophen Supp (... 120 MG PR Q4H PRN	Complete
10/28/15	16:45	10/28/15	17:00	DUBBELS	PHA	Acetaminophen Supp (... 60 MG PR Q4H PRN	Complete
10/22/15	13:22	10/22/15	13:20	DUBBELS	ADMISSIONS	Admission	Active
10/8/15	13:44	10/8/15	13:42	PORTUGAL	NUR	Treatment Transfer O (07,...	In Process
10/8/15	10:53	10/8/15	10:52	PORTUGAL	NUR	Treatment Transfer O (07,...	In Process
10/8/15	10:13	10/8/15	10:12	PORTUGAL	NUR	Treatment Transfer O (07,...	In Process
10/8/15	09:51	10/8/15	09:50	PORTUGAL	NUR	Treatment Transfer O (07,...	In Process
10/7/15	10:45	10/7/15	10:43	PORTUGAL	NUR	Treatment Transfer O (07,...	In Process
6/23/15	14:02	6/23/15	14:30	SUKHIJA	PHA	Acetaminophen Susp (... 0 MG PO Q6H PRN	Cancelled
6/23/15	14:15	6/23/15	14:30	SUKHIJA	PHA	Propofol Inj (Dipriv... IV SCH	Complete

3. This will give you a chronological view of upcoming and past orders.

4. This is an easier view to see what orders are due next.

Other Reports

1. From the EMR, click the Other Reports button on the right hand side



2. This will bring up a list of current reports, physician documentation, operative notes for this visit

Date ^	Report	Dictated By	Dictated Date/Time	Status	Report	Hx
4/21/16 16:42	Cardiology Consultation	Andrew Dubbels	4/21/16 16:42	Signed		
4/21/16 16:34	Cardiology Consultation	Andrew Dubbels	4/21/16 16:34	Signed		
4/8/16 16:24	Hospitalist Progress Note	Andrew Dubbels	4/8/16 16:24	Signed		
4/5/16 09:41	History & Physical	Attending Test	4/5/16 09:41	Draft		
3/22/16 12:26	High Risk Newborn Visit	Andrew Dubbels	3/22/16 12:26	Draft		
3/21/16 08:59	Electroencephalogram	Andrew Dubbels	3/21/16 08:59	Signed		
3/21/16 08:58	Electroencephalogram	Andrew Dubbels	3/21/16 08:58	Signed		
3/21/16 08:57	Electroencephalogram	Andrew Dubbels	3/21/16 08:57	Signed		
2/23/16 09:35	Telehealth Note	Vache Geyoghlian	2/23/16 09:35	Signed		
12/31/15 14:42	Gastroenterology Consultation	Vache Geyoghlian	12/31/15 14:42	Signed		
12/22/15 13:33	Discharge Summary	Terry Herrera	12/22/15 13:32	Signed		
12/17/15 09:49	Discharge Summary	Andrew Dubbels	12/17/15 09:49	ISigned		
9/30/15 10:46	Cardiology Progress Note	Andrew Dubbels	9/30/15 10:46	Signed		
9/30/15 09:46	History & Physical	Resident Faux	9/30/15 09:46	Signed		
9/30/15 09:44	History & Physical	Resident Faux	9/30/15 09:43	Signed		
9/30/15 09:35	History & Physical	Resident Faux	9/30/15 09:35	Signed		
9/30/15 09:31	History & Physical	Resident Faux	9/30/15 09:31	Signed		
9/24/15 15:21	Hospitalist Progress Note	Andrew Dubbels	9/24/15 15:21	Signed		
9/24/15 15:18	Hospitalist Progress Note	Andrew Dubbels	9/24/15 15:17	Signed		
9/24/15 15:17	Hospitalist Progress Note	Andrew Dubbels	9/24/15 15:17	Signed		
9/24/15 15:16	Hospitalist Progress Note	Andrew Dubbels	9/24/15 15:15	Signed		
9/24/15 15:15	Hospitalist Progress Note	Andrew Dubbels	9/24/15 15:15	Signed		
9/23/15 11:51	Hospitalist Progress Note	Andrew Dubbels	9/23/15 11:51	Signed		
9/23/15 11:48	Hospitalist Consultation	Andrew Dubbels	9/23/15 11:48	Signed		
9/23/15 11:41	Hospitalist Progress Note	Andrew Dubbels	9/23/15 11:41	Signed		
9/23/15 11:31	Hospitalist Progress Note	Andrew Dubbels	9/23/15 11:31	Signed		
9/22/15 15:13	Hospitalist Progress Note	Andrew Dubbels	9/22/15 15:13	Signed		
9/22/15 13:19	Hospitalist Progress Note	Tiffany Osburn	9/22/15 13:19	Signed		
9/18/15 14:16	Neuropsychological Consultation	Andrew Dubbels	9/18/15 14:16	Signed		
9/16/15 15:00	History & Physical	Andrew Dubbels	9/16/15 15:00	ISigned		
9/15/15 13:37	Oncology Progress Notes	Andrew Dubbels	9/15/15 13:37	Signed		
9/1/15 15:59	PACU Extended Note	Andrew Dubbels	9/1/15 15:59	Signed		
9/1/15 15:58	PACU Extended Note	Andrew Dubbels	9/1/15 15:58	Signed		
8/31/15 14:02	Hospitalist Consultation	Andrew Dubbels	8/31/15 14:02	Signed		
8/19/15 08:30	Hospitalist Progress Note	Andrew Dubbels	8/19/15 08:30	Signed		
8/19/15 08:29	Hospitalist Consultation	Andrew Dubbels	8/19/15 08:29	Signed		
6/23/15 14:23	Instructions	N/A	Unavailable	Entered		
6/10/15 14:24	Hospitalist Progress Note	Andrew Dubbels	6/10/15 14:24	Signed		
6/10/15 14:06	Hospitalist Progress Note	Andrew Dubbels	6/10/15 14:06	Signed		
6/10/15 13:36	Emergency Room Visit Notes	Andrew Dubbels	6/10/15 13:36	Signed		

Selected Visit Lifetime Summary View Converted Charts

Medical/Surgical Long Term Behavioral Rehabilitation

All Reports Surgery HEENT Nervous System

Cardiovascular System Respiratory System GI/GU Nutrition

Psychosocial Rehabilitation General Emergency

Report	Date ▲	Status	
Cardiology Consultation	4/21/16	Signed	🗨
Hospitalist Progress Note	4/8/16	Signed	🗨
History & Physical	4/7/16	Signed	🗨
Electroencephalogram	4/7/16	Signed	🗨
Endocrinology Progress Note	4/7/16	Signed	🗨
Telehealth Note	2/23/16	Signed	🗨
Gastroenterology Consultation	12/31/15	Signed	🗨
Discharge Summary	12/22/15	Signed	🗨
Instructions	11/24/15	Entered	🗨
External Medical Summary Report	10/28/15	Signed	🗨
Cardiology Progress Note	9/30/15	Signed	🗨
Hospitalist Consultation	9/23/15	Signed	🗨
Neuropsychological Consultation	9/18/15	Signed	🗨
Oncology Progress Notes	9/15/15	Signed	🗨
PACU Extended Note	9/1/15	Signed	🗨
Operative Notes	7/21/15	Signed	🗨
Emergency Room Visit Notes	6/10/15	Signed	🗨
Consultation	5/4/15	Signed	🗨
Pediatric Progress Note	5/4/15	Signed	🗨
Brainstem Auditory Evoked Response	4/15/15	Signed	🗨
Interpreter Interview	4/14/15	Signed	🗨
Diabetic Clinic	4/14/15	Signed	🗨
Neonatology Progress Note	4/10/15	Signed	🗨
Neurosurgical Progress Notes	3/27/15	ISigned	🗨
Surgery Progress Note	3/17/15	Signed	🗨
Orthopedic Consultation	2/2/15	Draft	🗨
High Risk Newborn Visit	11/10/14	Signed	🗨
Oncology Consultation	11/3/14	Signed	🗨
Physiatry Progress Note	11/3/14	Signed	🗨
Audiology Evaluation	10/22/14	Signed	🗨
Communication Report	9/11/14	Signed	🗨
Anesthesiology Progress Note	9/11/14	Signed	🗨
Anesthesiology Consultation	9/11/14	Signed	🗨
Critical Care Progress Note	9/11/14	Signed	🗨
Physical Therapy Evaluation	8/6/14	Signed	🗨
Progress Notes	3/18/14	Signed	🗨

- Click on the “Lifetime Summary” button at the top will show you reports and notes from the entire history in the hospital

Medication Reconciliation

Reconcile Meds - Ordering Provider: Kinnison, John MD				
+ Preferred Pharmacy Edit Remove Review RITE AID-2020 E COPPER AVE 2020 E COPPER AVENUE FRESNO CA 9373...				
Medication Reconciliation Last Updated By: Leone Cruz on 1/11/16 @ 1120				
- Home Meds (11)				
	Last Action	Last Taken	Generic	Action
Acetaminophen 160 Mg/5 MI Elixir (Acetaminophen Elixir) 20 Mg (0.625 ML) PO Q4H PRN #240 ML PRN T>38.3 (101F) or Mild Pain AS NEEDED	Last Taken Edited Leone Cruz 1/11/16 @ 1103	1/11/16 @ 0830 1ml	Acetaminop...	
Acetaminophen With Codeine 10 MI Solution (Acetaminophen-Codeine Solution) 2 MI PO BID #10 SEVERE PAIN	New Order Lisa Hasenma... 5/21/14 @ 1425	<Last Taken>	Acetaminop...	
Cephalexin 250 Mg Tablet 250 Mg PO BID #10 TABLET	New Order Lisa Hasenma... 11/19/14 @ 1044	<Last Taken>	Cephalexin	
Furosemide 20 Mg Tablet (Lasix) 20 Mg PO DAILY 30 Days Ref 3 Reported	New Order Candace M Bi... 1/8/16 @ 1445	1/1/16 @ 0800 20 mg	Furosemide	
Hyoscyamine Sulfate 0.125 Mg Tab.Subl 0.0625 Mg SL AC PRN #10 PRN Anxiety, agitation, or spasms	New Order Lisa Hasenma... 5/29/14 @ 1054	<Last Taken>	Hyoscyamin...	
Ibuprofen 100 Mg/5 MI Oral.Susp (Ibuprofen Suspension) 20 Mg PO Q6H #240 BOTTLE Reported	New Order Leone Cruz 1/11/16 @ 1120	1/11/16 @ 0630 Unknown Dose	Ibuprofen	
Lancets 1 Each Each (1St Choice Lancets) 1 Unit ASDIRECTED BID PRN 10 Days PRN Allergies	New Order Lisa Hasenma... 12/2/14 @ 1407	<Last Taken>	Lancets	
[blue] No Conflict Check Reported	New Order Candace M Bi... 1/8/16 @ 1445	Unknown Date Unknown Dose	[blue]	
[pink liquid] No Conflict Check Reported	New Order Jean C. Hoels... 12/18/15 @ 1136	12/18/15 @ 0630 Unknown Dose	[pink liquid]	
[pink liquid] No Conflict Check Reported	New Order Leone Cruz 1/11/16 @ 1120	Unknown Date Unknown Dose	[pink liquid]	
[white cream] No Conflict Check Reported	New Order Leone Cruz 1/11/16 @ 1120	1/11/16 @ 0900 Unknown Dose	[white cream]	
+ Inpatient Medications (2)		Home Meds		Action
+ Past Inpatient Medications (3)		Last compiled for 7 days Update		DC Date

[Meds](#) [Med Equip](#) [Favorites](#) [Common](#) [Category](#) [Name](#) [Function](#) [Ext Med Hx](#)

1. Click the Home Meds section to expand the Home Medication list

2. Select the medication you want to edit, click the cell in the “Last Taken” column

Reconcile Meds - Ordering Provider: Kinnison, John MD

Preferred Pharmacy: RITE AID-2020 E COPPER AVE 2020 E COPPER AVENUE FRESNO CA 93733...

Medication Reconciliation Last Updated By: Leone Cruz on 1/11/16 @ 1120

Home Meds (11)	Last Action	Last Taken	Generic	Action
Acetaminophen 160 Mg/5 MI Elixir (Acetaminophen Elixir) 20 Mg (0.625 ML) PO Q4H PRN #240 ML PRN T>38.3 (101F) or Mild Pain AS NEEDED	Last Taken Edited Leone Cruz 1/11/16 @ 1103	1/11/16 @ 0830 1ml	Acetaminop...	

Software by MEDITECH

Last Taken

Medication Ordered: Ibuprofen 100 Mg/5 MI Oral.susp

Date

1/11/16

Jan	Feb	Mar	Apr	May	June	
July	Aug	Sept	Oct	Nov	Dec	
SU	M	T	W	TH	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

2016 Today

Time

0630

7	8	9
4	5	6
1	2	3
←	0	N

Input range: 0000 - 2359

Dose: UNKNOWN

Comment: asked mother to bring next visit

Information Source: MOTHER

Medication Purpose: fever

Attention Required: Yes No

Unknown Date/Time
Unknown Dose

Clear Cancel Save

3. Enter in the pertinent information such as Last taken date/time and dose.
4. Click “Save” when done.

Adding a Reported Home Medication

Past Inpatient Medications (3) Last compiled for 7 days [Update](#) DC Date

Meds Med Equip Favorites Common Category Name Function Ext Med Hx

Medication Name Search: zofran [Clear](#) Undefined Med Selected Drug Plan

Standard Medications	NS	Action	Details
<input type="checkbox"/> ZOFRAN			
<input type="checkbox"/> ZOFRAN ODT			
4 MG - TAB.RAPDIS - B	Unknown ⓘ		
<input checked="" type="checkbox"/> 4 MG PO TID <prn> <reason> #30 <days> <rf> TABLETMELT		Reported	<input type="checkbox"/>
8 MG - TAB.RAPDIS	Unknown ⓘ		
<input type="checkbox"/> 1 TABLET PO DAILY <prn> <reason> <qty> 30 Days 3 <disp unit>			
8 MG - TAB.RAPDIS - B	Unknown ⓘ		
<input type="checkbox"/> <dose> <units> <route> <freq> <prn> <reason> <qty> <days> <rf> <disp unit>			
8 MG - TAB.RAPDIS	Unknown ⓘ		
<input type="checkbox"/> 8 MG PO AS DIRE... <prn> <reason> #10 <days> AD TABLET			<input type="checkbox"/>
<input type="checkbox"/> 8 MG PO TID <prn> <reason> #10 <days> AD TABLET			<input type="checkbox"/>
<input type="checkbox"/> ZOFRAN ORAL SOLN			
<input type="checkbox"/> ZOFRAN TAB			

1. Click on the “Medication Name Search” field
2. Begin entering the name of the medication
 - a. The live search function will filter medication based on your search
3. Select the reported dose and formulation by clicking on the appropriate checkbox

Inpt Meds Associate Remove Assoc View Renew Cancel DC Undo Print HOLD Review Select Prev Next Cancel Save

4. Click “Select” then “Save”

Discontinue a Home Medication

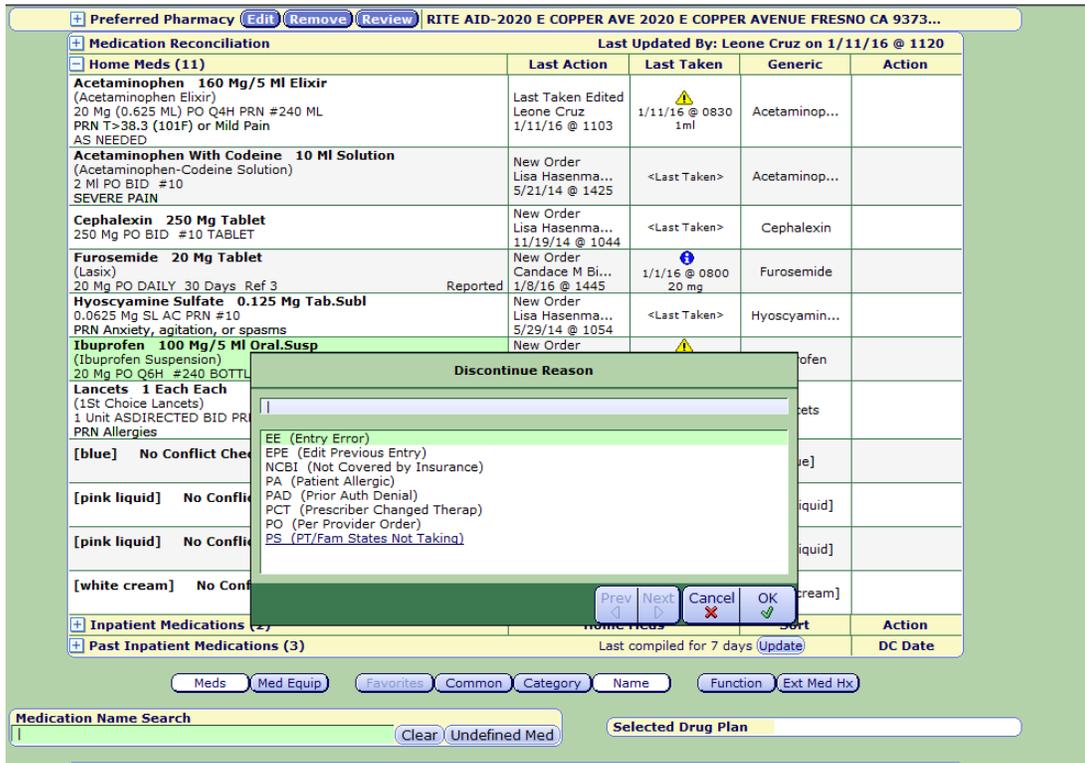
1. Select the home medication the parent/patient states they no longer take

The screenshot shows a software interface for medication reconciliation. At the top, it displays the preferred pharmacy: RITE AID-2020 E COPPER AVE 2020 E COPPER AVENUE FRESNO CA 9373... and the last updated by: Leone Cruz on 1/11/16 @ 1120. Below this is a table of 'Home Meds (11)'. The table has columns for medication name, last action, last taken, generic name, and action. A dialog box titled 'Discontinue Reason' is open over the table, listing various reasons for discontinuation such as 'EE (Entry Error)', 'EPE (Edit Previous Entry)', 'NCBI (Not Covered by Insurance)', 'PA (Patient Allergic)', 'PAD (Prior Auth Denial)', 'PCT (Prescriber Changed Therap)', 'PO (Per Provider Order)', and 'PS (PT/Fam States Not Taking)'. At the bottom of the dialog are buttons for 'Prev', 'Next', 'Cancel', and 'OK'. Below the table are sections for 'Inpatient Medications (3)' and 'Past Inpatient Medications (3)'. At the very bottom, there are buttons for 'Meds', 'Med Equip', 'Favorites', 'Common', 'Category', 'Name', 'Function', and 'Ext Med Hx'. A search bar for 'Medication Name Search' and a 'Selected Drug Plan' field are also visible.

Home Meds (11)	Last Action	Last Taken	Generic	Action
Acetaminophen 160 Mg/5 MI Elixir (Acetaminophen Elixir) 20 Mg (0.625 ML) PO Q4H PRN #240 ML PRN T>38.3 (101F) or Mild Pain AS NEEDED	Last Taken Edited Leone Cruz 1/11/16 @ 1103	1/11/16 @ 0830 1ml	Acetaminop...	
Acetaminophen With Codeine 10 MI Solution (Acetaminophen-Codeine Solution) 2 MI PO BID #10 SEVERE PAIN	New Order Lisa Hasenma... 5/21/14 @ 1425	<Last Taken>	Acetaminop...	
Cephalexin 250 Mg Tablet 250 Mg PO BID #10 TABLET	New Order Lisa Hasenma... 11/19/14 @ 1044	<Last Taken>	Cephalexin	
Furosemide 20 Mg Tablet (Lasix) 20 Mg PO DAILY 30 Days Ref 3	New Order Candace M Bi... 1/8/16 @ 1445 Reported	1/1/16 @ 0800 20 mg	Furosemide	
Hyoscyamine Sulfate 0.125 Mg Tab.Subl 0.0625 Mg SL AC PRN #10 PRN Anxiety, agitation, or spasms	New Order Lisa Hasenma... 5/29/14 @ 1054	<Last Taken>	Hyoscyamin...	
Ibuprofen 100 Mg/5 MI Oral.Susp (Ibuprofen Suspension) 20 Mg PO Q6H #240 BOTTLE	New Order		Ibuprofen	
Lancets 1 Each Each (1St Choice Lancets) 1 Unit ASDIRECTED BID PRN PRN Allergies			Lancets	
[blue] No Conflict Check			[blue]	
[pink liquid] No Conflict			[pink liquid]	
[pink liquid] No Conflict			[pink liquid]	
[white cream] No Conflict			[white cream]	

2. Click the “DC” button at the bottom of the screen

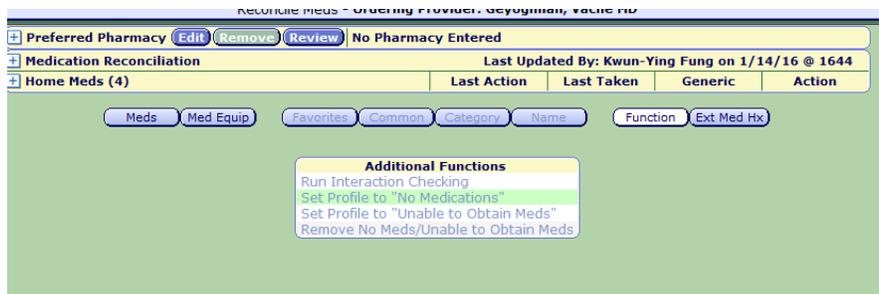
A horizontal row of buttons with the following labels from left to right: 'Inpt Meds', 'Associate Remove Assoc.', 'View/Change', 'Renew', 'Cancel DC', 'Undo Print', 'HOLD Review', and 'Select'.



3. Select an appropriate “Discontinue Reason”

Set Patient Profile to “No Medications”

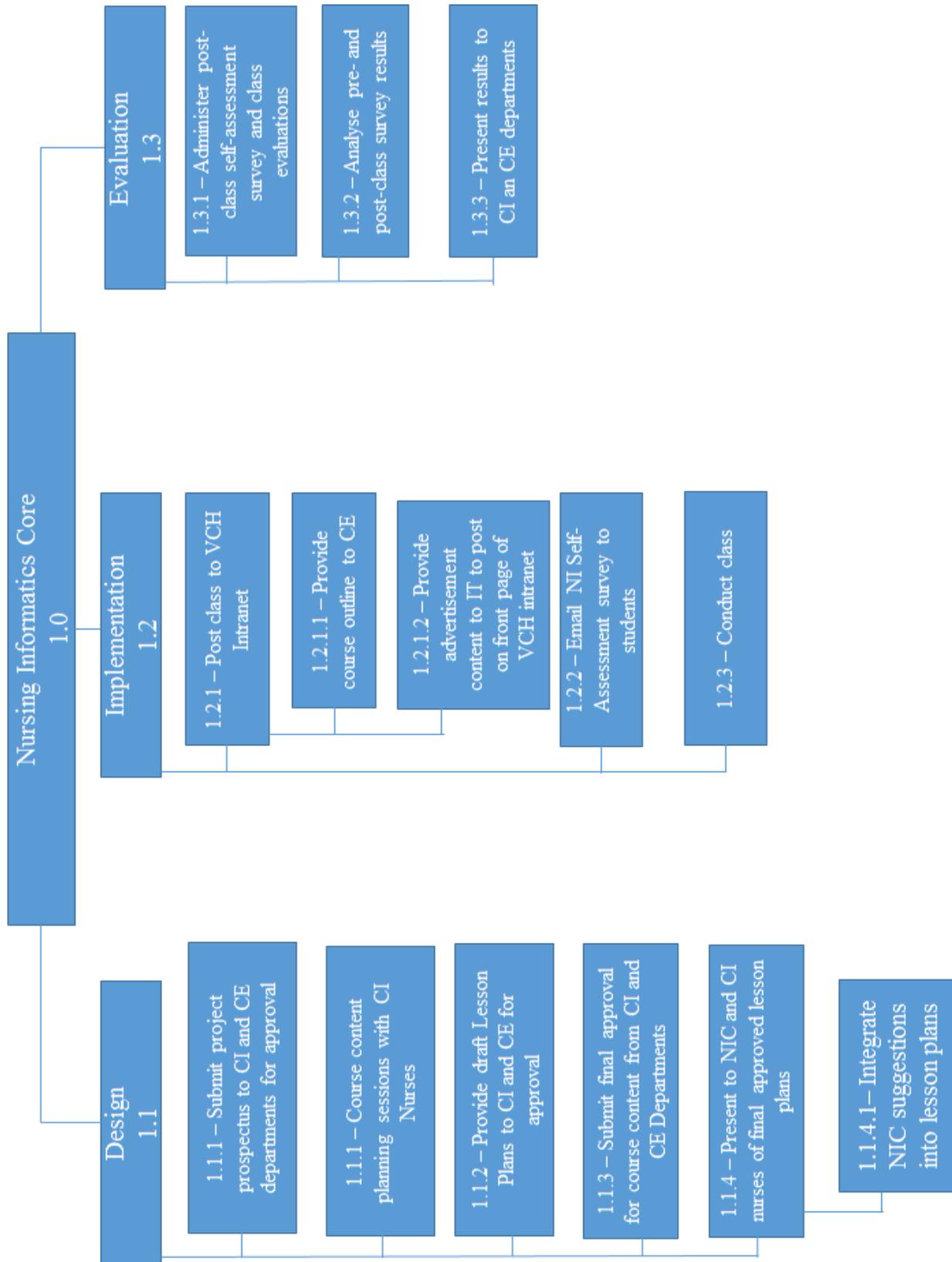
1. Click on the “Function” button
2. Select “Set Profile to ‘No Medications’”



Appendix J – Gap Analysis

Future State	Current State	Deficiency	Recommendations
Nurses document accurately and completely in the patient EHR	Legal and financial penalties for erroneous or incomplete documentation	Nurses document late, miss critical pieces of documentation, create an incomplete patient record	Learning objectives focus on reasons why documentation is structured, how the documentation flows and is based around policy to ensure that the nurse is acting according to policy
Nurses efficiently extract patient-centered data from the EHR	Nurses are missing key patient data that would help them improve patient care	Nurses are intimidated by the EHR and have inefficient workarounds at viewing patient history	Demonstrate the efficient workflow of viewing patient data giving an SBAR report using the EHR. Show how to view longitudinal patient data in the EHR.
The nursing workforce demonstrate a standard set of NI competency	Many documentation workarounds exist	Nurses have a varied, individualized, and informal set of NI competencies based on personal experience	Use the TIGER NI competencies as the standard

Appendix K – Work Breakdown Structure



Appendix L – SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • Provides nurses with a measurable, structured NI competency list as learning objectives • TIGER Competencies have high internal reliability and aligned with other standard-setting bodies • Input from multiple sources (CI nurses, CE, NIC) ensures high fidelity to nursing workflow and concerns • Enthusiastic support from both CI and CE departments • NI competencies are improved prior to EHR upgrade • Curriculum could be used to train and develop core super user group for future EHR upgrades • Could be used as part of professional development, part of the clinical ladder 	<ul style="list-style-type: none"> • One class offering • Varied computer skills among students may slow down class progress or engagement • ICDL courses are cost prohibitive • Departmental budgets have already allocated education time for nurses • Nurses see documentation as just another task, providing them with little clinical value.
Opportunities	Threats
<ul style="list-style-type: none"> • Increased importance of EHR and electronic records in healthcare • Meaningful Use requires nurses to demonstrate improved quality care • Help the organization meet Stage 2 and Stage 3 MU • Address/correct basic computer competencies • Shift to using Big Data as a driver of improved evidence-based medicine and patient care 	<ul style="list-style-type: none"> • Dynamic technological advances in EHR systems make this system obsolete • Multiple NI competencies sets, and lack of consensus for a dominate set • Stage 2 MU attestation period • Winter census leads to stressed and overworked nursing workforce • Competing EHR initiatives

Appendix M – Return on Investment

Costs					
Category	Item	Qty	Price	Hrs	Total
Development	Project lead research and preparation	1	\$60	36	\$2,160
	CI nurses consulting on lesson plans	3	\$60	8	\$1,440
	ITS support	1	\$60	1,000	\$60,000
Implementation	Instructor	1	\$60	1,000	\$60,000
	Student education cost	1,000	\$50	8	\$400,000
Total Cost					\$523,600
Assumptions					
Meet Stage 2 MU					\$2.0-6.3M
Avoiding ADE		49	\$3,511		\$172,039
Reduction in nursing OT		10%	\$1.87M		\$187,000
Total Assumptions					\$2.35- \$6.65M
Total net ROI					\$1.8- \$6.1M

Appendix N – Survey Tool

Please rate your proficiency level for the following items using a 4-point scale:

1 = Beginner, 2 = Comfortable, 3 = Proficient, 4 = Expert

Basic Computer Competencies

1. Start the computer and log on securely using a user name and password
2. Restart the computer using an appropriate routine
3. Shut down a non-responding application
4. Shut down the computer using an appropriate routine
5. Collapse, expand, restore, re-size, move, close a window
6. Create a folder and sub-folder
7. Use a text editing application
8. Sort files
9. Rename files, folders
10. Move files, folders between folders and drives
11. Restore files, folders between folders and between drives
12. Change the default printer from an installed-printer list
13. Open an application
14. Create a new file
15. Save a file to a location on a drive
16. Close an application
17. Switch between open files
18. Copy and paste content between files
19. Display/hide built-in toolbars
20. Insert, remove a file attachment

Clinical Information Management

1. Capture data and information related to clinical care
2. Update data and information
3. Print standardized (pre-formatted) reports
4. Demonstrate procedures that assure confidentiality of protected patient health information
5. Demonstrate procedures for maintaining security of patient health information
6. Demonstrate procedures to maintain security of organizational information
7. Find information to guide patient care (patient care guidelines, standards of care, just-in-time teaching, etc)
8. Communicate electronically with others such as colleagues, patients, other departments, and organizational units

Clinical Information Literacy

1. Determine the nature and extent of the information needed
2. Describe information needed through key concepts and terms

3. Identify keywords, synonyms, and related terms for the information needed
4. Describe the available information systems (Online formulary, UptoDate, EBSCO, Medline, etc)
5. Determine the most appropriate methods for accessing information electronically: search engines, interfaces (the database screens), and content available through a given system
6. State the risks and constraints of searching the Internet for needed evidence-based information
7. Use appropriate search language and parameters for selected system
8. Assess the quantity, quality, and relevance of the search results to determine whether alternative information retrieval systems or investigative methods should be utilized
9. Evaluate information and its sources critically and incorporates selected information into their knowledge base and value system
10. Identify verbatim material that can be appropriately quoted
11. Restate in your own words main concepts from a source
12. Compare information from various sources to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias
13. Determine the value added by the new information
14. Synthesize conclusions based upon information gathered
15. Use information effectively to accomplish a specific purpose individually or as a member of a group
16. Articulate knowledge and skills transferred from prior experiences to meet information-need purpose
17. Evaluate outcomes of the use of information
18. Describe privacy and security of information
19. Use approved passwords and other forms of ID for access to information resources

Adapted from Hunter, K., McGonigle, D., & Hebda, T. (2013). TIGER-based measurement of nursing informatics competencies: The development and implementation of an online tool for self-assessment. *Journal of Nursing Education and Practice*, 3(12), 70-80. doi: 10.5430/jnep.v3n12p70

Appendix O – Survey Responses

Pre-Class Survey

Start the computer and log on securely using a user name and password	4	4	4	4
Restart the computer using an appropriate routine	4	4	4	4
Shut down a non-responding application	1	4	4	4
Shut down the computer using an appropriate routine	3	4	4	4
Collapse, expand, restore, re-size, move, close a window	4	4	4	4
Create a folder and sub-folder	2	4	4	4
Use a text editing application	2	4	4	4
Sort files	2	4	4	4
Rename files, folders	2	4	4	4
Move files, folders between folders and drives	1	4	4	4
Restore files, folders between folders and between drives	1	4	4	4
Change the default printer from an installed-printer list	1	4	4	4
Open an application	1	4	4	4
Create a new file	2	4	4	4
Save a file to a location on a drive	1	4	4	4
Close an application	2	4	4	4
Switch between open files	1	4	4	4
Copy and paste content between files	3	4	4	4
Display/hide built-in toolbars	1	4	4	4
Insert, remove a file attachment	3	4	4	4
Individual Average	2.05	4	4	4
Class Average	3.5			
Clinical Information Literacy				
Capture data and information related to clinical care	2	3	4	4
Update data and information	2	3	4	4
Print standardized (pre-formatted) reports	4	3	4	4
Demonstrate procedures that assure confidentiality of protected patient health information	1	3	4	4
Demonstrate procedures for maintaining security of patient health information	2	3	4	4
Demonstrate procedures to maintain security of organizational information	2	3	4	4
Find information to guide patient care (patient care guidelines, standards of care, just-in-time teaching, etc)	2	4	4	3
Communicate electronically with others such as colleagues, patients, other departments, and organizational units	2	4	4	4
Individual Average	2.1	3.25	4	3.8
Class Average	3.28			

Determine the nature and extent of the information needed	1	4	4	4
Describe information needed through key concepts and terms	1	3	4	4
Identify keywords, synonyms, and related terms for the information needed	1	4	4	4
Describe the available information systems (Online formulary, UptoDate, EBSCO, Medline, etc)	1	4	4	2
Determine the most appropriate methods for accessing information electronically: search engines, interfaces (the database screens), and content available through a given system	2	3	4	3
Use appropriate search language and parameters for selected system	1	4	4	3
Evaluate information and its sources critically and incorporates selected information into their knowledge base and value system	1	4	4	3
Determine the value added by the new information	1	4	4	4
Synthesize conclusions based upon information gathered	1	4	4	4
Use information effectively to accomplish a specific purpose individually or as a member of a group	1	4	4	4
Articulate knowledge and skills transferred from prior experiences to meet information-need purpose	1	4	4	4
Evaluate outcomes of the use of information	1	3	4	4
Describe privacy and security of information	1	4	4	4
Use approved passwords and other forms of ID for access to information resources	1	4	4	4
Determine the nature and extent of the information needed	1	4	4	4
Describe information needed through key concepts and terms	1	3	4	4
Identify keywords, synonyms, and related terms for the information needed	1	4	4	4
Describe the available information systems (Online formulary, UptoDate, EBSCO, Medline, etc)	1	4	4	2
Determine the most appropriate methods for accessing information electronically: search engines, interfaces (the database screens), and content available through a given system	2	3	4	3
Individual Average	1.07	3.78	4	3.68
Class Average	3.10			
Total Average	3.29			

Post-Class Survey

Basic Computer Competencies				
Collapse, expand, restore, re-size, move, close a window	4	4	4	4
Create a folder and sub-folder	4	4	4	4
Use a text editing application	4	4	4	3
Sort files	4	4	4	3
Rename files, folders	4	4	4	4

Move files, folders between folders and drives	4	4	4	4
Restore files, folders between folders and between drives	4	4	4	4
Change the default printer from an installed-printer list	4	4	4	4
Open an application	4	4	4	4
Create a new file	4	4	4	4
Save a file to a location on a drive	4	4	4	4
Close an application	4	4	4	4
Switch between open files	4	4	4	4
Copy and paste content between files	4	4	4	4
Display/hide built-in toolbars	3	4	4	4
Insert, remove a file attachment	4	4	4	4
Identify possible problems with sending file attachments	4	4	4	4
Start the computer and log on securely using a user name and password	4	4	4	4
Restart the computer using an appropriate routine	4	4	4	4
Shut down a non-responding application	4	4	4	4
Shut down the computer using an appropriate routine	4	4	4	4
Individual Average	3.95	4	4	3.9
Class Average	3.96			
Clinical Information Literacy				
Capture data and information related to clinical care	3	3	4	4
Update data and information	3	3	4	4
Print standardized (pre-formatted) reports	4	3	4	4
Demonstrate procedures that assure confidentiality of protected patient health information	4	4	4	4
Demonstrate procedures for maintaining security of patient health information	4	4	4	4
Demonstrate procedures to maintain security of organizational information	4	4	4	4
Find information to guide patient care (patient care guidelines, standards of care, just-in-time teaching, etc)	4	4	4	4
Communicate electronically with others such as colleagues, patients, other departments, and organizational units	4	4	4	4
Individual Average	3.75	3.6	4	4
Class Average	3.84			
Clinical Information Management				
Determine the nature and extent of the information needed	4	4	4	4
Describe information needed through key concepts and terms	4	4	4	4
Identify keywords, synonyms, and related terms for the information needed	4	4	4	4
Describe the available information systems (Online formulary, UptoDate, EBSCO, Medline, etc.)	4	3	4	4
Determine the most appropriate methods for accessing information electronically: search engines, interfaces (the database screens), and content available through a given system	4	3	4	4
Use appropriate search language and parameters for selected system	4	4	4	4
Evaluate information and its sources critically and incorporates selected	4	3	4	4

information into their knowledge base and value system				
Determine the value added by the new information	4	4	4	4
Synthesize conclusions based upon information gathered	4	4	4	4
Use information effectively to accomplish a specific purpose individually or as a member of a group	4	4	4	4
Articulate knowledge and skills transferred from prior experiences to meet information-need purpose	4	4	4	4
Evaluate outcomes of the use of information	4	4	4	4
Describe privacy and security of information	4	4	4	4
Use approved passwords and other forms of ID for access to information resources	4	4	4	4
Individual Average	4	3.78	4	4
Class Average	3.94			
Total Average	3.83			

Class Averages

	Pre-class	Post-class	% difference
Basic Computer Competencies	3.53	3.96	12
Clinical Information Literacy	3.31	3.84	16
Clinical Information Management	3.12	3.71	18
Total Averages	3.29	3.83	16

Effect size $d = 0.72$, $p = 0.02$

Staff Nurse Results

	Pre-class	Post-class	% difference
Basic Computer Competencies	2.14	3.95	84
Clinical Information Literacy	2.12	3.75	76
Clinical Information Management	1.07	4	273
Total Average	1.77	3.9	120