

San Jose State University

SJSU ScholarWorks

Doctoral Projects

Master's Theses and Graduate Research

Spring 2022

How Implementing a Digital Competency Management System Reduced Nurse Training Cost and Improved NPD Practitioner Satisfaction in a Pediatric Hospital

Dionne Margallo

California State University, Northern California Consortium Doctor of Nursing Practice

Follow this and additional works at: https://scholarworks.sjsu.edu/etd_doctoral



Part of the [Nursing Administration Commons](#), and the [Other Nursing Commons](#)

Recommended Citation

Margallo, Dionne, "How Implementing a Digital Competency Management System Reduced Nurse Training Cost and Improved NPD Practitioner Satisfaction in a Pediatric Hospital" (2022). *Doctoral Projects*. 147.

DOI: <https://doi.org/10.31979/etd.dub5-5y3s>

https://scholarworks.sjsu.edu/etd_doctoral/147

This Doctoral Project is brought to you for free and open access by the Master's Theses and Graduate Research at SJSU ScholarWorks. It has been accepted for inclusion in Doctoral Projects by an authorized administrator of SJSU ScholarWorks. For more information, please contact scholarworks@sjsu.edu.

**How Implementing a Digital Competency Management System Reduced Nurse Training
Cost and Improved NPD Practitioner Satisfaction in a Pediatric Hospital**

Dionne Margallo, DNPc, MSN-Ed, RN, NPD-BC, RNC-NIC

Lisa Walker-Vischer, DNP, RN, CNS, CCRN

Margie Godin, MS, BSN, RN-BC

Kristine Taylor, DNP, MPH, RN, CENP

The Valley Foundation School of Nursing, San Jose State University

Doctor of Nursing Practice

May 2022

Abstract

Healthcare organizations must have high-quality nursing staff to deliver optimal patient care. Educators and managers evaluate nurses by their performance through nursing competencies, or “knowledge, skills, [and] abilities” (KSA) (American Nurses Association, 2015, p. 86). Traditional competency evaluations and manual tracking posed a problem within one pediatric hospital. Leaders did not have a transparent way to see the knowledge and skills of their nursing staff. This resulted in increased organizational costs due to retraining and increased workload and job dissatisfaction among educators. The purpose of this quality improvement (QI) project was to evaluate how implementing a digital competency management system (CMS) affected nurse training costs and assess nursing professional development (NPD) practitioners’ satisfaction after the digital CMS conversion. Technology Acceptance Model (TAM) was used to guide the QI project. The student conducted a cost analysis and measured nurse training cost prior to and after implementing a digital competency management system. The student also administered pre- and post-survey evaluations to determine NPD practitioners’ satisfaction before and after digital implementation. Retrospective data of training costs were collected prior to implementing the CMS. A Wilcoxon signed rank test compared the medians to examine the pre and post survey results of NPD practitioners’ satisfaction scores. The quality improvement project demonstrated that a digital CMS reduced nurse training costs by more than a half a million dollars and increased NPD practitioners’ satisfaction.

Table of Contents

Abstract	2
CHAPTER 1: INTRODUCTION	7
Problem	8
Theoretical Framework	9
Review of Literature	11
CHAPTER 2: METHODS.....	15
Design	15
Setting	15
Sample	16
Data	16
Procedures	19
Analysis Planning	22
Risks	22
Benefits	22
Costs	22
Payment	23
Confidentiality.....	23
CHAPTER 3: RESULTS	23
Cost Analysis	23
NPD Practitioner Survey	24
CHAPTER 4: DISCUSSION	25
Limitations	26

Nursing Implications26

CHAPTER 5: CONCLUSION27

REFERENCES28

APPENDIX A:41

APPENDIX B:43

LIST OF TABLES

Table 1. Training Hours and Cost Prior to Implementation of Digital Competencies ...	34
Table 2. 5-Point Likert Scale: NPD Practitioner Satisfaction Survey (Paper-Based Competencies)	35
Table 3. 5-Point Likert Scale: NPD Practitioner Satisfaction Survey (Competency Assessment and Digital CMS)	36
Table 4. Competency Management Project Timeline	37
Table 5. Training hours and cost post implementation of digital competencies.....	38
Table 6. Paper-based Competencies vs Digital CMS.....	39
Table 7 Paper-based Competencies vs Digital Competency Management System.....	40

LIST OF FIGURES

Figure 1. Original Technology Acceptance Model (Davis, 1986)9

How Implementing a Digital Competency Management System Reduced Nurse Training Cost and Improved NPD Practitioner Satisfaction in a Pediatric Hospital

Healthcare organizations must have high-quality nursing staff to deliver optimal patient care. Educators and managers evaluate nurses by their performance through nursing competencies, or “knowledge, skills, [and] abilities” (KSA) (American Nurses Association, 2015, p. 86). Employers require nursing competencies to satisfy organizational and departmental goals considering the continual change of the work environment (Wright, 2005). They use conventional paper competencies as manual documentation to show nursing qualifications and that nurses have completed appropriate training. Manual record-keeping poses a problem in the organization as paperwork often becomes misplaced, especially when employees transfer between departments.

Furthermore, subjective evaluations performed by managers, educators, or preceptors offer minimal insight into nurses’ true KSA to demonstrate the quality of patient care in the organization (Covell & Sidani, 2013). Employees are often evaluated solely based on other colleagues’ feedback, years of experience, and observation. For example, a manager may base an employee’s performance evaluation on personal interactions. This could create bias when validating competencies. Wright (2015) offers multiple methods to assess nursing competencies that may assist with subjective evaluations. They consist of available nationally validated tools that measure nursing competence and hospital organizations can utilize these tools to improve identification of nursing knowledge and skills.

Subjective evaluations and incomplete documentation create an endless cycle of retraining nurses to provide proof of competence, resulting in increased training costs for organizations (Bradley & Godin, 2020). Additionally, retraining increases educators’ workload

causing dissatisfaction on the job. The Joint Commission for Accreditation of Healthcare Organizations holds organizational leaders accountable in ensuring that nurses continually assess and maintain their competencies (Redman et al., 1999). More importantly than complying with regulatory agencies and state regulations, evidence suggests nursing knowledge and skills may influence patient care quality. Inadequate evaluations negatively impact patient outcomes (i.e., hospital-acquired conditions) (Covell & Sidani, 2013; Fiaz et al., 2018). Padula & Delarmente (2019) states an increase in preventable hospital-acquired conditions when nurses do not have the necessary competencies to care for patients.

Problem

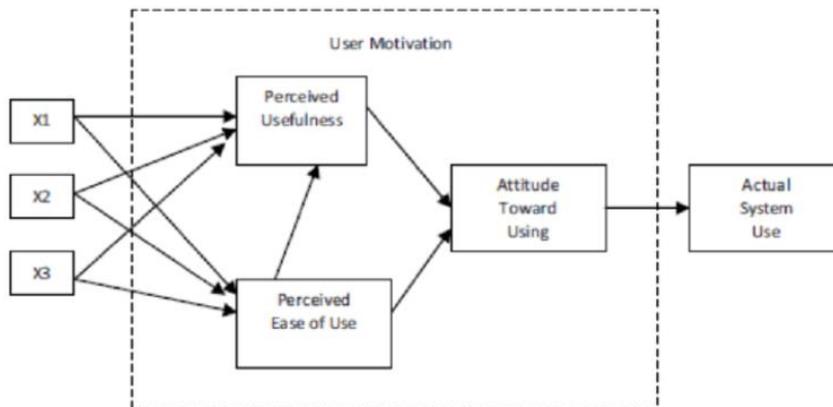
Currently, the identified practice gap reveals that traditional competency evaluations and manual tracking create a problem within the organization. The hospital does not have a clear understanding of the proficiency of its nursing workforce due to subjective competency assessments (Brettel et al., 2014) and inconsistent record-keeping. Therefore, the leadership team finds it difficult to assign “the right nurse, at the right time, with the right competencies and credentials, at the right cost” (Gavigan et al., 2020, p. 63). While there remains further research regarding competency assessment and management in the nursing profession, organizational leaders should prioritize supporting a standardized process for managing and evaluating employee competencies (Arcand & Neumann, 2005; Covell & Sidani, 2013). The purpose of this quality improvement project is to evaluate how implementing a digital competency management system (CMS) affects nurse training costs and assess nursing professional development (NPD) practitioners’ satisfaction after the digital CMS conversion in a Northern California pediatric hospital.

Theoretical Framework

In 1986, Fred Davis, a student at the Graduate School of Business Administration at the University of Michigan, developed the Technology Acceptance Model (TAM) (Allen, 2020). The idea of the TAM originated from the Theory of Reasoned Action (TRA) which predicted how technology is rejected or accepted. TAM differs in that it emphasizes that the actual use of technology determines rejection or acceptance (Granic & Marangunic, 2019). TAM has two primary components: 1. the user's perception of the new technology 2. product's ease of use and applicability to the work environment (Ammenwerth, 2019). TAM is useful in anticipating how successful a product will be adapted within the organization based on employee feedback. Hosain & Saddik's (2018) study explains that behavior towards technology largely influences product usage, a primary element of the TAM model (see figure 1).

Figure 1

Original Technology Acceptance Model (Davis, 1986)



Note. Creative Commons Attribution 4.0 International

With hospitals becoming more integrated with technology, education practices must shift methodologies to incorporate online platforms, mobile solutions, and digital learning (Tick, 2019). The student used the Technology Acceptance Model (TAM) to guide the project implementation. To successfully implement a digital competency management system within the hospital's infrastructure, stakeholders must buy-in to the product. A systematic review of the literature states that perceived ease of use and self-efficacy are critical in predicting a person's intention to use technology (Granic & Marangunic, 2019). The project lead involved clinical nurses, managers, and other stakeholders in the planning, development, implementation, and evaluation. At the start of the project, the project lead, nurse informaticists, and Information Services (IS) partners recruited frontline staff to assist particularly with product testing and education planning. The project team met weekly to discuss usability and functionality and how it will affect clinical practice. Each unit or department had a representative to ensure that the product accounts for unit-specific workflow. Each representative collated recommendations from the staff and addressed questions and concerns to the project team.

It was important to ask stakeholders their perception on the practice gap and intended process improvement before bringing in any type of technology. Per the TAM model, there may be resistance if employees do not see the value of the proposed solution and its applicability to the work environment. Stakeholders from various departments were also given the opportunity to apply the technology directly into practice. The project lead wanted to determine whether the use of technology alleviated or hindered workflow. Any hindrance to routine could potentially affect the adoption of technology.

Review of Literature

The student conducted a literature search relevant to nursing, competency assessments, training cost, competency management system (CMS), and patient outcomes. Search terms also included digital, digitization, electronic, mobile, and web based. Due to the limited results within nursing, the student broadened the search to encompass other disciplines outside of nursing and medicine. Five main topics transpired from the literature review: competency assessment, competency tracking, ease of use, staff satisfaction, and cost.

Competency Assessment

The literature review concluded that there is a greater need for improved competency assessments in the workforce. Gjellebaek et al. (2020) conducted two rounds of focus groups interviews in a four-month period and found that there were management challenges regarding digitization in healthcare; therefore, there was an increased need for competence in the workplace. As technology increases, organizations need to move away from traditional learning methodologies to appropriately assess a dynamic work environment.

Draganidis et al. (2006) developed a tool for learning paths and competency management. The paper proposed that competency assessments should include standardized, objective, and measurable evaluations to incorporate quality assurance among the staff. For example, Kelsey & Klaus (2016) stated that subjective evaluations can be mitigated utilizing validated evidence-based case studies, simulated scenarios, or observation of daily work to test knowledge and skills acquisition.

Competency Tracking

Regulatory agencies require hospital organizations to show proof of staff competence. Lack of standardized record-keeping coupled with missing documentation poses challenges regarding compliance. However, the true challenge of non-compliance affects patient safety (Wright, 2005). In a cross-sectional survey conducted by Covell & Sidani (2013) with 147 inpatient units, the article stated that high organizational performance was associated with a large amount of human capital. However, without an electronic competency management system, there was a gap in identifying the appropriate nursing skill-mix to care for patients. "Human capital is the carrier of the organization's knowledge and skills, therefore, developing core competencies requires developing individual and team competencies"(Paweloszek, 2017, p.1005).

Many of the studies support incorporating a digital CMS since electronic record-keeping allows for real-time data of staff's agility within the organization. Redman (1999) suggested a tool for "anytime, anywhere" capabilities to meet the demands of a dynamic workforce. It not only increases efficiency, but it allows the employer to obtain information at any time. From an education standpoint, Bradley & Godin (2020) also mentioned, educators could provide education resources, perform assessments, and track learning through a virtual platform. Brettel (2014) explained that a digital program could assist with data transfer and ease of sharing competencies within departments that possess similar needs.

Ease of Use

Technology is designed to ease the user's workload and increase efficiency (Ammenworth, 2019). In a mixed methods study by Cham & Cochrane (2020), the authors

proposed an electronic tool to assess clinical competencies. Cham & Cochrane (2020) surveyed 56 students on the ease of use of a digital resource and received an 80% response rate. Findings revealed that >80% of students reported that a digital resource improved the quality of timely feedback, while administrative workload decreased by 50%. Redman et al. (1999) stated that a digital CMS offers wireless, mobile, and web-based services to accommodate the user by providing immediate feedback and resources. For example, nurses could use their assigned mobile phones to search for videos and online modules to clinical procedures directly from the bedside (Bradley & Godin, 2020). Berber et al. (2018) explained that a digital CMS could integrate with Learning Management Systems (LMS), Electronic Human Resource Management (E-HRM)/Enterprise Resource Management (ERM), and the Electronic Health Record (EHR). Having this integration allows for a broader range of data analysis beyond one department.

Staff Satisfaction

Several studies suggested that the integration of a digital CMS improves staff satisfaction. Chaghari et al. (2017) affirmed that a digital CMS utilizes an andragogical approach to learning. Sormunent et al. (2020) stated that an andragogical method includes self-direction, motivation, and experience. Employees felt valued when employers allowed them to direct their learning and accommodate their needs. Anzieu's (2017) pilot study showed that staff appreciate convenience and timely feedback. It added value to the competencies because employees could identify training gaps. Similarly, employers had a clear understanding of each employee's complete profile. Covell & Sidani (2013) suggested nursing confidence increases nursing satisfaction.

Cost

While organizations' main goals include quality patient care and productivity, administrators must consider the cost to run a business. There is a substantial initial cost to implementing a digital CMS. The literature review recommended considering the benefits of a digital CMS versus keeping the same stagnant process to help with education and training costs, error reduction, and health service quality. According to Bradley and Godin (2020), their technology-focused application reduced their educational expenses by 94%. The practice change cost \$34,000 compared to \$540,000 in a traditional 4-hour classroom setting. Furthermore, a digital CMS could further decrease training and educational costs since a digital CMS could also function as a central repository, thereby saving time and money by repurposing learning materials (Draganidis et al., 2006; Vaistis et al., 2016). Since the start of the electronic health records, studies have shown that digital conversion has saved hospital organizations in cost and productivity from error reduction (i.e., medication errors, HACs), data collection, and paper tracking (Hillestad et al., 2005). According to Fiaz et al. (2018), the digitization of healthcare has had a positive impact on health service quality ($p < 0.001$), including cost. Finally, evidence supports that nurse competency is associated with patient outcomes, including reducing hospital acquired conditions such as Hospital Acquired Pressure Injury (HAPI) (Covell & Sidani, 2013). Padula & Delarmente (2019) reported that the cost of HAPI could exceed \$28.6 billion in the United States.

There were several limitations in the literature review. The quality of evidence found was limited to case studies, qualitative studies, quality improvement projects, and expert opinions. Due to the insufficient information regarding competency assessments and competency

management systems within nursing or nursing practice, the student searched for information outside of the profession. The studies could not conclude generalizability to nursing.

The literature supports transitioning to an electronic format for competency assessment and developing a centralized infrastructure for record-keeping (Arcand & Neumann, 2005). Digital competency assessments provide objective evaluations, timely and quality feedback, just-in-time training, and learner flexibility (Thalman et al., 2020). There is an initial cost to transitioning to a digital CMS, but organizations should weigh the benefits of its integration versus the traditional competency management process. Finally, the key to successful implementation and sustainability requires strong leadership and organizational support (Redman et al., 1999; Svetlik, 2007; Mathers & Cummings, 2019; Thalman et al., 2020; Noza-Margallo et al., 2021)

Methods

Design

The student conducted a cost analysis and measured nurse training cost prior to and after implementing a digital competency management system (CMS). The student also administered pre- and post-surveys evaluation to determine nursing professional development (NPD) practitioners' satisfaction before and after digital CMS implementation.

Setting

Lucile Packard Children's Hospital, Stanford (LPCHS) is a 361-bed academic center in Palo Alto, California, which provides direct care for Pediatric and Obstetric patients. The healthcare team offers clinical services and treatments across the world, from complex and rare conditions to well-childcare and pregnant women. It employs over 5,000 employees comprising

registered nurses, physicians, respiratory therapists, and ancillary staff. Nursing makes up 40% of employees, with about 2,000 nurses. Medical specialties include the following: childhood cancer, brain & behavior, general pediatrics, pregnancy and newborn, heart, orthopedics & sports medicine, pulmonary, asthma & sleep medicine, and transplant.

Sample

Aggregate data to calculate nurse training cost included approximately 1,464 inpatient pediatric registered nurses at LPCHS. Registered nurses who work in Ambulatory Clinics were excluded from the quality improvement project since outpatient departments were not trained on the use of the technology. Additionally, travel nurses typically complete their clinical contract within twelve weeks and were also excluded from the project.

To determine nursing professional development (NPD) practitioners' satisfaction, participants in the quality improvement project included fifteen inpatient unit NPD practitioners at LPCHS. Outpatient NPD practitioners were excluded from the quality improvement project because ambulatory clinics did not participate in the project rollout. Central NPD practitioners were also excluded since they did not have direct responsibility for competency assessments of clinical nurses.

Data

The student calculated overall training cost for nursing ongoing competency assessments particularly with technology using a digital CMS prior to and sixteen weeks after implementing a digital CMS. A 5-point Likert Scale questionnaire was used to measure NPD practitioners' impression on ease of use, accessibility, efficiency, likelihood to recommend, and overall satisfaction regarding traditional paper-based competencies versus a digital competency management system.

Training Cost

Pre-data. Traditional education and training with the use of technology specifically with electronic health record (EHR) documentation typically involves in-person class settings. The trainer would provide handouts, review step by step instructions using PowerPoint presentations, and instruct the participants to individually demonstrate proof of competence of the material. The educator would require each participant to sign a document attesting they have received education and training. The NPD practitioner and unit manager would also then sign the same document to complete the competency assessment. In addition, in-person classes take deliberate and careful planning with each clinical unit. NPD practitioners must solidify class dates at least six months before to secure classrooms. The hospital spends approximately \$15,000 on overhead costs for training (i.e., rooms, supplies, equipment). The NPD practitioner must collaborate with the unit managers to ensure each nurse is able to attend training considering their clinical commitment. Most nurses choose to attend the classes in addition to their regularly scheduled shift. The average cost of a full-time nurse is \$90 an hour. On average, units allocated four training hours per nurse for ongoing competency assessment, particularly with implementation of new technology. In addition, each unit was allowed RN facilitators to work a total of eight hours per one week for training. There were approximately 50 RN facilitators that assisted with training for the hospital. LPCHS spends \$18,000 for RN facilitators. Traditional 4-hour in-person class to train 1,464 RNs at LPCHS cost approximately \$596,040. This cost does not include another 4-hour training allotted to all nurses to complete other competency assessments. Table 1 shows the breakdown of training cost prior to the implementation of a digital CMS.

Post-data. To retrieve post-data training costs, aggregate data were measured and assessed using the CMS through the completion of one nursing competency: Documentation

Standards. Post-data were calculated based on the number of RNs trained, RN facilitator training hours, and overhead costs. The student also partnered with unit NPD practitioners to identify the clinical nurses' progress with competency completion. Data was stored and extracted from the hospital's electronic CMS. Once the clinical nurses demonstrated competence, an NPD practitioner, unit manager, or preceptor signed off nursing competencies using the CMS' digital verification methods.

Satisfaction survey

Pre-survey. First, a 5-point Likert Scale questionnaire was used to measure NPD practitioners' impression on ease of use, accessibility, efficiency, likelihood to recommend, and overall satisfaction regarding traditional paper-based competencies. Fifteen participants were asked to rate five questions on a scale ranging from 1 to 5 with 1 representing "strongly disagree" and 5 representing "strongly agree".

Post-survey. A 5-point Likert Scale questionnaire was used to measure NPD practitioners' impression on ease of use, accessibility, efficiency, likelihood to recommend, and overall satisfaction conducting competency assessments using a digital CMS. For the post-survey, the student wanted to distinguish the NPD practitioners' perception between the competency assessment process and the actual CMS used: HealthStream. Fifteen participants were asked to rate ten questions on a scale ranging from 1 to 5 with 1 representing "strongly disagree" and 5 representing "strongly agree". Five questions asked specifically about competency assessments and five questions focused on the digital CMS. The student administered the questionnaires anonymously using Qualtrics. Refer to Table 2 and 3 for the 5-point Likert Scale: NPD practitioner satisfaction surveys.

Procedures

Planning

The gap in practice recognized the need for a robust CMS. With support from the Associate Chief Nursing Officer (ACNO) of Technology and Innovation, the project lead, and the Nursing Informatics (NI) Manager explored a number of potential CMS software that would integrate with the organization. The project lead developed a committee of educators to identify current issues and barriers and asked for a list of desired improvements that could potentially assist in their workflow. Educators also polled staff (i.e., preceptors, resource nurses, bedside nurses) to obtain feedback on how the education team could enhance their competency assessments. The team collaborated with Human Resources (HR) and the Information Systems (IS) departments to understand the current organizational structure. With the collated feedback from educators, staff, HR, and IS, the project lead and NI manager invited CMS vendors who satisfied the organization's identified needs. The top three vendors were then invited to present their products to administrators and department leaders. Integration with the existing enterprise resource management and learning management system (LMS), ease of integration, a cloud-based platform, user experience, and overall cost provided the determining factors for the chosen CMS solution. Due to time constraints of the implementation phase, the project utilized the hospital's existing HealthStream LMS to function as a CMS. Paper competency checklists were converted to a digital format. At the time of the implementation phase, the chosen CMS was still undergoing IS security review; therefore, could not be utilized. HealthStream does not integrate or automate between HR, the education department, and clinical units of information that a true CMS would offer. There remained manual uploads that needed to be completed; however, once

information was uploaded, the managers, NPD practitioners, and employees were able to interact with the data.

Education and Training

Competency Management System. The project lead and NI manager presented to the Nurse Operations Council, Nursing Shared Governance, and the Committee for Recognition of Nursing Achievement (CRONA), the hospital's nursing union, regarding the upcoming process improvement that would affect nursing. During that time, the CMS team trained the education team, department managers, HR, and IS on functionality including the back-end user experience. Next, the frontline superusers, identified by the education team, received training to assist with implementation. Finally, the nursing staff received education and training on the use of the CMS. The staff training consisted of the rationale of integrating a structured CMS within the hospital setting, the nursing scope of practice related to competencies and use of technology, application of a web-based and mobile device (i.e., tablet) platform, CMS functionality, online resources, and troubleshooting. Education and training for the digital CMS for NPD practitioners were included during their scheduled work week. The education team provided just-in-time training, web resources, and NPD practitioner support. Refer to Appendix A for the CMS training materials.

Ongoing Competency Assessment Education and Training. State regulations and hospital policies require ongoing nursing competency assessments. The education team identified the need to perform an ongoing competency assessment with regards to documentation. The hospital purchased software that would allow clinical staff to chart in the EHR using a mobile application called Epic Rover to assist with this needs assessment. The education team provided Rover education and training using a digital CMS. The CMS consisted

of the following functionalities: integrated LMS, upload capability, information repository (i.e., employee files, learning modules), mobile phone or tablet accessibility, employee evaluation, and competency validation. The education department allotted a total of 30 minutes per RN of online learning, and web resources. NPD practitioners and the Epic team rounded on the units weekly until “go-live” for education and training support. Refer to Appendix B for the Rover training materials.

Implementation and Evaluation

Unlike traditional classrooms, having a digital CMS allowed nurses to learn at their own pace. For example, nurses had the autonomy to choose when they wanted to receive information, whether it would be during their clinical shift or outside of work. Nurses who chose to complete their assigned cognitive module were compensated for the time it took to complete the module per their hourly clinical rate. They had the ability to choose to receive additional information through 1:1 training with a superuser, online case-scenarios, or group learning. There was also an option to access learning using a desktop computer or mobile device. The digital CMS also added value to nursing competencies because they could demonstrate their knowledge and skills by simply providing patient care at the bedside. For example, a nurse performs their routine assessment and documents in the EHR. The NPD practitioner could validate the nurse by logging on to the EHR and verify that the nurse has correctly documented their assessment.

NPD practitioners and super users trained and assessed registered nurses from October 11 to November 8, 2021. Competency validators were educators, managers, preceptors, or unit superusers. The education team assessed nursing knowledge with case studies and a post-test through online learning with the LMS embedded within the CMS. Validators verified skills acquisition through EHR documentation. This included return demonstration and successful

completion of an e-learning module. Managers would then keep track of completed competencies stored in the CMS. Having a digital CMS allowed the validator to provide immediate feedback and evaluation. It offered convenience to nurses and educators since competency assessments and validations were done without having to attend a class. Table 4 provides the complete project timeline from planning to evaluation.

Analysis Planning

The student performed a cost analysis of the overall training cost of clinical nurses pre and post digital CMS implementation. Retrospective data were collected prior to implementing the CMS using previous costs related to nurse training. A Wilcoxon signed rank test compared the medians to examine the pre and post survey results of NPD practitioners' satisfaction scores. IntellectusStatistics software stored and analyzed the data.

Risks

Hospital policies and state regulations require ongoing nursing competency assessments. Potential minimal risks to participants included violation of employee confidentiality. The CMS required individual username and password to access employee files.

Benefits

There were no direct benefits to participating in the project, but a digital CMS provided the participants an innovative, efficient, and convenient approach to learning compared to traditional training.

Costs

There was no additional monetary cost to participants, except for their time during their clinical shifts. Each nurse was compensated 30 minutes for completing education through an online platform.

Payment

The hospital paid each RN for completing ongoing hospital training requirements. Participant compensation was calculated based on hourly RN salary.

Confidentiality

The CMS stored all employee files electronically and may be accessed by individual employees or administrators using a username and password. Personal information was not required and was not used for data collection. NPD Practitioners answered the satisfaction surveys anonymously. Qualtrics software stored survey results and required a log-in to access.

Results

Cost Analysis

In previous years, LPCHS spent approximately \$596,040 training RNs in a traditional 4-hour in-person class setting. To calculate the cost of training post digital CMS implementation, the student multiplied 1,464 inpatient clinical RNs by the average RN hourly salary rate of \$90, multiplied by 30 minutes for completing a combination of online learning and just-in-time training. Training 1,464 clinical RNs equaled \$65,880. Historically, each department completed their own training with their own RN facilitators. Since the project was a hospital initiative, the project team utilized all facilitators as resources for the entire hospital regardless of which unit they worked. The project lead and nurse informatics manager worked closely with the IS department to provide adequate support for RN facilitators. RN facilitators received training in conjunction with product planning and testing, therefore, separate “train the trainer” was not needed. RN facilitators provided 30 days of hospital training Monday through Friday, with two RN facilitators rounding for four hours on day shift and night shift. This equals 480 hours of superuser training. The student multiplied 480 hours by the average RN hourly salary rate of

\$90. The education department spent \$43,200 for superuser training. No additional overhead costs such as classroom, equipment and supplies were needed since all training materials were embedded in the digital CMS. The total educational cost for training was \$109,080. The change to a digital competency assessment from a traditional 4-hour in-person training saved the hospital \$486,960. Table 5 shows the breakdown of training cost post implementation of a digital CMS.

NPD Practitioner Survey

NPD Practitioner Surveys were distributed to fifteen inpatient NPD practitioners. Fourteen NPD practitioners responded to the pre-survey (paper-based competency assessment), and eleven responded to the post-survey (digital competency assessment and digital competency management system). Due to time constraints, the student did not use a true CMS for the project. The student converted HealthStream, a learning management system, to serve as the hospital's CMS. Thus, for the post-survey, the student wanted to differentiate between the NPD practitioners' perception of the digital competency assessment process and the actual CMS used: HealthStream. The student used the Wilcoxon signed rank test to compare the medians (*Mdn*) of the pre and post surveys examining the NPD practitioners' impression regarding the use of paper-based competencies versus digital competency assessment. The student also compared the medians of the pre and post surveys examining the NPD practitioners' impression regarding the use of paper-based competencies versus the digital CMS. The student used a Likert Scale to rate questions on a scale ranging from 1 to 5 with 1 representing "strongly disagree" and 5 representing "strongly agree". The survey questions consisted of the following categories: ease of use, accessibility, efficiency, likelihood to recommend, and overall satisfaction.

When comparing the medians regarding ease of use between paper-based competencies and digital competency assessments, results did not show statistical significance (p -value = 0.102). NPD practitioners agreed that paper-based competencies and digital competency assessments were easy to use. However, comparing the medians of accessibility, efficiency, likelihood to recommend, and overall satisfaction to digital competency assessments, results did show statistical significance with p -values 0.026, 0.003, 0.005, and 0.003, respectively. Table 6 shows the median results of paper-based competencies versus digital competency assessments. NPD practitioners agreed that digital competency assessments were accessible, efficient, would likely recommend, and overall satisfied compared to paper-based competencies.

When comparing the medians regarding ease of use between paper-based competencies and a digital competency management system, results did not show statistical significance (p -value = 0.254). However, comparing the medians of accessibility, efficiency, likelihood to recommend, and overall satisfaction to a digital competency management system, results did show statistical significance with p -values 0.011, 0.004, 0.004, and 0.003, respectively. Table 7 shows the median results of paper-based competencies versus a digital competency management system. NPD practitioners agreed that the digital competency management system was accessible, efficient, would likely recommend, and overall satisfied compared to paper-based competencies.

Discussion

The use of a digital competency management system (CMS) positively affected organizational workflow and efficiencies. A digital CMS provided a centralized repository to store employee data, educational materials, and standardized evaluation tools. This resulted in easy access to information and objective assessments of the nursing staff. A centralized platform

reduced hospital costs by eliminating paper documentation, retraining caused by missing or subjective competencies, and overhead costs associated with training. It offered convenience to staff by allowing just-in-time training, immediate feedback, and accessible resources. It provided job satisfaction to NPD practitioners by decreasing workload and creating meaningful mechanisms to accurately assess knowledge and skills of the staff.

Limitations

The quality improvement project had a small sample size of less than 1,500 registered nurses and fifteen NPD practitioners. The project was conducted in a single institution and limited the results to inpatient registered nurses and NPD practitioners employed within the hospital. Therefore, the results could not be generalizable to nursing. Additionally, the student did not factor the years of experience as NPD practitioners, nor the NPD Practitioners' knowledge and skills with the use of technology and a digital CMS. Finally, the student did not use a true CMS for the project.

Nursing Implications

The findings of the QI project provided internal evidence to support the purchase of a more robust digital competency management system. Additionally, the emergence of the COVID-19 pandemic has catapulted the organization to rethink its strategy on how to identify employee skill-mix to improve patient care. As a result, the hospital approved to implement the use of the digital CMS for nursing competencies, as well as other clinical departments (i.e., Respiratory Department). Padula & Delarmente (2019) state that nursing competency may influence hospital acquired conditions. This project may provide the opportunity to look beyond training costs and investigate cost savings related to patient outcomes. Decreasing hospital acquired conditions results in decreased cost to the organization. From an education standpoint,

NPD practitioners should continue to conduct a learning needs assessment and choose competency validation methods appropriately. Just-in-time training works well when the learners have foundational knowledge of the educational content. However, traditional in-person classes may still serve as a meaningful learning modality to students who require the fundamentals. Finally, NPD practitioners can prove the value of the profession by showing tangible outcome measures and return on investment.

Conclusion

Conventional competency evaluations and manual tracking posed a problem within one pediatric hospital. The hospital did not have a transparent way to see the knowledge and skills of its nursing staff. This resulted in increased organizational costs due to retraining and increased workload and job dissatisfaction among educators. The quality improvement project demonstrated that a digital CMS reduced nurse training costs and improved nursing professional development practitioners' satisfaction. The project warrants further understanding how a digital CMS will impact nurse staffing by having the "right nurse at the right time" (Gavigan et al., 2020, p. 63).

References

- Allen, R. (2020). A strategic digital marketing model of technology acceptance for those looking To bring about digital transformation. *Smart Insights*.
<https://www.smartinsights.com/manage-digital-transformation/digital-transformation-strategy/digital-marketing-models-technology-acceptance-model/>
- American Nurses Association. (2015). *Nursing scope and standards of practice* (3rd ed.). American Nurses Association.
- Ammenwerth E. (2019). Technology Acceptance Models in Health Informatics: TAM and UTAUT. *Studies in health technology and informatics*, 263, 64–71.
<https://doi.org/10.3233/SHTI190111>
- Anzieu, P. (2017). ANNETTE D4.2 Software support for competency management. 661910. The EU Framework Programme for Research and Innovation.
<http://www.enen-assoc.org/en/training/annette.html>
- Arcand, L. & Neumann, J. (2005). Nursing competency assessment across the continuum of care. *The Journal of Continuing Education in Nursing*, 36(5), 247-254.
doi: 10.3928/0022-0124-20051101-04.
- Berber, N., Dordevic, B., Milanovic, S. (2018). Electronic human resource management (e-HRM): A new concept for digital age. *Strategic Management*, 23(2), 22-32.
DOI:10.5937/StraMan1802022B

- Bhavnani, S., Narula, J., & Sengupta, P. (2016). Mobile technology and the digitization of healthcare. *European Heart Journal*, 37, 1428-1438. doi:10.1093/eurheart/ehv770
- Bradley, K. & Godin, M. (2020). Think different: Reimagining clinical practice and professional development by collaborating with the Apple higher education team. *www.nurseleader.com*. <https://doi.org/10.1016/j.mnl.2019.11.013>
- Brettel, M., Friederichsen, N., Keller, M., & Rosenberg, M. (2014). How virtualization, decentralization, and network building change the manufacturing landscape: An industry 4.0 perspective. *International Journal of Information and Communication Engineering*, 8(1), 37-44. doi.org/10.5281/zenodo.1336426
- Chaghari, M. Safari, M., Ebadi, A., & Ameryoun, A. (2017). Empowering education: A new model for in-service training of nursing staff. *Journal of Advances in Medical Education & Professionalism*, 5(1), 26-32.
- Cham, K.M. & Cochrane, A.L. (2020). A digital resource to assess clinical competency. *The Clinical Teacher*, 17, 153-158. <https://doi.org/10.1111/tct.13030>
- Covell, C. & Sidani, S. (2013). Nursing intellectual capital theory: Testing selected propositions. *Journal of Advanced Nursing*, 69(11), 2432-2445. doi:10.1111/jan.12118
- Draganidis, Fotis & Chamopoulou, Paraskevi & Mentzas, Gregoris. (2006). An ontology based tool for competency management and learning paths. 6th International Conference on

Knowledge Management (I-KNOW 06).

Fiaz, M., Ikram, A. & Ilyas, A. (2018). Enterprise resource planning systems: Digitization of healthcare service quality. *Administrative Sciences*, 8(38), 1-12.

doi:10.3390/admsci8030038

Gavigan, M., Dus, J., & Kingston, M. (2020). Leveraging size while remaining nimble with a workforce management strategy. *American Nurse Journal*, 15(9), 63-65.

doi: 10.1111/inr.12632.

Gjellebaek, C., Svensson, A., Bjorkquist, C., Fladeby, N., & Grunden, K. (2020). Management challenges for future digitalization of healthcare services. *Futures*, 124.

<https://doi.org/10.1016/j.futures.2020.102636>

Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology*, 50(5),

2572-2593. <https://doi.org/10.1111/bjet.12864>

Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., & Taylor, R. (2005). Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health affairs (Project Hope)*, 24(5), 1103–1117.

<https://doi.org/10.1377/hlthaff.24.5.1103>

Hoelscher, S. H., & McBride, S. (2020). Digitizing infectious disease clinical guidelines for

improved clinician satisfaction. *CIN: Computers, Informatics, Nursing*, 38(6), 303-311.

doi: 10.1097/CIN.0000000000000612

Hosain, S. & Saddik, B. (2018). Evaluation of Personal Digital Assistant Acceptance in Nursing Education. *Iraqi National Journal of Nursing Specialties*, 1(31), 93-100.

Kelsey, N. & Claus, S. (2016). Embedded, in situ simulation improves ability to rescue. *Clinical Simulation in Nursing*, 12, 522-527. <http://dx.doi.org/10.1016/j.ecns.2016.07.009>

Mather, C. A., & Cummings, E. (2019). Developing and sustaining digital professionalism: a model for assessing readiness of healthcare environments and capability of nurses. *BMJ Health & Care Informatics*, 26(1). doi: 10.1136/bmjhci-2019-100062

McLeod, S. A. (2019). Likert scale. *Simply Psychology*.

<https://www.simplypsychology.org/likert-scale.html>

Noza Margallo, D., Billner-Garcia, R., & Bradley, K. (2021). The show must go on: Using technology for rapid onboarding and orientation during COVID-19 and beyond. *The Journal of Continuing Education in Nursing*, 52(3), 115-117.

<https://doi.org/10.3928/00220124-20210216-04>

Padula, W. V., & Delarmente, B. A. (2019). The national cost of hospital-acquired pressure injuries in the United States. *International Wound Journal*, 16(3), 634-640.

<https://doi.org/10.1111/iwj.13071>

- Pawełszek, I. (2017). Process-oriented approach to competency management using ontologies. In *2017 Federated Conference on Computer Science and Information Systems (FedCSIS)*, 1005-1013. IEEE. doi: 10.15439/2017F441
- Redman, R. W., Lenburg, C. B., & Walker, P. H. (1999). Competency assessment: Methods for development and implementation in nursing education. *Online Journal of Issues in Nursing*, 4(2), 1-7.
- Rezgui, K., Mhiri, H., & Ghédira, K. (2014). Extending Moodle functionalities with ontology-based competency management. *Procedia Computer Science*, 35, 570-579.
<https://doi.org/10.1016/j.procs.2014.08.138>
- Sormunen, M., Saaranen, T., Heikkilä, A., Sjögren, T., Koskinen, C., Mikkonen, K., Kaariainen, M., Koivula, M., & Salminen, L. (2020). Digital learning interventions in higher education: A scoping review. *CIN: Computers, Informatics, Nursing*, 38(12), 613-624.
doi: 10.1097/CIN.0000000000000645
- Svetlik, I., Stavrou-Costea, E., Vakola, M., Soderquist, K. E., & Prastacos, G. P. (2007). Competency management in support of organisational change. *International Journal of Manpower*. <https://doi.org/10.1108/01437720710755245>
- Thalmann, S., Fessler, A., & Pammer-Schindler, V. (2020). How large manufacturing firms understand the impact of digitization: A Learning Perspective.

<https://doi.org/10.24251/HICSS.2020.590>

Thames, L., & Schaefer, D. (2016). Software-defined cloud manufacturing for industry 4.0.

Procedia Cirp, 52, 12-17. <https://doi.org/10.1016/j.procir.2016.07.041>

Tick, A. (2019). An extended TAM Model, for evaluation eLearning acceptance, digital learning and smart tool usage. *Acta Polytechnica Hungarica*, 16(9), 213-233.

DOI: 10.12700/APH.16.9.2019.9.12

Vaitsis, C., Stathakarou, N., Barman, L., Zary, N., & McGrath, C. (2016). Using competency-based digital open learning activities to facilitate and promote health professions education (OLAmE): A Proposal. *JMIR research protocols*, 5(3), e143.
doi: 10.2196/resprot.4974

Westbrook, R. A. & Oliver, R.L. (1981). Developing better measures of consumer satisfaction: Some preliminary results. *North America Advances in Consumer Research*, 8, 94-99.

Wright, D. (2005). *The Ultimate Guide to Competency Assessment in Health Care (3rd ed.)*. Creative Health Care Management.

Wright, D. K. (2015). *Competency assessment field guide: A real world guide for implementation and application*. Springer Publishing Company.

Table 1*Training hours and cost prior to implementation of digital competencies*

	Training hours	Cost per RN/hr	Total cost
1,464 RNs	4 hours	\$90/hr	= \$527,040
50 RN facilitator training	4 hours	\$90/hr	= \$18,000
RN facilitator cost per week	8 hours	\$90/hr	= \$36,000
Overhead cost (monthly cost) <ul style="list-style-type: none"> • Equipment/Supplies: \$4,000-5,000 • Room: \$10,000 (2 rooms) 			= \$15,000
Total			\$ 596,040

Table 2

5-point Likert Scale: NPD practitioner satisfaction survey (paper-based competencies)

	1- Strongly Disagree	2- Disagree	3- Neither Agree nor Disagree	4 - Agree	5 - Strongly Agree
Paper-based competency assessment is easy to use.					
Paper-based competency assessment is accessible.					
Paper-based competency assessment is efficient.					
I recommend using a paper-based competency assessment.					
Overall, I am satisfied with paper-based competency assessment.					

Table 3

5-point Likert Scale: NPD practitioner satisfaction survey (competency assessment and digital CMS)

	1- Strongly Disagree	2- Disagree	3- Neither Agree nor Disagree	4 - Agree	5 - Strongly Agree
Digital competency assessment is easy to use.					
Digital competency assessment is accessible.					
Digital competency assessment is efficient.					
I recommend using a digital competency assessment.					
Overall, I am satisfied with digital competency assessment.					
Digital CMS is easy to use.					
Digital CMS is accessible.					
Digital CMS is efficient.					
I recommend using a digital CMS.					
Overall, I am satisfied with digital CMS.					

Table 4*Competency Management Project Timeline*

Date	Action items
2018	Housewide learning needs assessment
Nov 2019- Feb 2020	Demo with different CMSs
Jan 2020	TJC visit
Apr 2020	Meeting with IS for CMS comparison
May 2020	Competency meeting with HR
Jul 2020	NPDS meeting - CMS decision
Jul 2020	Professional Development Council, Nurse Operations, Council -Shared Governance, CRONA Union - CMS approval
Aug 2020	CMS training
Sept 2020	Nurse Operations, Council -Shared Governance, CRONA Union - final approval
Sept 2020	CMS roll-out
Apr 2021	Rover Project planning kickoff -monthly meeting
Jun 2021	Rover Meeting - develop EHR flowsheet rows
Jul 2021	Education - design and development
Aug 2021	Administer pre-survey
Sept 2021	Rover superuser education and training
Oct 2021	Rover education and training
Nov 2021	Rover go-live
Nov-Dec 2021	Competency assessment & verification/evaluation
Dec 2021	Administer post-survey

Table 5*Training hours and cost post implementation of digital competencies*

	Training hours	Cost per RN/hr	Total cost
1,464 RNs	0.5 hours	\$90/hr	= \$65,880
RN facilitator training	N/A	N/A	= \$0
RN facilitator cost per week	480 hours	\$90/hr	= \$43,200
Overhead cost			= \$0
Total			\$ 109,080

Table 6*Paper-based Competencies vs Digital Competency Assessment*

	Paper-based Competencies (Mdn)	Digital Competency Assessment	P-value
Ease of Use	4	4	0.102
Accessibility	2	4	0.026
Efficiency	2	4	0.003
Likelihood to recommend	1	4	0.005
Overall satisfaction	2	4	0.003

Table 7*Paper-based Competencies vs Digital CMS*

	Paper-based Competencies (Mdn)	Digital Competency Management System	P-value
Ease of Use	4	4	0.254
Accessibility	2	4	0.011
Efficiency	2	4	0.004
Likelihood to recommend	1	4	0.004
Overall satisfaction	2	4	0.003

Appendix A

Competency Validation Tip Sheet

Center for Professional Excellence and Inquiry

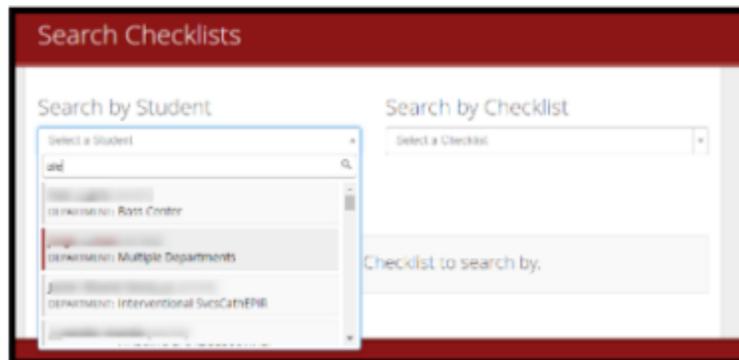


Electronic Competency Validation Tipsheet

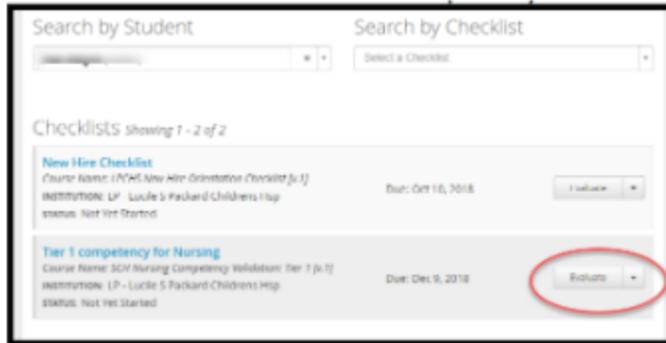
1. The preceptor/NPDS/manager will sign into his/her Health Stream (not the employee being validated)
2. Under "Options" to the right of the page, click "Evaluate Checklists".



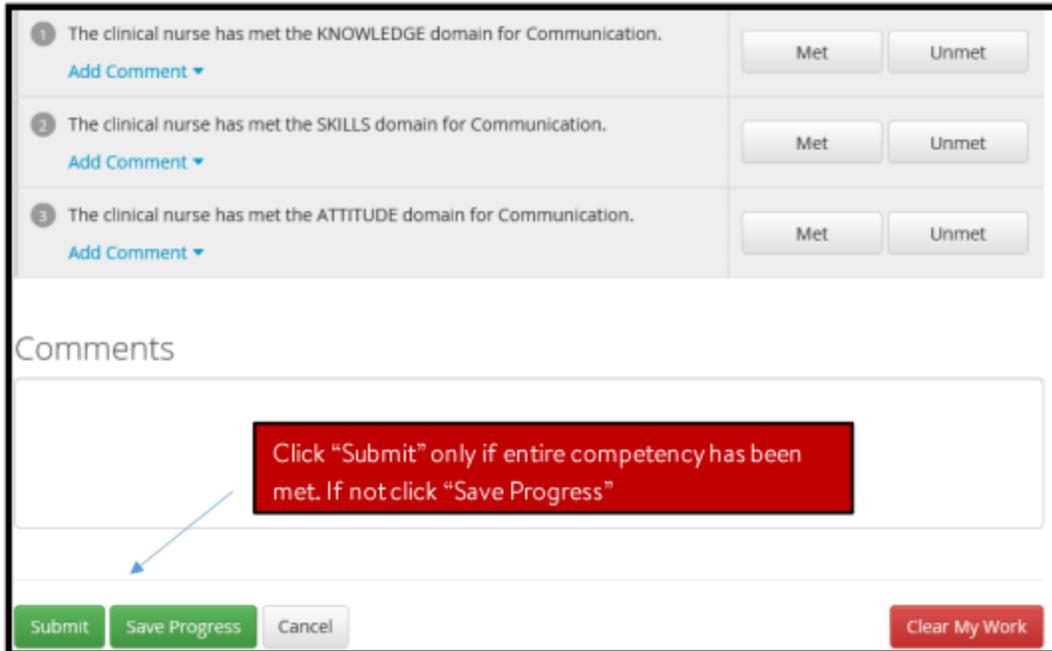
3. Search the employee's name under "Search by Student". Select the correct employee's name.



- 4. Checklists assigned to the employee will be listed. Click “evaluate” on the appropriate checklist.



- 5. Preceptors/NPDS/managers, specify method of verification under “Add comment”. (i.e. return demonstration). Click “Met”.



How to Validate Competency: [Video](#)

How to Print/Save Completed Competencies: [Video](#)

Appendix B

Rover Training Materials

Rover Mobile Application Tip Sheet – FACILITATOR/SUPERUSER USE ONLY		
<p>Target Audience: Inpatient Staff (RNs, RCPs, Nursing Assistants, Patient Care Technicians, Milieu Counselors, Patient Care Companions)</p> <div style="text-align: center;">  <p>Rover Intranet Site</p> </div>		
Facilitator GO-LIVE Preparation		
<ol style="list-style-type: none"> 1. Review the PowerPoint Presentation: Rover Mobile Application and Intranet Resources. 2. Complete E-Learning Module by 11/8. 	 <p>Superuser Sign-In Sheet</p>	 <p>Superuser Training Schedule</p>
Training Day (October 11-November 5)		
<ul style="list-style-type: none"> • Attend scheduled shift (If unable to attend scheduled shift, try to find a replacement and notify your unit NPDS/educator). • Sign-In using QR code (Remember to also clock-in and clock-out on Kronos-charge to cost center 87405) • Meet at the Command Center (Old Heart Center Room 1820) 5 minutes before shift to divide unit rounding assignment with other superusers. Check in with Command Center. • Direct USAs to send a reminder text to staff that Epic Rover is LIVE • Round on all departments and check-in with staff: <ul style="list-style-type: none"> ○ Remind staff to complete e-learning module by due date (11/8) ○ Show staff how to log-in to the Rover ○ Answer questions and assist staff with using Rover ○ Direct staff to additional resources on the Rover Intranet site. • For issues and questions, complete the Issues Tracker form by scanning the QR code. • Contact Command Center or refer to Decision Tree 		 <p>Issues Tracker</p>

Rover E-Learning Module: [Video](#)