2018

Using a best practice approach for EHR downtime guidance in onboarding of nurses

Jeffery M. Sano

Using a Best Practice Approach for EHR Downtime Guidance in Onboarding of Nurses

by

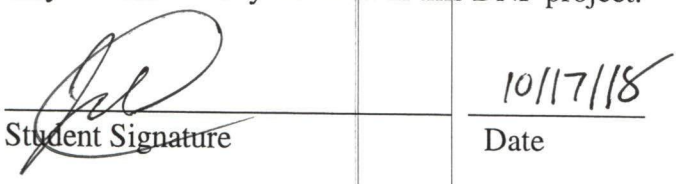
Jeffery M. Sano, MSN, RN

A DNP PROJECT

Submitted in partial fulfillment of the requirements for the
Degree of Doctor of Nursing Practice
to
The School of Graduate Studies
of
The University of Alabama in Huntsville

HUNTSVILLE, ALABAMA
2018

In presenting this DNP project in partial fulfillment of the requirements for a doctoral degree from The University of Alabama in Huntsville, I agree that the Library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by my advisor or, in his/her absence, by the Director of the Program or the Dean of the School of Graduate Studies. It is also understood that due recognition shall be given to me and to The University of Alabama in Huntsville in any scholarly use which may be made of any material in this DNP project.



Student Signature

10/17/18

Date

DNP PROJECT APPROVAL FORM

Submitted by Jeffery M. Sano in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice and accepted on behalf of the Faculty of the School of Graduate Studies by the DNP project committee.

We, the undersigned members of the Graduate Faculty of The University of Alabama in Huntsville, certify that we have advised and/or supervised the candidate on the work described in this DNP project. We further certify that we have reviewed the DNP project manuscript and approve it in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice.

10/17/18 Susan Alexander Committee Chair
(Date)

_____

1/25/18 _____ Clinical Preceptor

_____ DNP Program Coordinator

_____ College of Nursing, Associate Dean for Graduate Studies

_____ College of Nursing, Dean

_____ 11/8/18 Graduate Dean

ABSTRACT

The School of Graduate Studies
The University of Alabama in Huntsville

Degree: Doctor of Nursing Practice College: Nursing

Name of Candidate: Jeffery M. Sano

Title: Using a Best Practice Approach for EHR Downtime Guidance in Onboarding of Nurses

Abstract

Electronic Health Record (EHR) systems have been implemented throughout healthcare settings over the last few years, and clinicians rely on these systems to obtain information about patients, make clinical decisions, and deliver safe and appropriate care. Health information technology systems have downtime episodes both due to scheduled maintenance or unforeseen circumstances. The ability to deliver safe and effective care during downtimes is important, but training on downtime preparation is rarely included for healthcare staff. Training programs specifically designed on how to function during EHR downtimes, offered during nursing orientations, are needed to improve patient care and safety during potentially stressful situations.

Keywords: EHR downtime, downtime education, downtime training

TABLE OF CONTENTS

Page

SECTION I: DNP PROJECT

Using a Best Practice Approach for EHR Downtime Guidance in On-boarding of Nurses

Identification of the Problem

The Health Information Technology for Economic and Clinical Health Act (HITECH) was part of the American Recovery and Reinvestment Act of 2009 (American Recovery and Reinvestment Act, 2009). This act included the investment of $35 billion for building a Health Information Technology (HIT) infrastructure to improve the adoption of Electronic Health Records (EHR) throughout the United States (U.S.) (Mack et al., 2016). Through Meaningful Use (MU) financial incentives associated with the HITECH Act, EHR adoption in all facilities increased from 15% to 60% between 2009 and 2012, and increased from 16.1% to 38.1% specifically within hospitals during the same time period (Mack et al., 2016). Utilization of EHRs in the clinical setting has demonstrated improvements in patient safety and quality of care facilitated, in part, by increased access to information, utilization of barcode medication administration (BCMA), and increased efficiency (Kossman & Scheidenhelm, 2008). When the EHR system is not functional, it is termed *downtime* and may have a detrimental impact to all who rely on the EHR. All EHRs experience downtime episodes, both scheduled and impromptu due to factors such as system maintenance, necessary upgrades, power and internet outages, hardware failures, or other factors that influence EHR system function (Vaughn, 2011). Since the healthcare industry is a 24 hours per day, 7 days per week operation, downtime episodes can be important due to reduced efficiency and heightened risks in patient care. Downtime episodes will inevitably occur, making preparation of staff necessary to continue safe and efficient patient care during these times.

Downtime preparedness is an important issue at this 900 bed Level One trauma center located in the Eastern United States as it has recently been demonstrated that current mechanisms of preparation do not adequately prepare the nurses for unplanned downtimes. In March, 2016, the facility was targeted by a ransomware attack that left the organization without a functional EHR (as well as many other computerized systems) for approximately 48 hours. Despite having downtime processes and policies in place, many of the nurses were not familiar with these processes. In addition, the existing procedures were unable to manage this significant episode of downtime. After much scrambling to determine which processes to follow, including just-in-time education on paper-based documentation, the hospital facility and staff were able to function during the episode, but with notable reductions in efficiency. Post-event analysis revealed that inefficiencies were partially due to inadequate preparation of all staff (including nurses) on downtime processes and procedures, along with ineffective policies and procedures. Since the episode, significant changes in policies and procedures have occurred, but staff education and dissemination of the revised policies has not occurred. The purpose of this Doctor of Nursing Practice (DNP) project was to disseminate formalized, evidence-based education on downtime training for all newly-hired nurses within the medical-surgical (med-surg) and intensive care units (ICU) at the facility. The objectives of the proposed DNP project were: 1) Create a downtime training curriculum and module; 2) Offer a minimum of four downtime education classes to nurses newly hired; 3) Distribute a competency assessment and survey to nurses participating in the education class; and 4) Aggregate the

assessment and survey results to determine impact of the educational offering related to downtime process knowledge and preparedness.

PICOT Question

For newly hired nurses who were assigned to work within the med-surg and Intensive Care Unit (ICU) areas, (P) does formal education of EHR downtime processes, policies, and procedures during orientation (I) compared to the usual process (C) improve comprehension of downtime policies and procedures and improve performance of nursing care delivery during an EHR downtime event (O) over the next 4 months (T)?

Review of the Evidence

Searches using the CINAHL, OVID, and ProQuest Medline databases were conducted using search terms: EHR Downtime, EHR Downtime Education, and EHR Downtime Training with publication dates between 2004 and 2018 available in the English language. There were 183 results returned in OVID, 3 results in CINAHL, and 23 results in Medline. The Medline results were replicated within OVID, so these results were already included. The remaining results were examined for relevance to EHR downtime training and results were eliminated if they were not related to a hospital setting (i.e. ambulatory settings) or were specific to a service line (i.e. neonatal unit, GI lab, narrowing the literature to a total of seven articles.

Downtime Quantification

EHR downtime, or EHR unavailability, is defined as "instances in which clinicians or other end users cannot access all or part of the EHR" (HealthIT.gov, 2017, para. 1). Though EHR downtimes may not be frequent events, all organizations experience them

at times. In a survey of members of the Scottsdale institute, 95% (*n* =59) member organizations reported an episode of downtime in a 3-year period, with 70% reporting an episode of unplanned EHR downtime lasting >/=8 hours (Sittig, Gonzalez, & Singh, 2014). While many downtimes were uneventful, some have the risk of causing delays in care and patient harm. When dealing with extended downtime (such as the greater than 8 hour downtimes described above), the possibility of these negative events increases.

Reviews suggest that a common complaint by nurses related to use of EHR systems is downtime events, either planned or unplanned (Huryk, 2010). These reviews support a need limit scheduled and unplanned downtime episodes when possible, as well as improve staff preparation to continuing appropriate workflow during these episodes.

Downtime Policies

Getz (2009) examined hospitals that had experienced unplanned system downtimes as well as interviewed individuals in the Health Informatics and Education field regarding EHR downtime events. Mitigation strategies to avoid downtime events is stated to be the best planning for these type of events due to the disastrous consequences that EHR downtimes can have on patients and the facility. However, downtimes are unavoidable in certain situations, and the need for comprehensive downtime policies and procedures must be prioritized according to Ken Sterling, the President of the consulting firm *Sterling Solutions* (Getz, 2009). An Associate Professor in the Nursing Department at Pennsylvania's Slippery Rock University (also interviewed) stated that the nursing staff are trained on an EHR and not paper charting, so "if the downtime policy requires going back to the paper records and that method doesn't mirror how it was done on the EHR system, then they're going to be lost" (Getz, 2009, p. 16). The inclusion of staff training

on these policies, including access and implementation, is a key piece of downtime policy creation and should help to ensure smooth operation during downtime events according to those interviewed (Getz, 2009). Vaughn (2011) described an organization which has downtime plans created for every project implementation, but states that as time progressed, the information related to such downtime procedures inevitably became decentralized and therefore was very hard to access and locate when required. Initial and continued downtime education would keep employees up to date on how to access these policies when they are needed and validate the need for more comprehensive downtime training. Sumter Regional Medical Center in Americus, Georgia was struck by a tornado which rendered their computers and servers non-operational. They were able to continue working and caring for patients quite effectively and attributed this ability to staff being aware and familiar with their downtime procedures as well as the procedures themselves being extremely robust and engrained that it was considered *second nature* to the staff (Amidst Chaos, 2007). So not only are downtime policies important, but ensuring that staff are familiar, trained, and ready to implement these policies can contribute to safety of patients, quality of care, and improved facility operations during downtime events.

Safety Issues During Downtimes

Hanuscak, Szeinbach, Seoane-Vazquez, Reichert, and McCluskey (2009) conducted a study examining EHR downtime causes and the systems effected, specifically related to medication errors. The study was conducted by creating and distributing a three part survey (demographics, types of clinical information systems within the facility, and potential effects of these systems specifically based on medication safety) to participants at 78 hospitals in Ohio. This study conclude that more serious medication errors

occurred during system downtimes (39 total medication errors over a 12-month period during downtime, 14 reaching the patient, and one leading to an increased length of stay), but that these errors occurred even in the presence of backup systems and standardized protocols specific to downtime events (manual backup processes or backup servers) (Hanuscak et al., 2009). There are many factors that lead to these types of errors in downtime situations, and the ultimate conclusion of the study suggests that reduction in both length and frequency of downtime events should be prioritized, but lack of training and delayed medication ordering during a downtime were cited as contributing causes of these adverse medication errors (Hanuscak et al., 2009). Palojoki, Pajunen, Saranto, and Lehtonen (2016) conducted a survey in Finland to quantify high safety risk items associated with EHR use. Of the 2,864 eligible responses that were received, 48.99% of the respondents reported that extended EHR unavailability was the highest perceived risk related to EHR systems (Palojoki, Pajunen, Saranto, & Lehtonen, 2016). Therefore, downtime events have shown both an actual and perceived risk to patient safety and quality of care.

Delays in information transfer due to downtime also pose a significant safety risk. Wang, et al. (2016) specifically examined the effect of downtime on the pathology process, noting that downtime events including lack of an electronic order entry system and the standard electronic result reporting system, have the potential to significantly disrupt clinical processes. An example cited by Wang et al. (2016) was a delay in cancer diagnosis for six patients due to pathology results being delayed during a downtime event. Another example included delayed post-surgical treatment leading to musculoskeletal disability, and even a patient death resulting from delayed imaging

results needed for diagnosis during a downtime event (Wang et al., 2016). Downtimes events can cause situations that are detrimental to patient safety, making downtime avoidance and training crucial to effective and safe patient care.

Downtime Education Methods

Carr (2004) discussed requirements for downtime education when EHR adoption was still in its infancy, even prior to the enactment of the HITECH act. This training included easily accessible directions during both scheduled and unscheduled downtimes, but was tailored more from a general guideline perspective as opposed to a specific solution recommendation. Though Carr (2004) offered no specifics on education methods, downtime education was discussed early in the EHR adoption. However, more recent literature indicates that formal downtime training processes have not been widely used despite this early recommendation from early EHR adopters.

Sandra Dalton, the Senior Vice President (SVP) of patient care services and Chief Nursing Officer (CNO) at Fletcher Allen Health Care's expert opinion is that planning for downtime situations is one way to help prevent a downtime from becoming disastrous. Dalton indicates that utilizing the Boy Scout motto *Be Prepared* is how downtime situations should be approached (Getz, 2009). Ensuring that a plan is in place for these situations, as well as training the staff on this plan is how an organization can prepare for these difficult situations. Kelly McLendon, President of Health Information Xperts, concluded that educating staff on downtime processes will help to make the situation run more smoothly during this chaotic timeframe (Getz, 2009). Vaughn (2011) suggests that training for EHR downtime should be similar to training done for any change or implementation. Bloomington Hospital in Bloomington, IN, a 355-bed

facility, implemented computer-based training modules, refresher classes, posters on nursing units, flyers, and even questions related to downtime being embedded within their annual competency reviews as part of their EHR downtime training plan. The use of *mock downtimes* was conducted to both help the staff to understand their downtime knowledge, and to validate that their downtime policies and procedures were adequate and appropriate. Nelson (2007) suggests that *downtime drills* similar to fire drills should be conducted so that staff have the ability to practice the downtime plan and procedures. "Plans that are not used tend to be neglected and are quickly outdated" (Nelson, 2007, p. 49) and that using planned downtimes as a way to prepare for unplanned downtimes is not a proper method of preparation (Nelson, 2007). Vaughn (2011) identified that during downtime events, staff often did not know how to transition from the EHR system to the offline workflow, and were even unable to locate paper backup forms. Thus these steps of the process need to be included in downtime training and show that training is currently either inefficient or non-existent on downtime processes and procedures. Inadequate downtime preparedness not only has the potential to lead to ineffective care delivery during a downtime, but also care that has potential to lead to patient harm.

Just-in-time education is used to educate for downtime situations at some facilities, including currently at the facility which was the site of the DNP Project. However, the use of just-in-time education has been show only to help prepare staff for a planned downtime by acting as a refresher mechanism just prior to a scheduled downtime event (Anderson & Stafford, 2002), but is not effective as a standalone method. It is even more ineffective during an unscheduled downtime event as there may not have been a planned downtime event to practice beforehand. Mielcarek, Badger, and Gall (2016) examined a

scheduled EHR downtime episode in a healthcare system that utilized just-in-time education for the downtime process. It was concluded that that this process did not adequately prepare clinicians for the downtime, though the episode was scheduled and expected. Reasons included; the lack of clarity related to the process, lack of knowledge as to how to locate the necessary resources, communication issues surrounding the announcement of the outage, and data integrity with the recovery process (Mielcarek, Badger, & Gall, 2016). Therefore, just-in-time education can be helpful in some cases for scheduled downtime events, it has not shown to be an effective standalone downtime preparedness method.

As seen in the above reviewed evidence, formal EHR downtime training has potential to ensure nurses know how to access and implement the downtime plan, lead to smoother operation during a downtime, increase patient safety during downtime events, and decrease frustration with the EHR system. This DNP project implemented a formal EHR downtime training process for nurses new to the hospital in the selected areas during the on-boarding process based upon this evidence. The downtime training included training on the policies and procedures in place at the DNP project facility related to downtime (Getz, 2009), how to locate and use downtime forms, policies, and procedures, (Vaughn, 2011), and how to handle the recovery process after downtime events conclude (Mielcarek, Badger, & Gall, 2016).

Implementation

Conceptual/Theoretical Framework

Locsin's Technological Competency as Caring in Nursing theory was used as the guide to this DNP project. Locsin's theory considers society's transition to a

technologically complex world, even in the healthcare industry, and that this technology must be used in a way to increase the *knowing* of patients in order to better take care of them (Smith & Parker, 2015). In this technology rich world, "technology is used to know persons more fully as whole and complete in the moment" (Locsin, 2016, p. 7). EHRs are a robust technological tool used within many healthcare settings, containing a significant amount of information about the patient's history, care, current medications, allergies, and other factors. While Locsin's theory can be applied to a discussion of functional EHR systems, it also can be extended to the preparation for downtime episodes. In this particular project, the implementation of a training program to assist nurses to continue to deliver appropriate and safe care after the loss of access to the EHR is what is being implemented, but just because the EHR system is down does not mean that technology is no longer utilized. The EHR stores tremendous amounts of data, and systems are in place to enable access to portions of this data (ex. Downtime medication administration records (MARs)) in these times of system inaccessibility. As documentation in the medical industry has transitioned from paper documents to electronic, most health record documentation is not accessible in the traditional way (from the EHR) during a downtime event, so the information is not easily retrievable during this time, unless one has been trained in how to access it. This requires technological competency in understanding what information is accessible, how to access this information, and how to continue to document without a functional EHR system.

Locsin's theory is easily understood when a functional EHR is in place, but understanding downtime systems that are in place for such events and how to appropriately use them is still a form of technological competence. The ability to

understand downtime systems, processes, and procedures implemented will enable nurses to continue to *know* patients as fully as possible to enhance the delivery of safe and effective care during these downtime events.

Methodology

Participants

This DNP project implemented a formalized in-person EHR training class on downtime education for newly-hired med-surg and ICU nurses in the facility. The training classes were conducted during eight on-boarding training events, containing a total of 50 nurses. The initial formal EHR downtime education offering was limited to this group of med-surg and ICU nurses due to different EHR applications being used in other areas (i.e. emergency department, labor and delivery, peri-operative services, etc.).

Inclusion criteria were: all nurses newly hired to the facility working in the med-surg and ICU environments during the project timeframe. Exclusion criteria were: nurses who are not employed in clinical positions and therefore would not require EHR training or benefit from this training. Nurses hired into areas other than med-surg and the ICU were also excluded.

Setting

The setting of the DNP Project was a 912 bed acute care Level 1 trauma center. Each training session was held in a computer classroom setting with access to the internal facility network. The computers were necessary to show the nurses how to access the downtime policies and procedures and their downtime forms, as well as make it an interactive experience.

Timeline

The timeline of the DNP Project was one year from January to December of 2018, with the actual implementation of the final product between May and July 2018. The course creation itself was approximately one month to write the curriculum outline and to obtain internal validation by the nursing informatics department, the nursing education department, and the emergency preparedness department. The multiple validations helped to ensure that all of the appropriate elements were included in the training course. Both a course survey and competency assessment were created for the course. The one-hour courses were administered over a three month period, with eight in person education session offerings that reached 50 newly hired nurses. The class PowerPoint slides were electronically distributed to each of the participants three weeks after course completion for review, as well as links to repeat the course competency assessment and evaluation form a second time. It took approximately one month to examine the results of the competency assessment and evaluation forms to determine if the objectives of the course had been met.

The Practice Change

Educational Materials

A training curriculum for an EHR downtime course was be developed for this project. This curriculum is aligned directly with the hospital downtime policy and procedure and was used in an interactive training environment. The curriculum was based on the following training objectives:

- Understand what a downtime is.
- Understand why downtime training is important
- Know how to locate downtime policies, procedures, and forms

- Understand the downtime policy
- Know how to utilize downtime MARs
- Know how to perform basic downtime documentation
- Know the downtime recovery process

A 29-slide PowerPoint module was created based on the above objectives including embedded downtime documentation forms, the downtime policy, and interactive sections where the students participated in actually finding needed forms and policies. The course was added to the end of the current EHR training course and took approximately one hour to cover the material.

Instrumentation

A competency assessment and a survey were created and distributed during this project. This competency assessment included seven multiple choice questions based from the information contained within the PowerPoint presentation that was taught during the course. It was created and distributed via SurveyMonkey.com. It was designed so that it, as well as the course evaluation, were able to be completed in less than 15 minutes at the end of the EHR downtime training class. The competency assessment was distributed to all nurses who participated in the downtime training class (n = 50 participants with 50 responses) both at the end of the training session, and again electronically three weeks after class completion (n = 50 participants with 8 total responses). The students received an electronic copy of the PowerPoint slides at this time as well that could be used as a self-directed refresher course.

An investigator-designed survey was created to evaluate the perceptions of the nursing staff on downtime impact and preparedness for an EHR downtime event. The

evaluation survey was also created and distributed using SurveyMonkey.com. This survey was distributed electronically to all nurses who participated in the downtime training class at the end of training (n = 50 participants with 50 total responses), as well as again to these same nurses three weeks post-class completion (n = 50 participants with 8 total responses) (the same distribution schedule as the competency assessment). The results of this survey were used to quantify the perception of the nurses on how downtime events impact workflow, patient safety, and quality of care as well as the perception of preparedness for the nurses to function during downtime. The survey was investigator designed and new, therefore validity and reliability have not yet been established. It was, however, evaluated for face validity by content reviewers from the Clinical Informatics team and the Director of Evidence Based Practice and research at the healthcare facility. The survey questions were designed specifically to examine nurse's perceptions on downtime events, both related to impact on patient safety and workflow, and based on prior tools designed for distribution and evaluation post- downtime events (Nelson, 2007). The survey was designed to be quickly completed in approximately five minutes and includes demographic questions, Likert scale responses, and written responses for comments (Appendix A). The questions were created based on content validity in that all questions are related to downtime perceptions and preparedness.

Evaluation

A total of 50 nurses completed one of the eight offered downtime training classes that were offered May, 2018 through July, 2018. Classes were held at the conclusion of the EHR training course for the newly hired nurses, and ranged in length from 1 hour to 1 hour and 15 minutes. Class sizes ranged from three to ten participants. Approval for the

DNP Project was granted by the Institutional Review Board (IRB) at The University of Alabama in Huntsville (Appendix C) and exempted from IRB at the project facility as deemed by the Research Department as *Not Human Research* (Appendix D). Each participant signed a consent form prior to the start of the class. Descriptive statistics on survey results and competency assessments were completed using IBM SPSS Statistics for Windows, Version 24.0, Armonk, NY.

Evaluation Survey

A total of 58 responses to the evaluation questionnaire were collected from participants (50 from the initial class participants directly at the conclusion of class, and 8 repeat responses from individuals three weeks post class completion). The evaluation was offered to be completed directly at the end of the class, and the evaluation link was emailed out to class participants three weeks after completing the course for a reevaluation. Of the total number of 58 respondents, 50 (86.2%) indicated the evaluation was being completed for the first time (directly at the end of the class), while 8 respondents (16%) indicated it was not the first time completing the evaluation. With such a small number of repeat respondents (n = 8), these responses were removed from the dataset to focus only on the first time respondents.

Demographics. Respondents were largely female (*n*=43, 86%). Age was recorded in 10 year increments; 9 respondents (18%) were ages 18-24 years, 30 (60%) were ages 25-34 years, 8 (16%) were ages 35-44 years, and 3 (6%) were ages 45-54 years, with no respondents ages 54 years and older. Education status ranged from 10 respondents (20%) having an Associate Degree in Nursing (ADN), 37 (74%) with a Bachelor of Science in Nursing (BSN), and 1 (2%) with a Master of Science in Nursing (MSN). The nursing

experience ranged from 19 respondents (38%) being new to practice nurses without any previous nursing experience, 4 respondents (8%) having some, but less than one year of prior nursing experience, 2 respondents (4%) with 1 to 2 years previous nursing experience, 16 respondents (32%) with 3 to 5 years of previous nursing experience, 6 respondents (12%) with 5 to 10 years previous nursing experience, and 3 respondents (6%) with 10 or more years of nursing experience. The employment status ranged from 37 respondents (74%) being hired into the facility as full time nurses, 1 (2%) into a part time position, and 12 (24%) into a traveler/agency position (Table 1).

Downtime experience. There were 11 respondents who reported having previously worked during a downtime episode. Conditional logic applied to the evaluation survey allowed these respondents to answer more detailed questions related to their downtime experience. Of these respondents, five (45.5%) worked during only a single episode of downtime, while two respondents (18.2%) stated working during two downtimes, and four of these respondents (36.4%) stated working during five or more downtime episodes. The length of the downtime events experienced by the respondents ranged from less than 30 minutes to greater than 4 hours. The respondents were able to select more than one response to this question since many of the respondents experienced more than one downtime. A total of 17 responses were recorded for this question, with two responses (11.8%) indicating less than 30 minute downtime events, one response (5.9%) indicating 30 minute to 1 hour downtime events, three responses (17.6%) indicating 1 to 2 hour downtime events, four responses (23.5%) indicating 2 to 4 hour downtime events, and seven responses (41.2%) indicating greater than 4 hour downtime events.

The respondents who indicated working during a downtime episode were asked to evaluate their perceived impact of the downtime event as it related to general nursing workflow, patient safety, quality of care delivered, time spent with patients, and accurate documentation (Table 2). The perceived impact was rated on a five point Likert Scale with 1 indicating "No impact" up through 5 indicating "Significant Impact." The mean response on impact to general nursing workflow was 4 (M = 4, S.D. = 1.183). Most notable was the absence of responses indicating *no impact* for the survey item regarding impact of downtime upon general nursing workflow. The perceived impact on patient safety during the downtime events had scores ranging from 3 to 5 on the impact scale, with no users reporting 1 or 2. The mean response for perceived impact on safety was a 3.73 (M = 3.73, S.D. = 0.786). Perceived impact on quality of care received a mean impact score of 3.09 (M = 3.09, S.D. = 1.446). Impact on time spent with patients during the downtime event received a mean impact score of 3.91 (M = 3.91, S.D. = 1.044). Finally, perceived impact on accurate documentation during the downtime received a mean impact score of 4.09 (M = 4.09, S.D. = 1.044).

Perceptions of downtime preparedness. The final section of the downtime class evaluation asked all respondents to rate their perceived level of preparedness to appropriately function during a downtime event. This portion inquired about perceived preparedness as it relates to five categories that made up the downtime training curriculum:

1. Ability to access the downtime policy
2. Ability to access the downtime documentation forms
3. Ability to implement the downtime policy during a downtime event

4. Ability to accurately document during a downtime event
5. Ability to perform downtime recovery at the conclusion of a downtime event

The perceived level of preparedness was rated on a five point Likert Scale wherein 1 indicated *Completely Unprepared* and 5 indicated *Completely Prepared* (Table 3). Respondents perceived that they were prepared to access downtime policies (n = 50, M = 4.28, S.D. = 0.73). The respondents also perceived that they were prepared to access the downtime documentation forms (n = 50, M = 4.22, S.D. = 0.764). The respondents indicated relative preparedness to implement the downtime policy (n = 50, M = 3.9, S.D. = 0.814). They also indicated relative preparedness to accurately document during a downtime event (n = 49, M = 3.84, S.D. 0.825) (note that one respondent did not answer this question). Finally, they also indicated a relatively high perceived ability ability to perform downtime recovery the conclusion of a downtime event (n = 50, M = 3.94, S.D. = 0.818).

Free-text responses. The downtime training class evaluation offered multiple chances for respondents to include free-text comments. 11 of the 50 total respondents made a free text comment (excluding the 4 respondents who commented only included the word *none* or *no*) (Table 4). The comments were mixed as to being positive or negative in relation to the downtime training class. One nurse commented that "Although I am aware of the possibility of an occurance [sic] of downtime, I was not aware of what to do when one occurs. This class provided information on what to expect and actions to take during a downtime that will be useful." Another user commented that a downtime event "Appears to be a lot of work."

Competency Assessment

A seven-question competency assessment was also administered to all class participants at the end of the downtime training class, as well as a link to the assessment emailed three weeks after class completion. A total of 60 competency assessments were completed, 50 of the assessment responses (83.3%) indicating it was the first time completing the assessment (indicating these assessments were completed directly at the end of the class), leaving 10 respondents (16.6%) indicating it was not the first time taking the assessment and therefore respondents repeating the competency assessment three weeks post course completion. As with the evaluation, since there was such a small number of assessment respondents indicating it was not the first time taking the assessment (n = 10), these responses were removed from the dataset.

The seven competency assessment questions were multiple choice questions based on specific information that was taught during the downtime training course. These questions included very specific downtime procedure based questions for the facility ranging from where to find the downtime policy to what specific steps should be taken based off of a certain length of downtime (Appendix B). The respondents generally scored high on the competency assessment (*n* = 50, M = 87.7%, min = 28.57%, max = 100%, S.D. = 15.27%). There were 24 respondents (48%) who received a score of 100%, 14 respondents (28%) missed a single question, 9 respondents (18%) got two questions incorrect, 2 respondents (10%) got three questions incorrect, and 1 respondent (2%) got five questions incorrect. The most incorrectly answered question was *What does the term 'System Recovery' mean from a nursing perspective* and only received a correct response 74% of the time, closely followed by *What is the major difference between the two versions of downtime MAR (Medication Administration Records) that may be used during*

a downtime event? which only received correct responses 76% of the time. All of the other questions received correct responses at a rate of 84% or more.

Overall, with an average score on the competency assessment at an 87.71%, it would appear that the training offering does in fact appropriately teach the aspects of downtime education that are being assessed. The competency assessment was specifically created after the creation of the training course curriculum to assess specific components of downtime that are being educated about during the training class and are very specific to the DNP Project facility's EHR and downtime environment, so these specific questions would be difficult for a different entity to adopt if they were introducing an EHR downtime training course of their own.

Application to Practice

DNP Implementation Evaluation

This DNP project set out to achieve four objectives: 1) Create a downtime training curriculum and module; 2) Offer at least four downtime education classes to nurses newly hired to the facility; 3) Distribute a competency assessment and survey to nurses participating in the education class; and 4) Aggregate the assessment and survey results to determine impact of the educational offering related to downtime process knowledge and preparedness. All of these objectives have been successfully met. A downtime training curriculum and PowerPoint module were created, eight downtime training classes were held for 50 newly hired nurses, each nurse completed a competency assessment and evaluation survey, and the data from the evaluation and survey were aggregated and evaluated.

It is difficult to definitively determine that utilizing the pilot downtime training course in the future will yield better results during a downtime event than no training class at all for two major reasons. First, a downtime event has not been experienced at the facility since the training program was implemented, so the major metric this can be based on at this time is the perception of the nurses self evaluated preparedness to deliver safe, effective, and efficient care during a downtime event. While the results of the course survey show a very positive level of preparedness self-evaluation score (ranging from 3.84-4.28 in each of the five categories; 1 representing C*ompletely Unprepared* and 5 representing C*ompletely Prepared*), this is only the perception the nurse has as opposed to actual reality of a downtime event. The second reason is that the survey was only administered to individuals who did participate in the course offering, so there is no comparison of these perceptions to those who have not had formal downtime training. However, prior to the downtime course implementation, no formal training on EHR downtime existed, and past downtime events at the facility have been shown to not function smoothly partially attributed to the fact that nurses were not trained for downtime events. So while the current pilot training course is unable to definitively show that it will help solve the downtime preparedness problem, continued examination and evaluation of downtime events as they occur may be able to shed more light on the worth of the downtime training offering.

Project Implementation Discussion

Information overload. The principal investigator was the instructor of all of the downtime education classes. This class was situated at the end of a six hour initial EHR training course for newly hired nurses at the facility. There was one comment that

appeared a few times on the evaluation forms, but was something that a few people in every single class offering stated directly to the PI. This comment was that this class had a vast amount of information contained within it, and it was too much information to be absorbed by these newly hired nurses after a long day of EHR training. Essentially there was information overload, and the nurses were not yet familiar enough with the EHR at the facility to completely comprehend all of the information contained within the downtime training course. This information needs to be evaluated more fully by the facility leadership team to determine where and to whom this course should be offered, if it in fact will continue to be offered.

Perceived impact of actual downtime. In examining the perceived impact responses the evaluation survey from individuals who have worked during a downtime event, it is important to note that only one response had respondents stating *No impact* and this was in the area of Perceived Impact on Quality of Care. This only accounts for 2 responses out of 55 total impact responses, or 3.6%. This means that 96.4% of the responses indicate there is some form of perceived impact that a downtime has on an individual working during the downtime event. It is also interesting to note that over 50% of the responses in each category noted a level of impact as a 4 to 5 on the impact scale, with the exception of Perceived Impact on Quality of Care, which only had 45.5% of respondents indicating a 4 or 5 on the impact scale. Of the total respondents who indicated they had in fact worked during a downtime event, it seems clear that there is at least some form of perceived impact that downtime events have on general nursing workflow, patient safety, quality of care, time spent with patients, and accurate documentation.

Perceived level of preparedness. Looking specifically at the perceived level of preparedness responses on the evaluation survey from all individuals who participated in the downtime training class, not a single response indicated that respondents had a perception that they were *Completely Unprepared* in any of the categories. Since information regarding downtime events is not conducted in any other part of the orientation process at this facility, this can show that the implemented downtime training course does have some effect on the perceptions of preparedness to function during a downtime. It is also to note that 74% or more of the responses in each, with the exception of ability to perform accurate documentation, area had a perceived level of ability rated at a 4 or 5. Only 64% of the respondents indicate their perceived ability to accurately document during a downtime event is a 4 or 5 on the scale, showing that there is the least positive perception surrounding the actual downtime documentation component. Overall, respondents suggest relatively positive perceptions of preparedness for a downtime event. However, it is unable to be determined if this is in direct relation to the downtime course offering since no pre course metrics were available for comparison.

Incorrect responses on the competency assessment. The two most incorrectly answered question on the competency assessment were *What does the term 'System Recovery' mean from a nursing perspective* and *What is the major difference between the two versions of downtime MAR (Medication Administration Records) that may be used during a downtime event* which only received correct responses rates 74% and 76% respectively. The reasons for the two most incorrect responded to questions needs to be examined further, but could be the fact that less time in class was spent on these

particular topics, or could be the fact that these topics were covered near the end of the training class. As previously mentioned, free-text responses indicate that nurses feel that this course, administered the way it was for this project, led to information overload, and this could potentially be the reason for the higher incorrect response rates of these two questions. Unfortunately, the results of the competency assessment do not give a clear answer as to exactly why these two questions were answered incorrectly a higher percentage of the time, so more training and assessment evaluation must be conducted to determine what, if any, steps need to be taken to address this.

Evaluation survey and competency assessment. The evaluation survey used for this project was investigator designed and new, therefore validity and reliability have not yet been established. Though steps were taken to ensure both face and content validity were met, further testing of this survey will have to be performed for it to meet the standards of validity and reliability if it is to continue to be used in its current form for future downtime training courses.

Significance

EHR downtime has many negative effects on both patients as well as the facility experiencing the downtime. Getz (2009) shows that downtimes may have a disastrous effect both on quality of care, as well as general operations within an organization. Hanuscak et al. (2009) discussed a marked increase in medication errors during a downtime, stating lack of downtime education as a contributing factor. Therefore, a major significance of this project is the potential to increase patient safety, quality of care, and general facility operations during downtime events.

Another potential benefit of EHR downtime training is more positive feelings by nurses in regards to the EHR. As Huryk (2010) pointed out, one of the major complaints from nurses related to EHR systems is in relation to EHR downtimes. If nurses receive formal training on EHR downtime policies and procedures, they will potentially be able to function more effectively during a downtime, and therefore have less negative feelings about the EHR related to downtime. This can lead to higher overall morale of staff if they feel prepared to deal with the downtime scenario.

Barriers

One barrier that was observed throughout the project implementation period concerned timing of training sessions. When nurses are new to the DNP Project facility, they participate in multiple training classes for multiple different programs and products. Going into this project, a potential barrier was identified that the addition of a new training class dedicated toward EHR downtime may lead to training overload and also may not lead to retained knowledge since this is not a common scenario for staff. Chawla (2013) found that incorporating situation specific training one time to groups of people while they continued to receive other training and education in other areas showed a significant decrease in retention and use of these skills if was not practiced regularly. Therefore, this single class offering to nurses was known to potentially be a barrier to the EHR downtime training initiative. Examining the free-text responses of the survey evaluation, this potential barrier appears to have become an actual barrier to success of this initiative moving forward. Multiple nurses commented that this course had too much information to absorb after a long day of training and needed to be moved to a different portion of the on-boarding process. The nurses targeted in this pilot course offering were

brand new nurses to the facility, had very little experience with the current EHR, and were expected to not only participate in a six hour EHR training, but this training which followed the EHR training. This is currently being examined by the principal investigator to determine if this class should be moved to a different day later in the orientation process, or potentially even moved outside of orientation to a later date.

Costs

The financial costs associated with adding a training course for the large group of newly-hired nurses was another barrier. Each month, up to 50 nurses may be hired for the facility. Adding 1-2 hours of training for each of these nurses could have significant financial impact. The project was able to avoid incurring these additional costs by adding the downtime training sessions to current EHR training courses, and preventing increases in existing budgets for orientation. Should the downtime training course be rescheduled for another orientation session, in an effort to prevent perceptions of information overload by participants, increased costs for orientation could readily occur.

Sustainability

The sustainability of the proposed DNP project after the project timeframe will require both physical resources as well as a permanent addition to the nurse on-boarding process at the facility. Approval would also need to be obtained from executive nursing leadership as well as the Nursing Education department (since that department is in charge of the on-boarding process) to formally make the addition. The resources required would include *Train the Trainer* sessions for future trainers of the formal downtime sessions to receive training on how to appropriately administer the class, as well as a

resource to own the updating of the training outline as changes are made to the policies and procedures surrounding downtimes.

Section II – DNP Project Product

I. Professional Journal Selection

A. Scope of Journal

The *Journal of Informatics Nursing (JIN)* is the official journal of the American Nursing Informatics Association (ANIA). The scope of the journal is to publish research and other topics in regards to day-to-day practice specifically surrounding Informatics. It is a peer reviewed journal that contains articles on EHR systems, point of care technology, design decision support, and also include continuing education (CE) opportunities within each issue (Journal of informatics nursing, n.d.)

B. Aims of Journal

JIN is a quarterly digitally published journal meant for members of the American Nursing Informatics Association (ANIA). The journal is open to both novice and veteran authors to publish research and other informatics related articles and offers continuing nursing education (CNE) credits. The aim of *JIN* is to include articles that advance nursing informatics in many facets, including research, professional development, and practice (Guidelines for article submission, n.d.)

Table 1

Course Evaluation - Demographic Information

Gender		
	Respondents	**Percentage**
Male	43	86.0%
Female	7	14.0%

Age		
	Respondents	**Percentage**
18 to 24 years	9	18.0%
25 to 34 years	30	60.0%
35 to 44 years	8	16.0%
45 to 54 years	3	6.0%

Education Status		
	Respondents	**Percentage**
ADN	10	20.0%
BSN	37	74.0%
MSN	1	2%

Nursing Experience		
	Respondents	**Percentage**
New to Practice	19	38.0%
Some but less than 1 year	4	8.0%
1 to 2 years	2	4.0%
3 to 5 years	16	32.0%
5 to 10 years	6	12.0%
10 or more years	3	6.0%

Employment Status		
	Respondents	**Percentage**
Full Time	37	74.0%
Part Time	1	2%
Traveler/Agency	12	24.0%

Table 2

Course Evaluation - Actual Downtime Perceived Impact Frequency Analysis

Perceived Impact on General Nursing Workflow			
Scale		Frequency	Percent
No Impact	1	0	0.0%
	2	2	18.2%
	3	1	9.1%
	4	3	27.3%
Significant Impact	5	5	45.5%
		Mean	4
		Std. Dev	1.183

Perceived Impact on Patient Safety			
Scale		Frequency	Percent
No Impact	1	0	0.0%
	2	0	0.0%
	3	5	46.5%
	4	4	36.4%
Significant Impact	5	2	18.2%
		Mean	3.73
		Std. Dev	0.786

Perceived Impact on Quality of Care			
Scale		Frequency	Percent
No Impact	1	2	18.2%
	2	2	18.2%
	3	2	18.2%
	4	3	27.3%
Significant Impact	5	2	18.2%
		Mean	3.09
		Std. Dev	1.446

Perceived Impact on Time Spent With Patients			
Scale		Frequency	Percent
No Impact	1	0	0.0%
	2	2	18.2%
	3	0	0.0%
	4	6	54.5%
Significant Impact	5	3	27.3%
		Mean	3.91
		Std. Dev	1.044

Perceived Impact on Accurate Documentation			
Scale		Frequency	Percent
No Impact	1	0	0.0%
	2	1	9.1%
	3	2	18.2%
	4	3	27.3%
Significant Impact	5	5	45.5%
		Mean	4.09
		Std. Dev	1.044

Table 3

Course Evaluation – Perceived Preparedness for Downtime

Ability to Access Downtime Policy			
Scale		Frequency	Percent
Completely Unprepared	1	0	0.0%
	2	1	2.0%
	3	5	10.0%
	4	23	46.0%
Completely Prepared	5	21	42.0%
		Mean	4.28
		Std. Dev	0.73

Ability to Access Downtime Documentation Forms			
Scale		Frequency	Percent
Completely Unprepared	1	0	0.0%
	2	1	2.0%
	3	7	14.0%
	4	22	44.0%
Completely Prepared	5	20	40.0%
		Mean	4.22
		Std. Dev	0.764

Ability to Implement Downtime Policy			
Scale		Frequency	Percent
Completely Unprepared	1	0	0.0%
	2	2	4.0%
	3	13	26.0%
	4	23	46.0%
Completely Prepared	5	12	24.0%
		Mean	3.9
		Std. Dev	0.814

Ability to Accurately Document During a Downtime			
Scale		Frequency	Percent
Completely Unprepared	1	0	0.0%
	2	2	4.0%
	3	15	30.0%
	4	21	42.0%
Completely Prepared	5	11	22.0%
		Mean	3.84
		Std. Dev	0.825

Ability to Perform Downtime Recovery			
Scale		Frequency	Percent
Completely Unprepared	1	0	0.0%
	2	2	4.0%
	3	12	24.0%
	4	23	46.0%
Completely Prepared	5	13	26.0%
		Mean	3.94
		Std. Dev	0.818

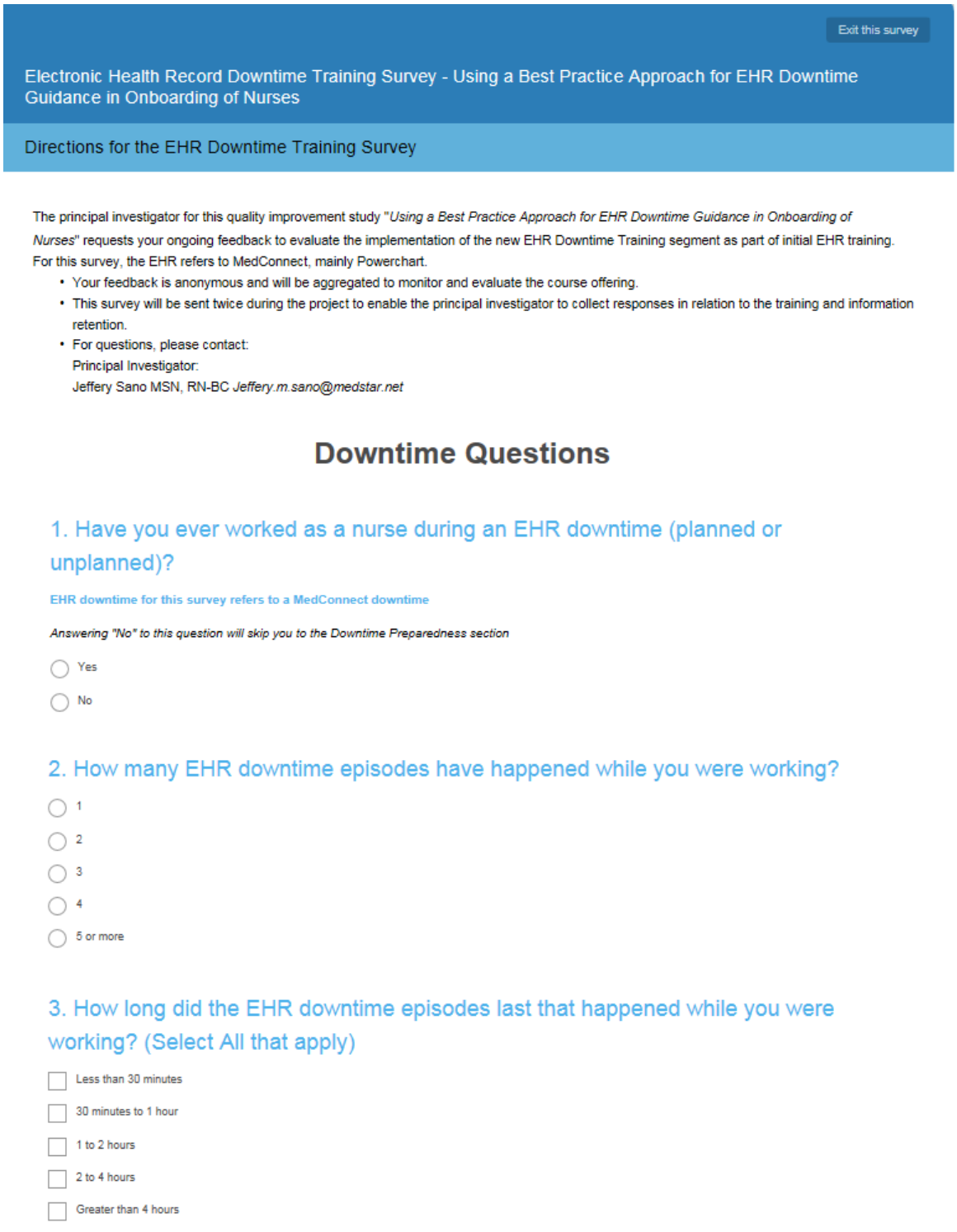
Table 4

Course Evaluation – Free-Text Responses

Free Text Comments
it is super interseting
Although I am aware of the possibility of an occurance of downtime, I was not aware of what to do when one occurs. This class provided information on what to expect and actions to take during a downtime that will be useful.
They are usually frantic and unorganized due to lack of preparedness. Although this has improved greatly over the last few years
nope! this was good at explaining the policy and proceedures!
Appears to be a lot of work
this class should be separte from the medconnect powerchart class, there is a lot of information
can make the powerpoint more engaging/vibrant
I feel that this was not too much information for the class. I felt that if this unfortunate event should occur, the staff will be extremely helpful in making sure that we get everything that we need in order to provide safe care to our patients.
Very good and informative presentation.
very helpful
I feel like it all may work in theory, but it is hard to assess my abilities and capabilities without actually having experienced a downtime event.

Appendix A

Downtime Preparedness Course Evaluation Questionnaire



Exit this survey

Electronic Health Record Downtime Training Survey - Using a Best Practice Approach for EHR Downtime Guidance in Onboarding of Nurses

Directions for the EHR Downtime Training Survey

The principal investigator for this quality improvement study "*Using a Best Practice Approach for EHR Downtime Guidance in Onboarding of Nurses*" requests your ongoing feedback to evaluate the implementation of the new EHR Downtime Training segment as part of initial EHR training. For this survey, the EHR refers to MedConnect, mainly Powerchart.

- Your feedback is anonymous and will be aggregated to monitor and evaluate the course offering.
- This survey will be sent twice during the project to enable the principal investigator to collect responses in relation to the training and information retention.
- For questions, please contact:
  Principal Investigator:
  Jeffery Sano MSN, RN-BC *Jeffery.m.sano@medstar.net*

Downtime Questions

1. Have you ever worked as a nurse during an EHR downtime (planned or unplanned)?

EHR downtime for this survey refers to a MedConnect downtime

Answering "No" to this question will skip you to the Downtime Preparedness section

- ◯ Yes
- ◯ No

2. How many EHR downtime episodes have happened while you were working?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5 or more

3. How long did the EHR downtime episodes last that happened while you were working? (Select All that apply)

- ☐ Less than 30 minutes
- ☐ 30 minutes to 1 hour
- ☐ 1 to 2 hours
- ☐ 2 to 4 hours
- ☐ Greater than 4 hours

Downtime Impact

4. Rate your perceptions of the impact of EHR downtime that happened while you were working

	1 = No Impact	2	3	4	5 = Significant Impact
Impact on general workflow *(i.e. Do you feel that an EHR downtime impacted your normal nursing routine?)*	○	○	○	○	○
Comment					
Impact of downtime on patient safety *(i.e. Do you feel than an EHR downtime impacted your ability to deliver safe care?)*	○	○	○	○	○
Comment					
Impact of downtime on Quality of Care *(i.e. Do you feel that the EHR downtime impacted the quality of care delivered?)*	○	○	○	○	○
Comment					
Impact of downtime on time spent with patients *(i.e. Do you feel that an EHR downtime impacted the time spent with each patient?)*	○	○	○	○	○
Comment					
Impact on downtime on appropriate documentation *(i.e. Do you feel than an EHR downtime impacted your ability to document medications, patient assessments, etc.?)*	○	○	○	○	○
Comment					

5. Do you have any additional comments related to the downtime events you experienced?

Downtime Preparedness (Perceived)

6. Please rate your perceived level of your preparedness for the following abilities

	1 = Completely Unprepared	2	3	4	5 =Completely Prepared
Ability to access the downtime Policy *(i.e. Do you know how to get to the downtime policy when needed?)*	○	○	○	○	○
Comment					
Ability to access required paper documentation forms *(i.e. Do you know where to obtain the paper downtime forms in the event of an EHR downtime?)*	○	○	○	○	○
Comment					
Ability to implement the downtime policy *(i.e. Do you know how to follow the downtime policy?)*	○	○	○	○	○
Comment					
Ability to accurately document on downtime paper forms *(i.e. Do you know how to document on the downtime forms?)*	○	○	○	○	○
Comment					
Ability to perform data entry post resolution of a downtime (downtime recovery) *(i.e. Do you know what to "back chart" when the downtime has concluded?)*	○	○	○	○	○
Comment					

7. Do you have any additional comments related to EHR downtime?

Appendix B

Downtime Preparedness Course Competency Assessment

What is the first thing I should do if I notice a potential downtime?
A. Panic
B. Call the helpdesk (x77731)
C. Ignore the downtime and assume the system will be back up soon
D. Post the downtime to social media

If only <EHR Name> is experiencing a downtime, how do you access the downtime policy?
A. A nursing supervisor will deliver it to your unit
B. There is no official policy for downtime
C. Starport's Downtime Landing page
D. The nursing office

What does 7/24 at <Facility Name> refer to?
A. A view only system that may be implemented in the event of a MedConnect downtime
B. Around the clock coverage
C. 0.29166666
D. A different system that data can be used to document vital signs in when the EHR is not functioning

What is the major difference between the two versions of downtime MAR (Medication Administration Records) that may be used during a downtime event?
A. There is no difference between the 2 MARs
B. The white MAR is only good for approximately 24 hours while the Green MAR is able to be used for longer downtime events
C. The white MAR is only to be used in the ICU's whereas the Green MAR is only to be used in Med-Surg areas
D. The only difference between the two MARs is the color

What does the term "System Recovery" mean from a nursing perspective?
A. The application is back online and is available for documenting again
B. Replacing the hard drive of a computer
C. Switching to paper documentation because the EHR is not accessible
D. The act of "back charting" required data collected during the downtime into the EHR once it is operational again

You are unsure what should be "back charted" into the EHR once the system is back online. What is the best resource you should consult to assist with this?
A. The Downtime Policy
B. The Scope and Standard of Nursing Practice
C. My unit manager
D. Just guess and hope for the best

If a downtime lasts less than 4 hours and does not encompass a shift change, what data should be "back charted" into the EHR?
A. Nothing needs to be back charted in this case
B. All data needs to be back charted in this case
C. Only vital signs should be back charted in this case
D. Clearing out tasks in Care Compass

Appendix C

UAH IRB Exemption Approval

THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

☐	Expedited (see pg 2)
☒	Exempted (see pg 3)
☐	Full Review
☐	Extension of Approval

February 1st 2018

Jeffrey Sano
Department of Nursing
University of Alabama in Huntsville

Dear Mr. Sano,

The UAH Institutional Review Board of Human Subjects Committee has reviewed your proposal, *Implementation and Evaluation of EHR Downtime Education for Newly Hired Nurses,* and found it meets the necessary criteria for approval. Your proposal seems to be in compliance with this institutions Federal Wide Assurance (FWA) 00019998 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46).

Please note that this approval is good for one year from the date on this letter. If data collection continues past this period, you are responsible for processing a renewal application a minimum of 60 days prior to the expiration date.

No changes are to be made to the approved protocol without prior review and approval from the UAH IRB. All changes (e.g. a change in procedure, number of subjects, personnel, study locations, new recruitment materials, study instruments, etc) must be prospectively reviewed and approved by the IRB before they are implemented. You should report any unanticipated problems involving risks to the participants or others to the IRB Chair.

If you have any questions regarding the IRB's decision, please contact me.

Sincerely,

Bruce Stallsmith
IRB Chair
Professor, Biological Sciences

OFFICE OF THE VICE PRESIDENT FOR RESEARCH
Von Braun Research Hall M-17 Huntsville, AL 35899 T 256.824.6100 F 256.824.6783

Appendix D

Facility IRB Examination

MedStar Health Research Institute

NOT HUMAN RESEARCH DETERMINATION

September 7, 2018

Jeffery M. Sano
110 Irving St NW
(202) 877-5258
Jeffery.M.Sano@medstar.net

Dear Jeffery M. Sano,:

On , April 18, 2018 the IRB reviewed the following protocol:

Type of Review:	*Initial*
Title:	Using a Best Practice Approach for EHR Downtime Guidance in On-boarding of Nurses
Investigator:	Jeffery M. Sano
IRB ID:	2018-207
Funding:	*None*
Grant Title:	*None*
Grant ID:	*None*
IND, IDE or HDE:	*None*
Documents Reviewed:	*EHR Downtime Protocol, Form 3, Jeff Sano Resume, Survey tool, UAH-Approval letter*

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities are research involving human in which the organization is engaged, please submit a new request to the IRB for a determination.

Sincerely,

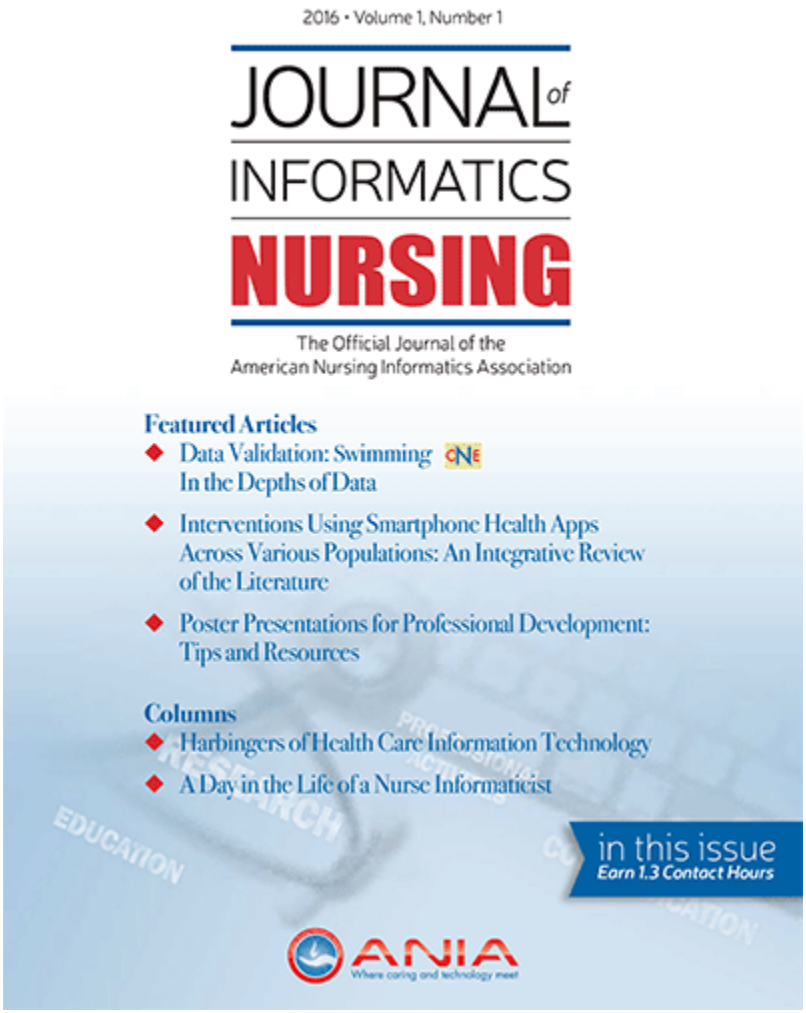
Yessica Contreras

MHRI,ORI Coordinator

Appendix E

Journal of Informatics Nursing Author Guidelines

Guidelines for Article Submission



The *Journal of Informatics Nursing,* the official publication of the American Nursing Informatics Association (ANIA), is a benefit of membership that includes clinical articles dedicated to advancing nursing informatics through practice (education and clinical), research, and professional development. Unless clearly specified, the views expressed in articles and columns published in the*Journal of Informatics Nursing* represent the opinions of the authors and do not reflect the official policies of ANIA.

The *Journal of Informatics Nursing* accepts original articles, case studies, letters, descriptions of clinical care, and research. Query letters are welcome, but not required. Material must be original and never published before.

All clinical manuscripts submitted undergo peer review. Each manuscript is evaluated on its timeliness, importance, accuracy, clarity, and applicability to nursing informatics. Accepted manuscripts are subject to copy editing.

Download guidelines in PDF format

Manuscript Preparation

Manuscript page layout should be portrait, double-spaced, set-up for 8.5" x 11" paper, using Times New Roman 12-point font. The manuscript should be no more than 18 pages. To be considered as a potential continuing nursing education (CNE) activity, manuscripts should be a minimum of 1,300 words (not including references).

Style should follow the *Publication Manual of the American Psychological* Association (6th ed., 2010). A good reference site for writers is the Purdue OWL (https://owl.english.purdue.edu). Avoid complex font attributes, such as outline.

Prior to submission, a colleague should read the manuscript, if possible.

Format of Manuscript

Title Page: Include the manuscript title, authors' names, credentials, and a biographic statement. Identify an address for correspondence, email address (required), and day and evening phone numbers.

Abstract Page: Write a brief abstract (40 words or less). Also include key words.

Text: Double-space all typing, using 1-inch margins. Include the title, or short descriptor, on top of each page, but do not include the author's name.

Subheadings: Include subheadings in the manuscript where possible. Headings should follow APA format.

References: All references should be from the last 5 years when possible. List all references in alphabetical order. All citations should reference primary sources. The use of secondary sources (material analyzed or interpreted from the primary source) is discouraged. If necessary, locate a copy of the original work and credit it as such. Authors are encouraged to provide the digital object identifier (DOI) number for references when possible.

Manuscripts must NOT contain reference software codes.

Sample references are:

Book
Sewell, J., & Thede, L. (2012). *Informatics and nursing: Opportunities and challenges* (4th ed.). Philadelphia: Lippincott, Williams & Wilkins.

Chapter in a Book
Kennedy, R., Androwich, I.M., Mannone, C., & Mercier, N. (2014). Informatics nursing

practice. In Haas, S.A., Swan, B.A., & Haynes, T.S. (Eds.), *Care coordination and transition management core curriculum* (pp. 163-174). Pitman, NJ: American Academy of Ambulatory Care Nursing.

Periodical
Curran, H.J. (2016). Fostering therapeutic communication while inputting data into the electronic health record. *Nursing Informatics Today, 31*(1), 4-7, 16.

Website
American Psychological Association (APA). (2010). *APA style.* Retrieved from http://www.apastyle.org

Figures: These include line drawings, photographs, diagrams, and graphs. Each figure needs to be numbered, and the number must correspond to a statement in the manuscript directing the reader to see such figure: (see Figure 1). Include a separate legend sheet with captions.

All graphics (figures, graphs, etc.) must be submitted in camera-ready form (e.g., jpeg, tiff). Photographs may be black and white or color. Electronic images should be high resolution (at least 300 dpi).

Please note: Images found on Google, Bing, or other online search engines are not public domain; permission from the original source/publisher must be provided. Acquiring permission to reprint previously published or adapted materials is the responsibility of the author.

Conflict of Interest

The *Journal of Informatics Nursing* requires authors, editorial board members, and reviewers to disclose any conflicts of interest related to their submission and involvement with the journal. The *Journal of Informatics Nursing* endorses and subscribes to the definition of Conflict of Interest by the International Committee of Medical Journal Editors (2006), "Uniform Requirements for Manuscripts Submitted to Biomedical Journals," which states:

Public trust in the peer review process and the credibility of published articles depend in part on how well conflict of interest is handled during writing, peer review, and editorial decision making. Conflict of interest exists when an author (or the author's institution), reviewer, or editor has financial or personal relationships that inappropriately influence (bias) his or her actions (such relationships are also known as dual commitments, competing interests, or competing loyalties). These relationships vary from those with negligible potential to those with great potential to influence judgment, and not all relationships represent true conflict of interest. The potential for conflict of interest can exist whether or not an individual believes that the relationship affects his or her scientific judgment. Financial relationships (such as employment, consultancies, stock ownership, honoraria, paid expert testimony) are the most easily identifiable conflicts of interest and the most likely to undermine the credibility of the journal, the authors, and of science itself. However, conflicts can occur for other reasons,

such as personal relationships, academic competition, and intellectual passion. Authors should identify individuals who provide writing assistance and disclose the funding source for this assistance.

Informed Consent

The *Journal of Informatics Nursing* requires authors to assure patients' and subjects' privacy, if applicable, related to their research and manuscript. The *Journal of Informatics Nursing* endorses and subscribes to the definition of Human and Animal Rights by the International Committee of Medical Journal Editors (2006), "Uniform Requirements for Manuscripts Submitted to Biomedical Journals," which states:

Patients have a right to privacy that should not be infringed without informed consent. Identifying information, including patients' names, initials, or hospital numbers, should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives written informed consent for publication. Informed consent for this purpose requires that a patient who is identifiable be shown the manuscript to be published. Identifying details should be omitted if they are not essential. Complete anonymity is difficult to achieve, however, and informed consent should be obtained if there is any doubt. For example, masking the eye region in photographs of patients is inadequate protection of anonymity. If identifying characteristics are altered to protect anonymity, such as in genetic pedigrees, authors should provide assurance that alterations do not distort scientific meaning and editors should so note. When informed consent has been obtained it should be indicated in the published article.

Human and Animal Rights

The *Journal of Informatics Nursing* requires authors to disclose Institutional Review Board consent, if applicable, related to their research and manuscript. The *Journal of Informatics Nursing* endorses and subscribes to the definition of Human and Animal Rights by the International Committee of Medical Journal Editors (2006), "Uniform Requirements for Manuscripts Submitted to Biomedical Journals," which states:

When reporting experiments on human subjects, authors should indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. If doubt exists whether the research was conducted in accordance with the Helsinki Declaration, the authors must explain the rationale for their approach, and demonstrate that the institutional review body explicitly approved the doubtful aspects of the study. When reporting experiments on animals, authors should be asked to indicate whether the institutional and national guide for the care and use of laboratory animals was followed.

Manuscript Submission

Authors should submit manuscripts via email. Text files should be saved as Microsoft Word documents.

Prior to submission, please download and complete the author **Copyright Release Form.** This form (one from each author) should be sent with your initial manuscript. The manuscript will not be reviewed without this form.

Submit questions, queries, or manuscripts to:
Journal of Informatics Nursing
editor@ania.org

References

American Recovery and Reinvestment Act of 2009. Pub. L. No. 111-5, 123 Stat. 115 (2009).

Amidst chaos from tornado, 'everybody worked together': registration staff moved smoothly into 'downtime procedure'. (2007). *Hospital Access Management*, *26*(4), 37-39.

Anderson, L. K., & Stafford, C. J. (2002). The "big bang" implementation: not for the faint of heart. Computers in Nursing, 20(1), 14-20; quiz 20-2. Retrieved from https://elib.uah.edu/login?url=https://search-proquest-com.elib.uah.edu/docview/71450322?accountid=14476

Carr, D. (2004). A team approach to EHR implementation and maintenance. *Nursing Management. IT Solutions: Advancing healthcare through information technology*. *35 (*Supplement 5),15-16.

Chawla, A. (2013). Early clinical skills training: too much, too soon?. *Medical Education*, *47*(5), 521-522. doi:10.1111/medu.12191

Getz, L. (2009). Dealing with downtime: how to survive if your EHR system fails. *For The Record (Great Valley Publishing Company, Inc.)*, *21*(21), 16-18.

Guidelines for article submission. (n.d.). Retrieved October 01, 2018, from https://www.ania.org/journal-author-guidelines

Hanuscak, T., Szeinbach, S., Seoane-Vazquez, E., Reichert, B., & McCluskey, C. (2009). Evaluation of causes and frequency of medication errors during information technology downtime. *American Journal of Health-System Pharmacy*, 66(12), 1119-1124. doi:10.2146/ajhp080389

Huryk, L. A. (2010). Factors influencing nurses' attitudes towards healthcare information technology. *Journal of Nursing Managment, 18(*5), 606-612. doi:10.1111/j.1365-2834.2010.01084.x

HealthIT.gov – Contingency Planning. (2017). Retrieved from https://www.healthit.gov/safer/guide/sg003

Journal of informatics nursing (n.d.). Retrieved October 01, 2018, from https://www.ania.org/publications/journal

Kossman, S., & Scheidenhelm, S. (2008). Nurses' perceptions of the impact of electronic health records on work and patient outcomes. *CIN: Computers, Informatics, Nursing*, *26*(2), 69–77. doi: 10.1097/01.NCN.0000304775.40531.67

Locsin, R. C. (2016). Technological competency as caring in nursing: co-creating moments in nursing occurring within the universal technological domain. *Journal Of Theory Construction & Testing*, *10*(1), 5-11

Mack, D., Shun, Z., Douglas, M., Sow, C., Strothers, H., & Rust, G. (2016). Disparities in primary care EHR adoption rates. *Journal Of Health Care For The Poor & Underserved, 27(*1), 327-338.

Mielcarek, F., Badger, M., & Gall, K. (2016). Outstanding practice-podium: EHR downtime/recovery planning: panic prevention. *Computers, Informatics, Nursing: CIN, 34(*10), 433. doi: 10.1097/01.NCN.0000504584.39401.22

Nelson, N. (2007). Downtime procedures for a clinical information system: a critical issue. *Journal Of Critical Care*, *22*(1), 45-50.

Palojoki, S., Pajunen, T., Saranto, K., & Lehtonen, L. (2016). Electronic Health Record-Related Safety Concerns: A Cross-Sectional Survey of Electronic Health Record

Users. *JMIR Medical Informatics*, *4*(2), e13. http://doi.org.elib.uah.edu/10.2196/medinform.5238

Smith, M. C., & Parker, M. E. (2015). *Nursing theories & nursing practice*. Philadelphia, PA: F.A. Davis Company.

Sittig, D. F., Gonzalez, D., & Sing, H. (2014). *Contingency planning for electronic health record-based care continuity: a survey of recommended practices.(83)*, 797-804. doi: https://doi.org/10.1016/j.ijmedinf.2014.07.007

Vaughn, S. (2011). Planning for system downtimes. *Computers, Informatics, Nursing : CIN*, *29(*4), 201-203. doi:http://dx.doi.org.elib.uah.edu/10.1097/NCN.0b013e318214fcc8

Wang, Y., Coiera, E., Gallego, B., Concha, O. P., Ong, M., Tsafnat, G., & ... Magrabi, F. (2016). Measuring the effects of computer downtime on hospital pathology processes. *Journal Of Biomedical Informatics*, *59*308-315. doi:10.1016/j.jbi.2015.12.016