Southern California CSU DNP Consortium

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IMPLEMENTATION OF AN ELECTRONIC HANDBOFF REPORT: A QUALITY IMPROVEMENT PROJECT

A DOCTORAL PROJECT
Submitted in Partial Fulfillment of the Requirements
For the degree of
DOCTOR OF NURSING PRACTICE

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ABSTRACT

Critical information such as a patient’s vital signs, neurological status, and level of care is exchanged between registered nurses during a patient handoff report. It is imperative that the communication between each registered nurse (RN) is accurate, specific, relevant, and timely. When the care of a patient is transferred from one healthcare provider to another, the patient may experience potential risk because of communication failure. The purpose of this doctoral project was to evaluate patient and nursing satisfaction. The aim of the proposed process was to have a concise communication tool. The use of this electronic handoff tool promotes relevant and timely communication between the Emergency Department (ED) and Medical Telemetry unit. The project product is an electronic handoff tool that is consistent, safe, and efficient.

The first step of the intervention process began with the use of the Iowa Model of evidence-based practice. An inter-professional team was created. The team consisted of frontline nurses, educators, administrators, and technicians. The team met to identify practice issues surrounding the current handoff process. The focus group met over a four month period. During these meetings, the ED to floor handoff report was developed.

The handoff report is part of the Electronic Health Records (EHR) operating system of Sunrise, Allscripts Corp., Chicago, Illinois (Vawdrey et al., 2013). This is the Electronic Health Records system used at the University California Irvine (UCI). In-service education was administered to all ED RN’s and Medical Telemetry RN’s on the
new electronic handoff process. The in-service education was conducted by the medical telemetry nurse manager and the emergency department nurse supervisor.

A three-month pilot took place between the ED and Medical Telemetry unit. Data collection began once the electronic handoff report pilot was implemented. The parameters analyzed: (1) Nursing Satisfaction Survey Monkey results; (2) Press Ganey Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Patient Satisfaction-Overall Recommend and Nursing Communication mean scores; (3) Emergency Department pre and post pilot Diversion times. The results from the three-month pilot were very satisfactory on patient and nursing satisfaction.

Statistically significant changes in nursing satisfaction survey scores were observed for both the efficiency of handoffs and overall satisfaction, $p < .001$. Approximately 3/4 of the participants rated the Electronic Handoff Trial positively (Excellent, Very Good, or Good) while 1/4 of the participants rated it negatively (Fair to Poor). Patient satisfaction HCAHPS survey results observed at post-test demonstrate statistically significant improvements in ratings of both nurses overall and likelihood to recommend, $p < .05$. A ten-percent increase in patient satisfaction was achieved after the implementation of the pilot.

As a result of positive feedback from the use of the ED to floor handoff report, the handoff process was expanded to all units within the hospital. More data will need to be collected by nursing leaders to determine if the ED to floor handoff report will demonstrate an improvement in patient safety, ambulance diversion times, and emergency department throughput.
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BACKGROUND

The Institute of Medicine reported that up to 98,000 deaths occur annually, and another 15-million patients are harmed while hospitalized in the United States (Kohn, Corrigan, & Donaldson, 2000). Many of these sentinel events are caused by preventable medical errors (Kohn et al., 2000). The Joint Commission discovered that seventy percent of sentinel events derived from failures or breakdowns in communication (Alvarado et al., 2006). A study by Agarwal, Sands, and Schneider (2010) quantifying the economic impact of communication shortcomings of U.S. hospitals asserted that twelve-billion dollars is wasted annually as a result of communication breakdown among health care workers. The significance of this problem becomes evident when one considers that communication inefficiencies in a 500-bed hospital can amount to loses of over four- million dollars annually (Agarwal et al., 2010).

Significance

Critical information such as a patient’s vital signs, neurological status, and level of care is exchanged between registered nurses during a patient handoff report. Therefore, it is imperative that the communication between health care professionals is accurate, specific, relevant, and timely (Welsh et al., 2010). When the care of a patient is transferred from one healthcare provider to another, the patient may experience potential risks because of communication failure (Flanagan et al., 2009). At the 2006 Agency for Healthcare Research and Quality Patient Safety conference, Dayton and Henriksen (2006) identified five factors that affect communication. These factors are interruptions of workflow, differences in education between physicians and nurses, protocols of hierarchy, structural complexities, and the risk of loss of critical information. The
significance of communication among nurses is abundantly clear when you look at the size of the nursing workforce. According to the American Association of Colleges of Nurses fact sheets (2016), there are 2.6-million registered nurses in the US workforce, and sixty-two percent of these nurses work in hospitals. In addition, there are four times as many registered nurses as physicians in the United States (AACN, 2016).

**Problem Statement**

A team of nurses from critical care, medical surgical, and emergency department, held a focus group meeting at UCI. The meeting was organized and led by the Nurse Manager of the Medical Telemetry Unit. During the meeting, this team of nurses discovered that there was a lack of a standardized handoff process. The nurses also concluded that this lack of standardized handoff has led to errors such as inaccurate level of care, incorrect isolation status, and treatment plans. This same focus group team concluded that these issues lead to a decrease in patient safety. Additionally, they ascertained that the current handoff report at UCI is often too long, and that it usually contains irrelevant information such as questions not applicable to the current plan of care. The nurses stated that the current process for handoff report frequently lacked vital information needed for safe care. In conclusion, this group of nurses agreed that more than one process of handoff is utilized between units (focus group-personal communication, February 3, 2016).

At UCI, various modified Situation, Background, Assessment, and Recommendation (SBAR) formats are used by nurses for handoff reporting between the Emergency Department (ED) and Inpatient units. The current process of verbal handoff via telephone call can create unnecessary wait time when giving reports. The ED nurses
stated that they often would have to make multiple phone calls to the receiving Inpatient nurse, because they are unable to give a report during the first attempt. This process also considerably delayed the transfer of patients from one unit to another. One of the negative outcomes was that a patient would remain in the ED longer than was needed. This delay has ramifications for the patient awaiting transfer as well as those in the ED waiting room. These ramifications are that the transferring patient may become extremely dissatisfied with the process, or that the patient in the waiting room may leave without being seen (LWBS).

Patients often share their dissatisfaction through the Hospital Consumer Assessment of Healthcare Providers and Systems survey (HCAHPS). This national survey was designed to quantify a quality measure of a patient’s hospital experience. In the fall of 2012, the Center for Medicare and Medicaid Services (CMS) began the process of withholding a percentage of payments to hospitals by 1%. This percentage is an estimated 850-million dollars (Zusman, 2012). How this money is distributed to hospitals depends on the performance of a hospital’s quality measurements that is directly reported by patients from their experience. It is imperative that nursing administration considers alternatives with the current handoff process. Although no presently the case in the ED, the patient’s quantification of their experience from the HCAHPS survey will have a direct impact on hospital reimbursement in the foreseeable future.

Throughput is defined as the process of admitting a patient from the ED into an Inpatient unit (Kane et al., 2015). The lag time for reporting and interruptions during a typical handoff report results in a decrease of the throughput. Such impediments often lead to unnecessary diversions of patients to the hospital. Diversion occurs when an ED
temporarily cannot accept ambulances transporting critically ill patients. This often happens because of overcrowding in the ED. Failure to expedite the transfer of patients from the ED to the Inpatient units is one notable cause that has led to the extended stay of many patients in the ED. Patients who remain in the ED while waiting for an Inpatient bed are referred to as “boarding” (Geiderman, Marco, Moskop, Adams, & Derse, 2015). This situation often results in the impairment of the ability of the ED to admit and care for new patients. Potential adverse outcomes such as delays for patients to obtain definitive medical care may occur when ambulance diversion occurs (Castillo et al., 2011).

The current diversion rate at the University of California, Irvine hospital is 25%. On a daily basis at UCI, the ED requests assistance from inpatient nurse managers in order to facilitate throughput of critically ill patients. Otherwise, these acute care patients would be diverted by ambulances because of saturation and boarding of patients in the ED. A study conducted by Baker and Esbenshade (2015) revealed that boarding has been identified as the root cause of overcrowding in ED. The boarding of patients reduces the ability of the ED to care for patients leading to a decrease in bed utilization. This leads to a decrease in the safety, quality, and satisfaction of patients. A “no-delay report” has been identified as an important tool for nurses to use to reduce the time it takes to transfer a patient from the ED to the Inpatient unit (Baker & Esbenshade, 2015). Baker and Esbenshade (2015) explain that a “no-delay” nurse report is best incorporated through the electronic health record. An electronic handoff can be considered a type of “no-delay” report because it reduces time from admit orders to arrival on Inpatient units. The use of a “no-delay” report may also decrease the potential for communication errors, because it
guarantees that the ED and the Inpatient unit nurses have the same information. In addition, a “no-delay” report improves patients’ perception of care because of timely transfers (Baker & Esbenshade, 2015).

**Purpose Statement**

The purpose of this doctoral project was to evaluate patient and nursing satisfaction. The aim of the proposed process is to have a concise communication tool. The use of this handoff tool will promote accurate and relevant communication between the ED and Inpatient units. This should result in increased patient safety by having precise, up to date patient information, and pertinent history readily available. The project product is an electronic handoff tool that is consistent, safe, and efficient. In addition, the handoff tool met national regulatory requirements. For example, the electronic handoff was supplemented by verbal handoff for information not available in the patient’s Electronic Health Record (EHR).

The primary outcome was to measure nurses and patients’ satisfaction with this new and improved process. The secondary outcome was measured by comparing pre and post pilot diversion times.

A pre and post nursing satisfaction survey was created in order to collect staff satisfaction. The survey consisted of five questions designed with specific queries directed toward staff perception of current processes for safe and effective handoff.

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is the national survey used to measure patient satisfaction. Although the patient experience was not included as one of the six aims recommended by the Institute of Medicine 2001 report Crossing the Quality Chasm to improve the delivery of
healthcare, it is a tool used by payers such as the Center for Medicare and Medicaid Services (CMS). The patient experience survey is used to measure value in the United States health care system (Farley et al., 2014). Under the Patient Protection and Affordable Health Care Act of 2010, results of these surveys are critical and will influence hospital and Emergency Department reimbursement (Farley et al., 2014).

The use of communication with technology as well as the restructuring of the current handoff process should help ease problems related to the quality and safety of care, the patient’s experience, and financial outcomes. The role of the advance practice nurse is well suited in bringing this technology into the field of nursing because of their academic background as well as their clinical experience. Leadership is required to challenge established practices and in order to evaluate current data to promote evidence based practice (Hanrahan et al., 2015).

**Theoretical Framework**

The mandate of today’s health care providers is to ensure that the best possible practice is delivered to all patients. The most effective way to improve outcomes is by promoting and implementing research based initiatives (Wuchner, 2014). The Iowa Model is a theoretical framework used by healthcare providers internationally to promote quality of care (Doody & Doody, 2011). This evidence-based practice model was first introduced by Marita Titler, PhD, RN, FAAN, in 1994. The originators of the model were recipients of the prestigious Sigma Theta Tau International Research Utilization Award. The authors of the Iowa model have received more than 3, 393 written requests from all 50 states including the territory of Puerto Rico to use the Iowa Model in their publications (Steelman, 2015). The Iowa Model has been translated into German,
Japanese, and Portuguese. Additionally, it has gained international recognition with 130 international requests to utilize the model from a total of 38 countries (Steelman, 2015). The model was revised in 2001 and again in 2015.

The Iowa Model was initially created to guide health practitioners to use research findings for improvement of care. Feedback from its users, analysis of evidence-based practice, and changes within the social and health care environment have helped refine its application (Titler et al., 2001). Opportunities known as “Triggers” are stimuli for nurses to question current practices. These reflections include important issues in today’s healthcare marketplace. Additionally, nurses seek to advance clinical, operational, and financial outcomes (Titler et al., 2001). The revised model promotes the use of pilot testing and implementation of practice changes. Changes in practice have led to improvements in patient safety, quality, and cost savings (Cullen & Adams, 2010).

The Iowa Model consists of eight steps. Step one includes selecting a topic that identifies opportunities and triggering issues. Important areas to consider in the first step are accrediting agency requirements as well as the organization and state or national initiatives. Clinical or patient issues are identified along with the philosophy of care. Step two involves stating the question or purpose of the project. This step was added as the model was revised. The reason for this step is to have the model take the patient population into consideration. Step three is to determine if the issue is a priority. This step determines the necessity and if resources are available to continue with the process. Once this step is affirmed, a team must be formed. Step four involves establishing a team. In this step, key stakeholders are identified. Recipients who would likely be impacted by the change are an essential component of the team. Step five focus is to
assemble, appraise, and synthesize evidence. Because of the large amount of published systematic reviews and clinical guidelines, this step is no longer the focus of the model. However, step five remains an essential component of the process. Step six is to design and pilot the practice change. The importance of this step is to facilitate the process and to avoid pitfalls. By understanding constraints and the context in which the change occurs will help engage the process. In step seven, the team will integrate the change into the practice with the goal to sustain it. Monitoring of key indicators through quality improvement is critical. The final step will disseminate and evaluate results. The knowledge acquired should be shared with others as deemed appropriate (Steelman, 2015; University of Iowa Hospitals and Clinics, 2015).
Figure 1. Iowa Model.
IOWA MODEL LITERATURE REVIEW

Overview

What is evidence-based practice? There are several studies in the literature that have used the Iowa Model as their theoretical framework. Cullen and Adams (2010) asked the question: What is evidence-based practice? The authors utilized their expert knowledge from the University of Iowa in the Journal of Peri Anesthesia Nursing, in order to describe the difference between evidence based-practice (EBP) and conducting research. These two processes are often confused by the novice and expert practitioners.

To conduct research is to generate new information. Evidence based practice is to take existing knowledge and to apply it into practice (Cullen & Adams, 2010). The purpose of EBP is to improve and achieve the best possible outcomes for patients and processes. Many times the confusion occurs because research may be conducted in a clinical setting and involve patients (Cullen & Adams, 2010). The question of Quality Improvement (QI) and its relationship with EBP may add to the confusion of practice improvement. Quality Improvement is described as data driven and process-based used in order to improve the quality of patient care so that it is safe, timely, equitable effective, and patient centered (Cullens & Adams, 2010). However, a QI project is not always based on evidence. Because of the multiple methods a practitioner can use in their practice to improve outcomes, a standard such as the Iowa Model can help guide the process. The literature described in this article sets the stage for the reader in order to guide implementation and utilization of the Iowa Model as an evidence-based practice model.
Improving stable patient flow through the emergency department by utilizing evidence-based practice: One hospital’s journey. Popovich, Boyd, Dachenhaus, and Kusler (2012) described how to improve throughput with the use of the Iowa Model of evidence-base practice. This project identified when to staff a satellite unit based on emergency department patient volume. Furthermore, this project sought to encourage early intervention of patient flow and prompt medical treatment for optimal resource application (Popovich, Boyd, Dachenhaus & Kusler, 2012). After identifying overcrowding in the Emergency Department of the Children’s Hospital in Columbus Ohio, the authors’ analyzed retrospective administrative data to determine when to staff a satellite area. They collected random sampling of data from January 2009 until July 2010. This information was used to identify volume triggers, acuity, and total length of stay (TLOS). Established teams of clinical and management staff gathered, reviewed, and developed evidence in order to use it as a framework for changes in practice. The revised volume driven protocol provided direction when to staff the satellite unit (Popovich et al., 2012). A new clinical decision-making tool referred to as the Emergency Severity Index (ESI) was developed specific to triage. This tool incorporated a five tier triage system that linked acuity to resource intensity in order to track trends and provide supplies as well as staffing (Popovich et al., 2012). Three out of five criteria are required in order to open the satellite unit. These five criteria are three or more patients waiting to be seen in the lobby, two or more patients in line at triage, five to seven level 5s (ESI) in the department, and eleven to sixteen (ESI) level 4s in the department (Popovich et al., 2012). This new protocol enabled nurses to better control the flow process and to prevent patients from leaving without being seen (LWBS) (Popovich et
al., 2012). In 2009, the pre-pilot data showed 62 children LWBS and in 2010 during the implementation of the project. Only 49 children were classified as LWBS, which is a 29% reduction in patients who left without being seen (Popovich et al., 2012).

**Use of an evidence-based shift report tool to improve nurses’ communication.**

Chung, Davis, Moughrabi, and Gawlinski (2011) used the steps in the Iowa Model to pilot a practice change. A need to modify the current change of shift report process was identified as a “trigger.” The authors discovered that the nursing staff missed communicating critical information during the handoff process between shifts (Chung, Davis, Moughrabi, & Gawlinski, 2011). An example of missed communication of critical information during handoff report is the process of scheduling patients for procedures. Often times, when a patient is scheduled for a procedure such as a diagnostic test, they are required to fast prior to the procedure. Such was the case of a patient in the study who was fed before the procedure. This miscommunication caused a delay, and the test had to be rescheduled. This error in communication resulted in longer hospitalization. This was considered a top priority by the organization. Delays at both the start and end of the shift were acknowledged. These delays resulted in overtime that caused a financial burden to the organization. The nurses in this study developed a standardized tool of handoff report. Consequently, the nurses in this team created a pilot program in which they used this new handoff tool. Twenty-two nurses volunteered to pilot the standardized handoff reporting tool over a two month period. The researchers surveyed the nurses and refined the tool based on their feedback. The researchers also collected and evaluated the reporting tool for precision and completeness. The nurses were also asked to collaborate on approaches to make the standardized shift report tool
more user friendly. The strategies included making the tool available on the hospital wide portal for nurses to access. Telemetry Technicians also helped nurses by placing labels onto the forms. As a result of their help, the nurses were able to retrieve patient reports faster. The researchers also created a guideline on how to use the tool. This guideline was combined into the new graduate orientation class and annual skills labs. Ultimately, the tool was implemented into the nursing unit. The result of these interventions provided a complete and more precise handoff report. The results also showed a decrease of overtime in work schedule (Chung et al., 2011). Using a tool such as the Iowa Model guided the authors to successfully change the practice of handoff report. Paired t-tests data from this pilot showed greater coherence between nurses, $p < 0.03$. This intervention also demonstrated that nurses were able to better to organize $p < 0.001$ and prioritize the shift, $p < 0.001$. Improved communication and standardization of shift reports were achieved on a busy medical surgical unit in a large tertiary care hospital.

**Introducing evidence into nursing practice: Using the Iowa model.**

Doody and Doody (2011) used the Iowa Model to guide implementation of evidence into nursing practice. The expectation of the modern nurse is to provide high quality care while achieving better patient outcomes. This is accomplished through the application of evidence and research into practice. It is the responsibility of a nurse to continuously question current practice. How to introduce, develop, and evaluate best practices from an evidence based approach instead of conventional wisdom is critical (Doody & Doody, 2011). Questioning the need for a change of the current process and incorporating evidence into practice will empower nurses. The popularity of evidence-based practice is
strong. However, this same practice is dependent on a nurse’s ability to gather and critique data (Doody & Doody, 2011).

**Sacred cow gone to pasture: A systematic evaluation and integration of evidence-based practice.** Hanrahan et al. (2015) conducted a systematic evaluation of nursing practices that have been identified in literature as “sacred cows” (SC) with strategies for change, through evidence-based practices. “Sacred cows” are enduring habits, undoubtedly considered routine even when proven wrong. The authors compared SC to EBP at a large academic medical center in the department of nursing. The authors enlisted the help of front line nurses to review and rate how often current practices were in use with best evidence versus SC. The method the authors used for the “Sacred Cow: Gone to Pasture” initiative was established, designed, and implemented in accordance to the Iowa model of evidence-based practice to promote quality of care. The findings indicated that although the organization had well established policy and procedures, actual practices revealed that SC persisted. Results gathered from the SC initiative identified a need for policy and practice change. Based on the evidence, nurses changed their practices in the use of catheters and bathing basins resulting in considerable reductions of infections.

**Literature Review**

A literature review was conducted utilizing the databases: PubMed, CINAHL, and EBSCO. Search terms included: handoff, patient safety, and nursing. Further refinement of the search terms included shift report and technology. Additional search items included communication, computerized report, and electronic handoff. Limits on the search included journals published between January 2006 through March 2016 and
English language only. Other limitations included scholarly journals in nursing informatics, nursing administration, and medical informatics. Publications from non-academic journal were excluded. Peer-reviewed journal publications represented the majority of the articles selected for review. Reference lists of retrieved documents were also hand searched to identify pertinent publications.

A secondary literature search was performed to evaluate research on using technology to improve handoff reports. This search was completed utilizing the databases: PubMed, CINAHL, and EBSCO. Inclusions were publications in English. Key search terms included: nursing, shift reports and technology. Publications excluded were those studies with non-clinical settings. A lower number of publications were found due to the limitations of the search terms, and publications from January 2006 through March 2016 were included. As shown in Tables 1 and 2, each database and search term generated a specific number of articles retrieved.

Table 1

*Cumulative Index of Nursing and Allied Health Literature Database Search*

<table>
<thead>
<tr>
<th>Terms</th>
<th>Limiters</th>
<th>Articles Retrieved</th>
<th>Articles Excluded</th>
<th>Articles Reviewed</th>
<th>Articles Used</th>
</tr>
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<tbody>
<tr>
<td>Handoff AND patient safety AND nursing</td>
<td>Peer Reviewed, English language, Publish Date: 2006-2016</td>
<td>90</td>
<td>40</td>
<td>47</td>
<td>9</td>
</tr>
<tr>
<td>Nursing AND shift report AND technology</td>
<td>Peer Reviewed, English language</td>
<td>20</td>
<td>12</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Articles excluded were based on title and relevance to project topic.
Table 2

*PubMed Database Search*

<table>
<thead>
<tr>
<th>Terms</th>
<th>Limiters</th>
<th>Articles Retrieved</th>
<th>Articles Excluded</th>
<th>Articles Reviewed</th>
<th>Articles Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handoff AND patient safety AND nursing</td>
<td>Peer Reviewed, English language, Publish Date: 2006-2016</td>
<td>98</td>
<td>51</td>
<td>47</td>
<td>6</td>
</tr>
<tr>
<td>Nursing AND shift report AND technology</td>
<td>Peer Reviewed, English language</td>
<td>9</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note.* Articles excluded were based on title and relevance to project topic.

Safety. Communication breakdown among heath care professional within an acute care facility setting has been identified as common trigger in the surge of preventable injury and death (Alvarado et al. 2006; Dayton & Henriksen, 2006; Kohn, Corrigan, & Donaldson, 2000; Mikos, 2007; Robertson et al., 2014; Sandlin, 2007; Shendell-Falik, Feinson, & Mohr, 2007; Sidlow & Sidlow, 2006; Wilson 2007). A lack of a standardized handoff report can result in significant safety issues such as delays in treatment, inappropriate plans of care, and mortality (Alvarado et al., 2006; Smith et al., 2015; Wilson, 2007). The Joint Commission has identified the need for a standardized handoff as an important patient safety goal (Haig, Sutton, & Whittington, 2006; Mikos, 2007; Sandlin, 2007; Shendell-Falik, Feinson, & Mohr, 2007; Sidlow & Sidlow, 2006). Effective handover reports between healthcare providers handoff need to be accurate, complete, specific and timely (Birmingham, Buffum, Blegen, & Lyndon, 2014; Welsh, Flanagan, & Ebright, 2010). When patients are transferred from one unit to another,
essential information is often misplaced or lost (Flanagan et al., 2009; Robertson et al., 2014; Shendell-Falik, Feinson, & Mohr, 2007; Smith et al., 2015).

**Technology.** Use of an integrated computerized sign-out system improves communication between healthcare providers, adds value to the plan of care, and enhances provider satisfaction (Baldwin, 1994; Collins et al., 2011; Flanagan, Patterson, Frankel, & Doebbeling, 2009; Sidlow & Sidlow, 2006). Use of technology within electronic health records has been suggested to improve the communication process to facilitate handoff reports (Bello, Quinn, & Horrell, 2011; Chung et al., 2011; Foster-Hunt et al., 2014; Matric, Davidson, & Salamson, 2010; Strople & Ottani, 2006; Stein & Stetson, 2011). The exclusive or nearly exclusive use of an electronic handoff communication tool has proven to be a reliable, efficient, and cost effective way to give report than the traditional verbal handoff (Chung, Davis, Moughrabi, & Gawlinski, 2011; Johnson, Jefferies, & Nicholls, 2011; Nelson & Massey, 2010; Schuster et al., 2014; Wentworth et al., 2012). Conclusions drawn from the literature demonstrates a significant benefit in a decrease of throughput times, increased patient safety outcomes, and continuity of care through the utilization of technology for shift report (Brebner et al., 2011; Sayah et al., 2014)

**Cost.** Communication breakdown in many hospitals across the United States result in millions of dollars of lost revenue. A study conducted by Agarwal (2010), quantifies the economic impact of communication breakdown. His research team found that over twelve billion dollars are lost annually by in hospital across the United States because of poor communication among health care providers. In addition, his research found that a 500-bed hospital may lose four million dollars annually as a consequence of
communication inefficiencies. The end result of poor communication among healthcare providers is substantial with billions of dollars wasted because of communication inefficiencies among health care providers (Agarwal et al., 2010). The use of standardized no delay handoff report in the emergency department can increase efficiency, decreases wait times, and improves patient satisfaction (Baker & Esbenshade, 2015; Brown-Lazzara, 2004). The use of a structured reporting tool decreases the usual phone call interruptions between units. As a result, nurses providing care to their patients are afforded more of the time needed to tend to their patients. In addition, it improves operating efficiencies, reduces the costs related to diversion, and boarding of patients who leave the emergency department without being seen (Baker & Esbenshade, 2015; Brown-Lazzara, 2004; Castillo et al., 2010). The use of process improvement theories such as the Lean Six Sigma or the Iowa Model of Evidenced Based Practice to improve quality care can significantly decreased door to wait time from emergency room to inpatient bed by 73%. The group of patients who leave without being seen by a provider decreased by 29% (Kane et al., 2015; Popovich et al., 2012). Finally, the patient experience will affect hospital reimbursement based on their survey results. In 2012, the Center for Medicare and Medicaid Services (CMS) began the process of withholding a percentage of payments to hospitals by 1%. This percentage is an estimated 850 million dollars (Zusman, 2012).

Satisfaction. The Standardization of handoff reports and computerized sign-out systems have resulted in significant benefits for nurses. Some of the advantages are increase job satisfaction, positive ability to care for patients, pertinent information sharing, and time saving (Bello, Quinn & Horrell, 2011; Chung et al., 2011; Sidlow & Sidlow, 2006).
Integration of clinical handoff Situation, Background, Assessment, Recommendations (SBAR) report through the use of technology provides accurate and concise time saving information. These are assets important to healthcare professionals, because they provide the satisfaction of a more effective and efficient process (Brebner, Sandhu, Addison & Kapadia, 2011; Collins et al., 2011; Mikos, 2007). Conclusions drawn from the literature review conclude that improvement through a standardized process of handoff report can increase patient satisfaction, decrease emergency department wait times to give report and improve process of throughput (Sayah et al., 2014).
METHODS

Design

The research design to be used in this Quality Improvement project was a non-experimental pre and posttest design. The purpose of this QI project was to improve handoff communication between the ED and Inpatient registered nurses (RNs) through the creation of an electronic handoff reporting tool. It was believed that a concise, complete, and timely handoff report will increase patient safety and nursing satisfaction. Furthermore, it was also perceived that this new type of handoff may enhance throughput and decrease cost. In 2015, there were 45-days of diversion. This equaled a total of 1,080 hours lost by the organization to diverted ambulances. Ambulance diversion can result in the loss of millions of dollars of revenue to the institution. The design team adapting the electronic handoff report was comprised of registered nurses, managers, directors, and informatics technicians (IT). There were two nurses from the Emergency Department (ED) and six nurses from all Inpatient units working on this project. In addition, one nurse educator from the Inpatient units and one nurse educator from the Emergency Department took part in the revision of the handoff process. Nursing directors from the acute care setting and their nurse managers also worked on the development of this Quality Improvement (QI) project. Two informatics technicians adapted the electronic program of the handoff report in order for it to be used at UCI. The template for electronic handoff report originated from the New York Presbyterian computerized patient handoff application (Vawdrey, Stein, Fred, Bostwick, & Stetson, 2013). The computerized handoff report was first introduced in March 2008 by New York Presbyterian Hospital (Vawdrey et al., 2013). The handoff report is part of the
Electronic Health Records (EHR) operating system of Sunrise, Allscripts Corp., Chicago, Illinois (Vawdrey et al., 2013). This modified handoff application is called the ED to floor handoff report. At this time, only UCI uses the customized ED to floor handoff report.

There are many things that can be communicated about a patient in a handoff report. In a digital handoff report, communication is very similar. However, an electronic handoff report is more concise than the traditional handoff report, because all the pertinent information about the patient is on one page. For example, one can give patient information about the admitting diagnosis, infection control, pain management, and physical assessment. In this ED to floor report, the nurses were able to give information to each other about what brought the patient to the hospital, their past medical history, a record of when their last pain dosage was given, and if they have influenza symptoms requiring isolation.

All the stakeholders met every second Wednesday for four months to collectively design and develop the best format. The Iowa Model of evidence-based practice was used to guide the team to successfully change the practice of handoff report. Focus groups were held at the institution to clarify issues with care transition. A survey was sent to the emergency department, critical care, and the medical surgical unit nurses. This survey was used as a needs assessment as well as pre-pilot data for the project.

The survey consisted of five questions. “I use a standardized reporting system.” “I feel I have adequate information required to deliver safe patient care.” “I feel I communicate adequate information to deliver safe patient care.” “I feel that our current process for giving/receiving a handoff report is time efficient.” “I am satisfied with the
handoff process.” Five Likert-type scale survey questions were answered in the following format: never, rarely, sometimes, often, and always. A total of 350 responses were received. The results indicated that a mere 26% of respondents who reported being always satisfied with the current handoff report. In contrast, only 23% who felt that it was always efficient. See Figure 2 for survey results. Having the results of the survey before the start of the project validated the need for the implementation of this initiative.

**Sample and Setting**

There are approximately 150 RNs who work in the ED and in the Medical Telemetry unit. All 150 RN’s were invited to participate in this QI project. The data included all admission handoff reports from the ED into the Medical Telemetry unit. The sample was chosen because of convenience and because all admissions from the ED to inpatient units required a handoff process. The QI pilot project took place in a 28-bed Medical Telemetry unit in a non-profit university teaching hospital located in a large urban area. In an average month, approximately 200-patients were admitted from the ED into the Medical Telemetry inpatient unit. The setting for the QI project was a level-one trauma center, tertiary university hospital located in Orange County, California. The hospital has a total of 422-licensed beds. The average monthly volume of the total Inpatient admissions are approximately 1,500 per month. The hospital is staffed with 990 full time RNs.

**Ethical Consideration**

Prior to starting the Quality Improvement (QI) project, the approval from the Institutional Review Board (IRB) was requested from the University of California, Irvine (UCI) IRB and the California State University, Los Angeles (CSULA) IRB. It was
anticipated that this quality improvement project would involve human subjects. However, all the data was aggregated and de-identified. As a result of the above, an exempt status was received from both UCI and CSULA. A letter specifying the exemption status approval is attached in the appendix A for reference.

**Instruments**

Two surveys were used to collect patient and nursing satisfaction. The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) was used to measure patient satisfaction. The HCAHPS survey is a national survey administered to a large percentage of patients that have been discharged from the inpatient units. Press Ganey is the outside vendor that the organization uses to administer and collect data results. The author filtered the reports based on the time frame of the pilot. The HCAHPS survey was developed by the Center for Medicare and Medicaid Services (CMS) in partnership with the Agency for Healthcare Research and Quality (AHRQ) (Centers for Medicare & Medicaid, 2003). The HCAHPS survey was determined to be valid and reliable. Psychometric testing during an intensive pilot study conducted across three states from December 2002 to January 2003. Reported results demonstrated that the instrument had a reliability of 0.74 (Centers for Medicare and Medicaid, 2003).

The nursing satisfaction survey was used to collect post pilot nurse satisfaction. This survey contained the identical five questions found in the pre-handoff satisfaction survey. The survey was delivered via Survey Monkey to all clinical staff in the ED and Medical Telemetry unit who participated in the pilot. The survey had specific questions directed towards staff perception of current process for safe and effective handoff.
Diversion times were collected and analyzed monthly by the data analyst in the Emergency Department. This information is used to identify delays in Throughput and process improvement of patient flow through the Emergency Department.

**Intervention and Data Collection**

The first step of the intervention process began with the use of the Iowa Model of evidence-based practice to promote excellence in the health care framework. Then, an inter-professional team was created. The team consisted of frontline nurses, educators, administrators, and technicians. The team met to identify practice issues surrounding the current handoff process. Pre-survey data results were reviewed. Scheduled meetings between the focus groups took place every second Wednesday over a period of four months. During these meetings, the creation of the electronic handoff reporting tool took place. In-service education was administered to all Emergency Department RN’s and Medical Telemetry RN’s on the new electronic handoff report was conducted by the medical telemetry nurse manager and the emergency department supervisor. A three-month pilot was conducted between the ED and Medical Telemetry unit. This pilot took place from August 1st, 2016 until November 1st, 2016. The data collection began when the ED to Floor handoff report was implemented.

**Data Analysis and Reporting**

For the data analysis, non-parametric Mann-Whitney U tests and Sample T-tests were used to compare the pre and post implementation data of the Quality Improvement project. The parameters analyzed was as follows: (1) hospital nursing satisfaction pre and post-survey results; (2) Press Ganey (HCAHPS) Patient Satisfaction nursing
communication and recommend the hospital; (3) Emergency department diversion rates pre and post-pilot; SPSS version 22 was used for this analysis.
RESULTS

The purpose of this pilot was to implement a standardized electronic handoff reporting tool to be used between the Emergency Department and Inpatient units. Feedback from focus group discussions on current handoff process provided evidence to support the need to have a concise communication handoff tool to be used between the Emergency and Inpatient units. The team identified an opportunity to pilot a practice change in the current handoff process through the use of technology and the Iowa model. Three months of data Survey results in the format of nursing and patient satisfaction were analyzed. In addition, the author reported comparisons of ambulance diversion times from 2015 and 2016. Years of experience between the Emergency Department and Medical Telemetry nurses were compared using a Chi-Square Test of Independence. Nursing satisfaction pre and post-pilot were compared using a Mann-Whitney U tests. Patient satisfaction and diversion rates were also compared using Independent Sample T-tests. The attached tables and figures display the results from this pilot improvement initiative.

Experience

Years of experience were collected from participating RN’s and examined by setting (Emergency Room vs. Medical Telemetry; See Table 3). A Chi-Square Test of Independence revealed a statistically significant association between years of experience and setting ($\chi^2(5) = 22.56, p < .001$), with examination of Standardized Residuals revealing that Medical Telemetry RNs were significantly less likely to be in the lowest experience category (0-5 years’ experience). Forty-nine percent of the Emergency Department nurses had less than five years of experience. The results of this analysis was
significant, because the level of nursing knowledge by years of experience can influence what information is considered important in a handoff report. Having a standardized, electronic template that gathers together all pertinent data automatically can help the novice nurse transmit critical information more effectively than with a traditional verbal report. Often times, verbal report can miss key information such as isolation status, level of care, and management plan.

Table 3

*Summary of participating RNs’ experience (n = 152)*

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>Emergency Room RNs</th>
<th>Medical Telemetry RNs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>52 (49.5%)</td>
<td>7 (14.9%)</td>
</tr>
<tr>
<td>6-10</td>
<td>21 (20.0%)</td>
<td>17 (36.2%)</td>
</tr>
<tr>
<td>11-15</td>
<td>15 (14.3%)</td>
<td>13 (27.7%)</td>
</tr>
<tr>
<td>16-20</td>
<td>6 (5.7%)</td>
<td>8 (17.0%)</td>
</tr>
<tr>
<td>21-25</td>
<td>6 (5.7%)</td>
<td>1 (2.1%)</td>
</tr>
<tr>
<td>&gt;25</td>
<td>5 (4.8%)</td>
<td>1 (2.1%)</td>
</tr>
</tbody>
</table>

*Satisfaction with the Electronic Handoff Tool*

Because the satisfaction survey measured outcomes is on an ordinal scale, a series of Mann-Whitney U tests were conducted to compare participating clinical staff members’ scores before and after implementation of the electronic handoff tool. These tests were conducted in order to determine the impact of the novel electronic handoff tool on five metrics:
1. Ability to adequately communicate information during handoff
2. Adequacy of information available at handoff
3. Frequency of use of a standardized handoff reporting system
4. Time efficiency of handoffs
5. Satisfaction with handoffs

As shown in Table 4, participating staff reported no change in three of the measures: their own use of a standardized reporting system, the adequacy of the information that they received at handoffs, and their ability to communicate information to others during handoff.

Table 4

*Summary of Mann-Whitney U Tests (n = 426)*

<table>
<thead>
<tr>
<th></th>
<th>Median Score</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>U</td>
<td>z</td>
<td>p</td>
</tr>
<tr>
<td>Ability to communicate information at handoff</td>
<td>5.0</td>
<td>5.0</td>
<td>12650.00</td>
<td>-0.81</td>
<td>.42</td>
</tr>
<tr>
<td>Adequate information at handoff</td>
<td>4.0</td>
<td>4.0</td>
<td>12356.00</td>
<td>-1.07</td>
<td>.28</td>
</tr>
<tr>
<td>Use of standardized reporting system</td>
<td>5.0</td>
<td>5.0</td>
<td>12948.50</td>
<td>-0.41</td>
<td>.69</td>
</tr>
<tr>
<td>Time efficiency of handoffs</td>
<td>4.0</td>
<td>5.0</td>
<td>8602.00</td>
<td>-5.05</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Satisfaction with handoffs</td>
<td>4.0</td>
<td>5.0</td>
<td>9653.00</td>
<td>-3.93</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

It is worth noting that strong ceiling effects were observed on all three questions at baseline, leaving little room for improvement at posttest, with 97.7% of respondents reporting that they often or always communicate adequate information during patient handoffs (see Figure 2).
Figure 2. Agreement with the statement: “I communicate adequate information during handoff to deliver safe patient care.”

91.7% report that they often or always received adequate information during handoff (see Figure 3).
Figure 3. Agreement with the statement: “I have adequate information during handoff required to deliver safe patient care.”

83.4% report that they often or always used a standardized handoff reporting system (see Figure 4).
In all three cases, baseline median scores were 5 ("Always"), the maximum score on the scale, leaving no room for improved scores at post-test.

Interestingly, statistically significant changes in scores were observed for both the efficiency of handoffs and overall satisfaction (see Table 4) with median scores on both items moving from 4 ("Often") at pre-test to 5 ("Always") at post-test. Figures 5 and 6 further illustrate this increase of scores at post-test, with the percentage of respondents marking 5 ("Always") more than doubling at post-test for both questions.

Figure 4.
Agreement with the statement: “I use a standardized handoff reporting system.”
### Table 4

**Summary of Mann-Whitney U Tests (n = 426)**

<table>
<thead>
<tr>
<th></th>
<th>Median Score</th>
<th>Pre</th>
<th>Post</th>
<th>U</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to communicate info at handoff</td>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>12650.00</td>
<td>-0.81</td>
<td>.42</td>
</tr>
<tr>
<td>Adequate info at handoff</td>
<td></td>
<td>4.0</td>
<td>4.0</td>
<td>12356.00</td>
<td>-1.07</td>
<td>.28</td>
</tr>
<tr>
<td>Use of standardized system</td>
<td></td>
<td>5.0</td>
<td>5.0</td>
<td>12948.50</td>
<td>-0.41</td>
<td>.69</td>
</tr>
<tr>
<td>Time efficiency of handoffs</td>
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<td>4.0</td>
<td>5.0</td>
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<td>-5.05</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Satisfaction with handoffs</td>
<td></td>
<td>4.0</td>
<td>5.0</td>
<td>9653.00</td>
<td>-3.93</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Figure 5. Agreement with the statement: “The current process for giving/receiving a handoff report is time efficient.”*
Altogether, this data suggested that while the participating Emergency Department and Medical Telemetry unit clinical staff rated their use of standardized reporting and their ability to communicate with one another very highly at both pre-test and post-test, implementation of the new electronic handoff tool made handoffs faster. Furthermore, the electronic report led to higher satisfaction in the handoff process.

**Satisfaction with the Electronic Handoff Trial**

In addition to the pre- and post-test data collected, participating staff members were also asked to rate their experience with the Electronic Handoff Trial on a scale from 1 (Poor) to 5 (Excellent). The resulting overall data are depicted in Figure 7, and largely
reaffirm the significant increase observed in participant’s satisfaction with the handoff process from pre to post-test. As shown below, approximately ¾ of the participants rated the Electronic Handoff Trial positively (Excellent, Very Good, or Good) while ¼ of the participants rated it negatively (Fair to Poor).

![Figure 7. Overall rating of the Electronic Handoff Trial](image)

Additionally, respondents also provided written feedback about their experiences with the Electronic Handoff Trial, which yielded useful information for ongoing program improvement. A thematic analysis of respondents’ positive and negative feedback produced a total of eight themes summarized in Table 5.
Table 5

Emergent themes regarding participants’ positive and negative experience with the Electronic Handoff Trial (*n* = 105)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Exemplar Quote*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive</strong></td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>Saves time on lengthy phone reports. It helps to be able to look over report before patient arrives and a call back number for verbal questions. Awesome! Helps minimize delays, cannot wait for whole hospital to adapt new process.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Information is concise and accurate with the important data needed. Important information such as pain meds and vital signs are carried over easily. Really like having the name and direct call back number of the RN in the Emergency Department.</td>
</tr>
<tr>
<td>Convenience</td>
<td>Love it! All documents are easily transferred and clearly visible. The electronic handoff report makes it very easy to give report. There is no waiting time for the nurse to call.</td>
</tr>
<tr>
<td>Timeliness</td>
<td>Saves time, improves throughput, and reduces down time. The electronic handoff report makes it quick to deliver a handoff without delaying patient wait times in the ED, crucial to preventing diversion.</td>
</tr>
<tr>
<td>Challenge of Transitions</td>
<td>People might have a hard time adjusting to this, but all new things takes time to get <em>accustomed</em> to, just like when charting became electronic. Please do not discontinue something so effective especially if all the other nurses on different units haven’t had a chance to try this out yet.</td>
</tr>
<tr>
<td><strong>Negative</strong></td>
<td></td>
</tr>
<tr>
<td>Incomplete</td>
<td>Not tons of information provided on form. Some of the assessment information was marked with dashes and not aware that the double dashed meant “not applicable.”</td>
</tr>
<tr>
<td>Technological Challenges</td>
<td>Limitations with current software. Looking forward to transitioning to a newer Electronic Health Record.</td>
</tr>
<tr>
<td>Length of Report</td>
<td>Template of Electronic Handoff report becomes longer than one page when the ED nurses include all of the history and physical. Not necessary to include this information since we can look it up.</td>
</tr>
</tbody>
</table>

* Bolding added by the author for emphasis
Review of the qualitative data listed in Table 3 identified many strengths such as efficiency, accuracy, convenience, and timeliness. Over 41.9% of the nurses surveyed rated the handoff report as excellent. Multiple comments by the nurses expressed satisfaction of the efficiency in utilizing the electronic report. Having a tool to help facilitate the transfer of patients out of the Emergency Department to the required level of care was also described by the nurses as crucial. The convenience of reading pertinent information located within the EHR was extremely helpful. Finally, having an accurate report with a name and call back number to the primary RN facilitated accurate transmission of information.

Notwithstanding, there remains opportunities for process improvement. Some of the problems encountered with the electronic handoff report are incomplete information, limited technology, and an excess of irrelevant information. On some occasions, important information such as the nurses call back number was missing. The current software often times does not interact with other software already in use for patient data. On occasion, some of the information gathered by the ED RNs contains an excessive amount of data irrelative to the patient’s care. These comments indicate a need for ongoing review and improvement of the handoff tool. The feedback provided by the pilot will be used to better guarantee that complete information is always provided. The feedback will be used to schedule consistent follow-up meetings with Informatics. These meetings will bring to the table improvement ideas to the software. The use of peer review to remind ED nurses to limit handoff information to one page will increase satisfaction with the handoff process, because they will not have to read excessive
amounts of pages. Regular in-services conducted by the nurse educators will help new nurses with the correct use the handoff report.

**Patient satisfaction (HCAHPS)**

In order to examine the effect of the electronic handoff tool’s implementation on patient satisfaction, patient rating on two items from the HCAHPS (overall satisfaction with nurses and likelihood to recommend the hospital) were compared from pre-test to post-test. As summarized in Table 6, statistically significant improvements in ratings of both nurses overall and likelihood to recommend were observed at post-test.

A ten-percent increase in patient satisfaction was achieved after the implementation of the pilot. Patient experience is tied to the hospital’s financial reimbursement. The Emergency Department has not experienced this financial requirement. However, it is projected to affect them in the foreseeable future.

Table 6

Summary of Independent Samples T-test Comparisons of Patient Satisfaction ($n = 123$)

<table>
<thead>
<tr>
<th></th>
<th>M (SD)</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses</td>
<td>76.8 (29.6)</td>
<td>83.7 (22.9)</td>
<td>-1.94</td>
<td>198.8</td>
</tr>
<tr>
<td>Recommend Hospital</td>
<td>70.3 (36.7)</td>
<td>80.3 (34.1)</td>
<td>-2.02</td>
<td>199.8</td>
</tr>
</tbody>
</table>

**ED Diversion Times**

In order to determine whether diversion times improved after implementation of the new electronic handoff tool, times recorded from August-November 2015 (pre-implementation) were compared to times recorded from August-November 2016 (post-implementation). Data was examined separately for ED, Trauma, and for ED and
Trauma combined. As shown in Table 7, no statistically significant changes in diversion times from pre-implementation to post-implementation were observed.

Table 7

Summary of Independent Samples T-test Comparisons of Diversion Time ($n = 114-519$)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>101.17 (32.38)</td>
<td>97.50 (37.54)</td>
<td>1.03</td>
<td>333.3*</td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>58.31 (59.51)</td>
<td>74.07 (87.27)</td>
<td>1.07</td>
<td>72.9*</td>
<td>.29</td>
<td></td>
</tr>
<tr>
<td>ED + Trauma</td>
<td>91.52 (43.83)</td>
<td>92.53 (52.80)</td>
<td>-0.24</td>
<td>517</td>
<td>.81</td>
<td></td>
</tr>
</tbody>
</table>

* The assumption of equality of variances was violated, so df were adjusted to compensate

Although no significant improvement was noted in ambulance diversion times, enough data was collected. This information can help with future research on barriers to diversion and throughput.
DISCUSSION

Implementation of the electronic handoff report and the use of technology was a significant milestone to improving the handoff process. The purpose of this doctoral project was to evaluate patient and nursing satisfaction. The aim of the proposed process was to have a concise communication tool. This handoff tool was modified with the help of the Informatics team and the current Electronic Health Record (EHR) system. The template was adapted to capture all pertinent information such as physical assessment, vital signs, and pain scores. Such information is uploaded automatically into the handoff report when the request for review is activated by the user. In order to limit the data to one page, only the most pertinent information documented by the ED staff is uploaded into the handoff report. An important feedback noted early on in the pilot was that the “patient’s story” was missing. The handoff team decided that the best solution was to ask the ED RNs to cut and paste the most relevant part of the history and physical from the ED assessment section of the EHR. Then, the author asked them to copy the information and paste it into the first section of the handoff report. This intervention helped to resolve the issue. Double dashes were used in the electronic handoff report to indicate “not applicable.” The ED RNs conduct a focus assessment and will not chart on systems not assessed. It took some time for the Medical Telemetry nurses to get used to viewing this method of assessment, because this approach did not offer them a complete picture of the patient’s assessment. For example, ED nurses commonly assess and chart on the chief complaint when they are documenting in the EHR. After the handoff report is reviewed, the inpatient RN has the option of calling the ED RN for additional information. Follow up phone calls were instrumental for meeting the regulatory
requirements. These phone calls provided supplemented information about the patient’s status. The ED RN can now send an electronic report for review. The receiving RN must respond within 15-minute in order to clarify any questions they may have about the electronic report. This new and improved system of reporting eliminates the inconvenience of having to call the receiving RN multiple times unsuccessfully. As a result, efficiency and nursing satisfaction was considerably improved.

Demographic data for years of nursing experience indicated that 49.5% of the ED RNs have a maximum of five years of experience. In contrast, Medical Telemetry Nurses with less than five year of experience are 14.9%. Therefore, the electronic handoff report considerably helps nurses with less experience by providing them with a standardized method of reporting. By requiring a phone conference within 15-minutes, it also teaches the novice nurse to develop accurate and timely habits of reporting.

Patient satisfaction was measured through the HCAHPS national survey tool. An increase by 10 % for recommend the hospital and overall satisfaction with nursing was shown to be significant with a $p < .05$. Hospital reimbursement is tied to patient experience. Having a standardized electronic handoff report contributes to patient experience, because patients tend to feel that the institution is well organized, modern, and professional. In addition, patients believed that they had a higher level of care, because nurses spent more time tending to their medical needs. This extra time was afforded to the nurse thanks to the streamlining qualities of the electronic handoff report.

Diversion times did not change from the three month sample in 2015 to the pilot three month sample in 2016. It is difficult to determine from this short pilot if the efforts of a “no-delay” handoff will improve over time. Availability of acute hospital beds with
high daily census may contribute to delays in throughput. Future studies are required to validate the electronic handoff tool in regards to diversion times.
LIMITATIONS

The author identified several limitations in this quality improvement pilot. The first factor identified was a strong chance for social desirability bias from the surveyed nurses. This was specific for the first three questions of the nursing satisfaction survey:

1. Ability to adequately communicate information during handoff
2. Adequacy of information available at handoff
3. Frequency of use of a standardized handoff reporting system.

Even though the survey had been designed to be anonymous, it was unable to determine whether or not participants believed the survey was indeed anonymous. It was very likely that the participants were influenced by social desirability bias. This may have been the case even on anonymous surveys. In other words, not many nurses would say that they “Never” or “Rarely” reported adequate information during a handoff in order to deliver safe patient care. Since all the results of the first three graphs in the nursing satisfaction survey presented non-significant findings, a ceiling effect could have occurred leaving no room for improvement. Scores for the first three survey questions were very high at pretest. As a result, documenting an increase in scores by posttest was not permissible. Consultation with a statistician was crucial for the author in identifying alternative methodological ways used in order measure or control for social desirability. The statistician suggested the above mentioned alternatives as opportunities for future research in order to control social bias.

A second limitation to consider was the scale used for the nursing satisfaction survey questions. The author feels that the survey questions would be best used to capture variance in behavior if the response options were expanded (ex: most Likert
scales range from 1-7 however, could be expanded even further to something like a 100-point scale). Also, switching the response options to a Likert scale or a truly numeric scale would allow future researchers to run parametric tests (t-tests) rather than non-parametric tests (Mann-Whitney U tests). This adjustment to the scale can greatly increase statistical power and should be consideration with future pilot projects.

A third limitation affecting diversion times was the challenge of throughput and bed availability. Throughput is a multifaceted issue affecting hospitals diversion rates nationally. Complex discharge issues such as limited social support, lack of transitional care infrastructure, and late consultations have been identified as barriers to the discharge process. There is a priority mandate from executive leadership for an interdisciplinary effort to collectively work on these above mentioned endemic issues. Although the introduction of a “no-delay” electronic handoff reporting tool was limited in its effort to improve throughput and decrease diversion rates, future pilots that incorporate multidimensional interventions affecting throughput and ambulance diversion are recommendable.

Lastly, patient safety was not a direct outcome measured during this quality improvement pilot, because of the limited time available to complete this project. Notwithstanding, a future pilot that will examine incident reports related to patient flow and isolation status and its relationship with the new electronic handoff reporting tool is strongly recommended.
CONCLUSION

The results of this pilot indicated overall positive results in nursing and patient satisfaction. The outcomes of the data analysis were applied, and it was determined that the electronic handoff report should be implemented between the Emergency Department and all remaining Inpatient units within the institution. Although ambulance diversion times did not show a significant timing improvement, further data gathering is suggested in order to determine if an electronic handoff report could benefit the throughput process. Incident reports related to patient safety were not presented during this Quality Initiative project. Future studies are needed to confirm if an electronic handoff report may improve quality and patient safety. Prospective pilots should be considered in order to evaluate the impact of the newly designed electronic report processes on diversion rates, throughput times, and patient safety.

Through the use of a quality improvement evidence based nursing framework such as the Iowa Model, implementation of an electronic handoff report was determined to be viable and recommendable. The use of the Iowa Model can also be extremely helpful when considering to make a practice change. The benefits of the use of this technology in handoff reporting resulted in a notable increase in nursing and patient satisfaction.
REFERENCES


APPENDIX A
IRB APPROVAL LETTER

Office Memorandum

DATE: September 6, 2018
TO: Angola Hudson, PhD
FROM: California State University, Los Angeles (Cal State LA) IRB
PROJECT TITLE: [IRB0177-1] Implementation of an Electronic Handoff Reporting Tool
REFERENCE #: 15-193W
SUBMISSION TYPE: New Project
ACTION: DETERMINATION OF NOT RESEARCH
DECISION DATE: September 6, 2018

Thank you for your submission of New Project materials for this project. The California State University, Los Angeles (Cal State LA) IRB has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact Elia Amaro at irbst@calstatela.edu or irb@calstatela.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within California State University, Los Angeles (Cal State LA) IRB's records.

-1-
The UC Irvine IRB is required to review and approve all research involving human subjects. If an individual has questions about whether an activity is human research, please review the Activities that Require IRB Review web page. In addition, this form is intended to help you determine if your project requires IRB approval. If you require written documentation from the IRB Office, complete the entire form, and email the signed form and any relevant supporting documents (i.e., grant, protocol, consent forms) to the HRP staff at IRB@research.uci.edu. You should receive a response within 10 business days.

### SECTION 1:
Determining whether an activity is human subjects research per DHHS Regulations

(Parta A and B below)

#### PART A: DETERMINATION OF "RESEARCH"

**45 CFR 46.102(d):** Research - a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.

A systematic approach involves a predetermined system, method or a plan for studying a specific topic, answering a specific question, testing a specific hypothesis, or developing theory. A systematic approach includes the collection of information and/or biospecimens, and analysis either quantitative or qualitative.

Activities designed to develop or contribute to generalizable knowledge are those activities designed to draw general conclusions, inform policy, or generalize outcomes beyond the specific group, entity, or institution (i.e., to elaborate, to be an important factor in identifying or expanding truths, facts, information that are universally applicable).

1. **Does the proposed activity involve a systematic approach?**
   - ☑ YES
   - ☐ NO

2. **Is the intent of the proposed activity to develop or contribute to generalizable knowledge?**
   - ☑ YES
   - ☐ NO

*If YES to both 1 & 2, the activity constitutes research.

#### PART B: DETERMINATION OF "HUMAN SUBJECT"

**45 CFR 46.102(f):** Human subject - a living individual about whom an investigator (whether faculty, student, or staff) conducting research obtains: (1) data through intervention or interaction with the individual; or (2) identifiable private information.

- **Intervention** includes both physical procedures by which information is gathered (for example, venipuncture) and manipulations of the subject or the subject’s environment that are performed for research purposes.

- **Interaction** includes communication or interpersonal contact between investigator and subject.

- **Private information** includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record information). Private information must be individually identifiable.

- **Identifiable** is where the identity of the subject is or may be ascertained by the researcher, or will be associated with the information. The research could involve the use of coded data/specimens.

- **Coded** means a living individual's identifiable information such as name or social security number has
Use the definitions above to answer the following questions.

1. Does the activity involve obtaining information about living individuals through intervention or interaction with the individuals?
   - Yes* ✓ No □

   *If YES to #1, the activity involves human subjects.

2. If NO to #1, does the activity involve obtaining protected health information (PHI) about deceased individuals?
   - Yes* ✓ No □ N/A

   *If YES, the following must be true:
     1) The use or disclosure is solely for research on the PHI of decedents; and
     2) The PHI is necessary for research purposes.
     3) If requested by the covered entity (UCI), the Lead Researcher will be required to provide documentation of the death of the individual(s).

3. Does the activity involve obtaining identifiable and private information about living individuals?
   - Yes* ✓ No □

   *If YES to #3, the activity involves human subjects.

4. Does the activity involve the use of coded private information/specimens?
   - Yes* ✓ No □

5. If YES to #4, the investigator(s) cannot readily ascertain the identity of the individual(s) to whom the coded private information/specimens pertain because:
   a. The holder of the key and investigator enter into an agreement prohibiting the release of the key to the investigator under any circumstances, until the individuals are deceased. Provide a copy of this agreement (an informal email exchange is sufficient). OR
      - Yes* ✓ No □
   b. The investigator has documentation of written policies and operating procedures from a repository or data management center that prohibits the release of the key to the investigators under any circumstances, until the individuals are deceased. Provide documentation of the written policies and operating procedures. OR
      - Yes* ✓ No □
   c. There are other legal requirements prohibiting the release of the key to the investigators, until the individuals are deceased. Provide documentation of the legal requirements.
      - Yes* ✓ No □

   *If YES to 4, and NO to 5a, 5b, or 5c the activity involves human subjects.

6. Were the information/specimens previously collected (or yet to be collected) specifically for the currently proposed project?
   - Yes ✓ No □ N/A

---

**SECTION 2:**

Determining whether the activity is clinical investigation per FDA Regulations (Part C below)

**PART C: DETERMINATION OF "HUMAN SUBJECT"**
21 CFR 50.3(a): Human subject - an individual who is or becomes a participant in research, either as a recipient of the test article or as a control. A subject may be either a healthy human or a patient.

Use the definition above to answer the following questions.

1. Does the activity involve human subjects as defined by FDA regulations?
   a. An individual will be a recipient of any test article (i.e., drug, biologic, or medical device) or as a control.
      □ YES*  ☒ NO
      *If YES to #1a, the activity involves human subjects.
   b. An individual on whose specimen* a medical device will be used (21 CFR 812.3(p)) (i.e., In vitro diagnostic** device)
      □ YES*  ☒ NO
      **If YES to #1b, the activity involves human subjects.

Note: The FDA regulations (21 CFR Parts 50 and 56) apply to all clinical investigations regulated by FDA, as well as other clinical investigations that support applications for research or marketing permits. Therefore, all studies of investigational IVDs that will support applications to FDA are subject to 21 CFR Parts 50 and 56, even if they are not subject to most requirements of 21 CFR Part 812. For more information see the FDA Guidance on In Vitro Diagnostic Device Studies - FAQs.

* Specimen – including use of leftover specimens that are not individually identifiable (e.g., a remnant of a human specimen collected for routine clinical care or analysis that would otherwise have been discarded).
** In vitro diagnostic products are those reagents, instruments, and systems intended for use in the diagnosis of disease or other conditions, including a determination of the state of health, in order to cure, mitigate, treat, or prevent disease or its sequelae.

SECTION 3: FUNDING

1. Will the activities be supported by Federal funding (e.g., NIH, NSF, DoE, DoD) that is awarded directly to UCI?
   □ YES*  ☒ NO
   *If YES to #1, provide a copy of the Human Subjects portion of the grant.

2. FUNDING SOURCE:
   □ Grant/Subaward (provide details below)
   □ Contract/Subcontract (provide details below)
   ☒ Department or campus funds (includes department support, unrestricted funds, start-up funds, personal funds, campus program awards, etc.)
   □ Non-cash support from manufacturer/sponsor (e.g., free drug, device, research materials)
   □ Subject/subject's insurance/third party payer
   □ Student project that will incur no costs

Sponsor Name(s): <Type Here>
SPA Proposal #: <Type Here>  Prime Awardee(s): <Type Here>

NOTE: If UCI is the prime recipient of a Federal award (e.g., NIH, NSF, DoE, and DoD) through a grant, contract, or cooperative agreement, however a non-UCI entity will carry out the non-exempt human subject research activities, CHRP considers UCI engaged in human subjects research and UCI IRB Approval is required.
SECTION 4: HUMAN SUBJECTS RESEARCH DETERMINATION

If the proposed activity does not meet the definition of human subjects research you are not required to submit this form. If you require a written determination, submit this completed form as follows:

From the lead researcher’s UCI email address, send the form to IRB@research.uci.edu. If the lead researcher is a student, a faculty sponsor is required; she must be included on the email submission. Alternatively, you may send a copy by campus mail to the UCI HRP, Office of Research, 5171 California, Suite 150, Zot Code 7600. For questions contact the HRP staff at IRB@research.uci.edu.

SECTION 5: CONTACT INFORMATION

1. UCI LEAD RESEARCHER (LR): Angelica Ahonen

2. LR DEPARTMENT: Medical Telemetry Tower 3

3. LR PHONE NUMBER: 714-456-6580

4. LR E-MAIL ADDRESS: aahonen@uci.edu

5. UCI FACULTY SPONSOR (FS – if required):

6. FS PHONE NUMBER:

7. FS E-MAIL ADDRESS:

8. ADMINISTRATIVE CONTACT (AC – if applicable):

9. AC PHONE NUMBER:

10. AC E-MAIL ADDRESS:

11. ACTIVITY TITLE (if applicable):

12. CATEGORY OF ACTIVITY:
   • Purpose/Aim is Social Behavioral.
   • Purpose/Aim is Biomedical.

SECTION 6: ACTIVITY INFORMATION

1. Describe the purpose of the proposed activity.
   The purpose of project is to develop and implement a standardized electronic handoff tool that will be used between the emergency department and Medical Telemetry Tower 3. By using a standardized electronic handoff tool this should decrease patient wait time and increase nursing and patient satisfaction with admission process.

2. Provide a brief description of the procedures.
   • Commencement of the project will begin once approval from the IRB is granted from UCI IRB and CSULA IRB
   • Principle analyst will provide the author de-identified throughput times for patients admitted from the Emergency Department (ED) to Tower 3 for the following:
     o September 2015 through December 2015
     o September 2016 through December 2016
   • Development of tool, review of de-identified data regarding:
     o Throughput time (ED to inpatient tower 3)
     o Aggregated data from HCAHPS and AHRQ surveys
     o Data from anonymous RN survey
   • A report of aggregated data will be presented to the medical center stakeholders and the author’s committee. Recommendations to use electronic handoff tool in other inpatient units to decrease wait time and increase nurse and patient satisfaction.

3. Describe the subject population, or the type of information/specimens to be studied.
   • Type of information to be studied are the times from emergency room to inpatient
4. Were the information/specimens originally collected solely for research purposes?
   - YES
   - NO
   - N/A

   *If YES to #4, the UCI IRB may request a copy of the IRB Approval Letter and Consent Form from the original study. This documentation will be reviewed to confirm that use of the information/specimens conforms to the informed consent form.

5. Explain where the information/specimens were collected/obtained (i.e. identify source of data/specimens). The throughput times will be provided to author as de-identified data by a principle analyst, who is on the throughput initiative project (TIP). The author will obtain anonymous RN satisfaction data from survey via survey monkey and aggregated data from HCAHPS (patient satisfaction) and AHRQ (nursing quality and safety) surveys.
   - Not Applicable – Activity does not involve the use of data/specimens.
   - UCIMC Pathology – UCI IRB Approved Pathology Research Bio-repository will be used.
   - UCIMC Medical Records – Identify the access point(s) below (e.g. QUEST, CoPath, OnCore, etc.).

   AND/OR

   The principle analyst obtains times using medical record numbers and encounter numbers. Report provided to author is de-identified and only provides times. There is no coded data on the report. The HCAHPS and AHRQ surveys are aggregated data and the RN survey is anonymous.

6. Explain how the information/specimens will be provided to the investigator (e.g. investigator will ask the UCIMC Medical Records Department to provide de-identified data; the investigator will be provided an already existing, de-identified data set, etc.).

   The principle analyst obtains times using medical record numbers and encounter numbers. Report provided to author is de-identified and only provides times. There is no coded data on the report. The HCAHPS and AHRQ surveys are aggregated data and the RN survey is anonymous.

7. Submit the survey or questions that will ask of individuals, if applicable. (Note: The proposed activity must meet the definition of research).

   See attachment

8. Provide a separate list of the data points, variables, and/or other information that will be collected and/or analyzed (i.e. data abstraction form).

   All information provided to the author will be de-identified.

   OR N/A

   Notes:
   - Access is limited to the items included in the list. The HRP must be notified if any additions to the list.
   - The list will be reviewed to confirm that no private identifiable information (i.e. PHI identifiers) will be obtained. If the list includes any private identifiable information, the activity involves human subjects.

9. If the activity involves collection of information from internet sources, please review the internet site’s privacy statement. The internet site may prohibit use of their information or may require their written permission prior to use. Provide a copy of the privacy statement.

   OR N/A

SECTION 7: LEAD RESEARCHER & FACULTY SPONSOR SIGNATURE(S)
(required only if hard copy submitted to HRP Office)
Lead Researcher’s Signature       June 30, 2016  
                Date

Faculty Sponsor’s Signature (if applicable)  
                Date

| SECTION 8: UCI DETERMINATION OF HUMAN SUBJECTS RESEARCH |
| FOR HRP STAFF AND IRB ONLY – researchers do not complete this section. |
| □ The proposed activity as described DOES NOT constitute human subjects research. IRB review is not required. This determination only applies to the activities described in this request. If there are any changes that may alter this determination the investigator may request another written determination. |
| □ The proposed activity as described constitutes human subjects research. Submission of an IRB Application IS REQUIRED. IRB Approval must be obtained before the research can begin. Please complete and submit an IRB Application with the appropriate protocol narrative. All forms are available on the Applications & Forms web page under IRB forms. If you have questions or need additional guidance on the IRB submission process, please contact HRP staff for guidance at irb@research.uci.edu. |

[Signature]  
9/14/16  
Date

HRP Staff/IRB Chair
APPENDIX B

PERMISSION TO USE IOWA MODEL

From: Kimberly Jordan - University of Iowa Hospitals and Clinics
Sent: Sunday, February 28, 2016 12:41 PM
To: Ahonen, Angelica
Subject: Permission to Use and/or Reproduce The Iowa Model (2015)

You have permission, as requested today, to review/use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (The Iowa Model Collaborative. (In review). The Iowa Model Revised: Development and Validation.) Click the link below to open the model.

Copyright of The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care will be retained by The University of Iowa Hospitals and Clinics.

Permission is not granted for placing the Iowa Model on the internet.

The Iowa Model - 2015

In written material, please add the following statement:

- Used/Reprinted with permission from the University of Iowa Hospitals and Clinics. Copyright 2015. For permission to use or reproduce the model, please contact the University of Iowa Hospitals and Clinics at (319)384-9098.

If you have questions, please contact Kimberly Jordan at 319-384-9098 or kimberly-jordan@uiowa.edu.
APPENDIX C
INFORMATIONAL UPDATE

INFORMATIONAL UPDATE
October 21, 2016

Informational Update: 
Electronic Hand-Off from the ED to Acute Care

New ED to Acute Care Hand-off Report

Beginning November 1, we will adopt a safer & more efficient ED Hand-off report. Analysis of current system of all verbal report revealed inconsistencies, lack of timely communication and dissatisfaction from both the ED and acute care nurses.

The hand-off report was created with RN’s, CNS, Managers from Acute Care and the ED, with great IT support. An extensive pilot was completed on Tower 3 with multiple improvements, and further expanded to Tower 3 and Tower 5.

Process:

1. The RN from the ED calls the Nursing Unit PCC and asks them to tell the primary RN to look at the electronic handoff report. The following information will be communicated:
   - The Patient’s name
   - Their medical record number
   - What bed they are going to be admitted to

For example: “This Sherlene in the ED, the electronic report is ready on patient John Doe going to bed 15. His medical record number is 1234567. Please make the primary/admitting RN aware to review the handoff report.” “Call us back within 15 minutes for a verbal follow up report if you have any questions or need clarification.” “The name and phone number of the ED RN is listed in the top left hand corner.”

2. The Primary RN has 15 minutes to call the ED RN for additional verbal questions.
3. The patient is brought up to the IP bed 15 minutes from the time of the ED call that Hand-off is ready.

To Access the Hand-Off Report in QUEST:

For questions, contact Angelica Ahonen 
Project Leader & Tower 3 Nurse Manager
# APPENDIX D

## SAMPLE HANDOFF REPORT

### [SAMPLE REPORT]

**ED To Floor Report Date:** 08/26/2016 16:30

**DEC JANE**

**T30012 Telemetry/Med Surg**

<table>
<thead>
<tr>
<th>General Patient Information</th>
<th>Infection Control</th>
<th>Medications</th>
<th>Physical Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nursing Handoff Narrative</strong></td>
<td><strong>Cough/Respiratory symptoms</strong></td>
<td><strong>IV</strong></td>
<td><strong>Nausea</strong></td>
</tr>
<tr>
<td>Angelica RN call if you have questions, ext: 435-5555</td>
<td>Breathing/Cough. Normal breathing effort</td>
<td>Medicated dose</td>
<td>Mental Status (Adult): Awake; Alert</td>
</tr>
<tr>
<td><strong>Chief Complaint</strong></td>
<td><strong>R/O influenza</strong></td>
<td>IV @ 75 mg</td>
<td>GCS Adult: 15</td>
</tr>
<tr>
<td>Low back and abd pain/unable to eat or drink X 2 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Admitting Diagnosis</strong></td>
<td><strong>Vital Signs</strong></td>
<td><strong>Medication</strong></td>
<td><strong>Center</strong></td>
</tr>
<tr>
<td>Pain</td>
<td>Heart Rate</td>
<td></td>
<td>Heart: Rhythm: semi</td>
</tr>
<tr>
<td><strong>Allergies</strong></td>
<td><strong>WBC</strong></td>
<td>None</td>
<td>Capillary Refill: Less than 2 seconds</td>
</tr>
<tr>
<td>Plastic tape/Rash</td>
<td><strong>BP</strong></td>
<td></td>
<td>Radial Pulse Left: Normal</td>
</tr>
<tr>
<td><strong>Advance Direcitive Status</strong></td>
<td><strong>HR</strong></td>
<td></td>
<td>Radial Pulse Right: Normal</td>
</tr>
<tr>
<td>Yes</td>
<td><strong>RR</strong></td>
<td></td>
<td>Pedal Pulse Left: Normal</td>
</tr>
<tr>
<td><strong>H&amp;P Risk Score</strong></td>
<td><strong>SPO2</strong></td>
<td></td>
<td>Pedal Pulse Right: Normal</td>
</tr>
<tr>
<td>A 1 or more may be at high risk for falls</td>
<td></td>
<td></td>
<td>Skin: Normal Temp: Warm; Jaundiced</td>
</tr>
<tr>
<td><strong>Cardiac Precautions</strong></td>
<td><strong>ICP Monitoring</strong></td>
<td></td>
<td>Respiratory</td>
</tr>
<tr>
<td></td>
<td>Device: --</td>
<td></td>
<td>Airway: Patient</td>
</tr>
<tr>
<td></td>
<td>Location: --</td>
<td></td>
<td>Breathing/Cough: Normal breathing effort</td>
</tr>
<tr>
<td></td>
<td>ICP (mm Hg): --</td>
<td></td>
<td>Breath Sounds Left: Clear on the left</td>
</tr>
<tr>
<td><strong>Spinal Precautions</strong></td>
<td><strong>CPP (mm Hg): --</strong></td>
<td></td>
<td>Breath Sounds Right: Clear on the right</td>
</tr>
<tr>
<td></td>
<td><strong>CVP Monitor</strong></td>
<td></td>
<td>GI</td>
</tr>
<tr>
<td></td>
<td>System: --</td>
<td></td>
<td>Nausea</td>
</tr>
<tr>
<td></td>
<td><strong>SMA Score</strong></td>
<td></td>
<td>GU Assessment: Foley 16 Fr Inserted 08-26-16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Necrosis</strong></td>
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<td></td>
<td></td>
<td></td>
<td><strong>Musculoskeletal</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Gait: Unsteady + Fall Precautions</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Weight Bearing:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Pleural:</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Deformity:</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Circulation/Sensation/Movement:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Skin Integrity/Impairments</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Skin Irritant</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Drug Allergies</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Wound Apperance:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Wound Type:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Wound Location:</strong></td>
</tr>
</tbody>
</table>

**Procedure List:**

- Body Part/Examination: --

**Pain Management**

- Pain Score (numerically): 8
- Interventions: pain medications; Dilaudid/Zofran

**Pain Assessment**

- Abdominal pain
- PCA Orders
- Hydrodynamics
- PCA Instillation [Last dose 01-09-16 @ 08-26-16 16:13]
- Pain Meds
- HYDROdynamics Instillation [Last dose 01-09-16 @ 08-26-16 16:13]
## APPENDIX E

### TABLE OF EVIDENCE

Nursing Hand-off, Patient Safety, and Technology in the Acute Care Setting

<table>
<thead>
<tr>
<th>Purpose (Author, Year)</th>
<th>Design/Key Variables</th>
<th>Sample/ Setting</th>
<th>Measures</th>
<th>Key findings</th>
<th>Author Conclusions</th>
<th>Limitations/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>To evaluate an informatics tool to improve patient handoffs (Flanagan, Patterson, Frankel, &amp; Doebbeling, 2009)</td>
<td>Observational mixed methods DV: resident reports of searching for patient information not contained in PHT. IV: Nine categories coded from the PHT pertaining to physician note along with allergies and code status.</td>
<td>Internal medicine resident completing month long rotations in MICU or IM from Indianapolis VA Medical Center Sample =42 residents 1264 handoff forms were collected and coded. 1216 were generated by the PHT. Sixty-three surveys completed by 35 (83% response rate) residents</td>
<td>Three sources of data collection: 1. 264 PHT forms coded for type of information. 2. 63 end of shift surveys 3. 18 Semi-structured interviews. Descriptive statistics for PHT coding and survey data. GEE methodology used.</td>
<td>PHT captures helpful information. PHT is a reliable method for transferring patient information. A standard electronic form reduces variability in information during handoffs.</td>
<td>Over 90% of PHT included nine of the coded categories and over 70% of the PHT contained the assessment and plan from physician note. 14 out of 63 surveys indicate information not provided in PHT.</td>
<td>Limitations: Participants only from one internal medicine resident program and cannot be generalized to other settings. Provider satisfaction was not evaluated limiting quality of information from EMH transferred into PHT.</td>
</tr>
<tr>
<td>To understand information transfer to improve patient safety and quality of care</td>
<td>Qualitative observational study. Purposive sample of PICU nurses.</td>
<td>Eight week study. Reports were audiotaped and field notes taken and All change of shift handoffs were not identical in detail or structured handoffs can decrease the loss of information in handoffs.</td>
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<td>Limitation of sample size and transferability to non ICU sites.</td>
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<td>care (Foster-Hunt, Parush, Ellis, Thomas &amp; Rashotte, 2014)</td>
<td>40 hand-offs provided a representative sample. Observations included morning and evening change of shift hand off report between incoming and outgoing PICU RNs. IRB approval. All PICU RNs consented to participate.</td>
<td>All participants were female. 14 nurses having three or less years’ experience. 26 nurses had four or more years of experience. PICU of the Children’s Hospital of Eastern Ontario located in Ottawa Ontario Canada.</td>
<td>hand off questionnaires used. Analysis consisted of 3 key phases: Coding structure in handoff. Constructing organization rating scale. Five point scale used to rate handoff organization from 1= not organized to 5 =highly organized</td>
<td>sequence of information. 71% of nurse’s handoffs with less than 3 years’ experience were moderately disorganized to moderately organized. In comparison, 61% rated as organized by RNs with four or more years experienced. Lack of organization may contribute to the perception of missing information by RN receiving report. This perception can have critical implications to patient safety.</td>
<td>Standardization of reports such as with an electronic structured handoff report could reduce information loss during hand off report. Organized information in a standardized format ensures complete transfer of information with potential increase in patient safety.</td>
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<td>To develop a minimum data set design for an electronic handoff tool to compliment verbal nursing handover report (Johnson, Jefferies, &amp; Nicholls, 2012)</td>
<td>Qualitative study. Observational approach using tape recordings and field notes during handoff report. Ethical approval received from the</td>
<td>195 patient handoffs observed across a variety of clinical settings. General Medical Surgical, Mental Health, Emergency, Aged Care,</td>
<td>Transcripts were analyzed using NVivo8. Researchers coded data using content analysis. Transcribed data items were tallied to determine frequency of MDS items</td>
<td>Analysis of content from transcripts found many items in NH-MDS were regularly reported during handovers. Final MDS will form the electronic fields and data items to be NH-MDS can guide RNs to give detailed report for patient handover. This study evaluated a preprinted sheet including data points to incorporate into future electronic form.</td>
<td>Limitations include need for further research with the association between use of NH-MDS and the electronic summary.</td>
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<td>Human Research and Ethics committee in the Health Service and the University of Western Sydney.</td>
<td>Critical Care and Maternity. The various ward settings allowed for physical and psychosocial patient care situations ranging from medical surgical units (23%) and mental health units (29%). Location: Various Health Centers in Sydney, Australia</td>
<td>within current handovers. Content of preprinted handover included 13 data fields. Clinical handover was delivered by outgoing RNs to oncoming RNs from preprinted sheets containing information to be used in electronic handover design.</td>
<td>used in the main computer system. Researchers anticipate the standardization of information transfer will result in patient safety by reducing gaps in patient information.</td>
<td>Tool provides a framework to be used by clinical staff and educators. Goal of the tool is to standardize handover report to improve patient safety through use of technology.</td>
<td>Further research on potential effects on patient outcomes and safety.</td>
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<td>To implement an electronic change of shift report using transforming care and the bedside processes and methods (Nelson &amp; Massey, 2010)</td>
<td>Mixed methods pre and post evaluation of the implementation of electronic shift report template. Quality improvement project developed by nursing staff using TCAB methods and processes.</td>
<td>A 32 bed (two 16 bed pods) GI surgical oncology unit at the University of Texas M.D. Anderson Cancer Center. 1 out of 10 hospitals participating in phases 2 and 3 of TCAB. The GI surgical oncology unit</td>
<td>Baseline data gathered. Pre-intervention change of shift report exceed 30 minute parameter by 36 minutes (average time 66 minutes) Overtime costs $220.50 per day annualized cost of $80,483.00. 5-item survey rated on a Likert scale given to pilot RNs</td>
<td>Change of shift report decreased by 38 minutes from initial data collection period. 6 months after implementation maintained a 39 minute decrease followed by a sustained overall time savings of 38 minutes four years later. End of shift OT reduced by $6,602.85 with an annual net</td>
<td>Inpatient units have implemented use of electronic change of shift report. Sustained results in cost savings and RN satisfaction.</td>
<td>Limitations: transferability to hospitals without EMR.</td>
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<td>PDSA model used for rapid cycle tests of change. RN from core team developed electronic report template.</td>
<td>was selected as one of the pilot units. A core team of 3 to 5 staff on the unit with support from nurse leader and other resources.</td>
<td>to gauge satisfaction with current handoff process. 7 testing cycles took place over 2 months. Re-measured at 2 months, 6 months post implementation (2005) and four years later (2008)</td>
<td>savings of $73,726.35 for pilot unit. Staff satisfaction increased with a sense of ownership and ability to make positive change in work environment.</td>
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<td>To examine medical-surgical nurses’ perspectives about processes that promote and hinder patient safety intra-shift and during handoff (Birmingham, Buffum, Blegen, &amp; Lyndon, 2014)</td>
<td>Constructive grounded theory. Method allows for observation of actions between RNs within their shift and during handoff reports. To collect data from RNs perspectives. Identifying what works with current process and risks to patient safety.</td>
<td>Purposive sample of 21 RNs. Individual semi-structured interviews and ethnographic observations Observations conducted between 2 medical surgical units at the VA hospital in San Francisco U.S.A.</td>
<td>18 RNs interviewed once and 3 RNs interviewed twice part of grounded theory method. A total of 24 interviews lasting 45- 60 minutes. Interviews recorded. Data collection and analysis was conducted simultaneously using constant comparison. Observations and interviews guided by theoretical sampling. Theoretical saturation reached when relationships RNs on both units described two important safety processes: Grasping the story Painting a full picture. Disruptions during handoff impede the processes and patient safety. RNs considered handoffs time “sacred” Multiple situations caused RNs to rush report. No mandated written or computerized format used. Without standardized format information incomplete.</td>
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<td>Study helps to identify complexity involved in safe handoff in practice setting. Importance of practice environment to support process of handoff. RNs began to develop a standardized tool during the study.</td>
<td>Future research to consider improvement interventions targeting processes. Limitations: small sample size. Study conducted in only one institution. Non participants may have different perspectives. No data for empirical link to outcomes.</td>
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<td>To identify and quantify ways in which the computerized sign out note (CSON) is being utilized by non-physicians. To determine perceived data quality of the CSON from a non-physician provider perspective. (Schuster et al., 2014)</td>
<td>Quantitative research. 10 question paper survey instrument used.</td>
<td>Non-physician clinical staff including, RNs, SW, US, OT, PT, CC, DP. Pharmacist and RT were excluded due to limited patient handover and direct patient care. Yale-New Haven Hospital (YNHH) 996-bed urban tertiary teaching hospital. 231 total responses. An overall response rate of 61%. Majority of responses were RNs.</td>
<td>Instrument assessed degree to which non-physician providers incorporated the CSON into daily practice. Questions regarding use and usefulness of CSON used 5 point Likert scale. Descriptive statistics to determine: 1. Frequency of CSON used 2. Usefulness for various tasks 3. Accuracy of CSON. Analysis by SPSS p value &lt; 0.05</td>
<td>Findings suggest handoff may be improved by providing a structured flexible written or computerized tool. 1. Frequency of CSON used often/always by 61% of all respondents. Significance use for transition of care to next shift by RNs 46% compared to only 22% by non-RNs (p&lt;0.010) 2. Usefulness for various tasks include medical history, code status potential pitfalls, allergies and medications. 3. Accuracy of CSON 96% by RNs compared to 76% by non- RNs (p&lt;0.001) Overall findings indicate a positive outcome. CSON is used 60 % of the time by non-physicians hospital-wide.</td>
<td>Non-physician care providers, most commonly RNs, use the CSON for multiple tasks despite availability of EMR. Nurses commonly identified CSON as accurate. A physician CSON may be incorporated into the workflow of other care providers in an EMR as a useful tool to improve communication of important information.</td>
<td>Further evaluation needed of which types of care providers should be given write access and the data fields that are appropriate for this tool.</td>
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<td>To understand the barriers and facilitators to nursing handoffs and provide recommendations for redesign (Welsh, Flannagan, &amp; Ebright, 2010)</td>
<td>Qualitative study. Grounded theory approach used. A pilot study with semi-structured interviews.</td>
<td>Convenience sample. 20 nurses total. Mix of RNs and LPNs. 7 nurses from day shift and 9 nurses from evening shift and 4 nurses from night shift. Average age 43 years old. A large Midwestern veteran’s administration medical center in Indianapolis, Indiana.</td>
<td>Interviews lasted 10-15 minutes. Tape-recorded and transcribed. Identified two types of handoff report used: taped and written. Medical and Surgical units (65% of respondents) used a taped report. Acute care unit (35% of respondents) used written report with a 14 item checklist for each patient. 2 reviewers coded the data into themes. Barrier: reduced report clarity Facilitator: any activity improved report clarity. Themes legitimized through nursing Analyses revealed 6 barriers and 4 facilitators to effective nursing handoff reports. Barrier # 1 Too little information Barrier # 2 Too much information Barrier # 3 Inconsistent quality Barrier # 4 Limited opportunity to ask questions Barrier # 5 Equipment malfunction Barrier # 6 Interruptions Facilitator #1 Pertinent content Facilitator # 2 Notes Facilitator # 3 face to face interaction Facilitator # 4 Structured form/checklist</td>
<td>and safe patient care handover.</td>
<td>Two other themes emerged from data analysis: Nurses accessed EMR to verify information received from report. 55% nurses reported a structured handoffs helped nurses plan their care. Examples of structured process are SBAR or PACE If end of shift report can be made more effective they will be valued as the critical patient care tool</td>
<td>Limitations: Convenience sampling Non generalizability of findings</td>
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<td>Use of an evidence-based shift report tool to improve nurses communication (Chung, Davis, Maughrabi &amp; Gawinski 2011)</td>
<td>Quantitative research Observational study EBP implementation project Pilot study with 10 question survey Educational 1 hour class provided Pilot project discussed each staff meeting to familiar other nurses with initiative</td>
<td>Convenience sample 22 volunteer RNs Ages 20-30 1-5 years of experience Large tertiary hospital Los Angeles California Medical surgical unit</td>
<td>10 item pre and post survey tool. Handoff tool created based on 22 RN volunteer feedback Standardized shift report tool used for 2 months during pilot by same 22 volunteer RNs</td>
<td>Paired t-test, significance in RNs responses to survey before and after implementation RN agreement standardized report provides more thorough &amp; accurate report after intervention $p = 0.03$ after intervention RNs reported time to organize shift and prioritize work decreased significantly $p = 0.001$ Chi square and Freidman non parametric test frequency late start of shift decreased after implementation of EBP $p=0.05$ Key shift report content missed before pilot improved by 82% after implementation</td>
<td>Implementation of standardized EBP nursing shift-report tool on a MS unit improved the handoff report. Tool effective to increase thoroughness of shift reports. Use of tool decreases delays in shift start time and overtime</td>
<td>Limitations: design of tool based on unit needs. May only be applicable to MS units Small sample size. Study conducted in only one institution</td>
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Note. PHT = Patient Handoff Tool; MICU = Medical Intensive Care Unit; IM = Internal Medicine; EMH = Electronic Medical Record; O= Objective; GEE = Generalized Estimating Equations; RN = Registered Nurse; DV = Dependent Variable; IV = Independent Variable; PDSA = Plan Do Study Act; PICU = Pediatric Intensive Care Unit; NH-MDS = Nursing Handover Minimal Data Set; TCAB = Transforming Care at the Bedside; GI = Gastrointestinal; OT = Overtime; VA = Veterans Affairs; CSON = Computerized Sign Out Note; YNHH = Yale-New Haven Hospital; US = Unit Secretaries; SW = Social Workers; PT = Physical therapists; OT = Occupational Therapists; CC = Care Coordinators; DP = Discharge Planner; RT = Respiratory Therapists; P = Participants; SBAR = Situation, Background; Assessment, Recommendations; PACE = Patient/Problem, Assessment/Actions, Continuing/Changes, Evaluation; EBP = Evidence Based Practice; MS = Medical Surgical; PA = cardiopulmonary arrest; DV = dependent variable; ED = emergency department; ICU = intensive care unit; IV = independent variable; MD = medical doctor; SARS = severe acute respiratory failure.