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Using an Educational Module and Simulation Learning Experience to Improve Medication Safety

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Safety

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Abstract

The purpose of this evidence-based change in practice project was to provide nurses with an experiential learning opportunity, using simulation, to identify and report near miss events during the medication administration process related to patient-controlled analgesia (PCA) usage. Despite extensive in-service training on a Medical/Surgical (Med/Surg) floor in an acute care hospital, inconsistent, inaccurate and incomplete documentation with use of the new PCA pumps continued to be problematic. A conceptual framework of just culture was used with the quality improvement method of the Plan-Do-Study-Act (PDSA) cycle for testing change. Medication safety education was a valid andragogical strategy to decrease rates of medication errors and improve patient outcomes by identifying complex system issues that interfered with safe practices. The education program consisted of a series of self-learning modules, definitions of near miss events and medication errors; in addition a simulation learning experience was included. A needs assessment was conducted to help determine gaps in practice. Results of the survey demonstrated inconsistencies in the current practice of documenting vital signs on patients with a PCA in contrast to the existing policy and procedure; these results were shared with the staff nurses at a staff meeting and via email. Although no changes in care delivery were directly observed, the doctorate of nursing practice (DNP) student was able to reinforce the documentation requirements per the hospital's policy.

Key words: *medication safety, medication errors, near miss events, medication safety education, simulation, patient-controlled analgesia, quality improvement*

Section II: Introduction

Background knowledge:

The setting consists of a small (172-bed) county hospital, which is also a teaching hospital. The organization espouses innovation, compassion, and dedication to high quality, patient-centered health care according to their mission and vision statements. Improving quality outcomes and increasing patient satisfaction are a few of the stated goals on the hospital's web page. However, being a government run organization, the hospital can be described as bureaucratic in terms of the organizational structure and complex processes that slows down the completion of an otherwise simple task. For example, the activity of signing a memorandum of understanding (MOU) for a doctoral student to complete an evidence-based change in practice project took approximately six months to get the necessary paperwork signed and processed.

In January 2014, the hospital was selected to become the region's designated Level II trauma center. As a result, the staff nurses received many hours of education related to caring for trauma patients as the implementation plan moves forward. Unfortunately, the needed education to prepare for the trauma designation proved to be a significant obstacle in the implementation of this evidence-based change in practice project. To further complicate any attempts to sustain planned change, there has been significant turnover within the administration. For example, over the past 18 months, three different Chief Nursing Officers (CNOs) have occupied the position. In addition, the current Chief Executive Officer (CEO) unexpectedly resigned in July 2014, resulting in an interim appointment to fill the position.

There has been a long-standing history of resistance to change within the organization. The nursing staff does not readily embrace change and are difficult to motivate to take responsibility for quality patient care. For example, when the responsibility for obtaining a

second set of vital signs on the shift was transferred to the primary nurse, there was resistance

and objections to the extra duties the nurse was required to complete on their shift. There is a

perception of a top-down process in which the nurses are being told to how to do their jobs and

being made to comply. As such, a culture of safety is not consistently demonstrated based on

anecdotal comments from the nursing staff and their supervisors; for example, the pharmacy

director removed privileges from several nurses who were not documenting accurately regarding

the use of patient-controlled analgesic (PCA) pumps instead of trying to determine the root of the

problem.

There is one nursing director who oversees the medical/surgical (Med/Surg) unit,

intensive care unit (ICU), acute rehabilitation unit (ARU), and Dialysis unit. The director's span

of control is comprised of approximately 120 full-time equivalent (FTEs) employees and stated

that it was difficult to find the time to be the role model the Med/Surg unit needed. The nursing

director also stated experiencing incivility by her coworkers through sabotage, indifference and

lack of collaboration.

The care problem was broad in terms of improving medication safety. After meeting with

the directors of Education, Pharmacy, and Quality, there were two specific issues identified; the

first issue was that nurses were not reporting enough near miss events and secondly, there were

persistent issues with PCA documentation despite extensive education when the new PCA

pumps were implemented. The hospital uses the standardized definition of a medication error

according to the National Coordinating Council for Medication Error Reporting and Prevention

(NCC MERP, 2014):

"A medication error is any preventable event that may cause or lead to inappropriate

medication use or patient harm while the medication is in the control of the health care

professional, patient, or consumer. Such events may be related to professional practice,

health care products, procedures, and systems, including prescribing; order

communication; product labeling, packaging, and nomenclature; compounding;

dispensing; distribution; administration; education; monitoring; and use." (About

medication errors section, para. 1).

Local Problem:

The true severity of the problem was difficult to quantify because of frequent changes in

reporting processes. Traditionally, Quality Review Reports (QRRs) were collected from

anonymous reporting through a dedicated phone line or the traditional handwritten method using

established paper forms. From these reports, data were collected and transcribed to an excel

spreadsheet that summarized the event date and description for tracking and reporting purposes.

The hospital also used an external vendor (BETA Healthcare Group) to trial a program to

measure the stability of medication incident rates from January 2010 until June 2012. This

system reported the number of incidents per adjusted census units and the categories of incidents.

A new process began in February 2014 that consisted of on-line reporting using the Quality

Management/Risk Module in Meditech. These new reports were more detailed and provided

information based on the number of patient days, number of medication incidents per location,

total number of QRRs (all types), and total number of QRRs specific to medication incidents.

Furthermore, both near miss occurrences and medication errors were categorized as medication

events. It is possible that near misses were incorrectly categorized as errors or went completely

unreported. Please see table one, for an overview of the medication events.

Old reporting system			6 months	
	2010	**2011**	**2012**	
Census (monthly)	318	321	318	
Incidents (average medication incidents per month)	20.5	18.5	47.7	

New reporting system	FY2011	FY2012	FY 2013	FY 2014
Number of patient days	No data	No data	39,344	38,822
Total # QRRs (all types)	No data	No data	1665	1912
Average QRR rate per 1000 patient days (all types)	No data	No data	42.3	49.25
Average QRRs/day (all types)	No data	No data	4.56	5.24
% of QRRs specifically related to medication events	n=210	n=411	36% n=604	22% n=437
Average medication related QRRs/1000 patient days	No data	No data	15.35	11.26
% of medication QRRs per location: ICU and Med/Surg	No data	No data	19% n=115	23.1% n=101
% of medication QRRs per location: Med/Surg (only)	No data	No data	No data	13.5% n=59

FY=Fiscal year (July-June); QRRs=Quality Review Reports; ICU-Intensive Care Unit; Med/Surg=Medical/Surgical Unit
Table 1: Medication Incident Rates

A review of the QRRs related to medication events from the 2012-2013 fiscal year demonstrated several issues. Examples of systems factors affecting safe medication administration in this small acute care hospital include lack of pharmacy driven protocols (i.e. Heparin), patient-controlled analgesic pumps that do not have the most frequently used opioid analgesics programmed (i.e. Fentanyl), and intravenous (IV) infusion pumps have out dated drug libraries programmed with ineffective safety guardrails. With the current IV pumps there is no efficient way to program new drugs; updates consist of a very labor-intensive process because of a lack of wireless integration.

From a human perspective, a survey conducted in summer of 2013 by the hospital examined staff perceptions of patient safety and error reporting; results indicated 88% of staff perceived that patients are provided safe care and 75% of staff perceive error-reporting is non-punitive. Although staff perceptions are high, room for improvement existed in order to determine the extent of awareness of the variety of factors surrounding medication errors. Lastly, according to the last Medication Error Reduction Plan (MERP) results, the hospital was found to

have deficiencies in reporting near miss events, making the current situation unacceptable. The

literature describes under reporting near miss events and medication errors as a pervasive issue;

this hospital is no different with the challenges experienced with medication event reporting.

In September 2013, the hospital changed the infusion pumps being used for patient-

controlled analgesia delivery to increase patient safety by monitoring end-tidal carbon dioxide

($ETCO_2$) concentrations. The pharmacy director reported improper documentation and

incomplete assessment practices as persistent problems with both the old and new PCA devices.

There are 400 nurses employed at the hospital with approximately 200 nurses having completed

an orientation checklist verifying their understanding of the use and management of the new

PCA pump. Not all nurses were required to complete the training because of service area and

infrequency in caring for patients with PCAs. Primarily nurses from Med/Surg and Labor and

Delivery care for the most patients on PCA pumps.

Electronic health record (EHR) audits revealed inadequate or incomplete documentation

for vital signs, patient assessment, and amount of drug administered. Specifically, according to

the pharmacy director, one third of the nursing staff who received the educational in-service

were not documenting correctly and an absence of a second independent verification had been

noted. However, further details regarding the scope of the problem was not differentiated per

nursing unit. In general, these practices posed a huge liability for the hospital by increasing the

risk for medication errors and impacting patient safety.

Purpose of Change:

Over the course of this project, the purpose has evolved as a result of many obstacles.

Initially, the purpose of the project was medication safety in terms of increasing the nurses'

awareness of factors often associated with medication errors. The second focus became evident

in response to the question "What is the best method to measure increased awareness of

medication safety?" when planning the evaluation of the project. The decision at that time was to

focus on QRRs by educating nurses on how to report near miss events in order to become

compliant with outside regulatory agencies (Centers for Medicare and Medicaid Services (CMS),

State of California Department of Health Care Services, and The Joint Commission (TJC)).

Lastly, concerns were expressed from the directors of pharmacy, quality management and

education related to continued issues with the use and management of PCA pumps, including

non-compliance with the established interdisciplinary policy and procedure and incomplete

documentation. Both pharmacy and quality management departments were tracking the problems

and working collaboratively to develop a resolution. In an effort to improve patient safety, new

PCAs pumps with $ETCO_2$ monitoring were purchased and implemented in September 2013.

Nurses received a two-hour educational in-service provided by the vendor with an additional

one-hour hands on opportunity with a "super-user" to review pump programming, the PCA

policy, and practice documentation in the EHR. Despite this method of education, issues with

documentation and adherence to the policy persisted.

       According to the Institute for Healthcare Improvement (IHI), it is reasonable to

implement small tests of change to determine how effectively the planned change will lead to the

desired improvements, which combination of changes will produce sustainable results, and to

evaluate costs, social impact and side effects from a proposed change (IHI, 2014). Essentially,

this test of change was measuring the impact of multiple, different educational modalities on

changing behavior. A traditional PowerPoint (PPT) was converted into a HealthStream© (a

learning management system) course and used to educate nurses on medication safety concepts

(developed by a DNP student). A second PPT was used to introduce the new online QRR

reporting system (developed by the hospital's quality department). Several educational

techniques were used to increase compliance with PCA documentation: just in time training

while observing nurses when PCAs were in use, face-to-face interviews to gain insight regarding

current practice and system obstacles, using an online survey to complete a needs assessment,

and a developing a simulation experience involving PCA care and management.

Based on the needs of the organization, there were two AIM statements for this project.

The first AIM statement was, "By September 31, 2014, the nursing staff on the Med/Surg unit

will increase the number of near miss reports using the new QRR module by 10%". The second

AIM statement was, "By September 31, 2014, the nursing staff on the Med/Surg unit will

achieve greater than 50% compliance with documentation of narcotic volumes and dosages given

on the PCA Change/Co-signature required screen in the EHR".

Review of the Evidence:

Both CINAHL and Proquest databases were searched using key terms such as factors

contributing to medication errors, human factors, system factors, human error, medication safety,

medication education, costs of medication errors, medication error rates, and near miss error

rates. Articles were reviewed to determine the scope of the problem, educational interventions,

and costs of medication errors. The Johns Hopkins Nursing Evidence Based Practice (JHNEBP)

Research Evidence Appraisal tool was used to determine the strength of the evidence, study

results and conclusions. The majority of the research articles were rated as Level III because

most were non-experimental studies and the majority of the non-research articles were literature

reviews (Level 5); the quality ratings for the scientific evidence were rated as predominately

good quality. See Appendix Q for the complete review of articles about medication safety

programs, scope of the problem and contributing factors and the cost of medication errors.

Administration of medications in a hospital setting is a daily occurrence; every nurse administers an average of 10 medication doses for every patient, every day (Aspden, Wolcoctt, Bootman & Cronenwett, 2007). The act of giving a medication is not a simple task; in fact the process is fraught with complexities. Medication administration errors occur at alarming rates in hospitals. The human and financial costs of these errors are astronomical; estimated direct costs are approximately $21 billion, indirect costs exceed $75 billion and account for approximately 7000 lives lost annually (Choo, Hutchinson, & Bucknall, 2010; Kohn, Corrigan, Donaldson, 2000; New England Health Institute (NEHI), 2011). There are many factors derived from human and system sources, contributing to these startling statistics.

Exact numbers of medication errors are difficult to obtain because not all medication errors are detected and not all detected errors are reported (Dennison, 2007; Hughes & Blegen, 2008). The committee on Identifying and Preventing Medication Errors reports at least 1.5 million preventable medication errors and adverse drug events (ADEs) occur each year in the United States, excluding errors of omission (Aspden, et al., 2007). It is estimated that on average, the hospitalized patient will be exposed to a minimum of one medication error each day they are hospitalized (Aspden, et al., 2007) due to the volume of occurrences. It is estimated that for every detected medication error, there are approximately 100 errors that go undetected daily as a result of the sheer volume of medications being prescribed, dispensed, and administered in the hospital (NEHI, 2011). Wahr et al. (2013) conducted a retrospective cross-sectional study (Level 3) and found the severity of harm for patients experiencing a medication error is low; greater than 90% of all medication errors result is no or low harm, with only 10% contributing to serious patient harm. After conducting a non-experimental, retrospective analysis (Level 3) of medication errors, Pinella, Murillo, Carrasco, and Humet, (2006), found that 36% of errors

resulted in slightly increased monitoring, 31% of errors did not result in patient harm, and 26% of the errors did not actually reach the patient. This means that the safety systems that have been implemented are moderately working to catch and prevent serious harm or death.

Unfortunately, nurses are often not aware that a medication error or near miss event has occurred (Choo, et al., 2010) or what constitutes a medication error (Dennison, 2007). Without clear definitions, the degree of underreported medication errors cannot be fully recognized, thus contributing to the inability to change key aspects of the complex medication delivery system (Harding & Petrick, 2008). The number of medication administration errors is underestimated and generally under-reported by an estimated 90% (McDermott, 2013). In a seminal ethnomethodological study, Baker (1997) identified six ways nurses categorize medication errors: it is not a medication error if a) it is not my fault; b) everyone knows; c) you can put it right; d) a patient has needs that are more urgent than the accurate administration of medication; e) it is a clerical error; and f) the irregularity prevents something worse. Baker determined that if an error occurred that could not be ascribed to one of these six categories, then it was considered a real medication error; at which time, the nurse's highest priority was to protect the patient. These conditions offer a deep insight into why errors are underreported.

There is an existing culture of fear and blame associated with the stigma and ramifications of reporting medication errors; approximately 50% of nurses are reticent about reporting medication errors because they fear disciplinary action and often don't report them (Brady, Malone & Fleming, 2009; Dennison, 2007). Additional explanations for under-reporting include an unawareness that a medication error has occurred, unfamiliarity with reporting processes when a medication error does occur, fear of legal ramifications, and fear of being

perceived as incompetent (Brady, Malone & Fleming, 2009; Choo, Hutchinson, & Bucknall, 2010; Dennison, 2007; Harding & Petrick, 2008).

There is a stigma attributed to making an error, and perceived repercussions if the error is negatively reflected in the nurse's performance evaluation. An AHRQ survey found that 56% of nurses thought mistakes are held against them and occurrences were recorded in personnel files (AHRQ, 2012). Choo, Hutchinson, and Bucknall (2010) recommend a simplified process for reporting medication errors and emphasized the need for developing a culture of safety by not punishing those who do report these errors. Brady, Malone, and Fleming (2009) suggest developing a clear definition of what a medication error is in order to increase the accuracy of reporting. Dennison (2007) recognized that leadership has a crucial role in creating practice change using a culture of safety; continuing to blame the individual or expect error-free performance is not realistic. A culture of safety will augment the reporting process of medication errors and reduce the likelihood that the same type of error will reoccur (Harding & Petrick, 2008; Wolf, Hicks & Serembus, 2006). Benner et al. (2002) identified a concept known as practice responsibility; which refers to individual accountability and experiential learning that is shared with others to collectively change practice by creating a safer patient care environment.

The traditional approach to medication administration includes the five rights as the standard and foundation by which nurses are taught; however, these five rights do not reflect the fundamental intricacies associated with the process of administering medications in a hospital setting (Choo, et al, 2010; Harding & Petrick, 2008). There is a strong consensus that the five rights consists of the right patient, drug, dose, route, and time; additional rights have been added to include right reason (Benner, et al., 2002; Harding & Petrick), and documentation (Harding & Petrick).

According to the California Health and Safety Code §1339.63, the legal definition of a medication-related error refers to any preventable medication-related event that adversely affects a patient in general acute care hospitals, and "that is related to professional practice, or health care products, procedures, and systems, including, but not limited to, prescribing, prescription order communications, product labeling, packaging and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use" (2011, para. 5). As mentioned previously, the hospital uses the standardized definition of a medication error according to the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP).

The process of medication delivery includes several components: prescribing, dispensing, administration, and evaluation. Nurses are directly and consistently involved in the administration phase of medication delivery and thus are well positioned to prevent medication errors from reaching the patient (Harding & Petrick, 2008; Kazaoka, Ohtsuka, Ueno, & Mori, 2007; Page & McKinney, 2007). Despite numerous definitions, a medication error can simply be defined as an actual or potential event, which may be preventable, and can lead to patient harm (Aspden, Wolcott, Bootman & Cronenwett, 2007; Choo, Hutchinson & Bucknall, 2010; Dennison, 2007; Fowler, Sohler, & Zarillo, 2009; Harding & Petrick, 2008; Taneja & Wiegmann, 2004; Wolf, Hicks, & Serembus, 2006). Making an error in the preparation of medication for a patient, by intercepting or recognizing the error before it reaches the patient is an example of a near miss event (Choo, Hutchinson & Bucknall, 2010; ISMP, 2009; Koohestani & Baghcheghi, 2009; Reid-Searl, Moxhan, & Happell, 2010). Wolf and Hughes (2008) report the magnitude and consequence of under reporting near miss events; near miss events can occur

300 times more frequently than adverse events and if reported, provide rich evidence to proactively reduce errors.

During medication administration, human errors can be attributed to the complex, multi-step system processes that are established in the hospital (Choo, Hutchinson, & Bucknall, 2010; Clancy, Effken, & Pesut, 2008; Harding & Petrick, 2008). Common human characteristics contributing to medication error include:

1. Problems with communication between health care providers were frequently cited as a contributing factor for medication errors (Benner, et al., 2002; Brady, Malone, & Fleming, 2009; Choo, Hutchinson, & Bucknall, 2010; Hughes, & Blegen, 2008; Karavasiliadou & Athanasakis, 2014; Reid-Searl, Moxham, & Happell, 2010; Saintsing, Gibson, & Pennington, 2011).

2. Problem with doctor's orders consisted of illegible handwriting, incomplete orders, and use of inappropriate or unapproved abbreviations (Benner, et al., 2002; Choo, Hutchinson, & Bucknall, 2010; Karavasiliadou & Athanasakis, 2014; Saintsing, Gibson, & Pennington, 2011).

3. The experience of the nurse was a factor in avoiding medication errors; lack of experience was a likely contributing factor to explain deviations from policies, procedures, and protocol that resulted in a medication error (Brady, Malone, & Fleming, 2009; Choo, Hutchinson, & Bucknall, 2010; Hughes & Blegen, 2008; Karavasiliadou & Athanasakis, 2014; Reid-Searl, Moxham, & Happell, 2010; Saintsing, Gibson, & Pennington, 2011; Wolf, Hicks, & Serembus, 2006).

4. Lack of knowledge related to pharmacology and math calculation skills was linked to more medication errors (Brady, Malone, & Fleming, 2009; Hughes, & Blegen, 2008; Karavasiliadou & Athanasakis, 2014; Kiekkas, et al., 2011).

5. Poor understanding of the equipment, such as IV infusion pumps, added to problem of medication errors (Karavasiliadou & Athanasakis, 2014; Saintsing, Gibson, & Pennington, 2011).

6. Process issues such as distractions, interruptions that affect the provider's ability to focus on the task of administering medications; examples include events on the unit, patient needs, or demands from coworkers (Benner, et al., 2002; Brady, Malone, & Fleming, 2009; Choo, Hutchinson, & Bucknall, 2010; Hughes, & Blegen, 2008; Karavasiliadou & Athanasakis, 2014; Wolf, Hicks, & Serembus, 2006).

7. Personal neglect is described as multi-tasking or by preparing medication in advance (Brady, Malone, & Fleming, 2009; Karavasiliadou & Athanasakis, 2014).

8. Multiple demands or stress of the work environment and the complexity of patients or physician prescriptions contributed to medication errors (Choo, Hutchinson, & Bucknall, 2010; Hughes, & Blegen, 2008; Kiekkas, et al., 2011; Saintsing, Gibson, & Pennington, 2011).

Common system characteristics contributing to medication error include:

1. Environmental factors such as poor lighting, noise levels, and equipment failure all contribute the increased incidence of medication errors (Benner, et al., 2002; Choo, Hutchinson, & Bucknall, 2010).

2. Medication related topics such look alike-sound alike (LASA) medications;

similar packaging and labels for medications impact the accuracy of medication

administration (Brady, Malone, & Fleming, 2009; Benner, et al., 2002; ISMP,

2007; Karavasiliadou & Athanasakis, 2014).

3. Inadequate orientation about the policies and procedures for medication

administration or insufficient training with the medication delivery system or

barcoding/scanning technology (Benner, et al., 2002; Choo, Hutchinson, &

Bucknall, 2010).

4. Nurse staffing, skill mix, shift length, heavy workload, high patient/nurse ratios,

lack of staff or presence of new staff nurses produces an unsafe environment

within which the nurse works (Brady, Malone, & Fleming, 2009; Choo,

Hutchinson, & Bucknall, 2010; Hughes & Blegen, 2008; Karavasiliadou &

Athanasakis, 2014; Kiekkas, et al., 2011; Saintsing, Gibson, & Pennington, 2011).

5. Technology, lack of clinical decision support features, equipment failures (Brady,

Malone, & Fleming, 2009; Hughes & Blegen, 2008).

Opioid errors are one of the top three medication safety issues for 2014 because of

inadequate assessment and monitoring (Erickson, 2014). Intravenous (IV) meds are more

dangerous when administering incorrectly because they result in more serious complications

(Dennison, 2007; Westbrook, Rob, Woods, & Parry, 2011). The probability of at least one error

was 73%, and when the medication was administered via IV bolus, the chance of error and harm

were four times more likely (p<0.001) (Westbrook, Rob, Woods, & Parry, 2011). There are 20

IV drugs that are responsible for 80% of all errors (Dennison, 2007). In a retrospective, cross-

sectional study, opiates, antibacterials and anticoagulants were the top three classes most

frequently involved in medication error across the United States and the United Kingdom (Whar, et al., 2013).

Conceptual Framework:

Healthcare has typically had a punitive approach to errors (Barnsteiner & Disch, 2012; Dennison, 2007; Leape, 1994; Marx, 2007; Reason, 2000). To help provide psychological safety and reduce the threat of talking about medication errors, a just culture environment is essential. Barnsteiner and Disch (2012) describe a just culture as one that is transparent, without fear of retribution if a medication error is made and rewards people who report safety-related information so that efforts can be directed towards improving and fixing the system.

According to Berwick and Leape, "if we truly want safer care we will have to design safer care systems" (1999, p. 136). Reason (2000) echoes this statement writing, "we cannot change the human condition, but we can change the conditions under which humans work" (p. 769). Emphasis on 'what' went wrong, not 'who' is at fault is critical (Barnsteiner & Disch, 2012). The underpinnings of just culture is about creating and supporting a learning culture, one that is open and fair, and centered on designing safer systems and managing behavioral choices (Marx, 2007). Decades ago, Leape (1994) recognized the paradox that exists in healthcare: the standard of practice in medicine and nursing is perfection, however healthcare professionals acknowledge that mistakes are inevitable and most want to learn from the mistakes in an understanding and supportive environment.

Marx (2007) describes three behaviors that contribute to error. The first behavior is a genuine human error or mistake as a result of an unintentional lapse or slip in judgment. This type of error is managed through changes in processes, procedures, or training with the intention of consoling or supporting the person who made the mistake. The second behavior is at-risk

behavior; this is most frequent and most dangerous behavior! The health care provider makes an

intentional and conscious choice to engage in the risk behavior because they may believe the risk

to be justified or may not even recognize the potential for risk. When health care providers

continually engage in at-risk behavior, they drift from following policies and procedure and best

practices by developing work-arounds because of time constraints and fluctuating patient needs.

This behavior is generally managed through removing incentives for at-risk behaviors, creating

incentive for health behaviors and increasing situational awareness. The last behavior is reckless

behavior in which there is a conscious disregard of rules/processes or an acceptance of an

unreasonable amount of risk. This behavior is managed through remedial or punitive action.

Unless there is a pattern of making medication errors or evidence of reckless behavior, one event

should not warrant disciplinary action or termination.

It is unrealistic to expect error-free performance. Reason (2000) describes active failures

as unsafe acts involving clinicians who are in direct contact with the patient or the system. These

active failures can be compared to Marx's description of human error in that they involve lapses,

mistakes, or unintentional procedural violations. Complex system processes produce latent

failures (Reason, 2000). These latent conditions are embedded within the organization and

waiting for the right opportunity (in the presence of an active failure) to present itself. Reason

(2000) uses a Swiss cheese model to demonstrate how an error can occur despite having system

defenses and safeguards in place to prevent them. Each slice of Swiss cheese represents a level

of protection; however gaps still exist, and when these gaps line up, an error can occur. Benner et

al. (2002) identified a concept known as practice responsibility, which refers to individual

accountability and experiential learning that is shared with others to collectively change practice

by creating a safer patient care environment. It is important for nurses to learn from not only their own mistakes, but also from the mistakes of others.

For an evidence-based change in practice project, the Plan-Do-Study-Act (PDSA) cycle is an appropriate quality improvement method for testing a change. The idea of implementing small tests of change to see what "sticks" is used for action-oriented learning (IHI, 2014). The first step of the cycle is planning the test of change (in this case, education) and determining the methods for collecting data. The second step involves trying out the test on a small scale; for this project, the Med/Surg unit was selected, rather than implementing the project throughout the entire hospital. Step three involves studying the data and analyzing the results of the education module. The final step is the refine the change, based on the previous results, in order to plan the next test of change.

Errors, near misses and adverse drug events (ADEs) must all be reported voluntarily and anonymously. Hospital administration will need to adopt a culture of safety to improve the reporting of actual and near miss events (Dennison, 2007). A top down approach is preferred because higher quality nursing practices are associated with practice environments are supported by administration (Flynn, Liang, Dickson, Xie, & Suh, 2012). Hospitals should be preoccupied with failure and build defenses to avert errors (Choo, Hutchinson, & Bucknall, 2010; Reason, 2000). Furthermore, Andel et al., (2012) reported a correlation between how a hospital is designed to improve quality of care and patient outcomes. Since errors are comprised of human and system factors, hospital administration must also be accountable for faulty systems and organizational processes. A just culture environment is also necessary to help provide psychological safety and reduce the threat of talking about medication errors. When nurses feel safe, they will be more likely to report errors and near miss events. Once systems issues and

processes are identified, administration has a responsibility to commit resources and personnel to build safer systems in order to improve the quality and safety of patient care.

Furthermore, education on quality and safety in nursing, the quality improvement process, definitions of a near miss event and medication error and how to report them is needed. Nurses should know how to perform a root cause analysis. Basic investigation skills include asking a series of questions: 1) what happened; 2) what normally happens; 3) what does the procedure require; 4) how did it happen; and 5) how are we managing it (Marx, 2007). Nurses should be accountable and responsible (to themselves, patients, and the profession) to determine why the mistake occurred instead of relying solely on the organization's quality improvement process.

Section III: Methods

Ethical Issues:

Health care providers are trained to deliver error-free care. No one sets out intending to deliberately commit a medication error; however, despite education and experience, nurses still make errors. Current estimates suggest that hospitalized patients are subjected to at least one medication error per day (Aspen, et al., 2007). When mistakes happen, health care providers experience a complex emotional response that includes devastation, embarrassment, desire to conceal the mistakes, shifting blame, and resistance to implicate other providers (Wolf & Hughes, 2008). Providers have an ethical obligation to tell the truth (veracity) to maintain the trust (fidelity) between patient and provider. Unfortunately, medication errors are under reported, unrecorded, and under-researched. Further explanations for under-reporting include not being aware that a medication error has occurred, not being familiar with how to report the error, and fear of legal ramifications or being perceived as incompetent (Brady, Malone & Fleming, 2009;

Choo, Hutchinson & Bucknall, 2010; Dennison, 2007; Harding & Petrick, 2008; Wolf &

Serembus, 2004). Nevertheless, nurses have a moral, legal, and ethical obligation to report

mistakes.

Beneficence is an ethical principle that generally defines nurses. The ethics of caring is a

contractual model in which there is an agreement between nurse and patient; "there is an

acknowledgement by the patient that the professional practitioner has the requisite skill to make

the technical decisions" (Carper, 1979, p.17). In addition, the ethical principle of nonmaleficence

(do no harm) must be considered. Harm is defined as any "avoidable distress caused to the

patient in the course of providing care" (Grace, 2014, p.27). Harm is usually unintentional, but is

often avoidable. A nurse must have adequate skills and competence to safely administer

medications to a patient, however, errors can and do occur. These ethical principles of doing

good and preventing harm are violated when errors are not reported.

Medication errors are devastating to everyone; therefore there are many stakeholders for

this project. Consumers are the primary stakeholders as they are directly impacted by medication

errors; patients have the right to receive quality care that is free from errors. The second most

important stakeholders are the healthcare professionals. When nurses commit medication errors,

they become a second victim because they are traumatized and struggle with the anguish, quilt,

and loss of self-confidence as they deal with the aftermath of the error. In terms of medication

safety, nurse autonomy is equally as important as patient autonomy. Ensuring the anonymity of

the nurses participating in this change in practice project was paramount. In terms of increasing

near miss reporting, anonymity was maintained. Lastly, the Institutional Review Board for the

Protection of Human Subjects (IRBPHS) at the University of San Francisco granted exemption

status since this project was deemed a quality improvement project.

Setting:

      Local environment. With respect to the local care environment, the common element or shared purpose, which would have the most likely influence of change, is that of patient safety. Knowing that nurses are busy, the education module was administered through the hospital's learning management system, Healthstream©, in order to be more convenient for the nurse. Instead of coming to work on a day off, the nurse was able to complete the module during working hours. This however, was not without sacrifices. For instance, the nurse would experience competing priorities with patient care needs during the shift and may not be fully invested in learning. In order to complete the module, the nurse may choose to go through the module very quickly, just to get it finished.

      The hospital is located in a large county along the central coast of California. According to the hospital website, the organization is designated as a Safety Net Hospital; this type of hospital provides 50% of hospital care for the states 6.6 million uninsured and trains nearly half of all new doctors in the state. The county owns the hospital; as such it is a government-run organization. This is relevant since most government processes are time consuming, cumbersome and convoluted. Planning the implementation of this evidence-based change in practice project was no different.

      Structure, processes, and patterns. The structure of the unit consists of one nursing director (who also oversees three other nursing units), one supervising nurse who has assistant director types of responsibilities, and two staff nurse III's who are frequently in the role of charge nurse on the day shift. Since both the staff nurse III's work on the day shift, this results in inconsistent oversight and follow up on the evening and night shifts. There are additional nurses who assume the role of charge nurse on these off shifts. The Med/Surg unit admits a variety of

different patient conditions and has a large number of indigent or uninsured patients. Workflow

consists of both eight and twelve hour shifts with a majority of full time nurses and few part-time

or per diem staff. The use of travelling nurses is low; however, the turnover rate has increased

over the past few months. Staff meetings are held every other month to keep the nursing staff

updated on how they are accomplishing specific quality metrics for core measures and a new

discharge process recently implemented.

One specific pattern of the setting was identified, both from personal experiences and

anecdotal accounts is a general resistance to change. The staff nurses are very hard workers,

however, they rarely want to participate in anything "extra". There is a comfortable habit of

dysfunction within the unit, which was stated by several staff nurses. An overall consensus was

people knew what needed to be improved, but they were lacking direct support (i.e. increased

staffing to make it happen). There is a sense of defeat on the unit because despite identifying

issues, the administration "doesn't listen, or do anything about it" and "nursing is the first place

they cut when times are tough". As a result, nurses are not fully invested in developing their own

professional practice in order to improve patient outcomes. Communication within the

organization goes in both directions, however, there is a distinct perception that administration is

frequently "telling them what to do".

Work processes. As a loosely coupled system, the Med/Surg unit lacks the characteristic

mutually understood rules that are consistently enforced trait of a tightly coupled organization

(Thompson, 2014). The nurses follow rules when the director is consistently on the unit;

however, policies are easily broken when the nursing director is not directly supervising the staff.

A simple, but specific, example of this is the policy of not having beverages on the workstation

on wheels (WOWs) while on the unit. When the director was off duty, due to a medical leave,

the nurses would keep their beverages with then on the WOWs representing a direct violation of the well-known and established policy.

Nurses on the unit were included in this evidence-based change in practice project. Several nurses offered positive comments regarding the medication safety course that was presented via Healthstream©. One on one interviews with nurses during working hours were conducted to determine current practice with PCA use and augmented an online survey to determine current knowledge and familiarity with the PCA policy as well as comfort levels working with the devices.

Nurses in this setting were not proactive to changing their work processes and the status quo is widely accepted. An example of the reaction to a change in the work process on the unit is presented here. Certified nursing assistants (CNAs) are responsible for obtaining the vital signs and documenting the results in the EHR. It is the responsibility of the nurse to review the vital signs and act on abnormal findings. The supervising nurse noticed a pattern that abnormal vital signs were being missed. Beginning in April 2014, the decision was made to have the CNAs obtain the first set of vital signs (at 08:00am for example), and the primary nurse was to obtain the second set of vital signs (at 12:00pm for example). One reason is so the nurse can be aware first hand of any abnormal vital signs or significant changes from the patient's baseline. Another reason this change was implemented was an attempt to improve patient satisfaction scores because the nurse would be spending more time with the patient and giving the patient more direct attention. This recommendation was widely protested with the objection of having "extra duties" to complete during the shift. The staff nurses were allowed to communicate their concerns to the director and supervising nurse. The initial response was to "give it time to work" with an explanation of the purpose of the change. Over the next few months, the nurses

continued to protest this change, without offering any alternative recommendations to improve

the process. Effective in September 2014, the workflow returned how it was originally by

requiring the CNAs to get both sets of vital signs for the shift. This demonstrates that if the staff

nurses continually resist change, leadership will eventually acquiesce.

Planning the intervention:

The medication safety education program consisted of

1. a series of self-learning modules to identify the importance of having a safe

   environment for medication administration in order to reduce harm as well as

   understanding the human and system factors that impact safe medication

   administration.

2. examples of near miss events, or actual medication errors to increase awareness

   and completion of risk notifications in order to improve the working conditions by

   identifying system-related medication administration problems.

3. a simulation experience to highlight safety while caring for a patient with a PCA.

The DNP student had the primary responsibility for coordinating the three components of

the education program: conducting a needs assessment, creating the education program (online

module and simulation exercise), and evaluating the entire process. A work breakdown structure

was created to assist with the planning (see Appendix R). The first step in implementing the

educational program was to fully understand the scope of the problem regarding medication

safety. A comprehensive review of the QRRs from the 2012 – 2013 fiscal year was completed.

Results confirmed there were breaches in the basic medication administration principles as well

as significant pharmacy issues. During review of the QRRs, the DNP student made

recommendations for redefining the medication event categories and subcategories in order to

improve medication error reporting. The DNP student worked collaboratively with the quality

director, information technology (IT), the pharmacy director and the Nursing Informatics

Clinical Experts (NICE) team to fine-tune the dictionaries in the EHR. Appendix A has the

revised dictionary that was used in the risk module. To capitalize on the required education for

the risk module, an introductory medication safety PowerPoint (PPT) was introduced for the

clinical staff in conjunction with the implementation of the new online risk module.

       To begin planning for the content of the medication safety course, a thorough literature

review was completed. Medication safety education is commonly recommended as a means to

improve patient outcomes. Lu, et al., (2013) reported a statistically significant improvement in

nurses' knowledge of high-alert medications after a 60-minute PPT presentation was given as the

educational intervention. Educating nurses about safe administration of medications is

multifaceted and involves instruction about actions and uses of medications, safe dosage, side

effects, and nursing implications (Durham & Alden, 2008). In addition, nurses need education

about 1) the importance of having a safe environment for medication administration by reducing

distractions, improving lighting and minimizing noise levels (Choo, Hutchinson & Bucknall,

2010; Wolf, Hicks, & Serembus, 2006); 2) recognizing perceptual factors and the complexities

inherent in the medication administration process (Page & McKinney, 2007; Saintsing, Gibson,

& Pennington, 2011; Taneja & Wiegmann, 2004); and 3) integrating pharmacokinetics and

pharmacodynamics principles into clinical practice (Brady, Malone & Fleming, 2009; Choo,

Hutchinson & Bucknall, 2010; Durham & Alden, 2008; Sears, Goldworthy, & Goodman, 2010;

Page & McKinney, 2007). Furthermore, Currie et al., (2009) developed a patient safety

curriculum that included an overview of patient safety and promotion of mindfulness, hazard and

near miss reporting, quality improvement methods such as root cause analysis (RCA) or failure

mode effects analysis (FMEA) and the disclosure of adverse events in healthcare. Leadership

commitment, professional salience, preoccupation with failure, non-punitive environment,

systems conducive to error reporting, and strengthening communication were identified as

important dimensions of a safety culture (Currie, et al., 2009).

It was not realistic to plan a 60-minute presentation of medication safety for the staff

nurses on Med/Surg for many reasons, primarily because the education and quality directors

requested the presentation to be brief since the nurses would be expected to complete the course

during working hours. The underlying message was to keep the introductory medication safety

course to less than 15 slides. A very brief, introductory 12-slide PPT presentation was created to

highlight each of the above concepts. The full slide set for medication safety can be found in

Appendix B. This PPT presentation was used in conjunction with the "Patient Safety/Risk

Notifications" PPT presentation developed by the Quality Management staff. An excerpt of the

slides related to the risk management process and definitions of a medication error, near miss

event, and hazardous occurrence, which augmented the medication safety slides can be found in

Appendix C. The plan was to create a series of short self-learning modules about medication

safety further exploring each concept in more detail.

Unfortunately, nurses are often not aware that a medication error or near miss event has

occurred (Choo, Hutchinson & Bucknall, 2010) or what constitutes a medication error

(Dennison, 2007). One of the main tenets of the project was to provide clear definitions of these

events and highlight the importance of reporting them in order to identify and key areas for

improvement within the complex medication delivery system. Another goal was to emphasize

that the leadership team had a commitment to excellent patient care and patient safety and would

appreciate the feedback. Dennison (2007) recognized that supportive leadership is crucial in

creating practice change using a culture of safety; continuing to blame the individual or expect error-free performance is not realistic. A culture of safety will augment the reporting process of medication errors and reduce the likelihood that the same type of error will reoccur (Harding & Petrick, 2008; Wolf, Hicks, & Serembus, 2006). Benner et al. (2002) identified a concept known as practice responsibility; which refers to individual accountability and experiential learning that is shared with others to collectively change practice by creating a safer patient care environment. Just culture theory is essential when educating nurses about medication safety and how to avoid adverse patient outcomes. The plan at the beginning of the project was to expand on these concepts through a comprehensive medication safety education program.

The second step in implementing the educational program was to survey the staff to identify current practice when caring for a patient with a PCA device. Gathering these data provides a better understanding of the barriers and obstacles that exist. Using an online survey, the current knowledge, attitudes, and beliefs regarding the use of PCAs as a means to manage postoperative pain can be assessed so the education module can focus on areas of confusion or misunderstanding.

The third step included analyzing these data and developing the simulation scenario. One goal of this proposal was to provide a simulation experience in a safe environment highlighting the nursing management of a patient with a PCA in order to improve assessment, care, and documentation. Developing a simulation scenario is challenging; it requires careful forethought and planning, has to be educationally sound, realistic, and based on evidence (Aschenbrenner, Milgrom, & Settles, 2012). Although Lu, et al., (2013) reported a statistically significant improvement in nurses' knowledge of high-alert medications after a 60-minute PPT presentation was given as the educational intervention, a tailored and innovative education program for nurses

was necessary to change the culture and attitudes toward PCA management at this small county

hospital. Developing a simulation scenario as a educational method would increase the

mindfulness of critical components of the PCA policy and highlight the common adverse drugs

events (ADEs) associated with PCAs as well as potential ways an error could be made. When

learners participate in simulation, they are more likely to be able to quickly adapt to changing

events and identify evolving patterns in a patient's condition (Clancy, Effken & Pesut, 2008;

Glasgow, Dunphy, & Mainous, 2010). Nurses can safely experience a variety of situations that

put the nurse at risk for committing a medication error or failure to identify ADEs related to PCA

usage. Being more cognizant of the factors contributing to PCA related errors will enhance

accountability when caring for a patient with a PCA for the management of postoperative pain.

The content for the simulation was determined from the surveys and interviews, from

which specific learning objectives could be developed. Med/Surg nurses were targeted for initial

implementation due to the frequency of caring for patients on PCAs. There were three different

concepts for the simulation scenarios that resulted from meetings with the directors from

education, quality management and pharmacy. The education director wanted a scenario that was

centered on recognizing a change in the patient's condition requiring prompt assessment and

intervention (such as a decreased in respiratory rate or altered level of consciousness); in this

situation, a rapid response team notification would be appropriate. The quality management

director requested a scenario that involved an embedded medication error in the scenario in order

for the nurse to identify the error and complete a risk notification (QRR) using the new online

risk module. Lastly, the pharmacy director requested a scenario that focused on the key problem

areas of documentation occurred during change of provider, discontinuing a PCA, when a

syringe is changed, and when a dose is increased. Scenario development worksheets were

created for each of these potential documentation problems (see [Appendix D1-D4](#)) because this was the area of highest need for the organization. In addition, this decision was based on results of direct observational experiences and one to one interviews with nurses where inconsistencies were noted regarding when a co-signature was required for documentation of the volume and dose infused via the PCA device. Once developed, piloted, and validated, the simulation scenarios can be published with the California Simulation Alliance (CSA) as a resource for other hospitals to use for PCA education, medication error reporting, and rapid response team activation training.

Aim of entity being changed. The primary goal of the nursing director of the Med/Surg floor and the pharmacy director was to improve compliance with PCA documentation. The secondary goal of the quality and pharmacy directors was to also increase reporting of near miss events. The nursing staff on the Med/Surg unit does not realize they are part of the bigger system. They view themselves as somewhat independent or an isolated entity. They generally do not feel as though they can make a difference (individually or collectively) or that administration will listen to or act on any concerns brought forward. As the beneficiaries of care, the patient was never identified as an overt consideration, but rather, an incidental result. The staff nurses collectively were more focused on getting the task done. Of course there were some exceptions and some nurses put their patient's needs first. The nursing staff on the unit does not see or embrace the notion that they are change agents as a means to improve patient outcomes. For example, an over bed trapeze was needed for a patient who was a paraplegic. It took over three days to locate all the components of the trapeze and set it up for the patient. Several staff nurses were apathetic to the situation and there was no sense of urgency to find the equipment in order to improve the patient care experience.

The hospital was recently selected to become the area's Level II trauma center. Staff

nurses at the hospital recognized this as a milestone and were generally excited about the

accomplishment. However, the implementation plan for the trauma designation requires specific

trauma-related education. The education department was focused on providing the education and

getting the "box checked" that it was done. The impact or change in practice as a result of the

education was not being evaluated or reinforced because there are no role models on the

Med/Surg unit to help mentor, support, and encourage sustainable changes in practice.

Leadership needs. Leadership within the hospital supported this evidence-based change

in practice project. The previous chief nursing officer (CNO) was involved in the project prior to

resigning; however, the new CNO was not committed to this project until recently. The

Med/Surg director was supportive at the very beginning of the proposal; however, she relied

heavily on the supervising nurse and her staff nurse III's to help. Unfortunately, these nurses

were often "too busy", had conflicting priorities, or were unavailable to help consistently, which

resulted in several significant project delays. Each director from education, pharmacy, and

quality were very helpful in the initial stages of the project, however each person had their own

needs and agendas that prevented their full support and participation. Several organizational

projects, including a Joint Commission survey and the trauma education, interfered with a

seamless role out of this evidence-based change in practice project. As a result, the leadership

needs were only partially met.

Cost/Benefit Analysis: There is a collaborative relationship between the local college

and the small county hospital. As a result of this partnership, a partial grant budget of $175,000

dollars was available for this project proposal as well as pre-established contractual deliverables.

The complete pro forma operating statement for this project is available in Appendix E for

review. Resources required for this project include primarily the time and energy investment of

the DNP student to create the education module about PCA management, safe medication

practices, and the simulation scenario. Meetings between the student, education director,

pharmacy director, quality management director and other relevant parties (selected committee

members, chief nursing officer, unit based nursing directors, etc.) would occur during their

working hours, and therefore would not incur additional expenses.

The DNP student anticipated approximately 300 hours to complete the project. These

hours are broken down to developing and analyzing the results of the surveys (60 hours),

researching, creating and implementing the education program (180 hours), and exploring best

practice, designing a simulation experience, and implementing the simulation exercise (60

hours). A simulation technician, currently 100% funded through a grant, will be needed each

time the scenario is run (approximately 60 hours including set up and take down). The supply

costs are minimal and would include moulage, syringes, intravenous solutions and equipment,

saline flushes, simulated tablets etc. There will also be costs for the small incentive/gift for each

nurse who completes the pre and post survey. There is the possibility for the loss of productivity

to the organization if the survey is completed during working hours. In order to minimize

disruption to the unit, nurses will likely require compensation to complete the simulation

scenario during non-working hours. It is estimated that completing the activities would

necessitate approximately two-three hours of time. Total estimated cost of the intervention is

$62,368.

The financial focus of the educational intervention was not to generate revenue, but

rather, to mitigation risk. Risk-mitigation requires certain assumptions related to frequency and

cost of errors. It was difficult to obtain accurate costs due to the voluntary nature of reporting

adverse drug events (ADEs); actual numbers of ADEs and associated costs are grossly

underestimated (Pinella, Murillo, Carrasco, & Humet, 2006; Wahr, et al., 2013). Furthermore, an

independent audit of a small state hospital found much higher rates of medication errors than

were self-reported by a ratio of 244:1 (Grasso, Rothschild, Jordan, & Jayaram, 2005); this one

study provides a glimpse into the actual scope of the problem. It is known that there are at least

1.5 million preventable medication errors and ADEs occur each year in the United States,

excluding errors of omission (Aspden et al., 2007). Current estimates suggest that hospitalized

patients are subjected to at least one medication error per day (Aspen, et al., 2007). The

probability of avoidable ADEs from an injectable medication is 3.3% (Lahue, et al., 2012);

therefore, the hospital can expect to have 12 events related to injectable medications per year

(based on the potential for 365 errors/year). The probability of a narcotic/analgesic related ADE

per occurrence is 0.33% with a 95% confidence interval (Lahue, et al., 2012); this represents

approximately four events related to narcotics per year. Granted, these are likely to be

conservative numbers; according to Andel, et al., (2012) preventable medical error (of which

medications are included) may actually be ten times higher.

Reported incremental costs of an ADE range from $2,000-$9,000 (AHRQ, 2001; Pinella,

Murillo, Carrasco, & Humet, 2006; Aspen, Wolcott, Bootman & Cronenwett, 2007; Leapfrog

Group, 2008; Lahue, et al., 2012); therefore averaging these amounts, the cost of an ADE is

estimated to be $5,500 in additional costs per hospitalization. This amount is exclusive of

medical professional liability (MPL), administrative costs, or litigation fees. Additional direct

costs of an ADE consist of the medical costs to payer (extended length of stay, additional

medications, physician visits) and lawsuits (Lahue, et al., 2012). The average incremental annual

costs for preventable ADEs was $600,000 in payer costs, the average annual MPL cost

associated with ADEs from injectable medications was $72,000 per hospital, and legal settlement

costs averaged $376,500 per case (Lahue, et al., 2012). Indirect costs of ADEs may include

missed work, reduced quality of life or disability for the patient, pain and suffering, and even

death (Lahue, et al., 2012). Based on quality-adjusted life years (QALYs), a conservative

estimate of the economic impact of medical errors is calculated with an estimated ten years of

life lost at an approximate cost of $75,000-$100,000 per year (Andel, et al., 2012). In addition,

the employee who made the error may call in sick necessitating the inclusion of replacement

costs to cover the shift. Total estimated cost of savings benefit related to avoiding one

medication error secondary to a narcotic agent is $487,690; Appendix F has the complete

cost/benefit analysis.

     Responsibility matrix. The complete responsibility matrix can be located in Appendix

G. The proposal for the evidence-based change in practice project was presented to the director

of education, who then requested that the directors from quality management and pharmacy were

included as well. The project plans were also communicated with the director of the Med/Surg

unit. Both the quality management and pharmacy directors had a vested interest in increasing the

near miss event reporting and welcomed the review of the previous fiscal year's QRRs for an

unbiased perspective and to identify any trends or patterns if present. Although no specific trends

were noted, the pharmacy director requested help to determine the reason for non-compliance

issues related to documentation with new PCA devices the hospital had recently purchased to

improve patient safety. Several meetings were conducted with the pharmacy director to ascertain

the scope of the problem. Within the education department, communication was also maintained

with a staff nurse III as a liaison to the education director in terms of helping to coordinate the

simulation scenarios. The DNP student assumed the majority of the responsibility for these

aspects of the project.

The quality management director had the responsibility of implementing a new risk

module for online reporting and requested assistance to redefine the medication event

dictionaries to facilitate the reporting process. The DNP student had a supportive role for this

aspect of the project. Communication needs branched out to include an information technology

specialist, and members of the nursing informatics clinical expert (NICE) team. Meetings were

centered on reviewing the new online QRR process as well as updated/redefining the medication

event dictionaries. In addition, while planning the education for the new online reporting process,

there was an opportunity to include the first introductory medication safety PowerPoint for

clinical staff only. The PowerPoint was reviewed by the NICE team and approved for

distribution.

Implementation of the Project:

In order to start the evidence-based change in practice project, a memorandum of

understanding was required. Approval from the agency and county counsel for the MOU began

in April 2013 and was officially signed in late September 2013. Preliminary planning meetings

occurred between the DNP student and the education director (who was also the student's

preceptor at the agency). During these meetings, the idea of improving medication safety was

presented as well as improving the incidence of near miss reports. With a conceptual framework

of "Just Culture", it was agreed that the project would benefit the staff of the Med/Surg unit and

the agency as a whole. The idea of a simulation was readily embraced because the hospital had

just purchased a simulation manikin and was renovating the education department to include a

simulation suite. April 2014 was the scheduled timeline for the simulation manikin to arrive and the simulation suite to become fully operational.

The director of education helped to coordinate a few meetings with the pharmacy and quality management directors because they each had a vested interest in this project. Between October and November 2013, 604 medication-related QRRs were reviewed and analyzed for trends and patterns. To obtain further insight into the scope of the problem, the DNP student attended a couple of meetings specific to evaluating medication events, including one in which the results of the annual Medication Error Reduction Program (MERP) were reported.

During November 2103 and January 2014, the DNP student was actively involved in meeting with quality management, information technology, pharmacy, and the NICE team to learn and review the online QRR reporting process, which was scheduled to go live in February 2014. Suggestions were made to improve the reporting process as well as providing recommendation for a new medication event dictionary. The original medication event dictionary consisted of 56 entries; this was streamlined to 8 new categories and 33 subcategories (see Appendix A). The introductory PowerPoint on medication safety was prepared for the clinical staff and reviewed by the team for approval to be used in conjunction with the education for the new risk notification process that was being implemented in February 2014.

During January 2014 to February 2014, there were three meetings with the pharmacy director to gain understanding of the PCA issues the department was experiencing. Initial reports from the pharmacy director indicated that the nurses on Med/Surg were not following the new policy regarding the frequency of assessments that were being documented. A couple members of the NICE team were included in these meetings in order to get a nursing perspective on the scope of the problem. In early February, the DNP student was scheduled for a training session

with members from the NICE team to learn how to operate the PCA pump and shown the

required documentation steps. Once the DNP student became comfortable with the PCA pumps,

the observations and interviews with the Med/Surg staff nurses regarding their current practice

while caring for patients with a PCA device was able to commence. A new orthopedic surgery

service was started in the spring 2014, so there were many hopes that patients with PCAs would

be available (status post a total knee or hip replacement).

The purpose of the observations and interviews were two fold: 1) to gather data regarding

current practice with PCA devices and 2) to provide "just in time" education to those interviewed

who were not fully aware or complying to the policy. Unfortunately, there were many challenges

in scheduling because the floor did not consistently have patients with a PCA pump;

furthermore, when patients were present on the unit, the DNP student was not able to be at the

hospital due to conflicts with the student's full-time work schedule. Over the course of six

weeks, a total of four nurses were observed and interviewed regarding their care of the patient

with a PCA.

The few observations did not add much insight to the issue. The nurses who were most

comfortable caring for patients with a PCA device, were also the one who were the most familiar

with the policy and therefore compliant with the established documentation requirements. The

goal was to focus the education on the nurses who did not consistently care for patients with a

PCA. In March 2014, an online survey was created to assess the current knowledge, attitudes,

and beliefs regarding the use of PCAs as a means to manage postoperative pain. Once the first

draft was complete, the survey was sent via email to the hospital's librarian, who was considered

to be a Survey Monkey expert. A meeting was scheduled with the librarian to review the survey

and obtain feedback on the survey questions (see Appendix H). The survey was live for a period

of three weeks from March 23rd – April 10th.

The results of the survey were analyzed by the end of April. Initial attempts to schedule

meetings with the education, pharmacy and quality management directors to provide the results

of the survey were unsuccessful, due to competing priorities with hospital projects or vacation

time. A meeting was eventually scheduled with the education director at the beginning of June.

During the meeting, the survey results were reported and a request was placed to get a copy of

the results from the medication safety course on Healthstream©. This is when the

implementation plan for the project got off track and then continued to deteriorate.

During the months from mid-June to September, two-way communication and

collaboration between the agency and the DNP student came to a standstill. In July and August,

four attempts were made to obtain the results of the medication safety course on Healthstream©

from the education department; the results were finally obtained at the beginning of September.

The explanations for the delay was the result of staff turnover in the education department, so no

one was sure how to access or where to find the results.

In July, August, and September, several emails and phone calls to pharmacy and quality

management were made to obtain the financial information regarding the cost of a medication

error, litigation costs, and fees for Medical Professional Liability (MPL) insurance to estimate a

possible return on investment. In addition, during the time period, the DNP student requested

updated information about PCA use on the Med/Surg unit (to include results of the PCA audits

completed by pharmacy), pharmacy reports regarding PCA and naloxone (Narcan) concomitant

use, as well as the number of rapid response team (RRT) calls that may be related to PCA use.

Lastly, requests were made for any adverse drug event (ADE) reports associated with PCAs,

updated medication error and near miss event rates for FY2014, and number of occurrences of

medication delivery on Med/Surg (specifically injectable medications). This information was

needed to develop the simulation scenario that was specific to the identified deficit and to meet

the needs of the pharmacy director. The only emails that were received from the agency during

the specified time period were automatically generated "out of office" notifications due to

scheduled vacations.

In September, one email was received from the pharmacy director indicating that

documentation was the main problem for the nurses when caring for patients with PCA devices;

however, the email lacked any specific details. Also, the results of the Healthstream© course

were received around the same time and efforts were made to move forward with the simulation

scenario. Several draft scenario development worksheets (Appendix D1-D4) were created

because without specific data from pharmacy or access to the PCA audits, it was difficult to

determine the exact documentation issue that was most problematic.

Support was requested and received from the Med/Surg director; the DNP student was

directed to work closely with the staff nurse III on the Med/Surg floor to determine the unit's

perspective and their specific needs and gaps with PCA documentation. The Med/Surg director

also warned the DNP student that the staff nurses were difficult to get motivated. During this

time, the staff nurse III on the Med/Surg unit was very busy and did not respond quickly to email

and could not be reached by phone. Several attempts were made to schedule days to review, pilot

and validate the simulation scenario; three days were scheduled but each day was cancelled by

the staff nurse III. By the end of the month, the DNP student had received a message that the

staff nurse III was on vacation until mid-October. The DNP student then contacted the

supervising nurse who was able to provide some assistance.

On October 6th, a meeting was finally scheduled with the directors from pharmacy, quality management and education. At this time, much of the data previously requested was provided, but not all. Unfortunately, the actual QRR data reported using the new online module was not released to the DNP student. No financial information was available regarding costs of medication error or from lawsuits because the primary patients served by the hospital is not a litigious population. The quality management recalls the hospital being sued twice in the past 20 years, with each settlement being less than $100,000. Furthermore, all of the directors were unaware of the exact nursing workflow with the PCAs to be able to provide any feedback on the draft simulation scenarios.

Lastly, the simulation suite was still in progress; the manikin had arrived, the suite was built, but the hospital was waiting for the audio/visual equipment to be installed. The DNP student already anticipated this and alternate plans were being made to conduct the simulations in situ on the actual Med/Surg unit. Final attempts were made on Oct 8th and 9th to pilot the scenario, but the supervising nurse was not available to help on those days. At this time, the DNP student made a very difficult decision to cease further attempts to implement the remainder of the project due to time constraints and a project due date of October 15th.

Planning the study of the intervention:

Assessment plans. Using the PDSA cycle, the first test of change was the introductory medication safety education course placed on Healthstream©. This course was assigned only to the clinical staff in the hospital. Upon completion of the course, staff nurses are expected to pass the post-test with a score of 80% or better. Due to a miscommunication, the quality management staff developed the post-test. After the introductory medication safety education course was created, there was uncertainty if approval was granted to place the course on Healthstream©. The

DNP student had the impression the course was not going to be used, so post-test questions were

not written. Nevertheless, upon realizing the course was in fact being used, the DNP student

planned to obtain the results of the post-test to determine knowledge gaps specific to the nurses

working on the Med/Surg unit. In addition, the number of medication events being reported,

from February to September 2014, would be compared to the preceding time period.

The second test of change was focused on improving compliance regarding PCA

documentation and increasing the number of near miss events being reported. Initial plans were

to collect data (between January and March) from one on one interviews, nurse observations, the

Healthstream© course results, and the needs assessment to create a targeted simulation scenario

to address the practice deficiencies with the PCAs (which were later identified to be

documentation issues). The needs assessment consisted of 20 questions (see Appendix H) related

to the policy and procedure as well as nurse comfort in caring for patients with a PCA device.

Planned simulation exercises were to be conducted in April, either in the education department if

the simulation equipment was ready or in situ on the actual Med/Surg unit. The simulation was

expected to be approximately 15-20 minutes in length including pre-brief and debrief. The

anticipated outcome of the simulation exercise was 1) increase awareness of the need to report

near miss events and 2) improved compliance with PCA documentation requirements.

Administration of the needs assessment survey was scheduled as a follow up to the first one to

compare results after participation in the simulation scenarios.

Gap analysis. The current clinical state and baseline data prior to implementing the

evidence-based change in practice project revealed a few gaps in practice. The pharmacy director

stated there were gaps with near miss reporting, which resulted in a deficiency in their annual

MERP reporting. An issue regarding the clinical practice of nurses while using PCA devices was

noted. According to the pharmacy director, approximately 1/3 of nurses were not documenting on the PCA intervention EHR screens appropriately. In addition, the pharmacy director also reported an increase in the number of adverse drug reaction reports related to opioids (morphine specifically). See Appendix I for complete gap analysis.

Gantt chart. A Gantt chart of the entire project can be found in Appendix J. This chart shows the original and updated timeline for this evidence-based change in practice project as a result of multiple delays from several unexpected obstacles. Initial milestones are indicated as well as actual dates of completion. There were four sub-projects that made up the entire project. Per the responsibility matrix, not all steps of the project were the sole responsibility of the DNP student; for instance, the actual implementation of the online reporting module was identified as agency responsibility. Developing the medication safety education self-learning module, determining the scope of the PCA noncompliance issue and creating the simulation experience were the DNP student's responsibility.

Nature of initial process change planned. The nurses on Med/Surg were directly connected with this activity. A "natural" work group was not evident on the unit because the floor nurses had variable schedules. It was hoped that the Med/Surg staff nurse III would have a vested interest in helping the DNP student to solicit volunteers for the simulation scenario and be available on the unit to ensure patient needs were still met when a nurse came to the simulation experience for 15-20 minutes; however, the staff nurse III was not very comfortable or knowledgeable about the PCA pumps and was not willing to help during implementation of the evidence-based change in practice project.

Leading the change. The DNP student was expected to lead the effort to implement the evidence-based change in practice project for the majority of the project. The director of

education, quality management, and pharmacy were available for support, encouragement, and

guidance. With no previous project management or formal leadership experience, the DNP

student expected some challenges with the implementation of the project. Because the agency is

also a teaching hospital, the DNP student felt the environment would be conducive to learning as

a result of the collaborative relationship with their university affiliate. Also, nurses would likely

be more receptive to learning about new strategies to improve patient outcomes as a result their

own work processes. The DNP student was curious about which educational methodology would

be the best to produce a change in behavior. The change of behavior would be measured in

increased compliance with vital sign documentation for patients on PCAs and an increase in the

number of near miss medication reports. There were plenty of resources available from the

various directors being very willingness to assist in the project to the availability of the actual

equipment needed for the simulation experience.

Methods of Evaluation and Analysis:

      Instruments used, analytic methods, and software used. Several assessment strategies

were utilized when evaluating the effectiveness of the implementation. Post-tests from the

Healthstream© course were used to determine baseline understanding of medication safety for

the nurses on Med/Surg. Although the DNP student did not participate in developing the post-

test questions, several questions were still relevant. Unfortunately, the DNP student was only

able to obtain these results as an aggregate; responses to individual questions were not available.

The needs assessment was conducted through an online Survey Monkey© and generated a

variety of descriptive results, including nominal, ordinal, interval, and ratio measurement

variables. Survey Monkey© was also planned for the post-simulation/reflection evaluation

surveys (see Appendix K for full post-simulation evaluation questions). Plans for full

implementation of the self-learning module are still being finalized. If the DNP student is

permitted to place the learning modules on Healthstream©, then that platform would be used to

evaluate the pre/post-tests for initial results. Then the DNP student would compare the results

between the two and determine the amount of improvement using simple ratios. Otherwise, the

DNP student will construct the self-learning module on paper, and use a Scantron© or

paper/pencil format to collect the results. All of the instruments and surveys were created by the

DNP student with the exception of the post-test for the introductory medication safety education

course on Healthstream©, which was developed by the quality management department.

       SWOT analysis. Strengths, weaknesses, opportunities and threats are fully described in

Appendix L. The strength of the education program is the multidisciplinary support received

from the directors of the Med/Surg unit, pharmacy, education, and quality management; the

previous interim chief nursing officer (CNO) supported the intervention as well. However, the

biggest weakness and threat is the potential resistance, lack of support and cooperation from the

individual staff nurses. Without a culture of safety, nurses may feel threatened or fear a negative

performance review. Perhaps a bigger threat is trying to schedule time for nurses to attend the

simulation experience. There are opportunities to market and publish the simulation scenario and

education module.

       Return on investment. A break-even analysis was difficult to measure for an

educational intervention. Education is often the first to be limited or eliminated when hospitals

look at their bottom line because it is considered "non-productive" time; adding training hours is

met with resistance (Zigmont, 2014). In addition, participants must have the desire to learn with

the right climate to transfer the new knowledge (Dennison, 2007). The goal of the educational

intervention was to avoid adverse outcomes, thereby preventing any additional costs to the

organization related to uncompensated expenses, increases in MPL fees, or litigation expenses. Specific details outlining the cost/benefit analysis were previously discussed in the Methods section of this paper (also see Appendix F). Many assumptions were required since financial data for the agency were not available. Direct, indirect and incremental costs were estimated based on the available literature about medication errors.

The presentation of options for the business plan proposal can be found in Appendix M, the operating statement is available in Appendix E, and the cost/benefit analysis is found in Appendix F. With respect to financial forecasting, if more occurrences are prevented, then the cost savings will increase. Medication error and ADE rates can be evaluated quarterly for the number of near miss reports and ADEs, change in MPL and payer costs, as well as legal fees. Sustainability can be established with annual competency testing or simulation exercises to keep nurses mindful of safe medication practices.

In terms of ADEs, the quantity represents the number of occurrences that need to be avoided in order to realize a return on investment. The fixed cost for implementing the education module and simulation experience for nurses to enhance their knowledge and understanding of caring for patients with patient-controlled analgesic devices is found on the operating statement ($62,368). In terms of preventing adverse outcomes, the price can be assumed to be the average cost of an ADE, annual payer and MPL costs associated with narcotic injectable ADEs, legal settlement costs and indirect costs ($487,690). Therefore, the hospital would need to avoid only one occurrence as a result of the educational intervention in order to break even. When totaled, for a moderate estimate for four events, the average additional cost per year is $1,928,760, resulting in an ROI of 30% when conservative direct and indirect costs are included (see Appendix N for full explanation of the Return on Investment and Break-Even Analysis).

Conceptual and operational definitions. The operational definitions of medication occurrences were included in the staff training PPT created by the quality management department. The hospital describes the different types of occurrences as:

- *Error*: An unintended event or act. This can be something that was done or something that should have been done but wasn't.

- *Near Miss*: An event that was "caught" and caused no harm, but for which a recurrence carries a significant chance of harm.

- *Hazardous Condition*: Any set of circumstances, which significantly increase the likelihood of a serious adverse outcome.

Despite these definitions, there was evidence from review of the QRRs that some degree of confusion or misunderstanding existed as near miss events were categorized as errors. The quality management director acknowledged the problem and realized that some of the medication event categories are actually near miss events and also indicated that the data are based on how the person entering the data choose to categorize the event.

<div align="center">

Section IV: Results

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Program Evaluation:

Nature of setting and improvement intervention. The Med/Surg unit operates with an average daily census of 22-24 patients on a 33-bed floor. The nurses administer approximately 14 medications per patient per day according to pharmacy. The incidence of PCA use on Med/Surg is outlined in table two. Data were requested in July 2014 regarding concomitant use of naloxone (Narcan) and a patient receiving analgesic via PCA device, but at the time of this writing, the report from pharmacy for patients receiving both PCA and Narcan was not provided to the DNP student. The quality management department reported no rapid response team calls

as a result of respiratory depression or arrest secondary to PCA use. Both reports were requested

within the time frame from October 2013 to September 2014.

	Medical/Surgical Unit
# of PCA patients/day	2.7
# of patients started on a PCA/day	0.45
# of syringes used/average patient	3.83

PCA=Patient Controlled Analgesia
Table 2: Incidence of PCA use.

Both AIM statements could not be measured within the specified time period. The first

AIM statement suggested that the number of QRR reports would increase by 10% after the

educational intervention. Unfortunately, there were discrepancies noted in the way QRRs were

categorized; with the new online reporting module, several near miss event categories were

labeled erroneously as a medication error. Actual error reports were not made available to the

DNP student; however, when a near miss report was generated, the results produced only four

entries from February to September. However, without actual baseline data and the confusion

between near miss events and medication event categories, the DNP student was not able to

determine the actual increase in the number of QRR events being reported. Despite providing

clear definitions of the categories of medication events in the educational PPT, a change of

behavior was not measurable.

The second AIM statement proposed a 50% increase in PCA documentation compliance.

The compliance issues regarding PCA documentation were discussed with the pharmacy director

prior to implementing the project; however, a baseline compliance level could not be established

and comparisons could not be made because chart audits were not made available to the DNP

student. Results of the needs assessment related to PCA use were presented to the nursing staff at

scheduled staff meetings. Nurses appeared surprised to learn they were over documenting on

some parameters and under documenting on others. See [Appendix P](#) for the handout provided to the nurses at the staff meeting.

Another contextual factor of the implementation was working with three additional directors (education, quality management, and pharmacy). The DNP student often felt conflicted in establishing priorities based on each director's needs. In retrospect, it would have been beneficial to coordinate communications with just one person; however, due to the obstacles experienced with communication, it is hypothesized that the project would have experienced even more delays. On the positive side, working with all three directors provided the DNP student with an interesting perspective of the entire operations within the agency.

Evolution of initial improvement plan. The project was forced to evolve over time due to delays in acquiring the necessary information (i.e. results of the Healthstream post-test and results from the PCA audits). Only one small portion of the project was implemented in a timely fashion because the agency had a firm "go live" date for the new risk module for online QRR reporting. Even this part of the project was not without difficulties. As previously mentioned, the DNP student was told the medication safety education course, when added to the training for the risk module, would be too long for the staff to complete and therefore not be used. The DNP student learned in late February that the medication safety education course was a requirement for the nursing staff to complete.

Education regarding the documentation requirements while caring for patients with a PCA device was challenging as well. It was difficult to determine the exact nature and scope of the problem. According to the pharmacy director, chart audits on PCA documentation indicated that nurses were not meeting requirements of the policy and the hospital received a Centers for Medicare and Medicaid Services (CMS) alert indicating that documentation of patient

assessments and vital signs was not consistent with the current policy. The needs assessment

survey was created to determine the current level of knowledge and understanding with the new

PCA policy and documentation requirements. The DNP student was not able to provide real time

education about the PCAs because of delays in coordinating schedules to learn how the PCA

pump operates and the expected documentation requirements. In addition, often times, the DNP

student was not available at the same time a patient with a PCA device was admitted to the

Med/Surg floor. Furthermore, "super users" on the unit as well as from members of the NICE

team were providing additional PCA training without any coordination with the DNP student.

Creating the simulation scenario was delayed until specific data was obtained about the

PCA documentation problem as stated by pharmacy. Results of PCA chart audits and baseline

compliance rates were not made available to the DNP student. Despite not having the

information, the DNP student continued to develop drafts of scenarios based on a variety of

possible documentation issues. Additional delays were experienced when the staff nurse III and

supervising nurse on Med/Surg were not available to help pilot or validate the scenarios. This

was an example of another pattern of care identified earlier; nurses on Med/Surg have the

perception that things are being done to them, that they are being forced to change their habits

without realizing that patient care and safety are at stake.

Change in care process. Regrettably, patient care was not changed during the

implementation of the evidence-based change in practice project. The results of the medication

safety education course on Healthstream© demonstrated that 49/51 (96%) staff nurses assigned

to Med/Surg successfully completed the course; completion of the course was mandatory as

determined by the quality management department. Of the nurses who completed the course,

29/49 (59.2%) scored 100%, 12/49 (24.5%) obtained a score of 90%, and 8/49 (16.3%) achieved

an overall score of 80% (which was the minimum required to pass the course). Upon further

analysis, the above scores were all acquired on the first attempt to complete the course.

Forty-three percent of the nursing staff participated in the online needs assessment about

the PCA policy and comfort level in operating the pumps. The results of the survey indicated

only 37% of the staff nurses were very comfortable operating the pumps and 32% were very

familiar with the current PCA policy. With greater than 60% of the staff being moderately

comfortable/familiar or not at all comfortable/familiar, there was an opportunity to increase not

only the familiarity with the PCA policy, but also the comfort level when working with the PCA

infusion pumps. When analyzing the assessment frequency data specific to the PCA policy,

results indicated that the staff actually over-assess their patients' vital signs on initiation of the

PCA pump, with dose increases, and during PCA therapy in terms of how often each parameter

is being measured. Some possible explanations for the differences in responses could be

confusion in the way the question was asked or not reading the question correctly. Pertinent

results of the needs assessment regarding PCA use can be found in Appendix O.

System/process failures. One process failure came with the construction of the needs

assessment survey itself. All of the questions were voluntary to answer; the hope was that the

nurses would elect to answer the questions willingly. In hindsight, this decision was likely a

mistake. Almost half of the nurses responding skipped the majority of the questions. This could

be because they were interrupted due to patient care needs, they elected not to answer the

questions or they were unfamiliar with the policy and didn't want to answer incorrectly. In

contrast, 100% of nurses answered the first two demographic questions in terms of years of

nursing experience and specifically, how long they worked on the Med/Surg floor. In addition,

the responses to frequency of monitoring were likely confusing to the nurses responding. For

example, the frequency of monitoring for a dose increase is every 15 minutes times two, then the

expected frequency of monitoring is every two hours; based on the responses to this question,

only 25% selected the every two hours option. A possible explanation for these results is that the

nurses most likely selected the vital sign monitoring specific to the dose increase, and did not

also select the frequency of on-going monitoring.

One important result that was noted provides an opportunity for the hospital to collect

better information on the number of medication errors and near miss events. According to

Stratton, Blegen, Pepper, and Vaughn (2004), the national average of the number of medication

errors per 1000 patient days was 5.66 in adult acute care units. At this agency, the medication

error data was not reported in the same manner; however, total numbers of patient days were

available allowing the DNP student to calculate the error rate per 1000 patient days as a means of

comparison. As reported in Table 1, the average number of medication related QRRs for fiscal

year 2013 (July 2012-June 2013) calculated per 1000 patient days were 15.35 and 11.26 for the

2014 fiscal year. This number is much higher than the national average because it is believed to

have near miss events being reported as medication errors, when in fact, the error never actually

reached the patient.

<div align="center">**Section V: Discussion**</div>

Summary:

      Key successes and difficulties. The success of this evidence-based change in practice

project was the experience the DNP student gained from planning, implementing and evaluating

a project of this scope and breadth. The opportunity to work with the three directors from

education, quality management and pharmacy allowed for a much broader perspective of the

agency's operations and processes and provided access to multiple areas of the hospital.

However, communication was a barrier due to many scheduling conflicts; only a few meetings were scheduled and most of the communication was via email or phone messages. Nevertheless, the opportunity to understand the scope of the problem, from different departments, with PCA documentation was incredibly valuable to examine the macrosystem functioning of the organization and to begin to understand the complexity of the documentation process.

Although no changes in care delivery were directly observed, the DNP student was able to begin to raise awareness of the importance of reporting actual and near miss medication events in order to make the medication administration process safer for patients. Another success of the project was to identify and clarify the frequency of PCA vital sign monitoring expectations per the hospital's policy and procedure. The strength of the project was the thoroughness of the investigation to examine the scope of the issue and to determine the correct androgogical methodology to provide a comprehensive educational experience in order to change clinical practice. The educational plan did not include a "one size fits all" approach, but rather, the education was tailored to the specific needs of the Med/Surg unit. The absence of timely feedback to determine the effectiveness of one intervention before testing another method hindered the implementation of the project; as a result, the DNP student could not obtain updated information to evaluate the scope of the practice change.

One major difficulty experienced was the timeliness of the information received from the various departments. Two-way communication stopped over the summer months (June-October) for a variety of reasons, some known and unknown. What was known about the lack of communication was that either the quality management director or the pharmacy director were on vacation and not available at various and multiple times during that period. In addition, there were staffing turnovers in the education department as well that delayed obtaining the results of

the Healthstream© module and learning the questions that were used for the post-test. Another area of difficulty was the cessation of free-flowing information and collaboration. A lot of data was shared with the DNP student in the early stages of the project; however, when additional data was requested (from June-October), the data was no longer being provided or shared as willingly.

      Lessons learned. There were several organizational and personal lessons learned. Key findings from the needs assessment survey demonstrated a discrepancy in actual clinical practices of obtaining vital signs for patients with a PCA device when compared to the policy. It was important to learn that nurses were over documenting in regards to the frequency on some parameters, and conversely under documenting on other requirements. In order to sustain the gain in knowledge regarding the frequency of vital sign documentation, small, laminated cards will be provided to the nurses on the Med/Surg unit (that can be worn on their badges) for a quick reminder.

      Documentation for the previous PCA devices was on paper (doctor orders and documentation); the manually tracking of the previous paper documentation method made it easier to make the drug dosage and volume totals add up because of the paper trail. The new online documentation was supposed to allow for better tracking of narcotic usage, but the integration of the PCA pump and the EHR was not fully understood. It would appear as though whole narcotic syringes had gone missing because of the inconsistent documentation practices by some nurses. The problem was a global one and could not be tracked to a few people. This raises obvious concerns from the pharmacy director's perspective: are nurses diverting narcotics or just not documenting accurately?

Change in knowledge doesn't always produce a change in behavior. The PDSA cycle was intended to implement small tests of change. Different andragogical approaches were used to determine the most effective method to educate the staff nurses. Three tests of change were planned: 1) PPT presentation on Healthstream© with post-test for introductory medication safety education information, 2) survey about current PCA practice, and 3) a simulation experience was planned as an interactive, hands on, active learning. Since the approval to pay nurses to come in for the simulations was denied, simulations would need to be done during working hours and would result in competing patient care priorities. As a result, simulations were planned to be completed on site rather than use the local college's simulation lab. The hospital had expected their simulation lab to be up and running by April 2014; as of October 2014, the lab was still not fully operational.

Failing to identify the informal leaders of the Med/Surg unit was an important personal lesson learned. The DNP student relied heavily on support from the formal leadership of the unit to propel the project forward. Had the informal leaders of the unit been identified early, these nurses could have been very helpful in championing the project to encourage participation and promote change. Another personal lesson learned was that passion about something (in this case, medication safety), does not translate to universal buy in from others. More importantly, passion is not enough to encourage others to be more interested in learning more about the subject. Lastly, even with sound teaching strategies, an educator cannot change behavior alone; that responsibility is that of the learner. According to Plutarch, "Education is not the filling of a pail, but the lighting of a fire" (often misattributed to William Butler Yeats). This quote exemplifies the need to find the right educational approach for the right nurse at the right time; something that hospital organizations generally do not have the luxury of time or money to do.

New possibilities. As previously discussed, the medication error rate per 1000 patient

days is much higher at this agency then compared to the national average. It is assumed that near

miss events are actually being categorized as medication errors. The evidence for this assumption

is in the Healthstream post-test for the medication safety course. The question asked, "If a

medication is filled wrong in the Pyxis, what type of Med Event would that fall under when you

report this safety issue in Meditech?" The options were Administration Issues, Drug Events, or

Pharmacy Issue. In addition to being a pharmacy issue, the more accurate answer to this question

is that the safety issue should be reported as a near miss (but, this was not one of the options). By

cross-referencing the medication event categories with those that are near misses, more accurate

data can be collected. When re-examining the medication event categories, there is an

opportunity to flag some of the categories as near miss events; a couple examples include:

pharmacy issues, Medication Administration Record (MAR) issues, and narcotic/count issues.

Another possibility that emerged as a result of this evidence-based change in practice

project was centered on recognizing the system factors affecting the timely documentation when

caring for patients on PCA devices. For example, when sharing the scenario development

worksheets for the simulation exercise, both the quality management and pharmacy directors

could not comment on the scenario because they both did not fully understand the nursing

workflow process involved for the required PCA documentation.

Implications. Education is not the same thing as learning (Zigmont, 2014). Furthermore,

learning (in contrast to education or 'seat time') has a measurable outcome in terms of better

patient outcomes, improving work environment and customer service (Zigmont, 2014). Zigmont

argues that the most efficient way to educate people is to fill a classroom, whereas the most

effective (and most expensive) method for learning is small group simulation experiences

(2014). Learning must be a priority that comes with the appropriate investment in time and

dollars. A philosophical shift is needed to support learning in order to improve patient

satisfaction and patient outcomes. In addition, participants must have the desire to learn with the

right climate to transfer new knowledge (Dennison, 2007).

        Dissemination plan. The results of the needs assessment was presented during scheduled

staff meetings on the Med/Surg unit and distributed by email for nurses who were not in

attendance. Approximately 25 nurses attended the staff meetings and were give a copy of the

results as well as a page of frequently asked questions (FAQs) regarding medication safety (see

Appendix P for the handout provided to the staff nurses). The FAQs provided an additional

opportunity to reinforce the definition of a near miss event and the importance of reporting both

systems and human issued contributing to either near misses or actual medication errors. Results

of the needs assessment and analysis of the Healthstream© post-test were also given to each

director with key lessons learned, suggestions for improvement, and strategies to overcome

obstacles.

Relation to other evidence:

        Comparison to previous studies. Very few research articles were discovered on

medication errors made by nurses; most of the articles were literature reviews to determine the

scope of the problem. See Appendix Q for summary of specific articles related to medication

safety education programs that were reviewed and how they were rated.

        Leufer and Cleary-Holdforth (2013) conducted a literature review to determine the extent

and severity of the problem of medication errors and the contributing factors. Medication safety

curricula should be focused on the fundamental concepts of medication administration to ensure

the highest level of safety (Leufer & Cleary-Holdforth, 2013). In addition, the complex processes

of prescription, calculation, constitution, checking, administration, patient assessment, documentation, and patient medication education should be addressed in the curricula (Leufer & Cleary-Holdforth, 2013). Extrinsic problems, such as workload, staffing ratio, skill mix, number of patients and patient acuity involve issues outside of the nurse's direct control (Leufer & Cleary-Holdforth, 2013). Whereas, problems related to knowledge deficit, practice deficit, math skills, inattention and distraction are examples of intrinsic issues within the nurse's control (Leufer & Cleary-Holdforth, 2013).

Previous studies presented mixed results. A randomized control trial by Lu et al., (2013) reported that using a 60-minute PPT presentation was an effective method of providing education as demonstrated by statistically significant increases in test scores post intervention. Sears, Goldsworthy, and Goodman (2010) also conducted a randomized control trial and reported fewer errors in the simulation intervention group compared to the control group indicating that a simulation-based education method was effective in changing practice by reducing the number of medication errors committed during the simulation exercise. Lastly, Dennison (2007) conducted a quasi-experimental study and reported a statistically significant increase in test scores after two 30-minutes computer modules about medication safety without a corresponding change in behavior.

Similarities/differences. This evidence-based change in practice project encompassed the tenets of previous studies and articles published about medication safety. Education programs are a convenient method for disseminating information about complex system issues to a large number of nurses. The literature consistently indicated that education programs should include clear definitions, reporting process for medication events, the importance of disclosure, and an overview of patient safety principles that include examples of system and human factors, as well

as an emphasis on culture of safety philosophy and leadership commitment. The PPT and simulation exercise for this project included definitions of near miss and medication error, human and system factors that contribute to medication errors. In addition, knowledge level of the pharmacokinetics of opioids (i.e. Morphine) to reduce the risk of respiratory depression with its use in PCA devices was surveyed. Concepts of a safety culture was explored with each director and reiterated with the Med/Surg staff to emphasize the importance of near miss reporting. These same methods (a computer based educational self-learning module and simulation exercises) were used in this project; however one major difference was that both educational modalities were used sequentially to change practice and not just to evaluate an increase in test scores.

Barriers to Implementation:

      Bias. External factors were not fully considered when implementing this project and contribute to confounding biases. The hospital continued to provide training about the PCA pumps from "super users" and members of the NICE team independent of the strategy the DNP student was trying to implement to improve PCA documentation. As a result, it will be difficult to determine if the behavioral change was a result of the evidence-based change in practice project or the educational efforts of the hospital.

      Known barriers. An obstacle that could not have been anticipated was the hospital's selection for Level II trauma designation. The implementation plan to obtain full designation required extensive amount of education related to trauma to prepare the entire staff in caring for these more complex patients. In addition, The Joint Commission had a site visit in September 2014, which impeded implementation of the evidence-based change in practice project because of the focus and attention the survey required.

Locally held assumptions. A few assumptions were evident among the staff nurses and the directors (pharmacy, education, quality management, Med/Surg). The staff nurses' reported feeling that administration makes them do certain things, they object to extra duties imposed on them, and feel overwhelmed and resistant to change. Many shortcuts and work-arounds were directly observed on the unit; when these issues are brought to the nurse's attention, the response was centered on not having enough time or resources to do their job. There was no awareness or acknowledgement of the impact the work-arounds had on patient safety. These assumptions were complicated by the mixed message from the administration of the hospital in that education fixes everything. There is often a knee-jerk reaction to educate the masses, but without taking the time to do it right and determining the root cause of the problem.

Interpretation:

There were many competing commitments during the implementation of this project. The hospital was committed to offering mandatory trauma education due to being selected as the local trauma center; full designation of Level II trauma status is expected in December 2014. The quality management director was working on several other projects, the education director was focused on coordinating the trauma education and developing the simulation lab, and the pharmacy director was preparing for the annual Medication Error Reduction Program (MERP) report. As a result of these competing commitments, the project could not be implemented within the established time frame and expected outcomes could not be fully observed.

The most important aspect of the implementation plan was conducting the simulation exercises to promote a change in practice was hindered because the simulation lab was not fully operational within the original timeframe proposed by the hospital. There was an initial agreement to pay the nurses to participate in the simulation activity. Original plans had the

nurses going to the local college to use their simulation lab (until the hospital's lab was fully

operational). The decision was then changed to have the nurses complete the simulation exercise

during working hours, despite not having the simulation lab ready.

The leadership did not agree with the need for change in terms of reducing costs

associated with medication errors. The DNP student learned in October 2014 that the population

served by the hospital is not a litigious one; the quality management director reported only one

lawsuit that resulted in a settlement of less than $100,000 in the 20 years of employment at the

hospital. Nevertheless, insights were provided into the process of PCA documentation and near

miss reporting that could help improve the system in which the nurses work.

Conclusions:

Requiring a specified amount of education about medication safety is the quickest,

easiest, and most cost effect way to address the issue; however, the outcomes do not always

demonstrate a change in behavior. Increasing awareness of the human and system factors

contributing to medication errors was an important goal to improve the system in which nurses

administer medications. Streamlining the medication events for the online reporting tool will

hopefully increase the convenience of reporting and enable more nurses to document both near

miss events and actual medication errors. The needs assessment to establish baseline PCA

knowledge clearly demonstrated an area for improvement as nurses, overall, indicated they were

only moderately comfortable with PCA devices. The intervention of combining didactic content

and a simulation activity is still useful as a means to change practice in terms of reporting more

near miss events and improving PCA documentation. A greater commitment from leadership is

necessary to sustain practice changes in order to improve patient outcomes. The DNP student

still plans to implement the simulation scenarios when the hospital's simulation lab is operational

(if permitted by the agency) and will re-send the needs assessment survey focusing on the

responses directly pertaining to PCA documentation. Follow up on the number of near miss

reports and PCA documentation audits will also continue.

    As a county-owned, bureaucratic organization, some of the delays in implementation and

evaluation of the project were expected, although they were not fully planned for. Examples of

obstacles that were not planned for include a site visit from The Joint Commission and being

awarded a tentative Level II trauma designation. In addition, the lack of cooperation between the

department directors and the DNP student over the last several months or the project was not

expected or anticipated. The lack of information truly hindered the implementation and

evaluation of the remaining components of the project. The reasons for the lack of cooperation

and information sharing are still unclear.

    There are several implications for patient care and developing health professional; both

leadership and healthcare professionals (nurses, physicians, and pharmacists) must be proactive

in identifying faulty systems and advocate for proper safeguards to be in place. Seamless

reporting of these events is the critical element in identifying complex system issues. According

to Tzeng, Yin, and Schneider, "errors need to be appreciated, understood and corrected

immediately" (2013, p. 15). Full disclosure of medication error rates, types, and circumstances is

necessary to fully appreciate the scope of the problem.

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Appendix A: Medication Events with Descriptions

Risk Module – Medication Event Options with related descriptions
12/16/13

(MEDADR) - Administration Issues:	**(MEDADDR) - Adverse Drug reaction**
- Medication contaminated - Delayed administration - Duplicate administration - Expired Medication identified - Omission (not given) - Found Med-not taken by patient - Pt unable to retain medication - Wrong Patient - Tampering evident - Wrong Time	- Adverse Reaction physical - Drug/Food Interaction - Drug/Drug Interaction - Side effect requiring additional meds
(MEDALLERG) - Adverse Drug Reaction	**(MEDDRUG) - Drug Events (5 Rights)**
- Allergy Known - Allergy Unknown	- Wrong concentration - Wrong Drug - Wrong Dose - Wrong Form - Wrong Route - Wrong rate of administration
(MEDMAR) - MAR Issues	**(MEDNARC) - Narcotic / Count Issues**
- Medication D/C'ed still on MAR - Duplicate order on MAR - Incorrect instruction - Incorrect Transcription of Med - Medication ordered, not on MAR	- Count incorrect - Waste incorrect
(MEDOVERR) - Override Issues	**(MEDPHA) - Pharmacy Issues**
- Emergency event - Medication ordered, not on MAR	- Expired medication found - Pyxis fill error

Appendix B: Medication Safety Module

Medication Safety

Barbara Durham MSN, RN, CNE, DNP-c

The Paradox:

▌ Decades ago, Leape (1994) recognized the paradox that exists in healthcare: the standard of practice in medicine and nursing is perfection.

▌ However healthcare professionals acknowledge that mistakes are inevitable and most want to learn from the mistakes, ideally in an understanding and supportive environment.

▌ It is unrealistic to expect error-free performance.

Medication Safety

▌ It is estimated that on average, the hospitalized patient will be exposed to a minimum of one medication error each day they are hospitalized. (Aspden, et al., 2007)

▌ There are many factors derived from human and environmental sources, contributing to these startling statistics.

Medication Errors

▌ One third of all medication errors occur during the administration phase of medication delivery (Aspden, et al., 2007; Harding & Petrick, 2008; Taneja & Wiegmann, 2004).

▌ Because nurses consistently administer medications, they are well positioned to recognize near-miss events and prevent medication errors (Harding & Petrick, 2008).

The Nurse's Role

▌ It is important for nurses to recognize the challenges faced when providing medications to their patients.

▌ Nurses have to not only catch their own errors, but the errors committed by physicians and pharmacists as well.

▌ Nurses must learn from their mistakes and be willing to disclose mistakes so that others may learn; this changes practice and ensures a safer patient care environment (Benner, et al., 2002).

The Nurse's Role

▌ Nurses have an obligation to look for risks, report errors or hazards, and help design safer systems (Marx, 2007).

▌ Recognizing conditions contributing to these errors is critical so that a safer patient care environment can be created.

▌ By reporting medication errors (actual and near-miss events), the system or environment in which nurses administer medications is improved.

Understanding Pharmacology

- Pharmacokinetics and pharmacodynamics
  - Peak, onset, duration, mechanism of action
- Side effects
- Rates of administration (IV meds)
- Nursing implications
- Monitoring parameters
  - i.e. Potassium levels prior to administering furosemide (Lasix)

Perceptual Factors

- The mind is easily fooled by the illusion created by familiarity, expectancy, and experience; this refers to a phenomenon known as confirmation bias (ISMP, 2004).
- Examples of confirmation bias that contribute to medication errors include:
  - Look alike/sound alike drugs, decimal point placement, units of measure, size and type of font, incorrect drug calculations, frequency of administration, similar packaging issues, and the use of unapproved abbreviations.

Human Factors

▌ Errors result from poor attention span, inadequate communication, faulty reasoning, reduced memory, insufficient training, fatigue and inexperience (Benner, et al., 2002; Brady et al., 2009; Clancy, 2008; Choo et al., 2010; Saintsing et al., 2011).

▌ Nurses rank distractions, tiredness and exhaustion as frequently contributing to medication errors (Choo et al., 2010).

▌ Failing to clarify orders, prescriptions, directions, and reporting parameters

System Factors

▌ Health care is a complex system, interprofessional, and involves multiple decision points that increase the potential for error.

▌ Insufficient infrastructure, time consuming computer processes and lack of clinical decision supports result in "work arounds" that interfere with safe medication administration.

▌ When a system issue interferes with safe medication administration, it is imperative for the nurse to report the problem so improvements can be developed and implemented.

Environmental Factors

❚ Nurses can also ensure a safe environment by reducing distractions, improving lighting and minimizing noise levels (Choo et al., 2010).

❚ The area where nurses prepare medications should be quiet and have good lighting.

❚ Medication rooms with more than one medication dispensing system become a high traffic area and increase the risk of distraction resulting in a medication error.

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Appendix C: Additional slides from patient safety/risk notifications training course:

Patient Safety/Risk Notifications

AKA "incident report" or "occurrence report"

Was previously known as Quality Review Report (QRR)

From paper to electronic

Risk Management Program

The purpose of a Risk Management program is to identify risks of harm to patients, visitors or staff, implement strategies to reduce the risk, and manage the potential outcome following any unusual occurrence (including managing, with the Claims Management Department, any claims or lawsuits that might result). One of the ways to identify potential or actual risks is through an Occurrence Reporting System.

Occurrence Reporting

Assists in identifying care or safety conditions that may result in an injury to a patient or staff.

Assists in monitoring frequency and severity of occurrences, identifying opportunities for quality improvement and/or potential legal liability and implementing corrective action.

Definition of Occurrence

Any unanticipated event that deviates from regular hospital operations.

Injury or harm may or may not result

Types of Occurrences

- *Error*: An unintended event or act. This can be something that was done or something that should have been done but wasn't.

- *Near Miss*: An event that was "caught" and caused no harm, but for which a recurrence carries a significant chance of harm.

- *Hazardous Condition*: Any set of circumstances which significantly increase the likelihood of a serious adverse outcome.

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Appendix D: Medication Safety Scenario Development Worksheets

Appendix D1: PCA Care and Management: Documentation Change in Provider

IDENTIFIED PROBLEM/SCENARIO TOPIC	DESIRED CHANGE/OVERALL GOAL
MEDICATION SAFETY REGARDING PCA USE ON A MED/SURG ACUTE CARE FLOOR.	ACCURATE DOCUMENTATION ASSESSMENT OF COMPLICATIONS
CASE SUMMARY	**CRITICAL PERFORMANCE ELEMENTS**
POST OP PATIENT WITH A PCA.	**PROPER DOCUMENTATION DURING CHANGE OF PROVIDERS WITH TWO NURSES**

CASE FLOW (15-20 MINUTE SIMULATION TIME MAXIMUM)

INITIATION OF SCENARIO		FIRST FRAME	
During change of shift: (Change in provider)	→→	1. Performs hand hygiene, introduces self, identifies the patient and explains purpose. 2. PCA check at the bedside; 3. RN asks for a 2nd RN to help 4. Brings WOW to bedside	→→

SECOND FRAME

For change in provider:

1. Completes documentation under PCA Change/Co-signature required in Meditech.
2. Verify PCA SETTINGS (with second independent verification):
    a. Clicks the "Yes" box
3. GENERAL:
    a. NOTES the number of injections, number of attempts, amount of drug in (ml) and (mg/mcg).
4. PROVIDER CHANGES: Checks the boxes for:
    a. "pump cleared"
    b. "change in care provider"
5. COMMENT as needed

THIRD FRAME		FOURTH FRAME	D E B R I E F
Clears the pump in two places: 1. Patient history (Zooms to 24 hours) and 2. Volume infused	→→	Documents in the IV spreadsheet 1. Enter intake in mls	

SCENARIO END POINT: ACCURATE DOCUMENTATION BY BOTH NURSES

Appendix D: Medication Safety Scenario Development Worksheets

Appendix D2: PCA Care and Management: Documentation when PCA is discontinued

IDENTIFIED PROBLEM/SCENARIO TOPIC	DESIRED CHANGE/OVERALL GOAL	
MEDICATION SAFETY REGARDING PCA USE ON A MED/SURG ACUTE CARE FLOOR.	ACCURATE DOCUMENTATION ASSESSMENT OF COMPLICATIONS	
CASE SUMMARY	CRITICAL PERFORMANCE ELEMENTS	
POST OP PATIENT WITH A PCA.	**DOCUMENTATION DURING DISCONTINUING PCA THERAPY WITH TWO NURSES**	
CASE FLOW (20 MINUTE SIMULATION TIME MAXIMUM)		
INITIATION OF SCENARIO Physician just completed rounds and wrote an order to discontinue the PCA and start oral analgesics	→→	FIRST FRAME 1. Performs hand hygiene, introduces self, identifies the patient and explains purpose. 2. PCA check at the bedside; 3. RN asks for a 2nd RN to help 4. Brings WOW to bedside	→→

SECOND FRAME

1. Completes documentation under PCA Change/Co-signature required in Meditech.
2. GENERAL:
   a. NOTES the number of injections, number of attempts, amount of drug in (ml) and (mg/mcg).
3. PROVIDER CHANGES: Checks the boxes for:
   a. "PCA discontinued"
4. PCA DRUG WASTED:
   a. Documents amount of drug wasted when syringe changed
   b. Includes 2.6 ml for drug wasted in the tubing
   c. Waste does NOT need to be double documented in the Pyxis
5. COMMENT as needed

THIRD FRAME Clears the pump in two places: 1. Patient history (Zooms to 24 hours) and 2. Volume infused	→→	FOURTH FRAME Documents in the IV spreadsheet 1. Enter intake in mls	D E B R I E F
SCENARIO END POINT: ACCURATE DOCUMENTATION BY BOTH NURSES			

Appendix D: Medication Safety Scenario Development Worksheets

Appendix D3: PCA Care and Management: Documentation when new PCA syringe is administered

IDENTIFIED PROBLEM/SCENARIO TOPIC	DESIRED CHANGE/OVERALL GOAL
MEDICATION SAFETY REGARDING PCA USE ON A MED/SURG ACUTE CARE FLOOR.	ACCURATE DOCUMENTATION ASSESSMENT OF COMPLICATIONS
CASE SUMMARY	**CRITICAL PERFORMANCE ELEMENTS**
POST OP PATIENT WITH A PCA.	**DOCUMENTATION DURING SYRINGE CHANGE WITH TWO NURSES**

CASE FLOW (20 MINUTE SIMULATION TIME MAXIMUM)		
INITIATION OF SCENARIO Patient presses call light saying the IV pump is beeping: (Change syringe of medication)	→→	**FIRST FRAME** 1. Performs hand hygiene, introduces self, identifies the patient and explains purpose. 2. PCA check at the bedside; 3. RN asks for a 2nd RN to help 4. Brings WOW to bedside	→→

SECOND FRAME
1. Completes documentation under PCA Setting Assessment (after new syringe is scanned) → Verified at the bedside with second nurse
   a. Verify PCA Medication (Morphine)
   b. Infusion mode (Continuous, Intermittent, Continuous with Intermittent, Other)
   c. Continuous rate (mg/hr)
   d. PCA intermittent dose (mg)
   e. Lockout interval (minutes)
   f. Max analgesia in 4 hours (mg)

THIRD FRAME
1. Completes documentation under PCA Change/Co-signature required in Meditech.
2. Verify PCA SETTINGS (with second independent verification):
   a. Clicks the "Yes" box
3. GENERAL:
   a. NOTES the number of injections, number of attempts, amount of drug in (ml) and (mg/mcg).
4. PROVIDER CHANGES: Checks the boxes for:
   a. "pump cleared"
   b. "syringe changed"
5. PCA DRUG WASTED:
   a. Documents amount of drug left in the syringe/wasted when syringe changed (include 2.6 ml if tubing is changed)
6. COMMENT as needed

FOURTH FRAME Clears the pump in two places: 1. Patient history (Zooms to 24 hours) and 2. Volume infused	→→	FIFTH FRAME Documents in the IV spreadsheet 1. Enter intake in mls	D E B R I E F
SCENARIO END POINT: ACCURATE DOCUMENTATION BY BOTH NURSES			

Appendix D: Medication Safety Scenario Development Worksheets

Appendix D4: PCA Care and Management: Documentation when PCA settings are changed

IDENTIFIED PROBLEM/SCENARIO TOPIC	DESIRED CHANGE/OVERALL GOAL
MEDICATION SAFETY REGARDING PCA USE ON A MED/SURG ACUTE CARE FLOOR.	ACCURATE DOCUMENTATION ASSESSMENT OF COMPLICATIONS
CASE SUMMARY POST OP PATIENT WITH A PCA.	**CRITICAL PERFORMANCE ELEMENTS** **DOCUMENTATION DURING PCA SETTINGS CHANGE WITH TWO NURSES**

CASE FLOW (20 MINUTE SIMULATION TIME MAXIMUM)

INITIATION OF SCENARIO		FIRST FRAME	
Patient presses call light saying increased pain levels not being relieved by PCA: (Change PCA settings)	→→	1. Performs hand hygiene, introduces self, identifies the patient and explains purpose. 2. PCA check at the bedside; 3. RN asks for a 2nd RN to help 4. Brings WOW to bedside	→→

SECOND FRAME
1. Completes documentation under PCA Setting Change Assessment → Verified at the bedside with second nurse
   a. Verify PCA Medication (Morphine)
   b. Infusion mode (Continuous, Intermittent, Continuous with Intermittent, Other)
   c. Continuous rate (mg/hr)
   d. PCA intermittent dose (mg)
   e. Lockout interval (minutes)
   f. Max analgesia in 4 hours (mg)

THIRD FRAME
1. Completes the intervention of "PCA initiation monitoring assessment" (when increasing the dose or rate; do not complete this if dose is being decreased)
2. Adds the "PCA change monitoring" intervention and documents according to policy:
   a. VS, pain, EtCO2 and/or O2 sat Q15 min x 2 (after dose increase)
   b. Sedation level

FOURTH FRAME		FIFTH FRAME	D E B R I E F
Clears the pump in two places: 1. Patient history (Zooms to 24 hours) and 2. Volume infused	→→	Documents in the IV spreadsheet 1. Enter intake in mls	

SCENARIO END POINT: ACCURATE DOCUMENTATION BY BOTH NURSES

Appendix E: Pro Forma/Operating Statement

Operating Statement:	Amount Requested	Total
REVENUE:		
No revenue will be generated for this project; rather, a cost savings will be realized by preventing avoidable adverse drug events.	Not Applicable	N/A
EXPENSES:		
PERSONNEL:		
A. RN coordinator (DNP student) ** Waived Volunteer (300 hrs x $64 + benefits ~ 35%)	+$19,200 +$6,720 benefits	$25,920
B. Pharmacy Director + benefits (# ~8 meetings x 1 hr @~$70/hr salary + benefits ~ 35%)	+$560 +$196 (benefits)	$756
C. Education Director + benefits (# ~8 meetings x 1 hr @~$70/hr salary + benefits ~ 35%)	+$560 +$196 (benefits)	$756
D. Quality Management Director + benefits (# ~8 meetings x 1 hr @~$70/hr salary + benefits ~ 35%)	+$560 +$196 (benefits)	$756
E. Simulation technician (60 hrs x $30/hr) + benefits	+$1,800 +$630 (benefits)	$2,430
F. Nursing salary for attending in-service and simulation 100 nurses x 3 hrs x $60/hr + benefits	+$18,000 +$6,300 (benefits)	$24,300
G. IT specialist to program TEST patients in Meditech	$300	$300
Subtotal Personnel Expenses:		$55,218
OPERATING EXPENSES:		
Employee incentives (Meal vouchers/Starbucks gift card to complete needs assessment) $10/nurse ($10 x 100 nurses)	$1,000	$1,000
Printed educational hand out materials	$400	$400
Simulation costs: Lab usage for 4 hours (includes set up, tear down, debriefing, hi-fidelity manikin, rooms) 25 sessions x $150/sessions (flat rate)	$3750	$3,750
Supplies (PCA pump tubing, syringes, IV solutions, saline flushes, simulated medication tablets)	$2000	$2,000
Subtotal Operating Expenses:		$7,150
Grand Total:		$62,368

Appendix F: Cost/Benefit Analysis

Costs		Benefits	
Personnel salaries:	$55, 218	**Preventing a medication error and avoiding associated costs:**	Potential savings of $487,690 per medication error avoided (specifically related to narcotics)
DNP student coordinator (waived) Pharmacy, Education, Quality Management Directors Simulation technician IT program specialist Nursing staff salary to attend in-service		Direct/indirect costs Increases in medical professional liability Legal settlement costs Extended length of stay Additional supply costs	
Employee incentives:	$1000		
Meal vouchers Starbucks gift cards			
Printed educational material:	$400		
Handouts			
Simulation costs:	$2000		
Manikin usage Wear and tear on manikin Necessary supplies (PCA tubing/syringes etc)			
Total:	**$62,368**		**$487,690**

Payback time is approximately **_one month_** after fully implementing the medication safety education program.

Appendix G: Responsibility Matrix

Project Team: Medication Safety Education Module								
Task:	**Subtask:**	**DNP student**	**Qual Mg't Dir**	**IT spec**	**Pharm Dir**	**Educ Dir**	**Educ SN-III**	**M/S Dir**
Online reporting for medication errors/near miss events	Implement online risk notification module		R					
	Redefine dictionaries for medication event categories and subcategories	S	R	S	S			
	Create education/training plan for roll out	S	R					
	Develop content for module for overview of medication safety	R	S			S		
Needs Assessment specific to the care and management of patients with a PCA	Develop survey on current knowledge and comfort level with PCAs	R	S		S	S	S	S
	Send out link to M/S nurses	R						S
	Collect and analyze results of survey	R						
	Distribute survey results	R						
Medication Safety Learning Module	Develop content for module (specific content)	R	S			S		
	Develop pre/post test	R	S					
	Peer review feedback from staff nurse III's	R						S
	Analyze results from pre/post test	R						
	Revise content based on results as needed	R						
Simulation Exercise	Write clear and directed learning objectives	R			S		S	S
	Develop realistic scenario	R					S	
	Pilot and validate scenario	R					S	S
R=Responsible								
S=Supports/assists								

Appendix H: Medication Safety Survey about PCA use

The purpose of this survey is to enable a Doctoral student (in Nursing Practice DNP) to complete a needs assessment and collect baseline information about nurses' current knowledge of PCA use and maintenance in terms of medication safety.

This survey should take 4 1/2 minutes to complete. Your time and cooperation are greatly appreciated. The survey will be open until 4/10/14.

Demographic Information

Please indicate how many years of nursing experience you have (at any hospital or healthcare agency) and how long you have worked on Med/Surg 3 (specifically) at this hospital.
1. How many years of nursing experience do you have?
    a. 0-2 years
    b. 3-5 years
    c. 6-10 years
    d. More than 10 year

2. How long have you worked as a registered nurse on Med/Surg 3 at NMC?
    a. 0-2 years
    b. 3-5 years
    c. 6-10 years
    d. More than 10 year

Baseline data

3. How comfortable are you working with patient controlled analgesia (PCA) devices?
    a. Not very comfortable
    b. Moderately comfortable
    c. Very comfortable

4. How familiar are you with the hospital's PCA policy?
    a. Not very familiar
    b. Moderately familiar
    c. Very familiar

Implementing the PCA policy

5. What topics do you include when teaching the patient/family about the PCA use? Select all that apply.
    a. About the actual medication (i.e. peak, onset, duration)
    b. Frequency of assessment required
    c. Side effects to report
    d. When to press the button
    e. Who can press the button
    f. Use of the PCA
    g. Other (please specify what additional information you teach your patient)

6. How frequently do you monitor a patient with a PCA on initiation? Select all that apply for each relevant parameter. Please note: Only answer for when you are INITIATING a new PCA.

	Q15 min x2	Q30 min x2	Q1 hour x2	Q1 hour	Q2 hours x2	Q2 hours	N/A
Oxygen saturation							
Respiration Rate							
Vital signs (HR/BP)							
Pain/ Sedation level							
Other (please specify which parameter and how frequently) [free text]							

7. How frequently do you monitor a patient with a PCA after each dose increase? Select all that apply for each relevant parameter. Please note: Only answer for when you have INCREASED THE DOSE on the PCA.

	Q15 min x2	Q30 min x2	Q1 hour x2	Q1 hour	Q2 hours x2	Q2 hours	N/A
Oxygen saturation							
Respiration Rate							
Vital signs (HR/BP)							
Pain/ Sedation level							
Other (please specify which parameter and how frequently) [free text]							

8. How frequently do you monitor a patient for the duration of PCA therapy? Select all that apply for each relevant parameter. Please note: Only answer for what you monitor DURING PCA therapy.

	Q15 min x2	Q30 min x2	Q1 hour x2	Q1 hour	Q2 hours x2	Q2 hours	N/A
Oxygen saturation							
Respiration Rate							
Vital signs (HR/BP)							
Pain/ Sedation level							
Other (please specify which parameter and how frequently) [free text]							

9. When do PCA settings/procedures require verification by 2 licensed staff (i.e. witness/cosign)? Select all that apply.
   a. When the PCA is initially set up
   b. When medication dose or limit has changed
   c. At end of shift
   d. When caregivers are changed
   e. When the medication syringe is replaced
   f. When the PCA is discontinued
   g. When the PCA pump is cleared at every handoff
   h. During patient assessment
   i. When any medication is wasted (including the tubing)
   j. Prior to transporting patient off the floor

10. When does the PCA pump need to be cleared (i.e. zeroed)? [free text]

11. When clearing the pump, which two places need to be zeroed? Select all that apply.
    a. Patient history
    b. Volume infused
    c. Dose request setup
    d. Drug event history

12. During your shift, the patient had 4 attempts, 4 injections, and received a total of 16 mg/(16 ml) of Morphine. When changing providers, what must you and the oncoming RN document before you can leave the unit? Select all that apply.
    a. Document under the PCA setting Change Intervention
    b. Document under the PCA CoSignature
    c. Required Intervention
    d. Document the total amount of drug infused in the IV spreadsheet
    e. Document on the PCA Initiation Monitoring Intervention

13. In terms of question #12, when this documentation is taking place (changing providers), where are you and the oncoming nurse?
    a. At the nurses station
    b. At the patient's bedside
    c. In the hallway
    d. In the charting room

14. When do you document the additional 2.6 ml (for the volume of the tubing) on the IV spreadsheet? Select all that apply.
    a. When the PCA is discontinued
    b. Every time the pump is cleared (zeroed)
    c. When the tubing is changed
    d. Every time a new syringe is started

15. When is the most common time of the day for a patient to experience respiratory depression?
    a. 6am12pm (0600 - 1200)
    b. 12pm6pm (1200 - 1800)
    c. 6pm12am (midnight) (1800 - 0000)
    d. 12am (midnight) to 6am (0000 - 0600)

16. The most important predictor of respiratory depression in patients receiving intravenous (IV) opioid analgesics in the hospital setting is:
    a. Respiratory rate
    b. Patient-reported pain intensity
    c. Sedation level
    d. Blood pressure

17. How do you know if a patient has a higher risk for respiratory depression? [free text]

18. How do you know if a patient is opiate naïve? [free text]

19. What are your biggest obstacles/challenges when caring for patients with a PCA? [free text]

20. Please include your name and email address if you wish to be entered into a raffle for a variety of gift baskets. Responses will be aggregated anonymously; your individual responses will be kept confidential. I promise.
    Name:
    Email Address:

Appendix I: Gap Analysis

Current Practice	Action Steps	Desired Practices (Goals)
Where are we now?	**How do we plan to move forward?**	**Where would we like to be?**
There is a "huge gap in near miss reporting"	• Define the gap • Delineate between near miss and an actual medication error • Implement new risk module for online reporting • Train staff on how to use new reporting process • Educate clinical staff on definition of near miss event and why it is important to report •	Increase the number of near miss reports by 10% in the first 4 months and by 30% after 8 months.

1/3 of nurse are not documenting correctly on the PCA intervention screens and IV flow sheet	• Determine the scope of the problem
	• Understand workflow process of nurses caring for patients with a PCA
	  o interview nurses
	  o provide just in time education
	  o conduct needs assessment
	  o plan simulation activity to high light correct documentation procedures
		>70% of nurses will be compliant with current PCA documentation requirements by the end of the project

Increase number of ADRs related to opioids (Morphine)	• Obtain baseline data regarding current knowledge of opioid adverse reactions and side effects • Provide education through a simulation activity to increase awareness of ADRs and how to report them.	Reduce the number of ADRs related to opioids by 20%

Appendix J: Gantt Chart

Medication Safety Education Program

	2013			2014											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Establish MOU agreement	began in April 2013 and final approval was obtained in September 2013														
Online reporting tool	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Redefine dictionary		ar	o	o											
Plan staff training		ar	ar	ar											
Develop training PPT on Healthstream		ar	ar	ar											
Develop introductory PPT about med safety for Healthstream			o	o M/C											
Develop post-test				ar											
Go live with Risk Module					ar M										
Analyze post-test results						o	o M				x C				
Medication Safety Module	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Determine scope of problem - review QRRs FY2013 (July-Jun)	o	o	o												
Develop content for series of self-learning modules on med safety				o	o	o M				x	x	x C			
Develop pre/post test						o	o					x C			
Peer review education module and test						o	o			did not complete				x	
Administer safety module								o M	o		did not complete			x	x
Analyze test results										o	did not complete				x

PCA documentation issues	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Conduct staff interviews				o											
Develop needs assessment					o										
Send survey to M/S nurses						o M/C									
Collect and analyze results							o M/C								
Disseminate findings								o	x/C						
Plan next steps								o	x	x	x	x	x/C		
Simulation exercise for PCAs	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Determine exact compliance issue								o	x	x	x	x/C			
Develop clear objectives								o				x/C			
Complete scenario development worksheets drafts for peer review									o M		x	x	x/C		
Develop actual scenario										o		x	x		
Pilot test the scenario										o		x	x		
Validate the scenario										o		x	x		
Implement scenario										o M		did not complete			

KEY:
Original Plan (o)
Milestone (M)
Actual timeline (x)
Completed (C)
Agency responsibility (ar)

Appendix K: Post Simulation Evaluation/Reflection Questions

1. The simulation experience was relevant to my clinical practice.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

2. I was able to identify the patient's primary problem.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

3. I was able to make clinical decision and determine appropriate interventions.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

4. The simulation experience seemed realistic.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

5. The simulation experience expanded my awareness of PCA documentation
   requirements.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

6. The debriefing/reflection session allowed me to explore my decision-making skills.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

7. The debriefing/reflection session provided valuable feedback.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

8. The overall experience helped me to identify areas of practice where I am strong.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

9. The overall experience helped me to identify areas where I need more practice.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

10. How long did it take you to engage or immerse into the simulation?
    a. Immediately
    b. 2-5 minutes
    c. 6-10 minutes
    d. Never fully engaged
    e. Other [FREE TEXT]

11. List one way your practice will change as a result of this simulation experience.
    [FREE TEXT].

Appendix L: SWOT analysis

	Helpful	Harmful
Internal origin (Microsystem)	**Strengths**: Have support from Pharmacy, Education and Quality Management. Expertise of nursing faculty in various teaching methodologies. Increase reports of near misses help to build a safer healthcare system. New simulation suite is being built in the education department. Simulation is a formative process. Simulation is a safe-environment to experience a "mistake". Scenarios enhance realism and provide excellent active learning opportunities. A simulation-learning environment helps the participant change mental models through the debriefing process. Safe and effective.	**Weaknesses**: Simulation resources need to be fully implemented. Need access to enough PCA pumps for training purposes. Nurses would need to be compensated for their time to attend the simulation experience. Coordination of time/schedules to offer simulation experience. Nurse resistance to learning a new practice policy. Nurses may not fully understand purpose of simulation-based learning. Need administrative support (from individual nursing unit managers/directors). Dependent on outside vendors to complete simulation suite in the established timeframe.
External origin (Marcrosystem)	**Opportunities**: Simulation scenarios can be published for PCA training/in-service. Medication module can be marketed. Conduct a needs assessment to determine obstacles and barriers of PCA documentation and assessment in order to address the root cause of the problem.	**Threats**: Budget for simulation is not fully established. Scheduling simulation experiences within nurses busy work schedules. May incur overtime to have participation in simulation scenario. Nurses may feel threatened or fear poor performance will be reflected on evaluation. Nurses may not want to participate in simulation experience. Nurses may not want to complete the medication safety self-learning module.

Appendix M: Business Plan Proposal – Presentation of Options

Presentation Of Options

      The status quo. If there is no change in the current practice of caring for patients with

PCAs, the poor practice issues are likely to continue. These practices pose a huge liability for the

hospital by increasing the risk for medication errors and patient harm, which results in litigation

and settlement. From a macrosystem perspective, the hospital may face fines and penalties from

licensing bodies, regulatory and accreditation agencies in addition to poor performance scores on

patient satisfaction surveys.

      The preferred solution. The proposed solution is to implement a tailored education

program to address the obstacles and barriers preventing nurses from adhering to the PCA policy

with 100% compliance. In order to tackle the specific needs of the staff, a pre and post survey

will be conducted to assess current practice and knowledge of frequency of assessments and

types of assessments (pain, sedation, respiratory) required. An education module through

Healthstream about medication safety from a system perspective, defining a medication error,

ADE, and near miss event, and introducing the tenets of just culture is the first step. Expected

results include following policy, documenting correctly, performing timely patient assessments

and consistently completing independent verifications when required. There is multidisciplinary

support for the education program from the pharmacy director, education director, quality

management director, and the chief nursing officer.

      The alternate solution. An alternative approach is to provide the education module only

related to PCA safety to all nurses. However, this solution does not address the root cause of the

nurses inadequate documentation related to PCA use. It is more expensive to repeat the

education to all staff rather than collecting data on the obstacles and barriers facing the nurses to

comply with the policy, specific education/interventions can be tailored to improve effectiveness

of the educational program.

## Appendix N: Return on Investment and Break Even Analysis

Return on Investment:

Return on Investment (ROI) =	Gain (Savings) $1,628,760 – Cost $62,368
	Cost $62,368
ROI (Direct costs) = 25.12%	
Return on Investment (ROI) =	Gain (Savings) $1,928,760 – Cost $62,368
	Cost $62,368
ROI (Direct + Indirect Costs) = 29.9%	

LOGIC:
- Annual cost for preventable ADE in payer costs = $600,000
- If 50% of preventable ADEs are related to injectable medications, then annual cost = $300,000
- Annual MPL cost from injectable medications = $72,000
- Therefore, annual costs for ADE's related to injectable medications = $372,000
- Multiple by 0.33% (probability of ADE being related to narcotics) = $122,760 is the total annual costs for ADEs related to narcotics.
- Legal settlement costs = $376,500 per case
- A conservative assumption of 4 occurrences/year, places the total cost of legal fees to $1,506,000
- Add the legal fees to the annual costs for narcotic ADEs = $1,628,760
- If indirect costs are included, we can add an additional conservative estimate of $75,000 per event ($300,000), for a grand total $1,928,760

Break-Even Analysis (direct and indirect cost of ADE):

Quantity (Q) =	Fixed Cost (FC)
	Price (P) per event– Variable Cost (VC)
Quantity (Q) =	FC = $62,368
	P= $487,690 – VC (unknown)
Q = 0.13	

A return on investment can be realized one month after implementing the medication safety education program.

LOGIC:
- Price per event = $122,760 is the total annual costs for ADEs related to narcotics divided by 4 events = $30,690.
- Plus the cost of the medication error/ADE itself = $5,500
- Plus the conservative estimate of indirect costs/event = $75,000
- Plus legal settlement costs of $376,500/event
- Grand total per event = $487,690

Appendix O: Selected Results of Needs Assessment

Question #3:

How comfortable are you working with patient controlled analgesia (PCA) devices?

- ☐ Not very comfortable
- ■ Moderately comfortable
- ☐ Very comfortable
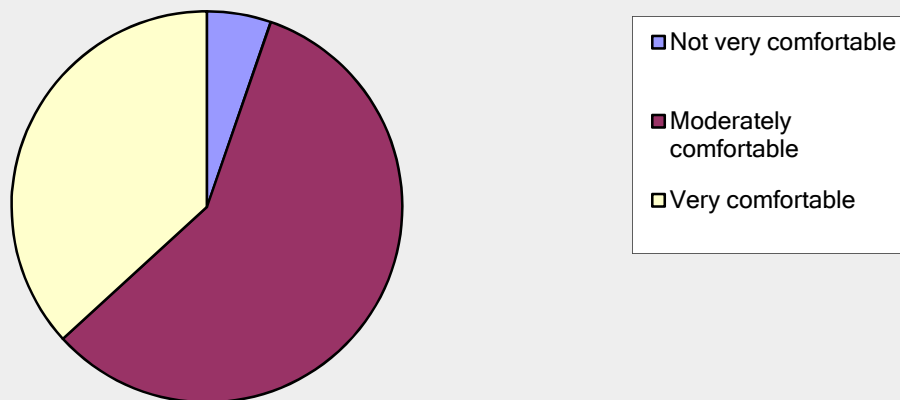
Question #4:

How familiar are you with the hospital's PCA policy?

- ☐ Not very familiar
- ■ Moderately familiar
- ☐ Very familiar
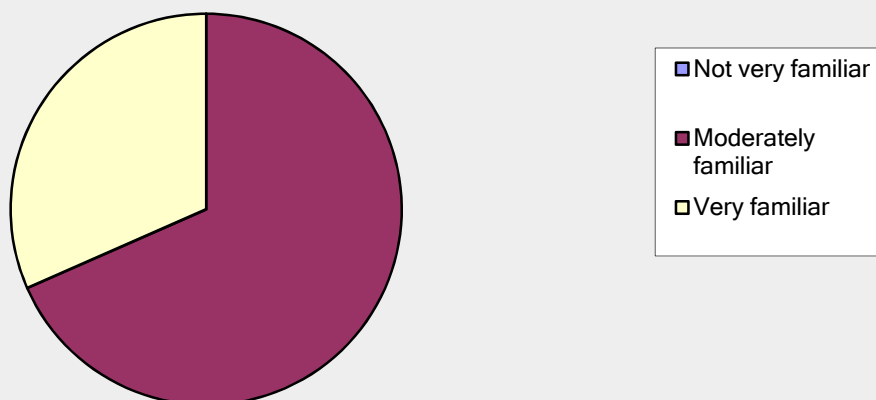
Question #6:

How frequently do you monitor a patient with a PCA on initiation? Select all that apply for each relevant parameter. Please note: Only answer for when you are INITIATING a new PCA.

	Q15min x2	Q30min x2	Q1hour x2	Q1hour	Q2hours x2	Q2hours	Not Applicable	Total Respondents
Oxygen Saturation	100.00% 12	50.00% 6	58.33% 7	16.67% 2	16.67% 2	33.33% 4	0.00% 0	12
Respiration Rate	100.00% 12	41.67% 5	50.00% 6	8.33% 1	16.67% 2	25.00% 3	0.00% 0	12
Vital Signs (heart rate/blood pressure)	100.00% 11	45.45% 5	45.45% 5	9.09% 1	9.09% 1	27.27% 3	0.00% 0	11
Pain/Sedation Level	90.91% 10	36.36% 4	45.45% 5	27.27% 3	18.18% 2	27.27% 3	0.00% 0	11

How frequently do you monitor a patient with a PCA on initiation? Select all that apply for each relevant parameter. Please note: Only answer for when you are INITIATING a new PCA.
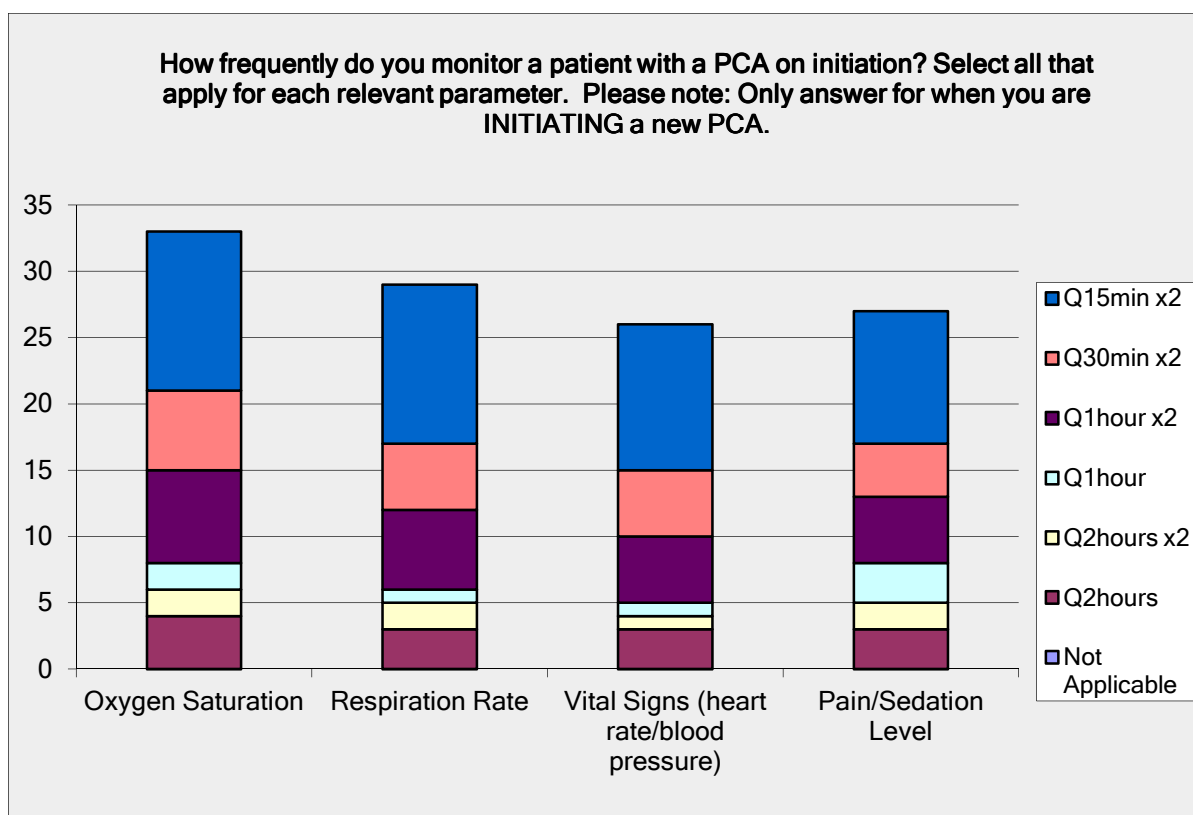
Question #7:
How frequently do you monitor a patient with a PCA after each dose increase? Select all that apply for each relevant parameter. Please note: Only answer for when you have INCREASED THE DOSE on the PCA.

	Q15min x2	Q30min x2	Q1hour x2	Q1hour	Q2hours x2	Q2hours	Not applicable	Total Respondents
Oxygen Saturation	83.33% 10	41.67% 5	33.33% 4	8.33% 1	8.33% 1	25.00% 3	0.00% 0	12
Respiration Rate	83.33% 10	41.67% 5	33.33% 4	8.33% 1	8.33% 1	25.00% 3	0.00% 0	12
Vital Signs (heart rate/blood pressure)	81.82% 9	45.45% 5	36.36% 4	9.09% 1	9.09% 1	27.27% 3	0.00% 0	11
Pain/Sedation Level	75.00% 9	33.33% 4	25.00% 3	16.67% 2	8.33% 1	25.00% 3	0.00% 0	12

How frequently do you monitor a patient with a PCA after each dose increase? Select all that apply for each relevant parameter. Please note: Only answer for when you have INCREASED THE DOSE on the PCA.
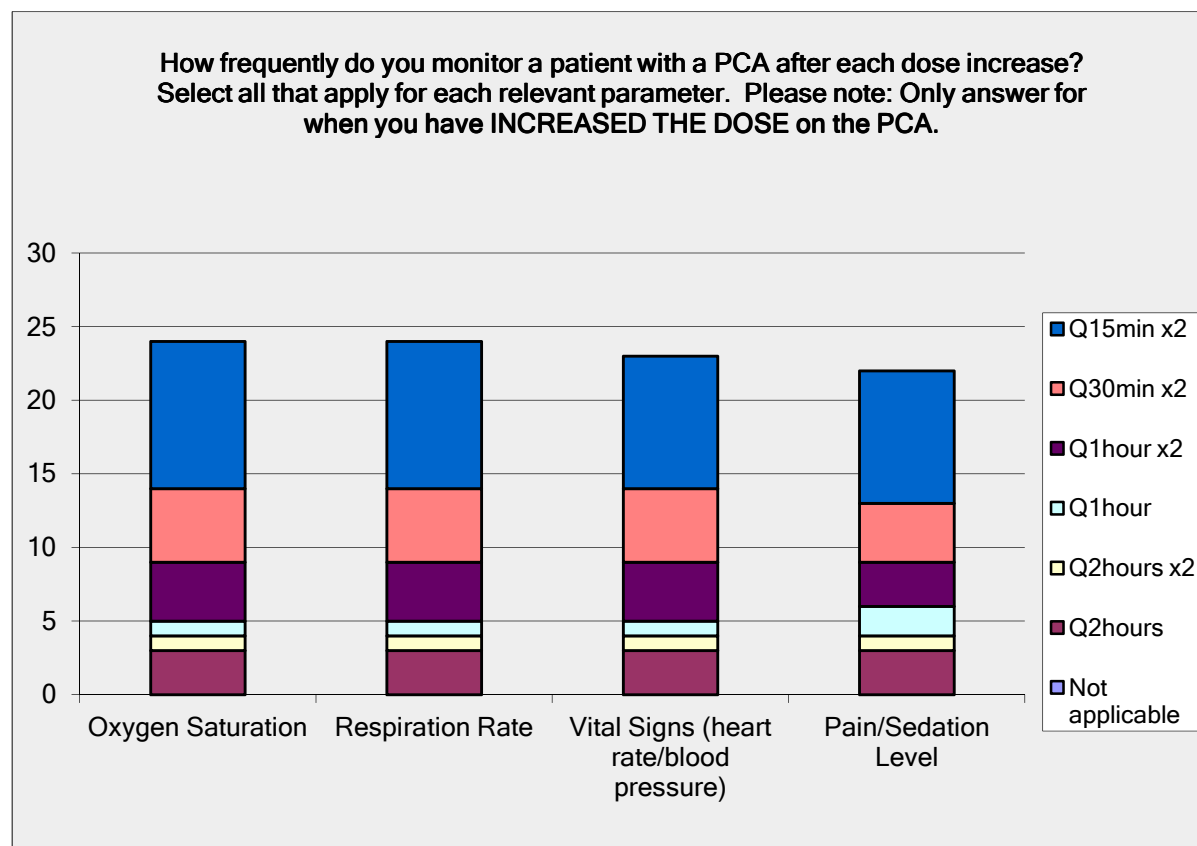
Question #8:
How frequently do you monitor a patient for the duration of PCA therapy? Select all that apply for each relevant parameter. Please note: Only answer for what you monitor DURING PCA therapy.

	Q15min x2	Q30min x2	Q1hour x2	Q1hour	Q2hours x2	Q2hours	Not applicable	Total Respondents
Oxygen Saturation	8.33% 1	8.33% 1	8.33% 1	16.67% 2	8.33% 1	91.67% 11	0.00% 0	12
Respiration Rate	10.00% 1	10.00% 1	10.00% 1	20.00% 2	10.00% 1	90.00% 9	0.00% 0	10
Vital Signs (heart rate/blood pressure)	11.11% 1	11.11% 1	11.11% 1	22.22% 2	11.11% 1	88.89% 8	0.00% 0	9
Pain/Sedation Level	9.09% 1	9.09% 1	9.09% 1	18.18% 2	9.09% 1	90.91% 10	0.00% 0	11

How frequently do you monitor a patient for the duration of PCA therapy? Select all that apply for each relevant parameter. Please note: Only answer for what you monitor DURING PCA therapy.
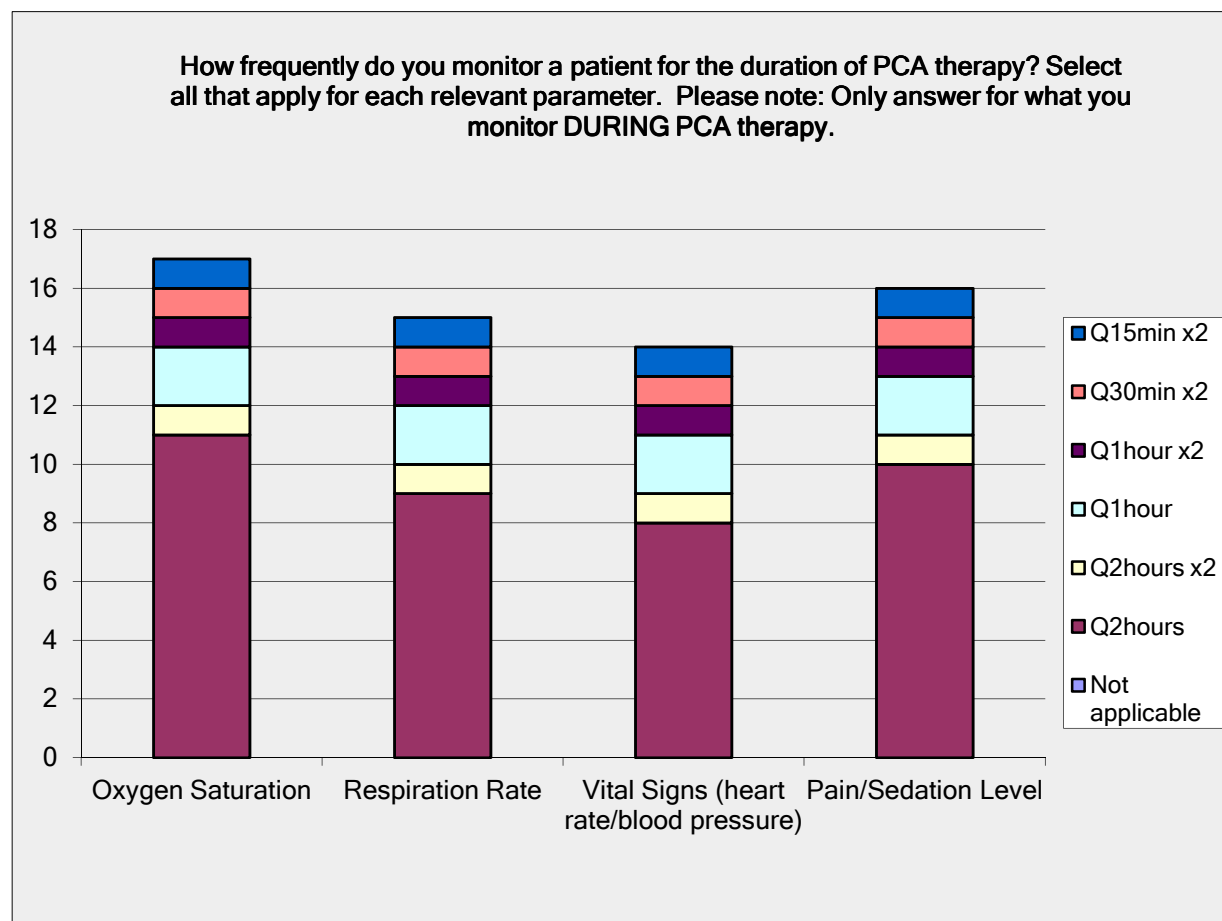
Question #9:

When do PCA settings/procedures require verification by 2 licensed staff (i.e. witness/co-sign)? Select all that apply.		
Answer Options	Response Percent	Response Count
When the PCA is initially set up	100.0%	11
When medication dose or limit has changed	100.0%	11
At end of shift	90.9%	10
When caregivers are changed	100.0%	11
When the medication syringe is replaced	100.0%	11
When the PCA is discontinued	100.0%	11
When the PCA pump is cleared at every handoff	100.0%	11
During patient assessment	0.0%	0
When any medication is wasted (including the tubing)	100.0%	11
Prior to transporting patient off the floor	36.4%	4
answered question		11
skipped question		10

Question #11:

When clearing the pump, which two places need to be zeroed? Select all that apply.

Question #12:

During your shift, the patient had 4 attempts, 4 injections, and received a total of 16 mg/(16 ml) of Morphine. When changing providers, what must you and the oncoming RN document before you can leave the unit? Select all that apply.

Question #13:

In terms of question #12, when this documentation is taking place (changing providers), where are you and the oncoming nurse?

- At the nurses station
- At the patient's bedside

Question #15:

When is the most common time of the day for a patient to experience respiratory depression?

□ 6am-12pm (0600-1200)

■ 12pm-6pm (1200-1800)

□ 6pm-12am (midnight) (1800-0000)

□ 12am (midnight) to 6am (0000-0600)

Question #16:

The most important predictor of respiratory depression in patients receiving intravenous (IV) opioid analgesics in the hospital setting is:

□ Respiratory rate

■ Patient-reported pain intensity

□ Sedation level

□ Blood pressure

Appendix P: Staff Meeting Presentation Handout
PCA Care and Management: Results from the Survey

| Expected frequency of monitoring per policy:	Upon initiating PCA therapy	With any dose increase	Duration of PCA therapy
Vital signs	Q15 min x2 Q30 min x2 Q1 hour x2 Then Q2 hours	Q15 min x2	
Respiratory rate only			Q2 hours
Pain and sedation levels	Q15 min x2 Q30 min x2 Q1 hour x2 Then Q2 hours	Q15 min x2	Q2 hours
ETCO$_2$ and/or O$_2$ sats	Q15 min x2 Q30 min x2 Q1 hour x2 Then Q2 hours	Q15 min x2	Q2 hours

Table A: Expected frequency of monitoring vital signs per policy and PCA orders

#6. Upon initiating PCA therapy (numbers in red are incorrect)	Q15 min x2	Q30 min x2	Q1 hour x2	Q1 hour	Q2 hours x2	Q2 hours	N/A
Oxygen saturation	100%	50%	58%	17%	17%	33%	0%
Respiration Rate	100%	42%	50%	8%	17%	25%	0%
Vital signs (HR/BP)	100%	45%	45%	9%	9%	27%	0%
Pain/ Sedation level	90%	36%	45%	27%	18%	27%	0%

Table B: Survey responses for question #6

#7. With any dose increase (numbers in red are incorrect)	Q15 min x2	Q30 min x2	Q1 hour x2	Q1 hour	Q2 hours x2	Q2 hours	N/A
Oxygen saturation	83%	42%	33%	8%	8%	25%	0%
Respiration Rate	83%	42%	33%	8%	9%	25%	0%
Vital signs (HR/BP)	82%	45%	36%	9%	8%	27%	0%
Pain/ Sedation level	75%	33%	25%	17%	9%	25%	0%

Table C: Survey responses for question #7

#8. During PCA therapy (numbers in red are incorrect)	Q15 min x2	Q30 min x2	Q1 hour x2	Q1 hour	Q2 hours x2	Q2 hours	N/A
Oxygen saturation	8%	8%	8%	17%	8%	92%	0%
Respiration Rate	10%	10%	10%	20%	10%	90%	0%
Vital signs (HR/BP)	11%	11%	11%	22%	11%	89%	0%
Pain/ Sedation level	9%	9%	9%	18%	9%	91%	0%

Table D: Survey responses for question #8   Barbara Durham, MSN, RN, CNE, DNP-c

Appendix P: Staff Meeting Presentation Handout
Patient Controlled Analgesia:

Documentation on PCA's should be done in **real time** at the bedside. Both nurses should actually see the number of doses given, number of attempts and amount of drug infused before clearing the pump. Nurses should not try to rely on memory to document this 'after the fact'. This is documented on the "**Co-Signature Intervention"** screen in PCS.

Always **ZOOM to 24 hours** when clearing pump with each syringe and care provider change. To get the most accurate totals and to ensure consistency.

PCA Waste
For **PCA Waste ONLY** you do not need to double document waste in Pyxis. PCS Meditech documentation is sufficient. Include the 2.6 ml anytime you are discarding the tubing (when the PCA is D/C'ed or the tubing needs to be changed).

The most important indicator of respiratory depression in patients receiving intravenous (IV) opioid analgesics in the hospital setting is actually level of consciousness.

Higher risk for respiratory depression occurs between midnight and 6am because of the tendency to let patients rest and not disturb them.

Opiate naïve patients are those who don't take a lot of pain medications routinely. Also, patients who are older are more susceptible to adverse effects because of changes in pharmacokinetics.

Barbara Durham, MSN, RN, CNE, DNP-c

Appendix P: Staff Meeting Presentation Handout
Did you know? Medication Safety FAQs

Question: What is a medication error?
Answer: A medication error can simply be defined as an actual or potential event, which may be preventable, and can lead to patient harm.

Question: What is a near miss event?
Answer: Making an error in the preparation of medication for a patient, by intercepting or recognizing the error before it reaches the patient is an example of a near miss event.

Question: Why is it important to report a near miss event?
Answer: It is important to report these types of errors because of many reasons. 1) It is likely a "system" problem. 2) Someone else can make the same mistake, but maybe, this time it reaches the patient.

Question: What are examples of system problems?
Answer: <u>Environmental factors</u> such as poor lighting, noise levels, and equipment failure all contribute the increased incidence of medication errors. Also, <u>medication related topics</u> such look alike-sound alike (LASA) medications, similar packaging and labels for medications impact the accuracy of medication administration. Sometimes, orientation about the policies and procedures for medication administration was inadequate or <u>insufficient training</u> with the medication delivery system or barcoding/scanning technology was received. In addition, <u>personnel issues</u> such as heavy workload, high patient/nurse ratios, lack of staff or presence of new staff nurses produces an unsafe environment within which the nurse works. Lastly, <u>technology</u>, lack of clinical decision support features, and equipment failures are more examples of system problems that contribute to medication errors.

Question: What are examples of human problems?
Answer: <u>Communication</u> issues contribute to medication errors if physician orders are not clearly understood, or not questioned when appropriate. <u>Process issues</u> such as distractions and interruptions (such as events on the unit, patient needs, demands from coworkers) can affect the provider's ability to focus on the task of administering medications. The <u>experience of the nurse</u> was a factor in avoiding medication errors; lack of experience was a likely contributing factor to explain deviations from policies, procedures, and protocol that resulted in a medication error. <u>Lack of knowledge related to pharmacology and math calculation skills</u> was linked to more medication errors. <u>Poor understanding the equipment</u>, such as IV infusion pumps, added to problem of medication errors. Nurses who <u>multi-task or prepare medications in advance</u> could predispose them to making errors.

Barbara Durham, MSN, RN, CNE, DNP-c

Appendix P: Staff Meeting Presentation Handout

Question: Are medication errors and near miss events, really such a big problem?
Answer: Yes. Here are a few facts:
1. The human and financial costs of these errors are astronomical; estimated direct costs are approximately $21 billion, indirect costs exceed $75 billion and account for approximately 7000 lives lost annually.
2. At least 1.5 million preventable medication errors and adverse drug events occur each year in the United States, excluding errors of omission.
3. Not all medication errors are detected and not all detected errors are reported; they are underestimated and generally under-reported by an estimated 90%
4. It is estimated that on average, the hospitalized patient will be exposed to a minimum of one medication error each day they are hospitalized.
5. It is estimated that for every detected medication error, there are approximately 100 errors that go undetected daily as a result of the sheer volume of medications being prescribed, dispensed, and administered in the hospital.
6. The severity of harm for patients experiencing a medication error is low; greater than 90% of all medication errors result is no or low harm, with only 10% contributing to serious patient harm.
7. One study found that 36% of errors resulted in slightly increased monitoring, 31% of errors did not result in patient harm, and 26% of the errors did not actually reach the patient.
8. Approximately 50% of nurses are reticent about reporting medication errors because they fear disciplinary action.
9. One third of all medication errors occur during the administration phase of medication delivery; making nurses well positioned to recognize near miss events and prevent medication errors.

Question: As a nurse, can I really make a difference:
Answer: Yes.
1. Nurses have an obligation to look for risks, report errors or hazards, and help design safer systems.
2. Recognizing conditions contributing to errors is critical so that a safer patient care environment can be created.
3. By reporting medication errors (actual and near miss), the system or work environment in which nurses administer medications can be improved.
4. "If we truly want safer care we will have to design safer care systems" (Berwick and Leape)
5. "We cannot change the human condition, but we can change the conditions under which humans work" (Reason)
6. Emphasis on 'what' went wrong, not 'who' is at fault is critical
7. The standard of practice in medicine and nursing is perfection, however healthcare professionals acknowledge that mistakes are inevitable and most want to learn from the mistakes in an understanding and supportive environment.

Barbara Durham, MSN, RN, CNE, DNP-c

Appendix Q: Review of articles about medication safety education programs, scope of the problem/contributing factors and costs of medication errors:

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Medication safety education programs:				
Sears, K., Goldsworthy, S., & Goodman, W.M. (2010). The relationship between simulation in nursing education and medication safety. *Journal of Nursing Education, 49*, 1.pp 52-55 DOI:10.3928/01484834-20090918-12	Could simulation help reduce med errors; had hard time finding clinical placements; are knowledge and skills learned in simulation transferable to clinical?	RCT using volunteers, posttest only design; 3 treatment groups, 3 intervention groups; 54 participants Poisson distribution P<0.05 **Strength of Evidence:** Experimental, randomly assigned Level 1; High Quality	Fewer errors reported in the Sim Educ int group Lack of knowledge,	Simulation based education intervention.
Lu, M.C., Yu, S., Chen, I.J., Wang, K.K., Wu, H.F., & Tang, F.I. (2013). Nurses' knowledge on high-alert medications: A randomized control trial. Nurse Education Today, 33, 24-30. doi: 10.1016/j.nedt.2011.11.018.	Explores the effectiveness of an educational intervention on nurses' knowledge about high-alert medications Taiwan	21 wards; 232 nurses, control and intervention group (60 min educ intervention – PPT) with pre and post test after 6 wks **Strength of Evidence:** Literature review Level 1; High Quality	Pre-test average: 75.8% (no diff in control and intervention groups) 100% response rate in control; 94% in intervention group Post-test average: 94.7% with paired T-test=10.82 and p<0.0001	PPT is an effective method for providing education in this group.
Dennison, R. D. (2007). A medication safety education program to reduce the risk of harm	Medication errors are under reported and under detected. Many nurses are unsure about what exactly	Participants were required to complete two 30 min computer modules on medication safety:	The Climate of Safety Survey was administered before and after participants completed the	Medication safety education program was developed to reduce harm caused

Article	Background	Research Methods and Strength of Evidence	Results	Implications
caused by medication errors. *The Journal of Continuing Education in Nursing, 38*, 4, 176-184. DOI: 10.1111/j.1365-2834.2009.00995.x	constitutes a medication error.	Focused on high alert IV meds, Analysis of reports from the US Pharmacopeia MEDMARX reporting system **Strength of Evidence:** Quasi Experimental Pre/Post Test Level 2; Good Quality	Medication Safety Education Program. Stat sign change in knowledge scores, but "no change in climate of safety scores, the use of behaviors advocated in the medication safety education program to improve medication infusion safety, the number of infusion pump alerts, or the number of reported errors.	by med errors. A change in knowledge does not produce a change in practice. Recommend education on problem solving on how to prevent med errors Leadership support is crucial in creating practice change.
Currie, L. M., Desjardins, K. S., Levine, E., Stone, P. W., Schnall, R., Li, J., & Bakken, S. (2009). Web-based hazard and near miss reporting as part of a patient safety curriculum. Journal of Nursing Education, 48, 13, 669-677. doi:10.3928/01484834-20091113-03	Web-based reporting system for post-baccalaureate students; incorporate patient safety concepts during formative nursing educ	Quantitative data collected on two questions: "On your shift today, were there any near misses?" "On your shift today, were there any 'dangerous situations' that could cause a future event?" **Strength of Evidence:** Non-experimental, prospective, observational Level 3; High Quality	453 students made 42552 reports; of the 10206 "yes" reports – 59% were hazards, 41% were near misses; of the near misses 48% had a planned interception and 52% had unplanned interceptions. Hazards are more visible and easier to report; during 1st and 3rd year, students reported 2 times more hazards (p<0.01).	Dimensions of safety culture Transform to become HROs Patient safety curriculum included: modeling, monitoring, and mindfulness

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Baker (1997)		Ethnomethodological study	The author identified 6 ways medication errors can be categorized: a) if it is not my fault, it is not an error; b) if everyone knows, it is not an error; c) if you can put it right, it is not an error; d) if a patient has needs that are more urgent than the accurate administration of medication, it is not an error; e) if it is a clerical error, it is not an error; and f) if the irregularity prevents something worse, it is not an error.	Clear definitions and examples of types of medication errors are needed so that the nurse can recognize that an error has occurred.
Page, K., & McKinney, A. A. (2007). Addressing medication errors: The role of undergraduate nurse education. *Nurse Education Today, 27*, 219-224. DOI:10.1016/j.nedt.2006.05.002	Dept of Health reports similar to IOM reports prompted a look in to medical and medication errors and began an initiative for "improving medication safety"	An educational initiative was therefore introduced to address this problem. A Medication Safety Day, which focused on the causes of medication errors, was implemented to highlight how and why drug incidents may occur. **Strength of Evidence:** Literature review Level 5; Good Quality	"Imperative that undergraduate education should emphasize the issues of medication safety"	Med Safety Day with focus on causes of med errors, "how and why", knowledge of pharm for junior doctors

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Hughes, R. G. & Blegen, M.A. (2008). Chapter 37. Medication administration safety. In R.G. Hughes (Ed), Patient safety and quality: An evidence-based handbook for nurses. AHRQ Publication No. 08-0043, April 2008. Agency for Healthcare Research and Quality, Rockville, MD. Retrieved from http://www.ahrq.gov/qual/nurseshdbk/	AHRQ handbook for patient safety	Summary of literature **Strength of Evidence:** Literature review Level 5; Good Quality	Strategies to improve med admin safety: Nationwide voluntary efforts – data is not reliable or valid Nurses' education and training: MAE are most likely to be wrong time, omission, and wrong or extra dose System, process and human factors: technology, distractions, and knowledge/math skills	Culture of safety Increase staff levels Improve system factors (new technology) Include continuing education on medication pharmacokinetics and math
Choo J . , Hutchinson A. & Bucknall T. (2010). Nurses' role in medication safety. *Journal of Nursing Management 18*, pp. 853–861. DOI: 10.1111/j.1365-2834.2010.01164.x	Safe med admin is essential to patient safety Multidisciplinary approach, interprofessional communication	Lit review **Strength of Evidence:** Literature review Level 5; Good Quality	Measures to prevent med errors: Establish med safety policies, increase nurse competence in medication administration, create safe environments for med admin, learn from other industries (aviation), harness information tech	Adopt safety measures similar to aviation Nurses have a role in system redesign Focus on the accountability of the organization, not the individual Embrace system factors
Tzeng, H.M., Yin, C.Y., Schneider, T.E. (2013). Medication error-related issues in nursing practice. MedSurg Nursing, 22, 1,	Addresses issues related to medication errors and strategies to decrease them "Errors need to be	Literature review **Strength of Evidence:** Literature review Level 5; Good Quality	Education: patient safety mg't in schools and on the job training (i.e. RCA), identify knowledge and skill deficiencies to	Use case-based scenarios and simulation based scenarios with specific clinical

Article	Background	Research Methods and Strength of Evidence	Results	Implications
13-16.	appreciated, understood, and corrected immediately"		address cognitive errors	examples to encourage learning and teach clinical reasoning
Leufer, T. & Cleary-Holdforth, J. (2013). Let's do no harm: Medication errors in nursing: Part 1. Nurse Education in Practice, 13, 213-216. http://dx.doi.org/10.1016/j.nepr.2013.01.013.	Determine the extent and severity of the problem of medication errors and contributing factors	Literature review **Strength of Evidence:** Literature review Level 5; Good Quality	Complex process: (prescription, calculation, constitution, checking, administration, pt assessment, documentation, pt med educ) Extrinsic problems: workload, staffing ratio, skill mix, # of pt's, pt acuity Intrinsic: knowledge deficit, practice deficit, math skills, inattention/distraction, transcription error, and disorganized pyxis.	Competence is a dynamic process and a continuum Identify system issues Focus on fundamentals to ensure the highest level of safety
Cleary-Holdforth, J. & Leufer, T. (2013). The strategic role of education in the prevention of medication errors in nursing: Part 2. Nurse Education in Practice, 13, 217-220. http://dx.doi.org/10.1016/j.nepr.2013.01.012.	Identify the role of education to prepare nurses for safe medication management and reduce med errors	Literature review **Strength of Evidence:** Literature review Level 5; Good Quality	Minimum of 10% error rate on drug calculations, poor math skills (in one study 35% scored > 70%). Educate patient/family to not distract nurses during med admin. Onus is on nurse to enforce no interruptions	Tailored education program helps to increase competence in med mg't and pharmacology and thus decrease medication errors

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Scope of the problem and contributing factors:				
Wolf, Z. R., Hicks, R., Serembus, J. F. (2006). Characteristics of medication errors made by students during the administration phase: A descriptive study. *Journal of Professional Nursing, 22*, (1), 39-51. doi:10.1016/j.profnurs.2005.12.008	Examine characteristics of medication errors made by nursing students	examined characteristics of med errors made by nursing students using MEDMARX database **Strength of Evidence:** Descriptive, retrospective, secondary analysis Level 3; Good Quality	Performance deficit Inexperience and distractions Errors of omission and wrong dose	Student med errors may be more frequent than thought; faculty must consider curriculum revisions incorporating medication use safety
Kazaoka, T., Ohtsuka, K., Ueno, K., & Mori, M. (2007). Why nurses make medication errors: A simulation study. *Nurse Education Today, 27*, 312-317. DOI:10.1016/j.nedt.2006.05.011	Communication problems in team nursing systems; Simulation involved a nurse giving a medication prepared by another nurse	Simulation study **Strength of Evidence:** Non-experimental Level 3; Good Quality	Must fully communicate pt symptoms and need for med; Frequent interruptions were recognized as an environmental factor	This study was done in Japan using team nursing system and is not fully applicable to the USA. One nurse must request another nurse to administer medications.
Harding, L. and Petrick, T. (2008). Nursing student medication errors: A retrospective review. *Journal of Nursing Education, 47* (1), 43-47.		Retrospective review of med errors by nsg students **Strength of Evidence:** Non-experimental Level 3; Good Quality	Rights violations System factors Knowledge and understanding	Teaching strategies need to account for the complexity of med admin process

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Wahr, J.A., Shore, A.D., Harris, L.H., Rogers, P, Panesar, S, Matthew, L., … & Pham, J.C. (2014). Comparison of intensive care unit medication errors reported to the United States' MedMarx and the United Kingdom's National Reporting and Learning System (NRLS): A cross-sectional study. American Journal of Medical Quality, 29 (1), 61-69. doi: 10.1177/10628606134829 64	Compare the characteristics of medication errors reported to MedMarx and NRLS in the US and UK. Were there substantial differences?	**Strength of Evidence:** Non-experimental, retrospective, cross-sectional Level 3; High Quality Severity scales were collapse to conform (for categorizing). n=2,837 UK errors n=56,368 US errors	Descriptive results: Low/no harm >90% Moderate to severe harm < 5% of reports Death < 0.1% of reports Same high risk medications: Insulin, heparin, morphine, potassium, vancomycin, furosemide, fentanyl. Differences: UK vs US Wrong dose 44% vs 29% Omitted dose 8.6% vs 27% Mod to severe harm 4.9% vs 3.4% Gentamycin 7.4% vs 0.7%	Because of the similarities, conclusions from other European studies are likely more transferable to the United States.
Westbrook, J. I., Rob, M. I., Woods, A., & Parry, D. (2011). Errors in the administration of intravenous medications in hospital and the role of correct procedures and nurse experience. British Medical Journal Quality and Safety, 20, 1027-1034. doi:10.1136/bmjqs-	To measure the frequency, type and severity of IV med administration errors in hospitals Are there commonalities between errors? Any association between nurse experience or procedural failures? Study conducted in Australia.	**Strength of Evidence:** Non-experimental, prospective, observational Level 3; Good Quality n=107 nurses n=568 IV meds n=6 wards in two teaching hospitals	69.7% of IV med admin had at least 1 clinical error and 25.5% were serious Wrong IV rate, mixture, volume, and drug compatibility accounted for 91.7% of errors. IV bolus was associated with 312% inc risk of error	IV meds have higher risk associated with them and often produce more serious consequences. Most errors were attributed to skill and knowledge deficiencies.

Article	Background	Research Methods and Strength of Evidence	Results	Implications
2011-000089			Error rates and seriousness decreased with more nursing experience. Each year of experience (up to 6 years) decreased risk of error by 10.9% and serious error by 18.5%.	
Flynn, L., Liang, Y., Dickson, G. L., Xie, M., & Suh, D.-C. (2012). Nurses' practice environments, error interception practices, and inpatient medication errors. *Journal of Nursing Scholarship, 44,* 2, 180-186. doi:10.1111/j.1547-5069.2012.01443.x	Determine relationships among characteristics of the nurse practice environment, staffing levels, error interception practices, rates of non-intercepted med errors	**Strength of Evidence:** Non-experimental Level 3; Good Quality

82 Med/Surg units from 14 US hospitals
Data collected over 8 months
n=686 staff nurses | Nurses should have more frequent engagement in interception practices to reduce medication errors: 1. check MAR with MD order; 2. determine rational for order/med; 3. request MDs to rewrite improper orders; 4. ensure the patient/family are knowledgeable and encourage them to question variances in practice | Supportive practice environments increase quality nursing practices. |
| Reid-Searl, K., Moxhan, L., & Happell, B. (2010). Enhancing patient safety: The importance of direct supervision for avoiding medication errors and near misses by undergraduate nursing students. International | Focus of this study was to examine the extent to which nursing students might contribute to medication errors and the factors that influence the practice of medication administration for students. | **Strength of Evidence:** Qualitative, Grounded theory, semi-structured interviews were audiotaped using open ended questions Level 3; High Quality

n=28 nursing students | 9/28 students reported making a medication error or near miss that was dependent on the level of supervision provided at the time of the incident.

Lack of supervision, distractions, reactions | Proper supervision is critical to intercept medication errors made by student nurses (establish a policy, provide training) |

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Journal of Nursing Practice, 16, 225-232. doi:10.1111/j.1440-172X.2010.01820.x	The aim was to build theory, not to test one. Study was conducted in Australia.		from supervising nurses had an impact on the student's learning experience (some nurses did not want to complete an incident report, while others followed the protocols)	
Karavasiliadou, S. & Athanasakis, E. (2014). An inside look into the factors contributing to medication errors in the clinical nursing practice. Health Science Journal, 8, 1, 32-44.	Aim was to review current literature related to the individual and the organizational factors that contribute to the occurrence of medication errors.	**Strength of Evidence:** Systematic review Level 4; Good Quality Inclusion criteria: English, published between 1990-2012.	**Summary of nurse factors**: Miscommunication, misreading labels, wrong dose calculation, not following 5 rights, personal neglect (i.e. fatigue), amount of clinical experience, problem with MD orders, difficulty/lack of knowledge about infusion devices **Summary of organizational factors**: Events on the unit, distraction, heavy workload, high nurse/patient ratios, new staff, medication related topics (i.s. labeling, packaging)	Focus on prevention and prompt detection, culture of safety. Education methods: lecture, simulation, projects, case studies

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Kiekkas, P., Karga, M., Lemonidou, C., Aretha, D., & Karanikolas, M. (2011). Medication errors in critically ill adults: A review of direct observation evidence. American Association of Critical-Care Nurses, 20, 1, 36-44. doi10.4037/ajcc2011331	Review of direct observational evidence related to IV medication administration because these drugs are of highest risk. ICU environment.	**Strength of Evidence:** Systematic review – 6 studies met the inclusion criteria Level 4; Good Quality	Patterns and characteristics of medication errors help to guide prevention strategies. Opportunities for errors: Nurse – patient ratio, personnel experience, types of drugs involved in the errors Increased monitoring was the most common consequence of medication error.	Medication errors reveal weakness in the care process. Detection of medication errors provides insights into unsafe practices and identify systems factors
Saintsing, D., Gibson, L. M. & Pennington, A. W. (2011). The novice nurse and clinical decision-making: How to avoid errors. *Journal of Nursing Management, 19*, 354-359. DOI: 10.1111/j.1365-2834.2011.01248.x	Novice nurses (<1 yr experience) have a higher risk of making medication errors and need to recognize potential mistakes	Literature review Found: This review examined three themes identified within the literature including types of errors, the cause of errors and potential interventions. **Strength of Evidence:** Integrative literature review Level 4; Good Quality	Med errors Patient falls Delays in treatment	Critical thinking and experience were the most common themes; and time management (with med errors). Help novice nurses inc their awareness of potential errors; curriculum changes to improve clinical decision- making.

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Brady A.-M., Malone A.-M. & Fleming S. (2009). A literature review of the individual and systems factors that contribute to medication errors in nursing practice. *Journal of Nursing Management 17*, pp. 679–697	Med errors are a significant cause of M&M. An imperative to reduce med errors to deliver safe care.	Lit review: CINAHL, PubMed, ScienceDirect, Synergy 1988-2007: Key words: med errors, med mgt, med reconciliation, med knowledge, math skills, reporting med errors **Strength of Evidence:** Literature review Level 5; Good Quality	These include medication reconciliation, the types of drug distribution system, the quality of prescriptions, and deviation from procedures including distractions during administration, excessive workloads, and nurse's knowledge of medications.	Establish reporting mechanisms, systematic approach to med recon, clear definition of what a medication error is to increase accuracy of reporting (to help establish policy aimed to reduce med errors), math competency,
Benner, P., Sheets, V., Uris, P., Malloch, K., Schwed, K., & Jamison, D. (2002). Individual practice, and system causes of errors in nursing: A taxonomy. *Journal of Nursing Administration, 32*, 10, 509-523.	Nursing role as patient advocate play a key role in reducing med errors. The goal of the study was to develop a taxonomy for prospective, systematic error reporting; taxonomy developed with prevention in mind	Purposeful sample of 21 cases involving competency and clinical judgment resulting in actual harm were selected from 9 state BRNs. **Strength of Evidence:** Expert Opinion Level 5; High Quality	Identified a "practice responsibility" to learn from experience and make the learning available to others to collectively change practice;	Emphasis on the importance of reporting and sharing medication errors that have been committed.
Wolf, Z. R. & Serembus, J. F. (2004). Medication errors: Ending the blame game. *Nursing Management, 35*, 8, 41-48.	To discover the reactions of managers and personnel involved in reporting errors	Open and closed ended question survey, self-report of serious error Response rate - ~7%	The most common disciplinary actions included: name identified on incident report 54%, private verbal reprimand 27%, counseled 25%, notation on personal record 11%, referred for education 5%	Culture of safety

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Cost of medication errors:				
Pinella, J., Murillo, C., Carrasco, G., & Humet, C. (2006). Case-control analysis of the financial cost of medication errors in hospitalized patients. European Journal of Health Economics, 7, 66-71. doi: 10.1007/s10198-005-0332-z.	Aim of the study was to contribute to what is known about the financial costs associated with medication errors. Conducted in Spain.	**Strength of Evidence:** Non-experimental, case/control study, retrospective analysis Level 3; Good Quality n=172 patient charts were analyzed produced a total n=63 cases.	Analysis indicated that medication errors added 303 days of hospital stay, overall annual cost of nearly €76,000. 35% orders are not validated; 22% were dispensing errors; 16% administration errors; 11% due to inattention 36% required increased monitoring; 31% no harm; approx. 26% were near misses. Average LOS for cases was 8.2 days and controls was 15.13 days	Medication errors have direct consequences with the increased resources used (labs, drugs, materials, etc). Indirect costs included productivity losses and intangible costs.
Lahue, B. J., Pyenson, B. S., Iwaskaki, K., Blumen, H. E., Forray, S., & Rothschild, J. M. (2012). National burden of preventable adverse drug events associated with inpatient injectable medications: Healthcare and medical professional liability costs. American	Study used a healthcare payer perspective to analyze the probability of ADEs and associated medical costs related to inpatient injectable medications, projected national number of ADEs and their costs. Also took a MPL insurer perspective in analyzing	**Strength of Evidence:** Systematic review; matched cohorts/ compared Level 4; High Quality		

Article	Background	Research Methods and Strength of Evidence	Results	Implications
Health & Drug Benefits, 5, 7. Retrieved from www.ahdbonline.com.	medication-related facility and professional insurance claims to generate a national MPL costs related to preventable ADEs.			

Appendix R: Work Breakdown Structure

Medication Safety Education – Work Breakdown Structure