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# Reducing Medication Errors in the Acute Care In-Patient Setting: An Integrative Review

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A Scholarly Project

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

of Doctor of Nursing Practice

by

Ronni Townsend Rothwell, MSN, RN

Liberty University

Lynchburg, VA

June, 2016

Scholarly Project Committee Approval:

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# REDUCING MEDICATION ERRORS IN THE ACUTE CARE IN-PATIENT SETTING: AN INTEGRATIVE REVIEW

A Scholarly Project

Presented to the

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## Abstract

Promoting a culture of safety in healthcare organizations has become a necessary goal to ensure that patients are safe, well cared for, and satisfied with the services they receive. One of the areas recognized as a major safety concern across hospitals in the United States and abroad are medication errors, which continue to occur at a staggering rate. This integrative review seeks to serve two purposes to combat this pandemic problem. First, the project will attempt to determine if an appropriate intervention or strategic initiative exists that can reduce medications errors for adult patients on an acute care patient unit in an inpatient hospital setting. Second, will be to disseminate and implement the identified cluster of interventions at a healthcare organization in central Virginia, and follow the data trends to determine its effectiveness.


*Keywords:* medication error, acute care, sentinel event, medication administration

REDUCING MEDICATION ERRORS IN THE ACUTE CARE IN-PATIENT SETTING: AN INTEGRATIVE REVIEW

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# REDUCING MEDICATION ERRORS IN THE ACUTE CARE INPATIENT SETTING: AN INTEGRATIVE REVIEW

Medication errors are one of the most costly safety concerns existing in healthcare systems today. The cost is realized in a variety of circumstances from increased bottom line monthly departmental expenses, time expenditure for staff to recover from the aftermath of a medication administration error, all the way to the ultimate price of a sentinel patient event. Medication errors are often linked to very specific causes such as pharmacy error, dispensing error, administration error, misidentification, and poor medication reconciliation. It is often difficult to determine the underlying causes of many of the errors that occur and similarly it can also be the result of more than one gap in safety protocols (Flynn, Liang, Dickson, Xie, & Suh, 2012).

In order to determine best practices when considering patient safety, every potential cause requires a thorough review. An in-depth integrated review will allow the project leader to demonstrate that medication errors continue to be a major contributor to sentinel events, budget overruns, staffing issues, and poor patient outcomes. Due to the estimated 98,000 deaths that occur every year from medical errors in U.S hospitals, it is important to note that a significant number of those sentinel events are due to medication errors (Tzeng, Yin & Schneider, 2013). Due to the assumption that many medication errors are grossly unreported that estimated figure is actually low (Tzeng, Yin & Schneider, 2013). Developing a strategy to prevent medication errors or, at minimum, decrease them is a current and relevant focus in healthcare today.

## Background

In order to develop a strategy to prevent medication errors, there are many systems to be evaluated for safety and service excellence. Identifying risks and having reporting systems in place go a long way in delivering safer patient services (Sud & Gorman, 2008). Many

interventions have been put in place over the past two decades to circumvent medication errors including bar code scanning, computerized electronic medical record, new smart infusion pumps, and specific protocols regarding actual administration. However, these interventions will only work if nurses, pharmacists, and all those who are involved in the safe administration of medications are completely compliant as well as transparent when an error does occur. Some of the negligence stems from poor system approaches such as improper execution of policies and procedures, a culture that does not support direct reporting of errors for fear of retaliation, poor staffing ratios, and higher patient acuity levels (Tzeng, Yin & Schneider, 2013). For these reasons, it is difficult to convince nurses to be forthcoming and report medication errors.

## Problem Statement

Promoting a culture of safety has become the standard practice in healthcare today. When entering an acute care facility, patients expect excellence in every aspect of their care in order to promote and advance the multidimensional physical and spiritual being. System factors are often found at the root of the problem that contribute significantly to the high incidence of medication errors (Keers, Williams, Cooke, & Ashcroft, 2013). Examples of systems factors that provoke errors include, but are not limited to, error-provoking conditions, poorly written orders or communication, staff fatigue, interruptions, and distractions (Keers, et al, 2013). “When all types of errors are taken into account, a hospital patient can expect on average to be subjected to more than one medication error each day. However, substantial variations in error rates are found across facilities” (Institute of Medicine, 2011, p. 1). Due to the chronic nature and high incidence of medication errors, a solution is needed to offset the negative impact on patient outcomes.

The nature of the potential outcome of an adverse drug event resulting from a medication error can be catastrophic. Given the enormous number of errors every day in all healthcare

arenas, this has evolved into a societal paradox that must be addressed. Because of these errors, the Centers for Medicare and Medicaid Services suggested a study be conducted by the Institute of Medicine to investigate the prevalence of medication errors and devise a plan to reduce medication errors that can be disseminated at the national level (Institute of Medicine, 2011). The problem continues to exist and with it a need for advanced practice nurses to research, analyze, and evaluate all areas surrounding medication errors in an effort to bring a systematic and sustained change that will reduce or eliminate preventable adverse drug events. Looking to the future, the Doctor of Nursing Practice (DNP) will be challenged to keep up to date with the latest evidential research to improve health care and improve clinical practice (Zaccagnini & White, 2014).

## Purpose of the Project

This project will seek to determine if an appropriate intervention or strategic initiative exists that can reduce medications errors for adult patients on an acute care patient unit in an in-patient hospital setting. For the purposes of this integrative review, an acute care setting is defined as an adult general medicine medical surgical unit.

The expected outcome of the integrative review will be to discover a strategy, intervention, or protocol that can be implemented within the project leader's healthcare organization to support a sustained change. Upon dissemination and implementation of the findings, a systematic evaluation can be conducted to determine the positive or negative outcomes of the intervention. Specifically, the project leader will be reviewing for interventions that facilitate an actual decrease in medication errors, have a significant impact on the budget dollars associated with these errors, and discern where positive patient outcomes are linked to decreased medication errors. In order to reduce and prevent adverse events, it is necessary to

recognize that medication errors are linked to patient safety and take steps to improve areas of clinical practice (Montesi & Lechi, 2009). Another objective will be to maintain sustainability over time by finding a means to change the behaviors that leads to medication errors and replicate the new behaviors (Moran, Burson & Conrad, 2014).

## Clinical Question

The Institute of Medicine (IOM) issued a report that discusses strategies to reduce medication errors that include encouraging all healthcare providers to fully engage and support efforts to improve the safety protocols surrounding medication use (2006). With this is mind, the following clinical question was pursued by this project leader. Is there a systematic approach that will reduce the number of medication errors in the adult patient population on an acute care unit within the hospital setting?

### Project Goals

There are two broad goals that will serve as the foundation for the clinical question:

1) To determine if an evidence-based intervention exists within the research that will lend itself to replication in another healthcare facility.
2) To disseminate and implement the identified intervention at a healthcare organization in Central Virginia, and follow the data trends to determine its effectiveness.

Focused objectives will be necessary to carry out these goals that will include developing eligibility criteria, finding information sources, and then conducting a thorough search of electronic search engines and databases.

### Building the Scholarly Project

In this project, the phenomenon of interest, broadly stated, is medication errors. Narrowing that topic was a challenging task, as there are a multitude of reasons why medication

errors take place and any one of those could be researched separately for further evaluation. Exploring medication errors thoroughly required a comprehensive search of the current literature followed by critique and analysis to determine the current and relevant evidence-based practice that could be implemented within a healthcare organization.

## Methods

### Protocol and Framework/Model Used

Scholarly projects should have either a conceptual framework or a theoretical framework or both. It is imperative to understand the difference between conceptual and theoretical framework in order to determine which would most successfully serve as a platform on which to build the project. Theory has been described as a system that demonstrates an organized relationship between two variables that exists to discover the nature of the relationship, while a concept is described more as a symbolic statement that outlines a phenomenon or a class of phenomena (Green, 2014). A grounded theory is often an excellent place to start as it allows a theory to evolve or generate as the data unfold, which is how the Theory of Planned Behavior was identified as a framework for this integrative review (Green, 2014). In decades past, researchers believed you could not begin a project without identifying a theory to build upon. The grounded theory disproves that belief and allowed the project leader to discover a framework that was well suited for this integrative review (Green, 2014).

Accordingly, the literature places a great deal of importance on the framework that is chosen to underpin the scholarly project as well as the use of theory to reinforce the research. Connelly (2014) said that a theory "should not be added to a study because the researcher was told in school that a theory is needed for a research study. A clear connection should exist among the theory, the problem … being studied, and the research method" (p.187). This can be

interpreted to mean that this project does not need a framework, however it is understood that having a framework will help the written proposal move fluidly and bring salience to the research question.

The theoretical underpinning that will be used to support the project is the theory of planned behavior (TPB). TPB serves to demonstrate that a person's performance would be determined by that individual's pre-determined decision to participate in a particular behavior. This decision has several influencing factors that include the value that the individual places on the behavior, how the individual perceives the behavior, as well as the individual's feeling of control over the resources and skill set he/she possess that gives comfort in performing the desired behavior (Nelson, Cook, & Ingram, 2014). This is an important concept as Doctors of Nursing Practice (DNPs) are utilizing their own research to bridge the gap that exists between knowledge and actual bedside nursing, in this case medication administration (Nelson, et al., 2014). The theory of planned behavior demonstrates the factors that affect the three main determinants to a planned behavior and how to connect that to the individual's intention to carry out the care being reviewed such as medication administration. By selecting the theory of planned behavior as the theoretical framework for the scholarly project, the clinical question was supported through the development phase. It will further enhance dissemination and implementation of the identified intervention.

**Eligibility Criteria**

The question that served as the impetus for the integrative review is as follows: Is there a systematic approach to medication administration that will reduce the number of medication errors in adult patients in an acute care inpatient hospital setting? The question was developed after careful consideration of the phenomenon of interest and the direction that would allow for

dissemination and implementation. The next step was to determine the inclusion and exclusion criteria.

Inclusion criteria for this project were articles that were published in 2006 to the current day, and relevant to medication errors or adverse drug events. Further refined, the project leader was looking specifically at medication errors that involved medication administration to adults on acute care units in a hospital setting. This included journals from the United States and around the globe. Exclusion criteria included any journal articles that were not peer-reviewed, and any articles over ten years old. The inclusion and exclusion criteria were developed to find the most appropriate articles to be utilized for this project. The final articles were then examined for rigor and level of evidence (Titler, 2006).

**Information Sources**

When conducting a literature search it is important to identify potential search terms to be included, along with a list of sources to search for scientific evidence. The choice of online search engine was Ebscohost where the databases used included PubMed, Cumulative Index of Nursing and Allied Health (CINAHL) (Rew, 2011). Resources used included the careful review of peer-reviewed journal articles regarding medication errors that were less than ten years old. The use of a matrix and a systematic review tool, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) were applied to reveal all pertinent information surrounding the reduction of medication errors in the acute care patient population. These resources assisted in finding an appropriate strategic intervention that will serve to bring patient safety to the forefront in all acute care settings within the healthcare organization and build safer systems to reduce the costs associated with the errors (Montesi & Lechi, 2009).

**Search**

A comprehensive search was conducted utilizing five separate databases. CINAHL, ProQuest, PubMed, the Joanna Briggs Institute, and MEDLINE which were searched with specific keywords to expand upon all pertinent and current research on medication errors in the adult population with acute care hospitals. Keywords that were used include medication error, adverse drug event, adult acute care unit, cause of medication error, and culture of safety.

The tool utilized to ascertain the levels of Evidence was Melnyk's hierarchy of evidence (Melnyk, & Fineout-Overholt, 2011) Rew (2011), which suggested that there are thirteen steps and main components of a literature review that can be referred to in order to keep the articles consistent. The components start with identifying the research data, creating exclusion and inclusion criteria, conducting the literary search using appropriate key terms and databases as well as extracting data, summarizing findings, and finally interpreting and finding meaning for dissemination (Rey, 2011). After consulting Melnyk's hierarchy of evidence the twenty articles accessed involved 15 primary sources and 5 articles that were noted as secondary sources. A range of levels of evidence existed among the twenty articles utilized for the integrative review with six articles being at Level II where evidence is obtained from at least one well-designed Randomized Controlled Trial (RCT). Level III evidence are well-designed controlled trials without randomization, quasi-experimental was found in four of the peer-reviewed journal articles. Level IV where evidence from well-designed case-control and cohort studies was inclusive in eight of the articles for this review. And finally level VI, where evidence is found from a single descriptive or qualitative study, there were two journal included in this review.

**Study Selection**

An integrative review of the most current literature on medication errors in acute care settings has been reviewed, critiqued, and analyzed utilizing a matrix and a systematic review protocol. Reviewing inclusion criteria required finding journal articles that were peer-reviewed and written within the past ten years. The articles were inclusive of those having to do with the adult population. An integrative review was conducted to review systems and approaches for reducing causes for medication errors that take place on an acute care unit in the adult population. Institutional Review Board (IRB) approval was sought through Liberty University and granted per the university's guidelines. There was a critique and analysis of the research gathered through a thorough review of 20 peer reviewed journal articles that were determined excellent sources based on inclusion and exclusion criteria. The 20 articles were a rendering out of 728 articles evaluated for appropriate criteria, rigor, and relevance to the clinical question.

**Data Collection Process**

The collection of data from primary research on the subject can be exceedingly complex due to the wide range of variables that have been previously studied across multiple healthcare disciplines. Any integrative review can encompass an infinite number of variables, issues, or populations; therefore, clarity of the review purpose is important.

The project leader will be the only person collecting information from the literature and has appropriately completed the necessary Collaborative Institutional Training Initiative (CITI) modules in order to meet the institutional requirement for project leader education. Prior to beginning the search, a librarian was consulted for assistance with selection of appropriate databases and choice of keywords based on the topic. A computer generated search was conducted using the databases CINAHL, MEDLINE, PubMed, and Cochrane in order to find

articles specific to medication errors occurring in acute care settings in the adult population. Medication errors have been an ongoing problem for many years and because of the comprehensive nature of this topic, an exhaustive amount of publications exist related to cause, implications, and concerns surrounding medication errors. Therefore, the original search was limited to peer-reviewed journal articles written within the past ten years. The search did not exclude unpublished dissertations, however none were utilized in the study.

**Data Items**

In order to begin the process of listing and defining variables that would assist in seeking data, the very first process took place. Defined as data reduction, the initial categorization of articles was completed based on chronology, subject matter, inclusion criteria or setting, but served to begin the laborious process of paring down the voluminous information on the subject of medication errors. Reducing the vast data to a manageable amount of information required various techniques that served to extract the most important information, then it was organized where the project leader sifted through for significance and relevance ensuring that rigor was maintained (Whittemore & Knalf, 2003). At this point, succinct organization of the literature was imperative in order to systematically compare and contrast the study's variables (Whittemore & Knalf, 2003).

**Risk of Bias in Individual Studies**

Because conducting a literature review is seen as researching the research, it is important that the methodology deliver the same rigor as the original research, therefore the steps in this framework should be equal to that of primary research (Cooper, 1998). A tool that will be utilized to assure rigor of the findings and proper reporting is the PRISMA flow diagram (Moher, Liberati, Tetzlaff, Altman & the PRISMA Group, 2009). This served to greatly reduce the bias

that could exist from too narrow a focus during the literature search. During this integrated review, no identifiable risk of bias was discovered within the reviewed themes and identified strategies in the individual studies. It is noted that this was pertinent to the adult population on in-patient acute care units.

**Summary Measures**

The purpose of the literature review was to confirm the need for an integrative review to determine appropriate methods to deliver safe and protocol driven medication administration in adult acute care patient settings. Through a synthesis of published articles that identify factors involved in medication errors in the afore stated population, the project leader was able to ascertain evidence-based recommendations for interventions and strategies that will direct policy development and new practices, as well as discover indicators for further research in this area. A literature matrix was used to systematically review the articles reviewed for this scholarly project and how they were analyzed for major findings, level of evidence, limitations, and gaps in practice.

**Synthesis of Results**

The literature findings demonstrate that a problem exists related to the high number of medication errors occurring in the acute care setting. A strong foundation is present on which to build a case for quality measures in the acute care setting will facilitate a reduction in medication errors that reach the patient with potential to cause harm. Nurses take pride in the responsibility that belongs to them when it comes to patient safety in general and medication administration specifically. Instituting a strategic initiative that will allow the evidence revealed through this integrative literature review to be brought to the patient bedside will allow nurses to engage fully in a climate of safety for the enhancement of positive patient outcomes.

# Results

## Study Selection

An extensive and unbiased analysis of the primary sources was the main objective for this phase, together with a synthesis of the extracted evidence to support the final conclusions (Whittemore & Knalf, 2003). By using primary research methods to analyze mixed-method and qualitative design studies, "Primary research methods of analysis developed for mixed-method and qualitative designs are particularly applicable to the integrative review method allowing for iterative comparisons across primary data sources" (Whittemore & Knalf, 2003, p.550). The project leader found 727 potential articles that were identified through databases that included CINAHL, PUBMED, Ovid MEDLINE and PROQUEST. A flowchart was then created of the search and screening process. Adapted from "Preferred reporting items for systematic reviews and meta-analysis: The PRISMA statement" by Moher et al. (2009). A flowchart was then created from the search and screening process. Adapted from "Preferred reporting items for systematic reviews and meta-analysis: The PRISMA statement" by Moher et al. (2009). The flow chart starts with a list of potential relevant articles identified through the following databases CINAHL (104 articles), PUBMED (381 articles), Ovid MEDLINE (50 articles), and Proquest (192 articles) giving a total of 727 easily identifiable articles. Additionally, one relevant article was available from Joanna Briggs Institute. Articles that were duplicated in the search through the use of multiple databases were immediately removed leaving of 689. At this point, a thorough scrub was completed to leave only those articles that addressed the main objectives of the clinical question. In that process, 601 articles were excluded. The remaining 88 articles were then screened for eligibility by using the inclusion and exclusion criteria and 68 were excluded with reason. The residual articles were included in this integrative review for a total of 20 peer-

reviewed studies that addressed recurring medication errors in the acute care setting among the adult population. (See Appendix A)

This integrative review included mixed methodologies as some were qualitative and some quantitative studies that were identified in the primary sources. A table was utilized to identify similarities and differences as the articles were critiqued and synthesized. The PRISMA Checklist was selected as the tool to determine if there was enough evidence to support an evidence-based practice project which would be conducted, evaluated, and disseminated to implement change in clinical practice to bring about positive outcomes.

The methodology utilized in this integrative review was a combination of the framework recommended by Whittemore and Knalf (2005) as well as the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA, 2009). An updated integrative review method gives way to wider and more diverse primary research methods which tend to cause greater evidence-based practice initiatives (Whittemore and Knalf, 2005). One of the advantages of an integrative review is that this method allowed for inclusion of several types of research including experimental, non-experimental, theoretical, and empirical when exploring information on a particular phenomenon (Whittemore & Knalf, 2005).

According to Cooper (1998), by following specific steps the project leader can build a framework that aligns well with an integrative review and can be modified to meet the needs of the individual study. Whittemore and Knalf (2003) support this method that requires the project leader to find the problem, search the literature, evaluate the data, analyze the data, and finally present the findings.

**Study Characteristics**

The problem to be addressed by this integrative review was whether or not an opportunity exists through an identified intervention to reduce medication errors on an acute care unit. At this point it is imperative to scrutinize the inclusion and exclusion criteria to make sure that important studies were included. The integrative review process requires the researcher to clearly identify a problem and purpose for each review which will create a focus and provide boundaries (Whittemore & Knalf, 2003). A well-specified research purpose in an integrative review will facilitate the ability to accurately operationalize variables and thus extract appropriate data from primary sources (Whittemore & Knalf, 2003). No bias was found within or across studies that would interfere with the integrity or rigor of the final articles selected for review.

**Results of Individual Studies**

Reduction in rates of medication administration errors (MAEs) and related adverse drug events (ADEs) were reported with the use of medication technology (automated dispensing, barcoding, and electronic prescribing) and nurse educational training (simulated learning and pharmacist-led training) interventions (Keers, Williams, Cooke, Walsh, & Ashcroft, 2014). This was further substantiated by Wimpenny & Kirkpatrick (2010) who cited a more effective system of quality control and safety is required to reduce illegible prescriptions and errors at the bedside. Wimpenny & Kirkpatrick (2010) did go on to say rigorous large-scale, high quality observational studies are needed to reflect actual practice conditions, while large, high quality Random Controlled Trials (RCT) are needed to obtain evidence on the effectiveness of differing roles and systems for prevention of MAEs. Another journal article by Lavinn, Harper, & Barr (2015) spoke to the connectivity of the electronic medical record (EHR) to medication errors by stating that this area is in need of further investigation, research, and nurse-led quality improvement

projects to determine the impact that the EHR on errors associated with medication administration.

The American Society of Health-Systems Pharmacists (ASHP) conducted a thorough review of the literature on medication errors and made recommendations for prevention. While the article discusses areas that need to be addressed by pharmacists, prescribers, and patients, the authors maintain that nurses are in the best position to detect and respond to medication errors due to the close proximity they share with the patient during medication administration (ASHP, 2014). The ASHP made recommendations for nurses to consider in order to be proactive in preventing medication errors that included proper patient identification, a thorough knowledge of all the medications being administered, a systematic approach to administration, and adhering to scheduled administration times (ASHP, 2014).

A clinical nurse specialist at Mayo Regional Hospital in Maine, found that procuring and implementing the use of secure work carts significantly reduced medication errors in that healthcare system (Stroud, 2013). It was determined that wrong time was the largest cause for medication error at Mayo Regional, however with the use of secure medication carts, nurses were more in control of their work flow and less likely to engage in work arounds to be in compliance. This created a culture of safety and satisfaction among the nursing staff that continues to affect the quality of patient outcomes due to the decrease in medication errors (Stroud, 2013).

A qualitative study of 20 nurses found the importance of nurse managers recognizing the value of the staff nurses' clinical reasoning skills as an important tool to medication safety, and the need to equip nurses with the knowledge and leadership skills necessary to perform this role. High levels of trust from nurse managers encourages the staff nurses to use

practices that will intercept medication errors before they reach the patient (Smeulers, Onderwater, Zwieten, & Vermeulen, 2014).

**Synthesis of Results**

Whittemore and Knalf (2003) add that there are four processes with which to further delineate the evidence found in an integrative review consisting of data reduction, data display, data comparison, and finally verifying and drawing a conclusion.

**data reduction.** In the very first process, data reduction is where the initial categorization of articles takes place. This can be done based on chronology, subject matter, inclusion criteria or setting, but serves to begin the laborious process of paring down the voluminous information on the subject of medication errors. Reducing the vast data to a manageable amount of information requires various techniques that will serve to extract the most important information, then organize it where the project leader can sort for significance and relevance ensuring that rigor is maintained (Whittemore & Knafl, 2003). At this point, succinct organization of the literature is imperative in order to systematically compare and contrast the study's variables (Whittemore & Knafl, 2003).

**data display.** For the information to be systematically reviewed, it will be necessary to display the extracted data in some form of matrix, form, or table to easily see trends and outliers. For the purposes of this study, a table was created that compares level of evidence, setting, population, type of error, and variables. By displaying the data in vertical columns for comparison, it enhanced the process of discerning patterns and trends and enhance the imagery in order to begin the analysis process.

**data comparison.** Once a table had been constructed with all pertinent usable data, then extraction of data that support trends was identified and analyzed. It is important to find the

supporting data for the empirical and theoretical frameworks that have been the platform for the study of medication errors in acute care units to tie the research to the project goals. Relationships between the trends revealed themselves and it was possible to draw conclusions that deliver clear connections between identified variables and outcomes. Data comparison required the project leader to be critical yet creative when conducting data analysis to reveal common themes and patterns in the evidence (Whittemore & Knalf, 2003).

**conclusion drawing and verification.** The final process in a data analysis comes when mining for data was over, the evidence has been categorized and mounted into tables for visualization of trends and everything is ready for final synthesis. This is when ideas, hunches, and deductive reasoning take place and it becomes imperative to document what trends and conclusions are being explored and the data source that supports them. Bias was viewed at this point of the process to determine if the information was thoroughly and exhaustively reviewed to make sure all important data were included in the final analysis and summation. The project leader anticipated common themes surfacing through the synthesis process and formed a strategic initiative to take to the next level in the process of implementing policy change.

## Additional Analysis

Two specific strategies to decrease medication errors in the adult patient population in acute care settings have emerged from the literature. First is to overcome the underreporting of errors, and second is to identify the root cause of the error, and when it is a system failure or process failure, develop a plan of action immediately. When the leadership team learns that the error was due to a system or process failure and concentrated on fixing the failed process instead of placing blame on staff, it has a major impact of how safe the staff members feel in reporting errors (Flynn, et al., 2012). When the focus is on providing a safe environment for patients and

staff, a culture of safety is born. The goal of a culture of safety is to sustain an environment that supports a comfort level in reporting errors without fear of retribution in order to keep every patient safe for the entire length of the admission (Vogus & Sutcliffe, 2007).

According to the International Health Institute (IHI), creating a culture of safety is multifaceted (2016). In order to address the underreporting of medication errors, the healthcare organization must develop and adopt a non-punitive reporting policy that is well communicated to the staff on a regular basis by unit leadership (IHI, 2016). It is incumbent on the nurse manager and other members of the leadership team to reinforce the organization's non-punitive philosophy by having nurses and other staff who have reported medication errors, near misses, or any other adverse event discuss in real-time with colleagues exactly how management supported them (IHI, 2016). This will strengthen the culture on the unit and within the organization and lend credibility to the non-punitive policy. Management should also encourage staff involvement in safety initiatives and give favorable recognition to staff members who report errors. This should also be reflected positively on each staff member's performance appraisal (IHI, 2016).

The second strategy to assist in alleviating medication errors is to "train managers to identify human factors and system failures in errors and adverse events" (IHI, 2016). Medication errors can be investigated and found to have a root cause related to one of three categories, potential system failure, probable process failure, or inevitable human failure (Flynn, et al., 2012). This is where the leadership team plays an integral role in drilling down to find the exact cause and flaw in the process. Even more important than finding the cause, is identifying the solution and repairing the problem. The IHI states the need to "Let reporters know something will be done with their report. That the system works. That way they feel that their report will be

useful" (2016, p. 2) Whether or not the error was caused by human failure, the reporter should feel good he/she contributed to the culture of safety and the safety of the patient by reporting an error.

## Evaluation Methods

The scholarly project was evaluated by the project leader, chair, and committee members continuously to assure that the evolving document maintained rigor and met the requirements of the Doctor of Nursing Practice program at Liberty University. The project leader continually referred to references and resources to maintain the integrity of the process and project. Through the use of the literature results matrix, trends and conclusions were identified and supported with evidence that was properly cited. Final summation and conclusions were investigated and no bias was identified. When a strategy is identified and the initiative is implemented in real time, it will be important to evaluate the effectiveness. Soliciting assistance from strategic partners to evaluate the implementation will be necessary. It is important to note any part of the plan that needs updating or revision throughout the entire period of dissemination and implementation. This will allow the initiative to grow and evolve as new evidence reveals itself that will enhance the effort.

One of the ways to evaluate the new initiative is to use the clinical audit process. Montesi and Lechi (2009) state that the clinical audit process "has influenced clinical practice and management, changing the culture of healthcare providers, enabling them to appreciate written guidelines and protocols and to develop a sense of clinical accountability, inter-professional understanding, and sensitivity to patients' needs" (p. 654). There are however, indications of barriers that exist such as the amount of time and energy that it takes to conduct the audit, the fact that resources must be acquired, and auditors must be educated.

Evaluation of the articles was extensive in order to determine relevance to the project question. Specific elements discerned were the type of study conducted within the research, methodology that was utilized and specific inclusion and exclusion criteria within the study. The PRISMA flow chart allowed for the inclusion and exclusion criteria to aid in minimizing articles that would not support the project (Moher, Liberati, Tetzlaff, & Altman, 2009). The flow chart created by the project leader is included as Appendix A. The PRISMA Checklist will be instrumental in determining the validity and quality of each article reviewed (Moher, et al, 2009).

Levels of Evidence were determined using Melnyk's hierarchy of evidence (Melnyk, & Fineout-Overholt, 2011). Melnyk's levels of evidence are endorsed by the National Council of State Boards of Nursing (NCSBN, 2011) who recommends in their toolkit to utilize Melnyk in all nursing research. NCSBN urges nurses to think of the Hierarchy of Evidence as a pyramid with the top being the strongest type of study and the bottom of the pyramid would be the weakest evidence. Level one is the top of the pyramid and NCSBN (2011) suggests working down the hierarchy. Polit and Beck (2012) suggest looking at the measurement, attrition rate, validity, bias, interventions, statistical analysis, and the discussion to assist in assuring the article is worth including.

## Discussion

### Summary of Evidence

The theory of planned behavior is well suited to assist leadership with the change in culture to one that identifies the patient at the center of all safety concerns including medication errors. Prior to determining how dissemination will take place, it is important to know why it will be done. Evidence-based practice has become a very familiar phrase in healthcare in general and specifically among those charged with the task of delivering positive patient outcomes.

Bedside nurses are the ones that will benefit the most from the latest research, but ironically are the ones that are least likely to engage in research efforts to bring best practices to their own daily practice. One of the things that discourages clinical nurses from utilizing research is that they find it difficult to understand and properly critique. Often the nurse may find conflicting conclusions regarding the same topic and this leads to underutilization of research reports (Kirkevold, 1996).

One of the most important ways to share the information is to have the project published. By publishing the research, the information is moved closer to the point of care where it can have the most impact on patient outcomes. When deciding how best to disseminate the information, first look at the driving force behind the project. Whether it was it to motivate others, educate or even inform fellow staff members or another population of people, it is important to look at the information and synthesize it in order to make the new information readily understood by the target audience (University of Regina, 2011).

Other ways to disseminate the information would be to submit an abstract for a poster presentation, or a podium presentation at a local, state, or national conference. Conferences to consider include: American Medical Surgical Nurses (AMSN), a pharmaceutical conference, safety and risk management in healthcare conference or seminar. One of the barriers that might exist is whether or not the parent organization or any community partners will be equipped with the proper resources and appropriate communication skills to be effective in disseminating the research findings. This could be resolved through marketing the program to assist in getting the research to the appropriate audience for consideration, however the question exists as to who will pay for the brochure Strategies to resolve this consideration includes gaining the interest of key stakeholders and demonstrating the need for an intervention that assists in maintaining patient

safety and ultimately saves resources. Other concepts include organizational culture, and attitudes of nurses regarding the importance of their role in preventing medication errors. This directly applies to the theory of human behavior and by integrating that into the methodology the project leader anticipates revealing and identifying any risks to the validity of the research. Leaving out criteria that should be included or adding too many variables and inclusion criteria may cloud the results and interfere with integrity and rigor of the findings. As the project unfolded, other barriers and road blocks surfaced making it challenging for the project leader to reach a clear intervention that can be implemented as a result of the research. Identifying the barrier, and then removing it, was an important step to aid in moving the project from bench to the bedside. One potential barrier may be lack of buy-in from the organization. Cooperation of executive leadership will be necessary in order to properly disseminate and implement any strategic initiative that will be discovered through the integrated review (Brownson, Colditz, & Proctor, 2012). Without the cooperation of executive leadership, new strategic initiatives have a long road to travel in order to take the project from bench to the patient's bedside. It is the aim of this project to have a tangible strategy that will have a real impact on reducing medication errors within a healthcare organization. With proper clinical audit, the initiative can be proven effective and then the dissemination of research can move outside of the initial organization to a state and even national level.

**Limitations**

Organizational readiness is strategically necessary in order to effectively disseminate and implement a proposed change initiative. For change to work and key stakeholders to demonstrate a willingness to support the change a certain amount of readiness must be achieved. This will offset the staggering statistic that approximately one-half of all changes that are

launched in large-scale organizations are unsuccessful (Weiner, 2009). With that in mind, it becomes imperative to learn the culture at the organization where an initiative is launched. How does the team work together for a common goal, and what is truly the number one safety problem identified within that organization are also important questions. If it is not medication errors, then it will be necessary to determine where that is ranked in importance among safety concerns within the organization.

A second barrier to this project may be lack of cooperation from the target audience. The nurses, pharmacists, and ancillary staff that will be directly affected by the proposed change may not see the work regarding the strategic initiative as credible, valuable, or worthy of implementation. To move a project forward it is imperative to partner with the target audience in planning the project and receiving feedback (University of Regina, 2011). Allowing the target audience some ownership in the protocol and having them help with the dissemination of the entire idea will serve to empower them (University of Regina, 2011). This will in turn demonstrate a paradigm shift from cynic to supporter. In addition to the aforementioned limitations, it should be noted that there was only one reviewer for this project.

**Conclusion**

An integrative review method on medication errors serves to summarize past empirical and theoretical literature. This review method utilized diverse methodologies in order to capture the context, processes and subjective elements of the topic, and then demonstrated how this could be applied to clinical practice and evidence-based initiatives by way of policy change. Protocol development for medication safety has been critiqued for its potential for bias and lack of rigor, therefore the project leader rigorously developed the integrative review to allow for various perspectives on initiatives to reduce medication errors. The literature reveals that many

interventions have been put in place over the past two decades to circumvent medication errors including bar code scanning, computerized electronic medical record, new smart infusion pumps, and specific protocols regarding actual administration. While these processes and systems have been in place for many years, there continues to be a vast amount of medication errors. A fresh approach would be to integrate the theory of planned behavior to reflect affecting change from within human performance.

Some of the inattention stems from poor system approaches. "System factors include failure to adhere to policies and procedures, an organization's safety climate or unfavorable working conditions, increase workload or patient acuity, insufficient staffing, and longer hours" (Tzeng, Yin, Schneider, 2013, p.13). Revisiting the clinical question is important when reducing the entire integrative review process to a tangible identifiable answer. Is there a systematic approach that will reduce the number of medication errors in the adult patient population on an acute care unit within the hospital setting? This integrative review reveals the answer is yes.

There is a cluster/bundle of approaches that stands ready to be implemented on any adult care inpatient unit that will achieve a reduction of medication errors as a direct result. The bundle approach requires promoting a culture of safety, partnering with an invested and trustworthy leadership team, and increasing reporting of medication errors without penalty, which will allow for study and change of damaged processes. Further research is suggested by way of piloting this strategic initiative that incorporates the identified bundle and then documenting the data, and comparing it to the previous quarter, in order to look for trends and evidence that the initiative is working and can be further disseminated across the healthcare system. Nurse educators within professional development services can be instrumental in the dissemination process.

Medication errors are a serious safety issue at every healthcare facility across the nation and around the globe and an ongoing battle exists to reduce medication errors in all settings within healthcare. The opportunities for improving processes and quality measures in this area are limitless. Advanced practice nurses are compelled to find ways to make a difference by initiating a practice, policy, or protocol that will decrease medication errors within healthcare organizations and beyond. Sustainability is synonymous with ongoing systems. After dissemination of this project takes place and ultimately a strategy is implemented, a decrease in errors will be revealed and supported by real data, and the validity of this integrative literature review will be demonstrated. Securing buy-in from leadership within the healthcare system is crucial to the success and sustainability of the project. By determining who the beneficiaries are and collaborating with community partners it will be much easier to obtain buy-in as a strategic initiative is recommended. Zaccagnini & White (2014) suggest that, "The DNP prepared nurse will have the skill and will work effectively within the organization to evaluate education delivery and make evidence-based recommendations for system change" (p. 356). Once the healthcare system is ready to pilot the initiative, data can be collected in real time and the validity of the project will come to fruition and process change will give way to a reduction of medication errors and positive patient outcomes.

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# TABLES

Table 1

*Inclusion and Exclusion Criteria*

| Inclusion | Exclusion |
|---|---|
| Publication from 2006-2016 | Publications prior to 2006 |
| Adult patient population > 18 yrs. | Pediatric patient population <18 yrs. |
| | |
| Peer-reviewed, gray literature (i.e. unpublished articles, dissertations, frameworks, policy documents, etc.) | Non-research articles (i.e. Commentaries, editorials, briefings, fact sheets) |
| English language | Publications written in a foreign language |
| Full-text articles | Abstract only articles |
| In-patient acute care setting | Ambulatory settings |

Table 2

*Results Matrix Medication Errors*

| **Focus of Article, Author/year** | **Level of Evidence/Source** | **Medication errors/ Background** | **Conclusions/ Practice Implications/ Recommendations** |
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| The rates of medication errors across three different medication dispensing and administration systems frequently used in critical access hospitals (CAHs) were analyzed. (Cochran, & Haynatzki, 2013) | III/Primary | • Nine hospitals agreed to participate and were assigned to one of three groups based on similarities in their medication-use processes<br>• A convenience sample of 350 observations for each hospital was chosen based on the available budget and expected hospital census | • Medication error rates were lower in CAHs with 40 or more hours per week of onsite pharmacy support with or without a bedside barcode<br>• Selection bias and the Hawthorne effect could have influenced the observed error rates.<br>• The lower-than-expected error rate reduced our ability to evaluate relationships between predictors and outcomes. |
| To examine the relationship between nurse staffing and the occurrence of medication errors on medical-surgical units.(Frith, Anderson, Fan & Fong, 2012) | III/Primary | • The patients in our study were most likely to be over 65 and white. There were slightly more females than males in the study<br>• Using a retrospective design, researchers analyzed secondary data from administrative databases of one hospital containing 801 weekly staffing | • Nurse staffing is an important strategy to prevent medication errors in community hospitals.<br>• The incidence and cost of medication errors continues to be a problem requiring solutions.<br>• Findings indicate even a small number of LPNs in staffing can contribute to medication errors |

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| | | intervals and 31,080 patient observations<br>• Study limited to 1 hospital | |
| To review and critically appraise interventions designed to reduce MAEs in the hospital setting (Keers, R, Williams, S. Cooke, J., Walsh, T. & Ashcroft, D. 2014) | II/Primary | • Adult patients on med/surg floors across 2 hospitals<br>• A systematic review including Randomized controlled trials (RCTs) and con-trolled trials (CTs)<br>• Theses and conference proceedings were excluded and data produced outside commercial publishing were not searched. | • Reduction in rates of medication administration errors (MAEs) and related adverse drug events (ADEs) were reported for some medication use technology (automated dispensing, barcoding, and electronic prescribing) and nurse educational training (simulated learning and pharmacist-led training) interventions<br>• Greater standardization of methods and a more theory-driven approach to the design and implementation of forth-coming interventions to minimize MAEs is needed |
| To determine the relationships among characteristics of the nursing practice environment, nurse | IV/Primary | • Nonexperimental design, individual medical-surgical units within acute care hospitals comprised the unit of analysis with 686 staff nurses | • Nurses' error interception practices align with lower rates of non-intercepted medication errors, further quantifying the important role |

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| staffing levels, nurses' error interception practices, and rates of non-intercepted medication errors in acute care hospitals. (Flynn, Liang, Dickson, Xie, & Suh, 2012) | | | of nurses in enhancing patient safety.<br>• Limited by use of incident reports to measure the frequency of medication errors. The underreporting of inpatient medication errors is well documented<br>• Suggest that supportive practice environments be encouraged |
| To study the prevalence of medication errors and formulate a national agenda for reducing those errors. (IOM, 2006) | VI/Secondary | • Medication errors are common and costly to the Nation.<br>• Errors occur during every step of the medication process. An adverse drug event arising from an error is considered preventable. | • Reduce medication errors by adopting a model of patient-provider relationship where the patient is an active participant in their care.<br>• Nurses and other providers such as doctors and pharmacists must communicate with patients and encourage patient engagement<br>• Hospital need to utilize technology and strategic initiatives to determine root cause of adverse drug events. |
| The aim of the study is to use the Theory of Planned | IV/Primary | • Despite the overwhelming statistics of number of errors and | • Errors cannot be completely removed from the equation but |

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| Behavior to flesh out the influencing factors that determine whether a nurse will report a medication error (Tabak & Fleishman, 2011) | | the cost associated with that, it is well known that only a portion of medication errors are reported<br>• Nurses are apt to report if they feel a legal, ethical, administrative or financial duty to do so.<br>• Factors that discourage reporting are fear of punishment, lack of confidence that it will help reduce further error. | can be lessened by encouraging reporting and then studying the reports to find root causes and make changes based on findings.<br>• The more a nurse perceives her behavioral control over adverse medication event reporting the more likely the nurse is to report the adverse event/<br>• Nurses need to feel a climate and culture within the healthcare organization that is positive to error reporting. |
| To explore nurses' experiences with and perspectives on preventing medication administration errors (Smeulers, Onderwater, Zwieten, & Vermeulen, 2014). | IV/Primary | • Insight into nurses' experiences with and perspectives on preventing medication administration errors is important and can be utilized to tailor and implement safety practices. A qualitative interview study | • Three specific themes emerged from the analyzed material: (1) the nurses' roles and responsibilities in medication safety, (2) the nurses' ability to work safely in daily practice and (3) the nurses' acceptance of safety practices.<br>• The nurses stated that the system does not adequately support them, which can lead to errors and additional time-consuming procedures |
| (Lavinn, Harper, & Barr, 2015) | | • The investigation of EHR-associated medication administration errors is a ripe area | • It is recommended that all four categories of prescribing, transcribing, dispensing, and |

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| | | for **nursing** research and/or nurse-led quality improvement studies. | administering be digitalized and synched in the EHR.<br>• Combine bar coding at the point of care for real time surveillance.<br>• The use of bar coding broadens the medication-administration patient safety zone. |
| (ASHP, 2014) | IV/Secondary | • Medication error prevention approaches that should be considered in the development of organizational systems and discusses methods of managing medication errors once they have occurred.<br>• These guidelines are primarily intended to apply to the inpatient hospital setting because of the special collaborative processes established in the setting | • Organizational policies and procedures should be established to prevent medication errors.<br>• Multidisciplinary team needed to develop policies and procedures<br>• Nurses serve as the final safety net between the wrong medication and the patient. |
| A study to evaluate the use of the workstation on wheels with locked drawers and how it impacts medication errors (Stroud, 2013). | VI/Secondary | • Workstations on wheels must be paired with the proper workflow and other infrastructure such as staffing patterns and time of medication admiration to reap the full benefit. | • Secure carts solve workflow issues<br>• Safety emphasis prompts implementation of workstations on wheels<br>• Medication administration delays were decreased by 40% |
| Develop a tool that will help to discover reasons associated with poor error | III/Primary | • Nurses strive to deliver high-quality care in an inherently | • The Safe Medication Audit Reporting Translation |

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| reporting. (Hutchinson, A., Sales, A., Brotto, V., Bucknall, T., 2015). | | complex and error-prone environment.<br>• Underreporting of medication errors interferes with the ability to understand the causative factors and impedes efforts to create and implement preventive strategies.<br>• Audit with feedback is a knowledge translation strategy that has potential to modify health professionals' medical error reporting occurrence. | (SMART) study was used to do the following:<br>• Return audit data on med errors to the nurses<br>• Test this feedback for its effect on nurses and subsequently errors<br>• Find the context in which this feedback can be utilized.<br>• Determined reasons for underreporting include the perception that if no harm is caused it is not necessary to report. |
| A descriptive cross-sectional study to identify the nurse point of view on medication errors. (Shahrokhi, A., Ebrahimpour, F. & Ghodousi, A., 2013). | IV/Primary | • The nurses point of view is instrumental in revealing the where, when, why and how medication errors occur.<br>• Nurses are in a unique place to address medication errors in real-time and report causes to improper medication administration and barriers to fixing the problems. | • From the nurses' point of view, factors such as nurse's carelessness, tiredness caused by excessive overtime work, inadequate knowledge in pharmacology and insufficient experience are the factors that have the greatest causational impact on medication errors.<br>• Factors such as financial problems and lack of interest in nursing job are the least effective factors |
| The aim was to review systematically the research literature on the efficacy of interventions in reducing medication errors in intensive care (Manias, E., | IV/Secondary | • The lifesaving medication treatments that are used to treat the critically ill patients are often medications that require careful titration. | • Eight interventions were identified: computerized physician order entry, changes in work schedules, intravenous systems, modes of education, medication reconciliation, |

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| Williams, A. & Liew, D. 2012). | | • Emphasis has been placed on examining the incidence of medication errors and risk factors | pharmacist involvement, protocols and guidelines and support systems for clinical decision-making.<br>• Sixteen out of the 24 studies demonstrated statistically significant reductions in medication error rates. |
| The aim of this study was to determine the relationship between patient characteristics and prescribing and transcribing medication errors during acute hospitalization of elderly patients in an internal medicine ward. (Yehuda, B., Bitton, A., Yitzchak, Pnina, S., Rotfeld, E. & Tikva, A., 2011). | II/Primary | • This cohort case-control study was conducted in Israel in a 37-bed medical surgical acute care floor in a tertiary hospital.<br>• 137 patients in the study had potentially harmful medication errors detected<br>• Conditional logistic regression was used to identify factors associated with medication errors. | • The study found that different patient-related factors are associated with prescribing and medication errors.<br>• Prescribing error was related to the patient's Charlson Comorbidity Index score, the risk of a transcribing error was associated with the number of medications taken by the patient.<br>• Despite the finding that more than half of the errors occurred during the first 3 days of hospitalization, the risk for a medication error was positively correlated with the length of hospital stay. |
| To demonstrate that detection, reporting, and analysis of medication errors are essential to ensure patient safety. | II/Secondary | • Medication errors are the most common type of medical error, and cardiovascular medications prescribed to inpatients account | • Errors were found to be especially high with look-alike and/or sound-alike medication names. |

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| According to the Institute for Safe Medication Practices, self-reporting strategies remain the most common method for identification of medication errors; however, it is likely that only a minority of medication errors are actually reported. (Michaels, A., Spinler, S., Leeper, B., Ohman, E., Alexander, K., Newby, L., Ay, H. & Gibler, W., 2010). | | for a large proportion of these errors.<br>• An average of 1 medication error occurs per hospitalized patient per day, and one quarter of all medication-related injuries are preventable.<br>• The emergency department (ED) and acute hospital setting remain locations at high risk for medication errors. | • Errors were found in medication formulation<br>• It is noted that older adult population are at higher risk for harmful and/or fatal med errors<br>• Critical to identify all med errors through voluntary reporting<br>• Imperative to have common definitions of medication errors and a blame-free culture in order to encourage nurses to report errors.<br>• To improve reporting, changes need to be made to the regulation of medication administration<br>• Education of all stakeholders early in their training to ensure safe medication-management practices. |
| The purpose was to determine if a preventive interventions program (PIP) is associated with a significant reduction on prevalence of patients with MEs in intensive care unit (Romero,C., Salazar, N., | Level II/Primary | • A prospective before-after study was conducted in a random sample of adult patients in a medical-surgical ICU.<br>• Between 2 observational phases, several interventions to reduce medication errors was implemented. | • Implementing preventative interventions by a multidisciplinary team resulted in a significant reduction on the prevalence of patients with ME at an adult ICU. |

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| Rojas, L., Escobar, L. & Grinen, Hector (2013). | | • Medication errors were observed through direct observation at baseline and post intervention.<br>• A total of 410 medication passes for 278 patients were evaluated.<br>• Post intervention, a 31.7% decrease on the prevalence of patients with MEs | • Utilizing a clinical pharmacist on the ICU significantly reduced med errors.<br>• Use of standard operating procedures were developed for preparation and administration of medication.<br>• The clinical pharmacist reorganized timing of medications where possible to reduce the number of medications given concurrently.<br>• Developing a reporting system with specially designed mailboxes and report forms were placed in the ICU, intended to receive staff self-reporting.<br>• Reporting included basic information related to the med error to facilitate learning from the error, to generate preventive interventions. The report was voluntary, anonymous, and non-punitive. |
| To look at interruptions and distractions as a | Level II/Primary | • Errors that lead to harmful adverse drug events (ADEs) | • Human errors are inevitable, Causes include multitasking |

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| connection to preventable medication errors. Also to reveal nurses skipping steps and using work arounds. (Durham, M., Suhayda, R., Normand, P., Jankiewicz, A. & Fogg, L. (2016). | | account for 1 in 3 of all hospital adverse events and prolong hospital stays by 1.7 to 4.6 days.<br>• A staggering statistic reveals that hospitalized patient typically experiences 1 medication error every day.<br>• Med errors are difficult to reduce because of low-visibility of the problem as well as the work environment of the nurse.<br>• Error reporting is voluntary and happens when there is both awareness of the error and a decision to report. Many nurses deny that they have ever made an error<br>• Human error is inevitable in complex environments, so behaviors and the system need to be managed to promote safety. | and reduced attention, failure to follow protocols, incorrect knowledge<br>• System improvement has been shown to be more effective than focusing on the individual alone.<br>• Standardization and simplification of the process, using checklists, accountability for practice, and simulation-based training can decrease variability to decrease error.<br>• Mindfulness refocuses attention and can be used as a strategy to reduce med errors.<br>• Studies have demonstrated the effect of mindfulness on sustaining attention<br>• Teaching mindfulness should serve as an important strategy to improve safety by helping clinicians manage interruptions and distractions. |
| Shed light on how the nurse's perception of the physical environment in the acute care setting affects the number of medication errors. (Mahmood, A., | Level III/ Primary | • Causes of medication errors include regulatory environment, organizational leadership and commitment, management policies and procedures, complexity of tasks involved, work culture, and physical environment. | • Identified solutions include: increasing the number of nurses per unit; better training of health professionals and reducing the number of work hours of nurses and using automated medication |

| | | | |
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| Chaudhury, H. & Valente, M. 2011). | | • The work environment of the nurse can contribute to stress and incidental medication errors.<br>• Underlying systems, processes and managerial decisions must be looked at as potential contributors to medication errors. | dispensation systems where currently unavailable.<br>• Environmental issues identified by nursing staff include, increased workspace for charting, use of flooring/ceiling materials/wall coverings that will reduce noise level, adequate lighting for increased visibility, workspaces with increased privacy to reduce stress and interruptions, and adequate space in medication rooms.<br>• These features of the environment have an impact on staff stress and fatigue |
| To identify the types and extent of workaround strategies with the use of Bar Code Medication Administration (BCMA) in acute care and long-term care settings. (Patterson, E., Rogers, M., Chapman, R. & Render, M., 2006). | IV/Primary | • A prospective ethnographic study was conducted using targeted observation to identify if using bar code scanners to identify patients and medications would reduce medication errors.<br>• Medication errors are the most commonly documented cause of adverse events in hospital settings. | • Noncompliance with recommended practices was observed in all settings and facilities.<br>• Workaround strategies were employed with BCMA that increased efficiency but created new potential paths to adverse events. This limits the effectiveness of BCMA<br>• Workaround strategies in use at a relatively high rate for |

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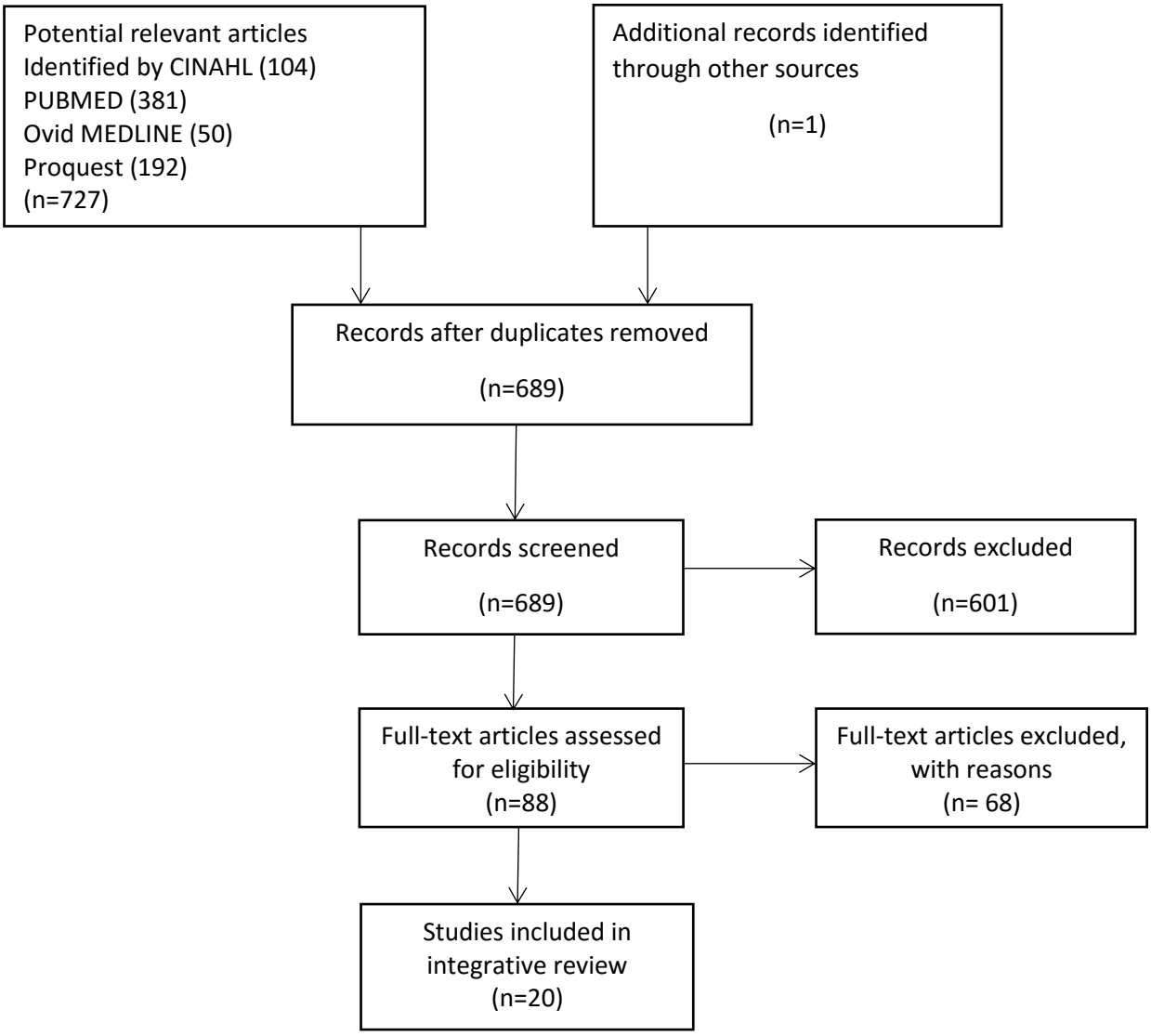
| | | | patient identification and medication administration.<br>• None of the identified workarounds are currently observable from the electronic medication administration record data, making them difficult to identify and address |
| A Cross sectional analysis to determine if medication errors are reported more readily when nurses have trust in their leadership, care pathways, and organization built around safety.(Vogus, T. & Sutcliffe, K. 2007). | II/ Primary | • No research on the benefits of safety organizing and other contextual factors believed to foster safety.<br>• A cross-sectional analysis of medication errors that were reported through an incident reporting system for the 6 months that followed a survey linked to survey data on safety organizing, trust in manager, use of care pathways, and RN characteristics and staffing | • Multilevel regression analyses showed that there were benefits to safety organization of reporting medication error. Even better results when partnered with high levels of trust in manager and use of care pathways<br>• What is needed includes trusted leaders, standardized protocols or care pathways. To reinforce patient safety<br>• Proved that when nurses trust their manager they will increase their participation of safety behaviors such as reporting medication errors. |

**Appendix A**

Project Leader's PRISMA Flow Diagram




Flowchart of search and screening process. Adapted from "Preferred reporting items for systematic reviews and meta-analysis: The PRISMA statement" by Moher et al., 2009, Annals of Internal Medicine, 151, p. 267. Copyright 2009 by PRISMA Group.

# Appendix B
CITI Training Certificate

## COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
### COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Ronni McCombie [redacted]
- **Email:**
- **Institution Affiliation:** Liberty University (ID: 2446)
- **Institution Unit:** Nursing
- **Curriculum Group:** Human subject - Basic
- **Course Learner Group:** Nursing
- **Stage:** Stage 1 - Basic Course
- **Description:** This course is appropriate for students doing class projects that qualify as "No More Than Minimal Risk" human subjects research.
- **Report ID:** 14737337
- **Report Date:** 06/18/2016
- **Current Score**:** 88

| REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES | MOST RECENT | SCORE |
|---|---|---|
| Liberty University (ID: 15111) Quiz | 12/07/14 | No |
| History and Ethical Principles - SBE (ID: 490) | 10/05/14 | 5/5 |
| Defining Research with Human Subjects - SBE (ID: 491) | 12/08/14 | 5/5 |
| Belmont Report and CITI Course Introduction (ID: 1127) | 10/05/14 | 3/3 |
| Records-Based Research (ID: 5) | 12/08/14 | 2/2 |
| The Federal Regulations - SBE (ID: 502) | 12/08/14 | 4/5 |
| Data Management (RCR-Basic) (ID: 16600) | 12/08/14 | 5/5 |
| Assessing Risk - SBE (ID: 503) | 12/08/14 | 4/5 |
| Vulnerable Subjects - Research Involving Prisoners (ID: 8) | 12/08/14 | 4/4 |
| Informed Consent - SBE (ID: 504) | 12/08/14 | 5/5 |
| Vulnerable Subjects - Research Involving Children (ID: 9) | 12/09/14 | 3/3 |
| Privacy and Confidentiality - SBE (ID: 505) | 12/08/14 | 3/5 |
| Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10) | 12/09/14 | 3/3 |
| Research and HIPAA Privacy Protections (ID: 14) | 12/09/14 | 4/5 |
| Vulnerable Subjects - Research Involving Workers/Employees (ID: 483) | 12/09/14 | 4/4 |
| Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID: 14928) | 10/05/14 | 5/5 |
| Conflicts of Interest in Research Involving Human Subjects (ID: 488) | 12/09/14 | 3/5 |
| Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680) | 12/08/14 | 3/5 |

**For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.**

**CITI Program**
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

# Appendix C

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

March 21, 2016

Ronni Rothwell McCombie
IRB Application 2485: Reducing Medication Errors on Acute Care Units within the Hospital Setting: An Integrative Review

Dear Ronni,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

[redacted]
*Administrative Chair of Institutional Research*
**The Graduate School**

LIBERTY
UNIVERSITY.
*Liberty University | Training Champions for Christ since 1971*