Evaluation of the effect of the Peer Review Impacts Safety and Medical-errors (PRISM) Program on critical care nurses' attitudes of safety culture and awareness of recovery of medical errors:

Author: Colleen Kirwan Snydeman

Boston College

William F. Connell School of Nursing

EVALUATION OF THE EFFECT OF THE *PEER REVIEW IMPACTS SAFETY AND MEDICAL-ERRORS (PRISM) PROGRAM* ON CRITICAL CARE NURSES' ATTITUDES OF SAFETY CULTURE AND AWARENESS OF RECOVERY OF MEDICAL ERRORS

a dissertation

by

COLLEEN KIRWAN SNYDEMAN

submitted in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

May 2017

May 2017

Abstract

Evaluation of the effect of the Peer Review Impacts Safety and Medical –errors (PRISM) Program on critical care nurses' attitudes of safety culture and awareness of recovery of medical errors

Colleen Kirwan Snydeman PhD, RN, NE-BC

Dissertation chair: Sister Callista Roy PhD, RN, FAAN

Problem: Nurses act as safety nets, protecting patients from harm through the identification, interruption and recovery of medical errors and adverse events but we need to know more about ways to learn from safety events. This study aimed to address a gap in our understanding of how the PRISM Program affects nurses' attitudes of safety culture, awareness of the recovery of medical errors, and practice as they relate to patient safety and error prevention.

Participants: Critical care nurses in a large academic hospital from intervention (n=95) and control (n=90) units were surveyed pre and post-implementation of the PRISM Program. Intervention nurses' response rates were 46% pre-survey and 41% post-survey. Control unit nurses' response rates were 38% for pre-survey and 31% for post-survey responses. A total of 42 (44%) intervention unit nurses participated in the PRISM Program.

Methods: A pre/post-test design with an intervention and control unit was used to evaluate the effects of the PRISM Program on nurses' responses on the Safety Attitude Questionnaire (SAQ) and the Recovery of Medical Error Inventory (RMEI) over a three month period. Nurses responded to questions about the impact on their practice.

Findings: Analysis demonstrated a significant decrease in the SAQ working conditions post-survey subscale scores and significant findings in the main effects, decreased SAQ subscales:

teamwork, job satisfaction, safety climate and perceptions of hospital management. The RMEI did not produce any significant findings. Comments provided insight into some nurses' participation in the program and the impact on their practice.

Implications: A significant decrease in post-survey scores indicate that informed nurses had a more critical view of safety culture and the environment they work in. Nurses expressed a desire to further use surveillance and additional manual checks that placed increased accountability and responsibility for their role in using strategies to keep patient safe and prevent errors and patient harm.

Acknowledgments

I am so very grateful for having had the opportunity to study in the doctoral program at Boston College. There are many people who have supported me throughout this process that I would like to acknowledge. As my advisor and dissertation chair, Sister Callista Roy supported my interests, thinking and struggles with her expertise, grace and positivity. I can't thank her enough for helping me complete this work and I feel so fortunate for having worked with her. My other esteemed dissertation committee members Dottie Jones and Patricia Dykes are icons in our profession and have informed this work beyond measure. Dottie has supported me from my application to the doctoral program to dissertation defense. Patti helped to create my burning research question. Matt Gregas provided expert guidance on statistical modeling and analysis that is truly impressive to me. I could not have completed the data preparation without the help of Sarah Dow Fleisher. And of course, there is Dean Gennaro and the many professors I had the privilege of learning from.

My Massachusetts General Hospital colleagues have been helping me for years. Jeanette Ives Erickson created the environment for advancing our profession in the most innovative ways and I am so fortunate to be working under her leadership. This study would not have been possible without the support of the intervention and control unit staff and leadership who agreed to participate in this study. Thank you for contributing to this study and to nursing research. Specifically I must recognize Tara Tehan, Jeanette Livelo, Mary Guanci and Lillian Ananian.

Theresa Gallivan, Marianne Ditomassi, Diane Carroll, Chris Annese, Aileen Tubridy, Vivian Donahue, Adele Keeley, Ed George, Robin Lipkis Orlando, the staff of the Cardiac Intensive Care Unit, Lori Powers, Sandra Thomas, my team in the Office of Quality & Safety and a dear mentor Ed Coakley; all these friends and colleagues have helped to cover me and encouraged me.

The doctoral journey was made bearable because my Honey badger Team of student colleagues were there supporting each other for most of the stresses, struggles and surreal moments. Thank you to Anna, Nick, Katie, and Theresa for keeping me going. I miss this team, who really cared deeply about what they were doing. But most of all I miss my friend Patti Branowicki all the time. I miss our morning calls while we were on our way work. I miss her wisdom, advice and role modeling living every day to the fullest. I finish this work on behalf of you too.

Lastly and most importantly, I recognize my family. To my husband Willy, thank you for taking care of me more than I deserved. He fed me while I worked, assumed additional responsibilities for me, and sacrificed time and fun so that I could complete this journey. To my children Shanley, Cayla and Torin who have also sacrificed less time with their Mom while the classes and research were being done. They did so unselfishly and respectfully. You make me proud. So often I wish my parents were physically here to celebrate new accomplishments but I think Jack and Peggy Kirwan are with me in spirit.

Somewhere something incredible is waiting to be known.

Anonymous

Table of Contents

Tables

Figures

CHAPTER ONE

STATEMENT OF THE PROBLEM

CHAPTER ONE

STATEMENT OF THE PROBLEM

In 2000, the Institute of Medicine (IOM) estimated that approximately 100,000 lives each year are lost to errors in healthcare. This report has been revolutionary to the way we think about how we care for patients and keep them safe (Kohn, Corrigan, & Donaldson, 2000). Evidence to date supports the IOM's claim suggesting that despite efforts to improve patient safety, reduce medical errors, and improved systems and technologies, errors are on the rise and progress is slow (Rothschild et al., 2006; Lucero, Lake & Aiken 2010; Levinson, 2010; Landrigan, Parry, Bones, Hackbarth, Goldman, & Sharek, 2010; Federico, 2014).

Initially the IOM (2000) noted that patient death resulting from error was projected to be the 8th leading cause of death in the United States (U.S.), due in great part to the fact that the healthcare system is poorly organized and unable to deliver consistent, highly complex, quality care to all people. More recent estimates of preventable patient harm could be as high as 400,000 or the 3rd leading cause of death (James, 2013; Makary & Daniel, 2016). Financial estimates indicate an annual cost of measurable medical errors in the U.S. to be $17.1 billion dollars, with pressure ulcers being the most common medical error (Van Den Bos, Rustagi, Gray, Halford, Ziemkiewicz, & Shreve, 2011). To achieve the IOM aim of safety, emphasis is placed on the importance of evidence-based decision making, viewing safety as a system property with increased transparency, reducing risks and requiring greater attention to systems that help prevent and mitigate errors.

Statement of the Problem

Despite the medical evidence that adverse event peer review (AEPR) programs are an effective quality and safety strategy, adverse event nurse peer review (AENPR) programs are not required by the nursing profession and can be found in only limited settings. Adopting a nurse peer review (NPR) process enhances accountability for nursing practice and can be one effective method of impacting patient outcomes (Thielen, 2014; Barr, 2010; Haag-Heitman & George, 2011). Nurses are at the frontlines of patient care. It is important for nurses to understand the effects of strategies used to improve patient safety and prevent and/or reduce safety events that include near misses, errors and adverse events. AENPR programs focused on safety events are strategies utilized by some healthcare organizations to review near misses, errors, and adverse events to understand root causes and to improve patient care. A review of the literature suggests that empirical evidence is needed to better understand the impact AENPR may have on the quality and safety of nursing care and patient safety.

Over one-hundred years ago, the American College of Surgeons adopted peer review (PR) as a means of reducing errors in surgical practice to improve patient care (McDonnell, Laxer, & Roy, 2010). Today peer review in medicine is a required method of evaluation for academic surgical programs and occurs during what is known as one of academic medicine's most recognized forums for adverse event peer review (AEPR) (Pierluissi, 2003): the morbidity and mortality conference (MMC) (Antonacci, 2009). Medical evidence shows that adverse event peer review can be an effective means of educating physicians on practice improvement initiatives (Bechtold, Scott, Nelson, Cox, Dellsperger & Hall, 2007; Kuper, Nedden, Etchells, Shadowitz & Reeves, 2010). A well-designed, peer review process is an effective, self-regulating activity that makes a vital contribution to the quality and safety of care and has the potential to improve patient outcomes (Edwards, 2011).

The effects of an AENPR program on safety culture and the recovery of medical errors have not been reported. Engaging nurses in conversations about practice and safety events to learn and act on new knowledge will enhance their understanding of how safety events occur and can be prevented, intercepted and recovered. Seeing nursing practice decisions through a lens of safety contributes to a nurse's deeper understanding of how each patient and their unique needs may be vulnerable to harm. When a nurse is able to connect her patient's situation to a safety event, a new level of concern and anticipation exists and heightens the nurse's awareness for the need to prevent a similar type of event. There is extraordinary power in a nurse's surveillance and vigilance for keeping patient safe. A process for the review of safety events designed specifically for nurses about nursing care will further promote responsiveness to safe risks and the potential for near misses, errors, and adverse events. Understanding the effects of an AENPR program on nurses' attitudes of safety culture and awareness of recovery of medical errors will inform the nursing profession's perspective in this area and could lead to more widespread adoption of these programs.

The problem is fundamentally a concern for the safety of patients in hospitals. By its nature, ontologically nursing as a profession and a practice discipline aims to meet the health care needs of patients. Safety is a basic need that nursing as a discipline can address. Therefore, as a profession with a specific knowledge base derived from theory, practice and research nursing scholars have the epistemologic responsibility to add to the knowledge needed to meet this most essential need.

Significance of the problem

This study aimed to significantly reduce errors by increasing nurses' awareness of errors, error prevention strategies, the outcomes of errors, and the importance of nursing assessments and practices related to error prevention. In addition, this study sought to augment our understanding of how participation in an adverse event nurse peer review program affects a nurse's practice, as it relates to patient safety and error prevention. It is important to understand how nurses impact patient safety and how the discipline of nursing might further support a patient safety agenda. This study was designed to contribute to this knowledge gap.

Currently there are approximately three million nurses (HRSA, 2010) in the U.S. and nurses, as the healthcare providers most likely to encounter patients at their most vulnerable points in time, are in the best positions to impact patient safety, prevent harm, and keep patients safe (IOM, 2011, Page Ed.,2004; Habel, 2011). The American Nurses Association (ANA) establishes standards of nursing practice and in 1988 published *Peer Review Guidelines,* to systematically access, monitor, and make judgments about the quality of nursing care provided by peers as measured against professional standards (p.4). The guidelines exist today but are not widely accepted nor required as a means of evaluating nursing practice.

Nurses have an obligation to protect patients from harm. Inherent in the Code of Ethics for Nurses' are expressions of values, duties, and commitments to the public that include professional growth, preserving integrity, and safety (ANA, 2010). The ANA definition of nursing is:

> "*Nursing is the protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities, and populations (ANA, 2010, p. 10).*"

Nursing peer review promotes professional accountability for safe nursing practice and serves as a connection with adherence to standards of practice and nursing actions that are associated with high quality, safe patient care (Krautscheid, 2014). AENPR programs designed to analyze adverse events and errors have been used to promote exemplary professional practice and accountability for practice (Branowicki, et al, 2011; Raia, 2011; Diaz, 2008; Fujita, Harris, Johnson, Irvine, & Latimer, 2009). The AENPR process is hypothesized to further advance professionalism through increased accountability, the promotion of self-regulation of practice, and the enhancement of system improvements (Haag-Heitman & George, 2011). Barr (2010) states that adopting a NPR process and taking accountability for nursing practice can impact patient outcomes. AENPR programs have the potential to impact quality and safety; however further research is needed to see if empirical evidence can demonstrate a link of these approaches to measures that directly and indirectly impact the quality and safety of patient care.

The nurse-patient relationship is fiduciary, therefore built on trust and patients and families expect high quality care that keeps them safe. High quality, safe care is reliant on the following characteristics of the nurse; knowledgeable, skillful and experienced; perceptive about inadequacies in the care giving environment; willingness to focus on the individual needs of the patient in question; and motivated to resolve problems at a variety of levels (Grace, 2009). Krautscheid (2014) recommends that the Code of Ethics serve as a mandate for accountability and should include the addition of life-long learning, quality patient care, and upholding professional standards. She opines that accountability means being ready to articulate and justify one's actions or omissions to others. Nurses have a moral obligation to report errors and near misses and evaluate areas for practice improvement as part of our social mandate to protect not just one patient but all patients and society.

The critical care setting is highly susceptible to patient safety issues including adverse events, serious medical error and near misses (Rothschild et al, 2005) due to the acuity and complexity of patient care (Dracup, 2003). Critical care nurses care for patients in a challenging, stressful, fast paced environment. Key authors indicate critical care nurses are uniquely positioned to identify, interrupt and correct errors and near misses. Understanding how critical care nurses act as safety nets is important in preventing serious error and injury, including those that are life threatening (Dykes, Rothschild& Hurley, 2010; Hurley et al, 2008; Henneman & Gawlinski, 2004).

Collectively and individually nurses have a professional responsibility and duty to protect all patients from harm. Peer review is one method used to learn about errors, adverse events, and patient harms in order to prevent and/or recover errors in the future. Studies indicate that the critical care setting is an area of great vulnerability for patients and critical care nurses have a tremendous opportunity to impact patient safety in this area. This study strived to contribute new knowledge in this area through attitudes of safety culture and increased nurse's awareness of the identification, interruption and recovery of error, thereby significantly reducing patient harm and improving patient safety.

Purpose of the study

A nurse peer review program was designed to promote the analysis of case study reviews of safety events related to nursing care in order to promote safety culture, raise awareness of error prevention and recovery, learn from safety events and consider opportunities for improvement in individual practice, unit level or organizational level systems. The Peer Review Impacts Safety and Medical-errors (PRISM) Program was a nurse peer review program that

provided an opportunity for critical care nurses to participate in case study reviews that have resulted from a safety event such as near misses, errors, and/or adverse events. Therefore the purpose of this study was to determine the effect of the PRISM Program on critical care nurses' attitudes of safety culture and awareness of recovery of medical errors in one critical care unit in an academic medical center setting.

Operational definitions

There are key operational terms, based on existing knowledge, which will be used in this study. A detailed summary of these operational definitions are listed in Table 1.1.

Table 1.1. Operational Definitions

Operational Term	Definition
Academic medical center	A healthcare organization associated with a medical school and other healthcare programs (2015, Medical dictionary at **http://medical-dictionary.thefreedictionary.com/academic+medical+center**
Critical care nurses	Registered nurses working in intensive care units
Critical care nurses' practice	The specific practice of registered nurses working in an intensive care unit
Critical care setting	Intensive care unit location
Nurses' attitudes of safety culture	The way nurses think and feel about safety culture in their current work environment, as measured by the Safety Attitudes Questionnaire (SAQ) (Sexton et al., 2006).
Nurses' awareness of the recovery of medical errors	The extent to which nurses know and experiences the identification, interruption, and recovery of errors in their practices as measured by the Recovered Medical Error Inventory (RMEI) (Dykes, Rothschild,

	& Hurley, 2010).
Nurse peer review	The process by which practicing registered nurses systematically access, monitor, and make judgments about the quality of nursing care provided by peers as measured against professional standards (ANA, 2010, p.4).
Peer	A registered nurses working in the critical care setting regardless of rank
Peer Review Impacts Safety and Medical-errors (PRISM) Program	A nurse peer review program designed to review case studies resulting from safety events such as near misses, errors, and/or adverse events.
Recovery of medical errors	An active three stage process of identification, interruption, and correction to prevent an adverse event or potential adverse event from reaching a patient (Hurley et al.,2008). For the purposes of this study the recovery of medical errors will be measured using the Recovered Medical Error Inventory (RMEI) (Dykes, Rothschild & Hurley, 2010).
Safety culture	The values, norms, beliefs, practices, policies and behaviors of personnel in the healthcare setting related to safety (Pronovost, 2005). For the purposes of this study safety culture will be measured by the Safety Attitudes Questionnaire (SAQ) (Sexton, et al., 2006).

Assumptions. For the purposes of this study, it can be assumed that all survey instruments provided to the participants were valid and reliable tools, as reported in the literature. Although individual experiences vary, it can be assumed that the nurses surveyed offered truthful

answers to all survey questions. Finally, it can be assumed that nurses offered their honest reflections of their perceptions of the effect the PRISM Program has on their practice as it relates to safety and errors.

Aims, research questions and hypotheses

Research aims. The research aims of this study were to:

1. Evaluate the effect of an adverse event nurse peer review program on critical care nurses' attitudes of safety culture.
2. Evaluate the effect of an adverse event nurse peer review program on critical care nurses' awareness of recovery of medical errors.
3. Understand the effect of an adverse event nurse peer review program on critical care nurses reported perception of their practice.

Research questions. The research questions for this study were:

1. What is the effect of the PRISM program on critical care nurses' attitudes of safety culture in the academic medical center setting?
2. What is the effect of the PRISM Program on critical care nurses' awareness of the recovery of medical errors in the academic medical center setting?
3. What is the critical care nurses' perception of their practice with regard to safety and recovery of errors, following exposure to the PRISM Program? Within the context of this question the following two questions will be asked:
    a. What changes have you made in your practice based on participation in the PRISM Program as it relates to safety culture? Please describe.

b. What changes have you made in your practice based on participation in the PRISM Program as it relates to the recovery of errors? Please describe.

Research hypotheses. The research hypotheses for this study were:

1. Critical care nurses' SAQ scores on the intervention unit post-implementation of the PRISM Program will be higher than pre-intervention scores and higher than the control unit scores.
2. Critical care nurses' RMEI scores on the intervention unit post-implementation of the PRISM Program will be higher than pre-intervention scores and higher than the control unit scores.
3. Open ended descriptive questions will provide insight into further understanding the effect of the PRISM program on Intervention unit critical care nurses' practice, as it relates to safety culture and recovery of medical errors.

Summary

This study sought to reduce adverse events by preventing errors through increasing nurses' awareness, accountability and responsibility for the important role nurses play in keeping patient's safe and preventing harm. Nurses are positioned to have great influence on patient safety initiatives for individuals, communities, and populations by analyzing the care they provide, reporting errors, and contributing to quality and safety initiatives. The PRISM Program was an intervention designed to further advance professionalism and accountability through the promotion of self-regulation of practice, and the identification of practice and system improvements. Understanding the effect of nurses' exposure to the PRISM Program on their

attitudes and awareness of safety culture and the recovery of errors should help to advance a nursing safety agenda that includes more emphasis on nurse peer review.

CHAPTER TWO

REVIEW OF THE LITERATURE

CHAPTER TWO

REVIEW OF THE LITERATURE

This chapter describes and discusses the literature relevant to the research aims of this study. The chapter is organized into the following sections: theoretical framework; adverse events and errors; peer review in nursing; adverse event peer review in nursing; adverse event peer review programs in medicine; adverse event peer review programs in nursing; adverse event peer review programs in nursing: nursing morbidity and mortality conferences; safety culture; Safety Attitudes Questionnaire; recovery of medical errors; Recovered Medical Error Inventory; and summary.

Theoretical framework – the Model of Recovering Medical Errors

The Model of Recovering Medical Errors (Hurley, Rothschild, Moore, Snydeman, Dykes, & Fotakis, 2008) framework will serve as the conceptual framework for this study. The model was derived from a qualitative study of critical care nurses' experiences of intervening to protect patients from actual or potential medical errors. The model has an historical and evolutionary influence from a series of adapted theoretical models. The Donabedian theory of quality assurance, a meta-theory, serves as a guiding theoretical framework for many quality and safety studies, including this study. The three core principles of quality measurement- structure, process, and outcomes- derived from the Donabedian theory are widely identified within the quality and safety literature, research, and healthcare operations (Donabedian, 2003; Barr, 2010). The influence of these core principles are easily identified in this conceptual model. A model of the overall theoretical and conceptual frameworks and empirical indicators for this study are depicted below in Figure 2.1.

A middle range theory and a three stage model emerged from Hurley et al.'s (2008) study demonstrating the process of recovering medical errors in a coronary care unit. In Stage I (antecedents), the emerging clinical scenario in conjunction with the knowledge and experience of the nurse, and the context of the critical care environment are the antecedents that lead to processes, actions (identification, interruption, and interception) (Stage II), and then outcomes (Stage III). A detailed review of the theory is included in Chapter 2.

The Model of Recovering Medical Errors helps to illustrate the structure, processes and actions used by nurses to identify, interrupt, and intercept near misses and errors that lead to outcomes that help to contribute to safer patient care. The model highlights the important role of nurses in recovering nursing errors and errors by other disciplines. The design of this study incorporates the use of the Model of Recovering Medical Errors as an overarching programmatic framework and as a framework to be used during nurse peer reviewed case studies as a means of describing specifically how nurses identify, intercept, and recover errors and near misses.

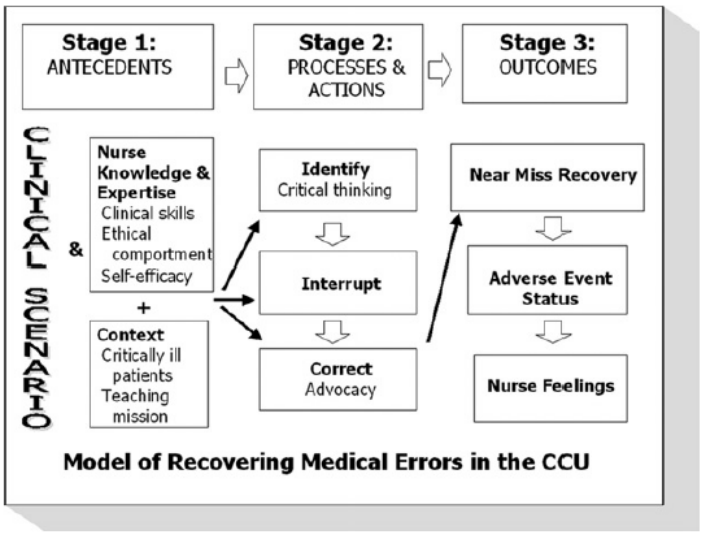


Figure 2.1. Model of Recovering Medical Errors (Hurley, Rothschild, Moore, Snydeman, Dykes, & Fotakis, 2008)

Adverse events and errors

Technologies, systems, and human connections that impact the very core of patient care are fraught with the potential for error that makes patients vulnerable to harm. A patient's risk of dying of an adverse event in a United States (U.S.) hospital is as high as 1 in 200 and adverse event injuries are estimated at 2.4 million per year with an estimated cost between $348 and $913 billion dollars (Goodman, Villarreal, and Jones, 2011). Current improvements in healthcare science, technology and systems have helped to advance the quality and safety agenda for patient care. However, despite these advancements, adverse events and medical errors continue to occur.

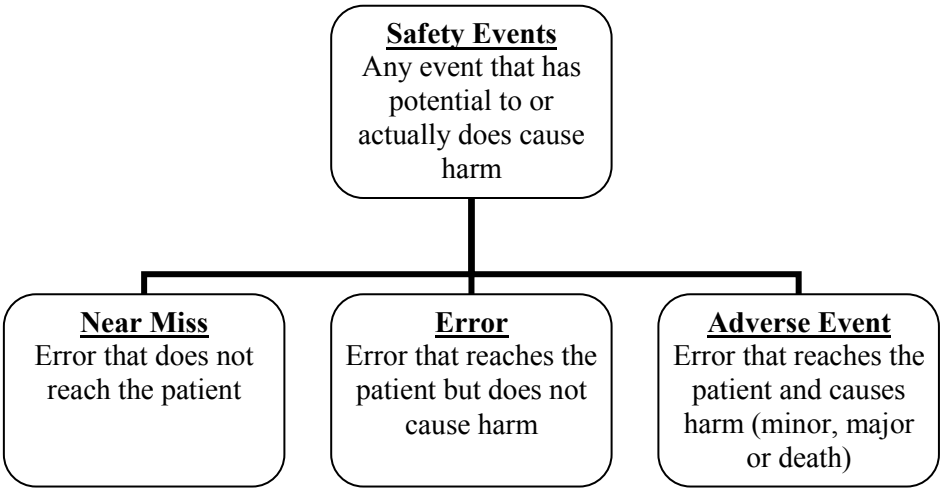
The complexities of caring for patients in the U.S. exist at the individual level, system level, and the national level (James, 2013). Nurses are at the point of care and the center of patient interactions and are positioned to play an essential role in protecting patients from harm through the prevention and/or recognition of medical errors and adverse events (AEs). It is important to enhance our knowledge and understanding of how nurses can further prevent and/or identify AEs and avoid patient harm.

AEs are errors resulting in harm caused by medical care received in the course of a patient's hospitalization. An AE is an unintentional and definable injury resulting from medical management and is not part of a disease process (Pierluissi et al., 2003). Actual patient harms are deemed "preventable," when the harm is found to be caused by an AE resulting from an error that could have been prevented (Forester et al., 2011). AEs and the underlying root cause must be analyzed to understand the fundamental mechanisms of failure points and identify opportunities for improvements in patient safety and systems improvement (Pagano & Lookinland, 2006).

Types of safety events

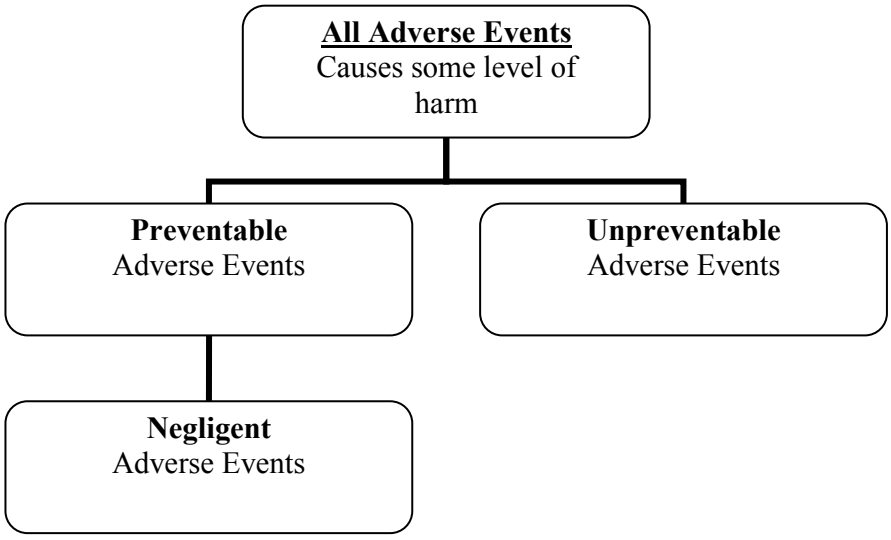
For the purposes of this study, safety events will encompass the following: near misses; errors, and adverse events, as depicted in Figure 2.2.

Figure 2.2. Types of Safety Events



Near misses are errors that did not reach the patient. AEs are then separated into two categories: preventable AEs or unpreventable AEs. A smaller subset of preventable AEs is AEs resulting from negligence (Wachter, 2012). Figure 2.3 depicts the different types of adverse events.

Figure 2.3. Types of Adverse Events



Near misses are errors that could have resulted in harm (Forester et al., 2011) if they had not been recognized and intercepted in some way. Near misses are important signals that should not be ignored. Without the consequence of patient harm to consider, near misses offer important opportunities for analysis to identify and further prevent a similar mode of error from reaching a patient. Near misses offer a significant opportunity for root cause analysis and should be given equally high priority for a case review as compared to an AE/error resulting in patient harm. Much can be learned and much can be prevented through the analysis of near misses.

The distinction in definitions is an important factor in the analysis of error and patient harm and the answers are not always obvious. It can be difficult to determine if causal factors were related to errors in medical care or a patient's medical condition. Approximately half of unpreventable AEs are related to a patient's medical condition and half are related to error (Landrigan, Parry, Bones, 2010 & Levinson, 2010)). Root cause analyses of AEs help to determine if an AE was preventable or unpreventable and if an error occurred in the process of care.

Incidence of adverse events

Authors have supported the estimated incidence of AEs and harm in the process of patient care. Levinson's (2010) research supports the prevalence of AEs. Levinson conducted a random sample record review of 780 Medicare beneficiaries from all beneficiaries during one month. Record reviewers determined the following: if an AE had occurred; if the AE was a seriously reportable event (SRE) or a hospital-acquired condition (HAC); the level of harm; and if the event was preventable. Levinson reported that 1 in 7 patients (13.5%) experienced an adverse event, 13.5% of AEs resulted in temporary harm, 1.5% experienced an AE that

contributed to their death (estimated to approx.15,000 patients annually), 1.0% had a HAC and 0.6% had a SRE. Of these AEs it was determined that 44% of AEs and AEs with temporary harm were clearly or likely preventable, with an estimated additional cost of 324 million dollars.

James (2013) conducted a literature review of four published studies (including Levinson's study) that used the Institute for Healthcare Improvement's Global Trigger Tool (GTT) to identify preventable AEs in the hospital setting. James states that AEs should only be considered preventable when they can be traced to a likely error. The causes for a preventable AE in hospitals include: errors of commission, errors of omission, errors of communication, errors of context, and diagnostic errors. The GTT (Classen, Resar, Griffin, Federico, Kimmel, Whittington, Frankel, Seger and James, 2011) is a two tiered system that includes screening of AEs by trained personnel (usually nurses) and final determinations and severity levels are made by physicians during the second-tier analysis when they determine if an AE occurred. A 780 random sample taken from the 1 million Medicare patients discharged from hospitals in the month of October 2008 was used. Of the 7780 sample, there were 128 serious AEs. The sample was extrapolated to the Medicare population and James estimated that events that contributed to a patient's death were 1.5% or 15,000 per month or 180,000 per year. Although this was a literature review of only 4 studies the findings are consistent with the findings of other studies about the prevalence of AEs.

Adverse drug events (ADEs) are a specific type of adverse event. AHRQ (2014) reports that ADEs effect nearly 5% of hospitalized patients, making them one of the most common types of in-patient errors. AHRQ estimates that hospitalized patients experience 1.6 million ADEs annually, despite numerous safety strategies already in place such as computerized order entry, medication reconciliation, bar coding, smart pumps, pharmacist oversight, improved labeling,

and adherence to the five rights of medication administration (right patient, right drug, right dose, right route, and right time (Federico, 2014)). AHRQ reports that ADEs are the continued result of system flaws, an impaired safety culture, and human factors.

The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) (2014) defines a medication error as a 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. Medication errors can occur in many ways. 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.

The NCC MERP acknowledges unintentional human error associated with ADEs and opposes the criminalization of errors in healthcare. The council encourages open reporting of ADEs and provides a detailed algorithm and index for the analysis and categorization of ADEs. The NCC MERP index has nine categories ranging from circumstances that have the capacity to cause error to an error that may have contributed to or resulted in a patient's death. These tools can be very useful following an ADE.

The following study acknowledges the prevalence of AEs and also claims that there is still little evidence of widespread improvement of AEs. Through retrospective record reviews over a five year period, of 2341 admissions across 10 hospitals in North Carolina, investigators showed no significant changes in the overall rate of harms per 1000 patient days or in the rate of preventable harms. Healthcare providers in the state of North Carolina had demonstrated an active level of commitment to patient safety training and improvements with a 98% hospital enrollment compared to such enrollment nationally at 78%. The hypothesis was that North

Carolina would have decreasing rates of harm over time due to their patient safety efforts. Despite the advantage of using North Carolina as the subject of this study, the authors were not able to conclude that North Carolina had shown a significant decrease in patient harms. The authors suggest the need to find ways to translate effective safety interventions into routine practice and monitor safety over time (Landrigan, Parry, Bones, Hackbarth, Goldman, & Sharek, 2010).

Incidence of adverse events in nursing

The critical care setting provides life saving care but also poses considerable patient safety challenges associated with the severity and complexity of patient's illness and instability that require high-risk interventions and medications. To describe the frequency and types of adverse events and near misses that occur in the critical care setting, Rothschild et al. (2005) conducted a 1-year prospective observational study of on-call interns in medical and coronary care units in an academic tertiary care hospital. Reported findings revealed the following rates per 1000 patient days for adverse events, preventable adverse events and serious errors were 80.5, 362, and 149.7 respectively. These findings translate into a daily rate of 0.8 adverse events and 1.5 serious errors for a ten bed critical care unit.

Thirteen percent (13%) of adverse events were determined to be life-threatening or fatal. Serious medical errors (61%) occurred mostly during the ordering or execution of treatments, especially with medications. It is important to note that adverse events and non-intercepted serious errors (36%) and serious errors (42%) were most commonly recognized and /or intercepted by nurses. This study not only demonstrates the level of risk associated with the critical care environment but also suggests the importance of the role of the nurse in recognizing and intercepting errors to reduce patient harm. This important finding led the authors to conduct

a follow up study to assess the incidence and types of errors that are were recovered by nurses in a cardiac intensive care unit (Rothschild et al., 2000).

Rothschild et al., (2005) found that in intensive care units (ICUs) rates per 1000 patient days for adverse events, preventable adverse events, and serious errors were 80.5, 36.2 and 149.7 respectively. Significantly 11-13% of these were life-threatening. The authors found that the most serious errors resulted during the ordering or execution of interventions, especially medications (61%). Patients are frequently receiving multiple, continuous medications, doses are often changed, incompatibilities can occur, and there may be urgent or emergent needs for new medications. More harmful medication errors (14%) are reported in the ICU setting than non-ICU (7%), frequently occurring during the phase of administration (Latif, Rawat, Pustavoitau, Provonost, & Pham, 2013). Of note, administration of medications is a task that lies mainly in the hands of nurses.

Rothschild et al., (2006) then conducted another observational study of nurses over 147 days, as they recovered medical errors that included those intercepted before reaching the patient and errors that reached the patient but were caught before serious harm occurred. The study found that there were slightly more than two potentially harmful medical errors per patient per day recovered by each cardiac intensive care unit nurse in a ten bed ICU that could be extrapolated to 7300 medical errors per year. The errors were most commonly associated with tasks, procedures or treatment orders and skill based errors. The study highlights the important role nurses play in preventing patient harm through surveillance at the frontlines of care. The focus of this study was placed on nurses intercepting errors by physicians however nurses are positioned to intercept human errors in numerous ways by other members of the healthcare team, including other nurses and themselves, in addition to system errors.

This study provided important information about the role of the critical care nurses in medical error prevention and became foundational work for further nursing research in this area on the identification, interception and recovery of medical errors by nurses. The selection of the critical care setting for this research is supported by this study and indicates there is sufficient opportunity to impact error prevention, identification, interception, and recovery.

Lucero, Lake and Aiken (2010) examined the relationship between nurse's reports of unmet nursing care needs and in-patient adverse events: reports of medication errors; hospital acquired infections; and patient falls with injury. The authors conducted a secondary data set analysis (10,184 nurses in 168 acute care Pennsylvania hospitals) using multivariate linear regression analysis of unmet nursing care needs on adverse events and adjusting for the influence of the care environment and patient factors. Seven unmet nursing care needs were self-reported and included those items that if left undone may compromise quality care: patient/family teaching; preparing patients/families for discharge; comfort/talk with patients; adequate nursing documentation; back rubs and skin care; oral hygiene; develop/update nursing care plans. Composite measures of the individual nurses were rolled up to hospital level composite scores (reliability using Cronbach's alpha coefficient = 0.73) and analysis was then conducted on each adverse event. Study findings suggest that unmet nursing care needs had a significant effect on each adverse event (alpha ranged from < 0.5 to 0.001) with a greater influence on hospital acquired infections. However, this finding could be due to the types of unmet needs studied.

The study suggests that up to 28% of nursing care may be left undone and can increase adverse events in hospitalized patients. Conversely the study suggests that the actual nursing time spent at the bedside with patients to complete care may decrease the occurrence of adverse events. Authors suggest that adverse events could be mitigated when nurses complete care

activities that require them to spend time with their patients. It is important to note that the nursing practice environment (staffing; BSN-mix; favorable environment; unit type; hospital size; hospital teaching status; high technology) was not associated with any adverse events. Findings suggest that the more time nurses spend at the bedside with patient focused care delivery activities, the less adverse events will reach patients.

This study had a very large sample size and power but still had study limitations that include the self-reporting of all data, wide variation in reported unmet nursing needs and adverse events, and the limited sample from one state. A similar study using actual adverse event and unmet needs data is an opportunity to further explore this reported relationship of findings. However, the empirical relationship of unmet nursing needs as a contributing factor to adverse events demonstrated in this study warrants attention and provides support for specific contextual discussion points to embed within the root cause analysis of as this proposed study.

Benner, Sheets, Uris, Malloch, Schwed, and Jamison (2002) developed a taxonomy of nursing errors that identified individual, practice responsibility, and system contributions to errors. The authors reviewed 21 disciplinary case files collected from 9 State Boards of Nursing that involved actual or potential patient harm as a result of competency or clinical judgment issues. Eight categories of nursing errors were identified including contributing or causative factors: lack of attentiveness; lack of agency/fiduciary concern; inappropriate judgment; lack of intervention on the patient's behalf; medication errors; lack of prevention; missed or mistaken physician/healthcare provider's orders; and documentation errors. Root causes, system and/or practice issues are identified for each category. System issue categories include: environmental; communication; employee safety/support; leadership/management; backup and support; and other.

Reports to Boards of Registration have a serious and punitive air to them. However, Benner et al. (2002) combine the concepts of individual practice responsibility with system analysis and shared practice responsibility based on practice standards that are socially accepted and taken from nurse practice acts, professional associations, regulatory bodies, and the healthcare setting itself. The authors promoted a learning culture and knowledge development in a setting where clinicians have a practice responsibility to learn from experience and share their learning with others so that future practice improves.

As a result of this study The Taxonomy for Error Reporting: Root Cause Analysis and Analysis of Practice Responsibility (The TERCAP Error Audit Tool) was established as a survey instrument to classify nursing errors, causes, patient outcomes, and disciplinary actions. The tool provides a way to analyze and compare nursing errors and disciplinary actions across states leading to error prevention through identified educational needs and practice improvements. Medication errors were assessed using the National Coordinating Council for Medication Error Reporting and Prevention guidelines.

While the attention to serious reportable events by nurses may seem like a punitive focus the author's emphasis on experiential learning is consistent with a safety culture environment and is the opposite of a "shame and blame" punitive culture. The concept of an "error chain" is introduced as a sequence of errors that precipitate an adverse event has application to nursing errors because often adverse events cannot be attributed to just one nurses (E.g.: pressure ulcers and hospital acquired infections). The authors suggest that embracing mutual real time monitoring for errors by peers may have an impact on error prevention. This study produced interesting findings and further research questions but no follow up studies were found. The

taxonomy of nursing errors as described has application for root cause analysis of case reviews. Topic headings could be used with a fishbone diagram to generate discussion about cases.

In summary, reports indicate that at a minimum medical error and adverse events are not declining. There are many reasons for speculation on why this may be the case: increase in errors; increased reporting of errors; increased reporting of data metrics attributable to errors; and/or increase in the complexity of care. The placement of nurses at the point of patient care creates the opportunity to prevent and/or identify, intercept and correct adverse events and medical errors to prevent or limit harm. Providing safe patient care relies on our ability to monitor, report, analyze, and understand adverse events and medical errors and their associated causes.

Peer review in nursing

Peer review, the hallmark of a mature profession (Donabedian, 1976), done in the setting of a culture of safety can provide a learning atmosphere for nurses where the highest standards of care can be upheld, competency maintained, integrity preserved, and professional growth enhanced (Haag-Heitman & George, 2011). Peer review provides a mechanism for self-regulation of practice that can aide in enhancing nurse's efforts toward improving patient safety, high quality care and personal and professional accountability for performance (Donabedian, 2003; White & O'Sullivan, 2012).

Donabedian promoted self-regulation of practice in association with a mature profession that ensures a responsibility for practice and high quality patient care for the public trust (Donebedian, 1976). A profession is the property of society and it is the society, not the profession, which determines what professional skills and knowledge are most needed and

desired of a profession (ANA, 2010). A profession is granted authority over its own practice and autonomy in conducting its own affairs, by society. Nursing is both valued within society and is accountable to society and therefore has a professional obligation through our social mandate to keep patients safe (Powers and Faden, 2006). Professional accountability supports safe nursing practice and is the connection between standards of care and nursing actions that are associated with high quality, safe patient care (Krautscheid, 2014). To that end, nurses have a moral obligation and are professionally accountable to report patient safety concerns as part of their social mandate to protect patients and society.

The ANA *Code of Ethics* (2015) also addresses peer review in the context of the nurse's ethical obligations to promote health, patient safety and optimal patient care, advance the profession, have control over nursing practice, maintain competence, and subscribe to lifelong learning. The ANA Code of Ethics specifically states that nurses are professionally responsible in promoting a culture of safety; establishing processes to investigate causes of errors or near misses and address associated system factors (p.11). Nurses are responsible for identifying, implementing and evaluating standards of practice and for reviewing tactics to safeguard patients and nurses that include peer review processes, quality improvement, staffing plans, credentialing, and research initiatives (p.16). Nurses must achieve the highest standards of care and routinely evaluate their own performance and participate in substantive peer review (p.22).

In 1988, the American Nurse Association (ANA) published *Peer Review Guidelines* (1988), highlighting six principles that promote a consistent approach to peer review (Haag-Heitman & George, 2011). Haag-Heitman and George (2011) promote contemporary principles of peer review however the authors state that new approaches to peer review to attain quality and safety outcomes across the continuum of care will emerge. The authors state that the guidelines

should be viewed as guidelines rather than a definition of peer review. A review of the adverse event nurse peer review literature will demonstrate the use of most of these principles but not all. In particular, it is difficult to conduct AENPR with only nurses of the same rank because advisors are needed to guide conversations about policy, competency, learning and performance improvement opportunities and provide support for implementation of improvement initiatives.

Haag-Heitman and George (2011) speak to three concepts for the use of peer review to maintain standards of nursing practice and improve patient care: role actualization; practice advancement; and quality and safety of care. Each concept has an individual, unit and organizational focus and nursing peer review is at the center intersection of all these factors. A peer review focus on quality and safety through nursing shared governance councils creates a context that incorporates all these concepts and can align with the strategic goals of the profession and organizations to improve quality and safety outcomes (Haag-Heitman & George, 2011). These principles of peer review are listed on Table 2.1.

Table 2.1. Principles of Peer Review

	Principles of Peer Review (Haag-Heitman & George, 2011, p.48)
1.	A peer is someone of the same rank.
2.	Peer review is practice focused.
3.	Feedback is timely, routine, and a continuous expectation.
4.	Peer review fosters a continuous learning culture of patient safety and best practice.
5.	Feedback is not anonymous.
6.	Feedback incorporates the nurse's development stage.

Adverse event peer review in nursing

Multiple approaches to peer review are employed in the nursing profession including; evaluative peer review, manuscript peer review, regulatory peer review, and adverse event (AE) peer review. While the nursing profession has extensively recognized the first three types of peer review, AE peer review has not been as widely recognized or adopted. Authors promote the concept that a commitment to a robust peer review process is important to advancing the nursing profession, especially in the areas of knowledge development and quality improvement (Bender et al.,2009; Haag-Heitman & George, 2011), however more research is needed in this areas to demonstrate the impact of AE peer review.

Historically, it is significant to note that the initial review of adverse events was established by the medical profession. AE peer review began over one hundred years ago in 1912 by Dr. Ernest Codman to improve surgical clinical practice and patient care (Orlander, Barber, & Fincke, 2002). Following much controversy, the method was later accepted and adopted by the American College of Surgeons as an important means of case review and quality improvement (Deis, et al., 2008). Research in medicine has shown that peer review can be an effective means of educating physicians on practice improvement initiatives (Bechtold, Scott, Nelson, Cox, Dellsperger & Hall, 2007; Kuper, Nedden, Etchells, Shadowitz & Reeves, 2010).

Today AE peer review is an established, required method of review for academic residency programs, and most often occurs during what is widely known as morbidity and mortality conferences (MMCs) (Antonacci, Lam, Lavarias, Homel, & Eavey, 2009). MMCs are one of academic medicine's most recognized forums for review of AEs (Pierluissi, Fischer, Campbell, & Landefeld, 2003). Edwards (2011) stated that a well-designed, peer review

process, such an MMC, is an effective, self-regulating activity that makes a vital contribution to the quality and safety of care and has the potential to improve patient outcomes.

The Donabedian theory of quality assurance serves as a meta theory of this research and also as a guiding framework for the organization of the literature review. The three central principles of quality measurement - structures, processes, and outcomes - derived from the Donabedian theory are widely identified within the quality literature, research and healthcare operations (Donabedian, 2003). In healthcare, the structures and processes of AE peer review programs are primarily designed to lead to improved outcomes (Barr, 2010). Using the Donabedian framework to categorize the literature helps to illustrate the types and frequencies of publications that report structures, processes, and/or outcomes of AENPR and thus demonstrate where the gaps exist in the literature.

A literature review was conducted using the following databases; Medline, CINAHL, Ovid, PsychInfo, Health and Psychological Instruments, and Cochrane Database of Systematic Reviews. The following key words were highlighted in the database search; peer review, adverse event, near miss, nursing, medicine, safety report, error, medication error, morbidity and mortality. The literature searched was constrained from manuscripts published between 1980 and 2014. Reference lists from pertinent published literature were also reviewed. Exclusion criteria included articles related to annual peer review, manuscript peer review, educational peer review, and non-English language publications. Thus for clarity, inclusion criteria comprises nursing and physician literature, published in English. Research and non-research articles and refereed and non-refereed articles were also included in order to capture the fullest extent of published information available. In total, 51 articles met the criteria. Table 2.2 represents the types of

literature reviewed. The literature is organized within a structure, process and outcomes framework categorized by the nursing and medicine.

	AE NPR	Nursing MMC	Physician MMC	Totals
Structure	2 (13%)	2 (17%)	0	4 (8%)
Structure & Process	6 (40%)	2 (17%)	4 (17%)	12 (23%)
Structure, Process, & Outcomes	7 (47%)	8 (66%)	20 (83%)	35 (69%)
Total # Articles	15	12	24	51

Table 2.2. Types of Literature Reviewed Using the Structure, Process, and Outcome Framework

Adverse event peer review programs in medicine: the morbidity & mortality conference

An understanding of the medical approach to AE peer review informs the knowledge base for nursing and aides in the adaptation of peer review for the nursing profession. In totality the medical literature reports outcomes more often than the nursing literature. However, medicine has devoted many more years to the process of peer review and there are still gaps in the knowledge associated with improving patient safety outcomes. Therefore more research is needed from both medicine and nursing.

In 1912, the American College of Surgeons adopted peer review as a means of looking at adverse outcomes in clinical surgical practice to improve patient care (McDonnell, Laxer, & Roy, 2010). Medical evidence shows that peer review can be an effective means of educating physicians on practice improvement initiatives (Bechtold, Scott, Nelson, Cox, Dellsperger & Hall, 2007; Kuper, Nedden, Etchells, Shadowitz & Reeves, 2010). A well-designed, peer review process is an effective, self-regulating activity that makes a vital contribution to the quality and safety of care and has the potential to improve patient outcomes (Edwards, 2011).

As noted**,** adverse event peer review is a well-accepted practice in medicine, one in which learning from error is embraced and is in fact, a required educational element of an academic medical program. In order to effectively understand the knowledge and associated gaps in knowledge related to adverse event peer review it is important to understand the existing medical science in this area. It is therefore important to examine the adverse event peer review literature in medicine to extrapolate generalizable findings for consideration in the discipline of nursing and in particular this study.

Although a review of the AE peer review medical literature is important to this topic it is also important to keep in mind the similarities and differences between the practices of AE peer review in medicine and nursing. The medical literature extensively reports the use of the term MMCs, while nursing reports both AENPR and NMMCs. Medicine's focus on morbidity and mortality are often the focus on the actions of specific caregivers while nursing AEs can be focused on the actions of either individuals or a number of caregivers over a period of time.

The medical research findings cover a broad range of topics. Medical MMCs have been in place for some time now and thus the objective of many studies is to examine existing issues or compare programs. This author found no studies that implemented new programs. In summary, a total of twenty-four physician articles were reviewed and all included information about the structure and process of MMCs; 80% of articles included outcomes.

Survey methods were often used to generate information about AE programs; however culture of safety surveys were not used. Ten (41.6%) surveys were used in the physician studies and most were created by the study authors to: determine the prevalence and characteristics of MMCs nationally (Gore, 2006), locally in academic medical departments (Orlander, Barber, & Fincke, 2002), and in acute care programs (Edwards, 2011). Surveys were used to compare

changes in program structures and processes (Bechtold et al., 2007; Murayama, Derossis, DaRosa, Sherman, & Fryer, 2002; Risucci, Sulivan, DiRusso, & Savino, 2003); and determine how frequent AE's and errors are discussed during MMCs (Pierluissi, Fischer, Campbell, & Landefeld, 2003).

Gore (2006) conducted a national survey of 546 surgical program directors from 34 institutions in the United States and Canada (455 responses/83% response rate) to assess the format of MM conferences and compare the format with perceived attitudes and experiences toward the educational value and effectiveness of MM as a quality assurance tool. Specific perceptions about quality assurances focused on variations in conference format that affected the educational impact, error analysis and reduction of future errors. Gore concluded that MMCs are educational and effective in reducing future error. The author challenges the medical community to adapt MMCs to remain current with the changing healthcare environment. This study bolsters the MM/PR initiatives in nursing and in this study, in particular. It is important for all professions to know more about the impact reviews of this type can have on learning from error and near misses. Gore's work stimulates thinking about the need for future research of nursing MM/PR programs nationally.

Edwards (2010) created a 13-item Peer Review Program Self-Evaluation Tool to survey 1986 members of the American College of Physician Executives. The survey yielded a small (25%) response rate of 362 responses from 330 facilities including 296 acute care hospitals. The survey items focused on perceived quality impact, medical staff satisfaction, and likelihood of future program changes. The survey was designed to create a standardized description of important aspects of the peer review process in the different organizations. Open-ended questions further explored perceptions and measures in place to evaluate program effectiveness.

Overall, a total score on the survey was strongly associated with a belief that peer review programs had a significant impact on the quality and safety of care and medical staff satisfaction. However, the study raised more questions than it answered about using the structured review process and rating scale items which were found to be not significant. This was a surprising finding and inconsistent with the literature. The small sample size is one limitation of this study. Results could also be suggestive of the use of structures and models that are outdated and Edwards (2011) set out to further investigate that finding.

In a follow-up study Edwards (2011) used the data from the previous survey of 296 acute care programs to determine if peer review program factors associated with a higher subjective quality impact are also associated with improved reported performance. Edwards found that peer review programs and related organizational factors explain up to 18% of the variance in standardized measures in quality and safety. Associated factors that contributed to the variance were: clinician-clinician issues, standardization of the process, reviewer participation, likelihood of future program changes, and organizational/cultural factors. In fact, Edwards found that the majority of programs relied on outdated, dysfunctional structures and adoption of best practices may be needed. Admittedly only small effects were detected and a longitudinal review over a three year period at least would be needed to detect outcome measures such as mortality. However, Edwards claims that this study offers evidence that well designed peer review processes and organizational culture improve quality and safety. This study does lay ground work for further research of peer review programs. The study also provides support for my proposed research of a peer review process and the impact on the culture of safety.

Of particular interest was Bender's (2009) reported use of an electronic audience response survey system during 22 surgical MMCs to compare responses to questions between

attending physicians and residents. The study reflected high heterogeneity between the residents and attending physicians in their responses to appropriateness of care, system issues, and other quality issues. A mean of 50% of respondents identified some quality issue in each case, 27% identified a system issue, and 37% identified a physician issue. This anonymous MMC peer review is a method that could be used in future nursing research.

Numerous authors' findings supported essential key elements for successful MMC programs. Examples of these findings include: definitions of the program, guiding principles, goals and objectives (Orlander eta l., 2002; Berenholtz, Hartsell, & Provonost, 2009); case selection criteria, use of a moderator, elicitation of input from staff (Aboutmatar et al., 2007; Berenholtz et al., 2009); attendance guidelines (Bechtold et al., 2007; Orlander et al., 2003); learning atmosphere (Pierluissi et al., 2003) with an emphasis on educational aspects (Pierluissi et al., 2003; Gore, 2006; Murayama et al., 2002; Kuper et al., 2010; McDonnell, Laxer, & Roy, 2010; McKay, Shepard, Bowie, & Lough, 2010); use of a structured framework for review (Deis,et al., 2008; Berenholtzet al., 2009), focus attention on AE's and quality improvement efforts (Antonaccci, Lam, Lavarias, Homel, & Eavey, 2009; Pierluissi et al., 2003; Gore, 2006; Edwards, 2011; Lau & Litman, 2011), assign responsibility for follow up (Aboumatar et al., 2007; Bechtold et al., 2007), and draw conclusions (Orlander, et al., 2002).

The following is a descriptive study of MMCs. The authors (Aboumatar et al., 2007) used the MMC conceptual model to structure case reviews. This study is a good representation of a number of other supportive studies with similar findings. The model included goals, structure, and the MMC process for case identification, selection, review and analysis. Through case discussion and recommendations the outcomes were to improve patient care and enhance education. The aim of the study was to address medical errors, identify system failures, and

implement interventions to reduce the probability of repeat events. Although this study was an organizational study, the data was presented by department (n=12) and therefore there was a small sample size. However, the study concluded that a well-designed MMC process that elicits input from participants, follows a structured design to identify system issues, and follows up on recommendations can be an important mechanism for advancing education and improving patient safety and quality of care. This study and others are helpful guides in establishing the structure and process for the AE nurse peer review root cause analysis that will be one of the foundational elements of this dissertation.

Some studies demonstrate relevant statistically significant findings. Antonacci et al. (2009) found the use of an error-based, individualized MD report card resulted in the identification of quality issues at a rate three times greater than required. Following changes in MMC programs a number of studies found statistical significance in improved attendance rates (Bechtold et al., 2007), better identification of system related issues (Bender et al., 2009), less variation between services (Gore, 2006), greater willingness to ask questions (Gore, 2006), less blame (Gore, 2006), an increased number of cases presented (McDonnell et al., 2010), improved teaching environment (Murayama et al., 2002), and a greater likelihood of reaching consensus (Risucci et al., 2003).

For example, Murayama et al. (2002) evaluated the impact of formatting and content changes to their MMCs based on pre-post surveys of residents and faculty, with 81% and 76% response rates, respectively. Changes to the MMC were: succinct case presentations and literature reviews; faculty discussion was facilitated by a moderator; change in time (6PM to 7AM); all deaths presented; and residents were encouraged to discuss cases with the attending physician prior to presentations. Significant improvements were found in resident's results but

not faculty results. The residents perceived statistically significant positive changes in the post survey on the following: resident and faculty attendance, faculty contribution, analytical questioning, faculty adding facts to cases, MMC formats structures, written summary distributed, and discussion stimulates further study.

The authors concluded that MMCs resulted in significant improvements in the educational value of the MMCs as perceived by residents. The MMC also provides the ideal teaching environment for residents and faculty to intelligently discuss judgment, practice techniques, and patient management issues. Finally, the authors state that perceptions of the MMC can be enhanced by emphasizing their importance as the "Most valuable hour of education each week for an academic department" (Murayama et al., 2002, p.250). The use of a pre/post survey was an effective method of analysis of changes to a MMC program; however the survey was created by the study authors and was not a valid and reliable tool. The study findings continue to support the MMC as an important means of learning from adverse events and error in healthcare and can be extrapolated and adapted to other professions such as nursing.

The medical community has an historical commitment and professional mandate to conduct MMCs to learn from AEs, prevent AEs in the future, and improve patient safety. These programs are well-established yet must maintain their relevance as healthcare advances. Other disciplines, such as nursing, can learn from our medical colleagues and adapt the structures and processes of MMCs to strive toward improved patient safety outcomes.

Adverse event peer review programs in nursing

Knowledge about the potential impact that AE nurse peer review (AENPR) programs may have on improving outcomes is beginning to emerge. As noted in Table 2.2, the number of

nursing publications that include outcomes is 47% (AENPR) and 66% (Nursing MMCs), or a mean of 56% as compared to physician publications (83%). The nursing literature addresses both AENPR and Nursing Morbidity and Mortality Conferences (NMMCs) and this review will address them separately. For the purposes of this study, this literature review will emphasize the structures, processes, and outcomes that address AEs within a culture of safety and with a goal of learning from such events in order to improve systems, practice, and patient safety. Although important to discuss in this review, peer review committees focused on evaluating a nurse's practice in a confidential manner and making decisions about the quality of care provided, is not the specific focus of AENPR in this study.

NPR structures and processes have been designed to analyze cases where an AE is associated with nursing practice (Branowicki, Driscoll, Hickey, Renaud, & Sporing, 2011; Diaz, 2008; Fujita, Harris & Johnson, 2009; Raia, 2011). AE programs within departments of nursing are focused on ensuring quality nursing care and patient outcomes through the evaluation of the following: nursing care provided (Whitaker & McCanless, 1988); associated standards of care (Fujita et al,2009); contributing factors (Raia, 2011); learning opportunities (Morby & Skalla, 2010); patient safety (Branowicki et al., 2011); and opportunities for process and system improvements (Morby & Skalla, 2010; Hitchings, Davies-Hathen, Capuano & Morgan, 2008).

Collaborative or shared governance structures often provide a supportive framework for AE NPR. Committees, councils, and workgroups report to nursing leadership and/or have reporting responsibilities organized within the nursing department or an organizational quality domain. Groups may be comprised of staff nurses only or advanced practice nurses, and/or nursing leadership.

This author found limited use of theory guided research in the area of AENPR. Only three publications indicated the use of a theoretical framework in the development and ongoing function of an AE NPR program. The use of theory would guide future studies in selecting meaningful variables for outcome research. The limited use of theory may be an indication that more qualitative approaches to AENPR are needed to generate middle range theories that could guide future testing through research.

Fujita (2009) used the novice to expert theory to identify and select competent staff nurses to participate in the AE NPR process with a shared governance model. Morby (2010) applied Watson's theory of human caring to guide the values, goals, and guiding principles used as a blueprint for the foundation of her peer review program. Branowicki et al. (2011) used Donabedian's structure-process-outcomes model as the conceptual framework and theoretical rationale for linking outcomes with the structure and process of the NPR panel. Although these authors used theory to guide their work, these were not robust research studies but were peer review programs designed to improve processes and outcomes.

The processes used to conduct AENPR vary in how cases are identified and what methods are used to conduct AE reviews. AE cases may be identified through referrals from staff nurses or leadership, safety reporting systems, observations of practice, and audits of the medical record. An organized approach for review of cases is important and different processes are employed such as root cause analysis and failure mode review (Bry, Stettner, & Marks, 2006), failure mode effect analysis (Hitchings, 2008), and presentation of cases (Hunt, 2008). Each of these approaches allows for an organized process of review. Embedded in some of these procedures are templates (Hitchings et al., 2008), severity scoring systems (Hunt, 2008), scales (Pfeiffer, Wickline, Deetz, & Berry, 2012), and algorithms (Branowicki et al., 2011), used to

guide the AE NPR process. Hitchings et al. (2008) reported using the Socratic method of questioning as an effective strategy to explore root causes.

Bry et al. (2006) described a three step process to guide the analysis of an AE through the work of a nurse peer review committee. The three step process included a root cause analysis, failure mode review and the assignment of a level rating to the care provided during the AE, regardless of the outcome. The root cause analysis used standard categories to cover the aspects of an investigation of an AE. The categories included: patient identification, observation and assessment; communication; availability of information; care planning process; orientation, training and competence/credentialing; supervision of staff; staffing; environment; and equipment issues.

Phase two used a failure mode review to assess for gaps in critical thinking among those involved in the AE. Finally the committee assigned a level rating of I-IV (justified; questionable; not-acceptable for a well-trained, experienced nurse; and unacceptable and patient safety was compromised) to the care provided, regardless of the outcome. Trends in findings were tracked by the nursing department but were not reported. The process is simple and easy to follow. The authors promote their structure and process as a means to increase nurse accountability and reduce future AEs using this peer review model however no reported outcome data is provided. Bry's search for error and the targeted assignment of a level to the error is concerning in the setting of a transparent, just culture. The described process feels like a search for blame and not consistent with a culture of safety. This type of approach will not be used in this study.

There is no overall compelling argument from the literature for using any one particular process however the traditional root cause analysis within the framework of the recovery of error

provides a positive view for discussion of an adverse event. It is an efficient way to explore probable cause or causes. For the purposes of this study, the root cause analysis is best suited to guide AENPR and should identify system failures and learning opportunities.

Both the structures and processes used in AENPR are important factors in establishing programs that are effective in creating an environment that is confidential and safe so that nurses are able to speak openly about their practice and opportunities for improvement. There are many options for consideration when creating an AENPR program. Understanding the associated outcomes from these AENPR programs are important for this review. Although Bry et al. (2006) used both a root cause analysis and failure mode analysis; the authors did not report outcomes.

Hunt (2008) described a Nursing Peer Review Committee structure created to address nursing and system issues related to clinical cases associated with adverse outcomes that had previously been discussed at their Patient Care Assessment Committee. The Patient Care Assessment Committee reviewed cases from a medical perspective and often did not allow opportunity to explore nursing issues. The NPR committee does not meet the classic definition of peer review as it included representatives from management, education, clinical practice, performance improvement and patient safety.

Staff nurses presented cases in a narrative fashion with the support and coaching from their leadership within a just culture of safety. The session included the narrative, nursing assessment and problems, timeline of events, contributing factors, the adverse event or events, an action plan, and relevant evidence, followed by discussion. Each case is assigned a severity score (0=acceptable standard of care; 1= minor variation from standard of care; 2= major variation in standard of care). A database summarized AEs, actions taken, and provided trends and themes for future goal setting for improvements in practice and team collaboration. Improvements have

focused on care transitions and handoffs, and effective team communication. Reportedly, the NPR Committee structure has contributed to stronger collaborative relationships with physicians through the review of clinical cases and system improvements.

This is a sophisticated design that seems to require a thorough understanding of a non-punitive, just culture of safety, so that staff nurses feel safe in presenting and analyzing their practice. Hunt's attention to a just culture environment is to be commended and will be an important aspect of the current study. However, the assignment of a severity score to the standard of care does not take into account potential contributing factors for error. One might also question how safe a staff nurse might feel discussing their errors and practice with a committee comprised of nurses from all levels who will then be judging their practice. No empirical outcomes were reported with this publication.

Of the fifteen AE NPR articles reviewed, seven (47%) reported outcomes. However, even among those that reported outcomes statistical analyses were limited. Outcome measures of AE NPR included numbers of case review, case review findings, process and system improvements, and lessons learned, comparisons to nurse sensitive indicator benchmarks, and basic percent measures. The reported trends and themes of case findings included: failure to follow standards of care, policies, and procedures; failure to rescue; communication issues; inaccurate documentation; and clinical judgment problems.

Whittaker and McCandless (1988) reported that record reviews of AEs, over a 12-month period, identified variations in nursing care that resulted in some degree of adverse patient outcomes. Sixty percent (60%, N=35) of the AEs were found to be the result of substandard care in need of intervention. The inter-rater reliability of the reviewers was not reported. Their findings resulted in policy review (60%), educational programs (52%), and individual

counseling/disciplinary action (20%). This study made an impressive, early attempt at quality improvement and peer review prior to the emphasis placed on patient safety today. Many of the quality issues they screened for in this study are consistent with those we monitor today such as falls, pressure ulcers, and medication errors. Even though this study is a closed record review, the adverse events they discovered are consistent with clinical nurse sensitive indicators and support possible themes for the case studies for the current study.

Boyde and Wotten (2001) conducted a mixed methods study using peer review observations to audit the performance of staff nurses in cardiac arrest situations (N=50). The authors found that first responder nurses were able to perform effective cardio-pulmonary resuscitation (CPR); a finding that the authors say contradicts previous research findings that nurses don't retain learned CPR. The study aims were directed more toward the effectiveness of CPR training however the authors used peer review methods of observation to assess performance in real time. This is an interesting concept for collection of data associated with a particular practice concern. This method could be considered if trends were discovered during AENPRs and a more in-depth analysis of nursing practice was needed.

In summary, the AENPR literature to date promotes the important elements of structures and processes of programs deemed effective by their authors to influence positive outcomes in quality and safe patient care. However, in general more evidence is needed to support these claims. The current study aims to close the existing gap in outcomes in the AENPR literature.

Adverse event peer review programs in nursing: nursing morbidity and mortality conferences

The nursing morbidity and mortality conference (NMMC) literature shares many of the same themes of AENPR literature and there are also some differences. The NMMCs tend to be more stand-alone conferences and lack the structures associated with reported AENPR programs. The NMMC literature includes more studies with reported outcomes. NMMCs have the name recognition associated with physician MMCs and therefore they are similar in nature. One nursing study is interdisciplinary. The interdisciplinary study has been included with the nursing section because it was published in a nursing journal and provides relevant information for the current study. Both MMCs and AENPR programs seek to address adverse event analysis but it seems as though the NMMC literature does a better job promoting a culture of safety atmosphere.

A number of authors claimed that MMC are underutilized in nursing and encourage their use as a transparent means of critically reviewing nursing practice and learning from AEs and errors (Beyea, 2009; Dracup & Bryan-Brown, 2003; Guger, Daum, Vacek, Angeletti, O'Malley, Curell, & Phillips, 2011; Meurier, 2000; Nolan, Burkhard, Clark, Davidson, & Agan, 2010; Ropp, 2011). A professional autonomous practice domain requires an ability to use science to critically analyze care delivery (Staveski, Leong, Graham, Pu, & Roth, 2012) and the NMMC is one process of critical analysis used to analyze and improve the quality and safety of patient care (Guger et al., 2011; Ksouri, Balanant, Tadie, Heraud, Abboud, Lerolle, Novara, Fagon & Faisy, 2010). Nolan (2010) defines the NMMC as an open discussion of patient complications, high risk situations and deaths, where current practices and systems are reviewed and measured against the most current evidence available. NMMCs provide an opportunity to discuss AEs,

errors (Beyea, 2009), systems, procedural issues (Dracup & Bryan-Brown, 2003), high risk, low volume cases (Hiner, White & Fields, 2009), suboptimal outcomes (Straveski et al., 2010), and/or a healthcare acquired conditions or nurse sensitive indicators (Guger et al., 2011; Nolan et al., 2010; Ropp, 2011).

In the setting of a NMMC, authors emphasized that organizations should provide an open blame-free atmosphere and emphasize a learning culture using the best evidence available while also focusing on systems and their complexities (Pagano & Looklinland, 2006; Dracup & Bryan-Brown, 2003; Staveski et al, 2012; Szekendi, Barnard, Creamer, & Noskin, 2010). The NMMC should seek to create and support safe systems, promote team communication, allow for the questioning of authority, promote transparency, and encourage reporting of AEs and near misses (Pagano & Looklinland, 2006; Meurier, 2000; Ropp, 2011; Ksouri et al., 2010; Staveski et al, 2012; Szekendi, et al., 2010). The NMMC literature is highly relevant to the approaches used today in quality and safety. The underscored themes apply to a safety culture and are consistent with the goals of the current study.

The NMMC literature describes various structures and processes for the approach used to review cases. A review of twelve NMMC articles revealed that 33% of NMMCs were held among interdisciplinary teams (Staveski, 2012; Ksouri et al., 2010. Szekendi et al., 2010). Other NMMC programs were specific to areas of care such as: intensive care (Pagano & Looklinland, 2006; Nolan et al., 2010; Ksouri et al., 2010), perinatal (Hiner, White, & Fields, 2009), and peri-operative (Beyea, 2009). Some NMMCs were focused on particular patient problems such as: ventilator associated pneumonia (Nolan et al., 2010) and pressure ulcers (Guger et al., 2011). A focus on specific problems is an interesting one and could be easily applied to an area of concern. For the purposes of the current study, the critical care arena is the areas of focus.

Ksouri et al. (2010) conducted a study of the usefulness and feasibility of regular interdisciplinary M&MCs in intensive care units (ICU) to improve patient safety and the quality of care. The study was a prospective design conducted by both physicians and nurses in one, 18 bed intensive care unit over a one year period. Criteria were established for the types of cases to be reviewed. Cases reviewed were all deaths and 4 adverse events considered to be preventable (unexpected cardiac arrest, unplanned extubation, re-intubation within 24-48 hours of planed extubation, and readmission within 48 hours after discharge). The process included case review, analysis, discussion, classification of severity, and recommendations.

A total of 300 patients were analyzed involving 260 deaths and 100 adverse events (rate 16.6 per 1000 patient days). A comparison of causes was conducted between patients experiencing an adverse events and those experiencing death. Adverse events were also compared based on preventability. The authors reported some statistically significant differences between the groups including: adverse events occurred more often between 12-4PM (P=0.001); preventable deaths were associated with iatrogenesis (P=0.008); human errors (P <0.001); and communication failures (P=0.003). Also based on MMC participants' analysis of preventability, 6.1% of deaths and 36% of adverse events were determined to be preventable or probably preventable.

The MMC yielded three important system improvements: standardized procedure for the treatment of sepsis; standardization of daily order for mechanical ventilation settings; and the reorganization of role responsibilities for nurses during cardiac and/or respiratory arrests. The MMC was perceived positively by physicians and nurses particularly when senior staff related to similar mistakes they had made or other relevant errors and lessons learned. However they reported that the MMCs were very time consuming. Efforts were then made to schedule time for

pre-work prior to the presentations. The authors deemed MMC as feasible and useful in the ICU setting and particularly could be used to assess the quality of care, patient safety and team communication (Ksouri et al., 2010).

This study is important to this literature review because the MMC was deemed useful in the ICU setting and relates to quality care and patient safety. Important improvements were made following MMCs however one might expect there would have been more due to the fact that the study was conducted for one year in a large ICU setting. The activities associated with MMCs were time consuming and this finding is not unique to this study.

To guide the process of NMMCs cases are selected using established criteria or on a referral basis (Guger et al., 2011; Nolan et al., 2010; Ropp, 2011; Ksouri et al., 2010). Many different methods of case analysis were used to present an organized review including: Situation-Background-Assessment-Recommendation (SBAR) and FOCUS- Plan, Do, Check, Act framework (Pagano & Lookinland, 2006; Ropp, 2011); root cause analysis (RCA) (Szekendi et al., 2010); Reason's Organizational Accident Model (Meurier, 2000); Fishbone- cause and effect analysis (Guger et al., 2011); and the Iowa Model for evidence based practice (Nolan et al.,2010; Hiner et al., 2009). Goals, guideline principles (Pagano & Lookinland, 2006), definitions (Ksouri et al., 2010), review of the process (Staveski et al., 2012), and ground rules (Nolan et al., 2010) were all strategies that helped to set the stage for successful NMMCs.

Szekendi et al. (2010) used monthly interdisciplinary Patient Safety M&M forums to retrospectively review adverse event cases using the RCA approach to promote transparency, a non-punitive attitude, and an open forum to learn from errors; thus improving the safety culture. The study was conducted in an 899 bed academic medical center. Sixty cases were reviewed with over 3000 participants, averaging 70-100 per session. The AHRQ's Hospital Survey on

Patient Safety Culture (HSOPSC) was used to measure the organizational safety culture at three intervals of repeated measures (2004, 2006, and 2008). Statistically significant improvements (<.001 for all items) were reported in three domains: hospital management support for patient safety; feedback and communication about error; and non-punitive response to error. The organization also saw a 66% increase in voluntary safety reporting. In program evaluations nurses noted that it was important for them to learn from actual cases, how mistakes are made, and how the organization works to prevent the errors from happening in the future. This study then led to the development of two additional discipline specific programs for nursing and pharmacy.

Szekendi et al. (2010) used the RCA format promoted by the Department of Veterans Affairs (2001). The categories used for adverse event analysis are focused on failures related to human factors (communication, training, and fatigue/scheduling), environment/equipment, rules, policies/procedures, and effective barriers/controls to protect patient safety. These categories will be useful in the design of the intervention for the current research.

Admittedly, this was not the only organizational effort directed at improving the culture of safety and therefore the M&M forum may not be the only reason the HSOPSC scores improved. A four year period of measurement of an organization is difficult to attribute to one intervention due to the many limitations that could be encountered such as history, maturation, attrition, and exposure to the HSOPSC. In addition, the study lacked controls and reached a limited number of participants for the given timeframe. However the authors are to be commended for an intervention that reportedly demonstrated leadership and organizational commitment to patient safety, promoted reporting of safety concerns, and a blame-free environment. This study is recognized by me as an important study in this literature review.

The Szekendi et al. (2010) study supports the aims of the current study from the perspective of an M&M review that used the RCA format and used a culture of safety survey as an outcome measure.

A summary of the outcomes of the NMMC literature shows an overall positive nursing response to NMMCs. Nurses' positive survey responses demonstrated an overwhelming acceptance of the process of NMMC (Pagano & Lookinland, 2006; Guger et al., 2011; Ropp, 2011). Nolan et al. (2010) reported outcomes of the NMMC that revealed decreased ventilator associated pneumonia rates and recommendations for practice improvements including changes in standards, altered training and orientation, and increase compliance with practice standards (Nolan et al., 2010). Ropp (2011) highlighted a 90-100% survey response to agree and strongly agree when nurses were asked if the NMMC improved practice, competence, and overall healthcare. Guger et al. (2011) reported overall positive evaluations of NMMCs yet less than 50% of nurses understood the process used with the fishbone cause and effect analysis.

Eight (66%) of the twelve NMMC articles reported outcomes, however, only four (33%) of the eight articles reported outcomes of statistical significance. Szenkendi et al. (2010) demonstrated a statistically significant improvement in scores on the Patient Safety Culture Survey and a 66% increase in AE reporting following the implementation of interdisciplinary monthly MMCs. Staveski et al.'s (2012) quarterly Quality Improvement Cycle of rotating MMCs with a journal club and interdisciplinary educational sessions showed an increase in reporting of errors and AEs and improvements in practice. Nolan et al. (2010) demonstrated a statistically significant ($p<0.001$) increase in the use of "I" statement (versus "You" statements) during NMMCs. The "I" statements served as a proxy for RN accountability for practice. As noted, in the intensive care setting, Ksouri et al. (2010) analyzed 260 deaths and 100 AEs through MMCs.

Significant findings revealed that AEs occurred more often between 12-4PM ($p = 0.001$), and 6.1% of deaths and 36% of AEs were considered preventable. Preventable deaths were associated with iatrogenic ($p = 0.008$), human errors ($p < 0.001$), and communication issues or management factors ($p = 0.03$).

In summary, AENPR and MMCs are aligned with efforts to review adverse events and near misses in a structured, systematic manner in an effort to identify causal agents, improve the quality and safety of care and prevent harm. Evidence suggests AENPR programs impact quality and safety but more research is needed in this area. Further research and evidence of positive outcomes of improved patient safety is needed to generate interest in more wide spread acceptance and adoption of such programs. The current study aims to contribute to this knowledge gap.

Safety culture

Safety culture is an important core component of quality and safety improvement efforts. The IOM report, *Keeping Patients Safe* (2004) emphasizes that within a strong culture of safety nurses will be more vigilant and report errors and near misses, thus nurturing a continuous learning environment. As described, the nursing literature promotes the use of AENPR and NMMCs as transparent methods for critically analyzing practice and learning from adverse events and errors (Branowicki, 2011; Diaz, 2008; Fujita et al., 2009; Raia, 2011; Guger et al,2011; Meurier, 2000; Nolan et al, 2010; Ropp, 2011). Research has demonstrated a link between safety culture and error reporting, reduction in adverse events, and reduced mortality. However, the overall strength of the evidence is often low and more research is needed to demonstrate these relationships (Weaver, Lubomski, Wilson, Pfoh, Martines, and Dry, 2013).

Safety culture combines the shared mental content (values and beliefs), norms (language and behavior patterns), institutions (positions and committees), and artifacts (characteristic physical structures, equipment, and processes) of organizational culture and relates them specifically to safety. Employees are guided by an organizational commitment to safety where individuals uphold their own standards and those of their co-workers (Hudson, Berenholtz, Thomas, and Sexton, 2009).

As previously discussed, the IOM (2000) called for a change in our paradigm of how medical errors were viewed in healthcare from a focus on blaming individuals to promoting a systems approach. Kaissi (2006) contrasted these two general types of organizational culture related to patient safety and medical errors. The "culture of blame" focuses on the individual's unsafe acts at the sharp end of patient care. Assigning blame to people separates errors from the system context and has limited reach to effectively reduce risk and further harm. The "culture of safety" emphasizes a systems approach based on the assumptions that human error will happen and the focus of these errors must be to examine the conditions under which they happened. In a culture of safety environment, an organization encourages reporting of errors, communication of errors, and prioritizes safety over financial and organizational goals (Kaissi, 2006).

On July 29, 2005 the Patient Safety and Quality Improvement Act of 2005 was signed into law in response to the IOM report, *To Err is Human*: Building a Safer Health System (IOM, 2000) and to growing concern about patient safety in the U.S.. The act demonstrates a commitment by the Federal Government to foster a culture of patient safety. The act acknowledges that barriers to patient safety include fear of discovery that result in under reporting of events and an inability to aggregate adverse event data for analysis (AHRQ, 2012). The law establishes Patient Safety Organizations (PSOs) to collect, aggregate, and analyze confidential information reported by health care providers in order to identify patterns of failures,

propose measures to eliminate safety risks and analyze national and regional statistics (Kinnaman, 2007). The act was an important step in advancing safety culture.

The Joint Commission (JC) Leadership (2015, p. LD-14) standard states that leaders create, maintain, regularly evaluate and prioritize changes based on the culture of safety and quality throughout the hospital. The JC requires that leaders routinely assess safety culture and implement changes based on priorities identified in the survey. The JC definition highlights the important qualities of a healthy safety culture:

"In a culture of safety and quality, all individuals are focused on maintaining excellence in performance. They accept safety and quality as personal responsibilities and work together to minimize any harm that might result from unsafe or poor quality of care, treatment or services. In this culture, one finds teamwork, open discussion of concerns about safety and quality and the encouragement of and reward for internal and external reporting of safety and quality issues. The focus of attention is on performance f systems and processes instead of the individual – although reckless behavior and a blatant disregard for safety are not tolerated. Organizations are committed to ongoing learning and have the flexibility to accommodate changes in technology, science, and the environment. The leaders provide for the effective functioning of the organization with a focus on safety and quality."

The degree to which individuals and organizations promote and demonstrate a commitment to safety culture has an important influence on reporting, analyzing, and improving adverse events, especially those that result in patient harm. More research is needed to better understand the relationships between nurses' attitudes of safety culture and interventions that could influence those attitudes in a positive manner.

Safety culture and adverse event peer review

A commitment to a fair and just safety culture requires changes in attitudes and beliefs, strong leadership, and a visible priority for a focus on patient safety. Openly sharing information to learn from mistakes in a transparent, safe manner among and between caregivers is one of the most important aspects of a safety culture (Leape, Berwick, Clancy, Conway, Gluck, & Guest, et

al, 2009). A strong culture of safety reduces fears so that nurses will be more inclined to be vigilant, report errors and near misses, with an emphasis toward learning from each event to strengthen the culture of safety. Peer review done in the setting of a just culture of safety, provides a safe learning environment for nurses where the highest standards can be upheld, competency maintained, integrity preserved, and professional growth enhanced (Haag-Heitman & George, 2011). AENPR supports a culture of safety by analyzing errors in an open, non-punitive, safe, learning atmosphere with the goal of reducing the reoccurrence of adverse events.

Mardon, Khanna, Sorra, Dyer, and Famolaro (2010) tested their hypothesis that hospitals with a more positive patient safety culture would have lower Patient Safety Indicators (PSIs). Using multiple regression analysis authors examined the relationship between 15 safety culture variables and a composite score of adverse events based on 8 risk-adjusted PSIs from 179 hospitals. Safety culture variables were taken from the AHRQ Hospital Survey on Patient Safety (HSOPS). After controlling for hospital bed size, teaching status, and ownership authors reported that 7 out of 15 relationships (47%) were statistically significant and all were negatively correlated, as expected. Significant safety culture variables were: the frequency of reports, handoffs and transitions, organizational learning, staffing, teamwork across units, teamwork within units, and the composite HSOPS.

Limitations of the study included the use of voluntary self-selected hospitals that may be more open to sharing information and thus may already have an established safety culture. The PSIs (E.g.: sepsis, pneumothorax) selected were associated with medical care and not nursing care so findings may not be generalizable for this study however the association with safety culture and adverse events is important.

Safety culture: comprehensive reviews of the literature

Comprehensive and/or systematic literature reviews of safety culture have been conducted. Halligan and Zecevic (2014) reviewed 139 studies of safety culture in healthcare in order to summarize definitions, identify theories, dimensions and measures and review progress in improving safety culture. This review found limited use of theoretical underpinnings (41%), variation in terms and definitions, and 12 different survey tools used to measure safety culture. Fourteen (10%) used qualitative methods to collect data on safety culture. This review highlighted safety interventions but stated that none of the articles reviewed assessed the effectiveness of the interventions. The literature review provided an up to date review but did not shed any new light on what is known about safety culture.

Weaver et al. (2013) published a systematic review of 35 quantitative safety culture articles to identify and assess interventions used to promote safety culture or safety climate in the acute care setting. The authors categorized various studies and identified the following common interventions that improved safety culture: Team training, executive walk-rounds, and Comprehensive Unit-Based Safety Program (CUSP). CUSP is a multi-faceted strategy that combines team training with evidenced-based algorithms to improve patient care.

Twenty-two studies used the Safety Attitudes Questionnaire which is the survey proposed in the current study to measure the attitudes of critical care nurses toward safety culture. Twenty-three (23) of 32 studies reported a statistically significant impact of the intervention on the overall safety score and half reported at the domain level. Only two team training studies were conducted in the medical or intensive care unit setting. Six of the eight CUSP studies reported statistical significance in staff perception of safety culture. The literature review

supported interventions that improve staff perception of safety culture, care processes, and potentially improve causes of patient harm. However, the conclusions are weakened by the low strength of the evidence and the limitations of the evidence. Most studies used pre and post-test designs without the use of controls and there was only one randomized controlled trial. Authors suggest that the evidence is emerging and would be further strengthened with the use of control groups and theoretical models. Both suggestions are incorporated into this author's research proposal.

Sammer, Lykens, Singh, Mains, and Lackan (2010) set out to describe what patient safety culture is through a review of the U.S. literature within the hospital setting. The aim of their literature review was to develop a conceptual cultural safety model. The authors identified the following seven subcultures of patient safety culture: leadership, teamwork, evidence-based, communication, learning, just, and patient centered.

Sammer et al. (2010) emphasized the important role of leadership in fostering and nurturing a culture of safety. Conversely the lack of leadership acts as a barrier to a culture of safety. A learning culture exists in hospitals that emphasize safety through strong support for learning from mistakes through root cause analysis and performance improvement processes. A fishbone diagram highlights each theme and important elements. This literature review highlights the important role of the leader in establishing and supporting a culture of safety with specific regard to learning from error. The overall model and characteristics are representative of safety culture and therefore did not produce a major new finding. However, the summary supported the importance of leadership presence during root cause analysis and provided support for the adaption of peer review guidelines to include leadership during PRISM Program case studies.

In the ICU setting safety culture can have a powerful influence on the quality and safety of patient care. Hudson et al. (2009) summarized the relevant methodologies, knowledge and tools of safety culture necessary for critical care clinicians to understand and assess the important attributes in their ICUs. The authors stated that evidence has demonstrated that safety culture is measurable using valid tools, multidimensional, exists at the unit/team and organizational levels, varies significantly by role group, and is associated with clinician behavior and operational outcomes. Specifically, the authors concluded that improvements in patient safety cannot be sustained in the absence of a supportive safety culture, especially in the intensive care unit setting.

Safety Attitudes Questionnaire

The Safety Attitudes Questionnaire (SAQ) is one method for assessing safety culture. The SAQ was developed by Sexton et al. (2006) at the University of Texas. The SAQ originated from the Intensive Care Management Attitudes Questionnaire which was refined from the aviation industry's Flight Management Attitudes Questionnaire (FMAQ) (Sexton et al., 2006). The survey was initially tested for psychometric properties in 203 various clinical settings, in three countries (United States, United Kingdom, & New Zealand), with respondents totaling 10,843. The survey has been adapted for specific clinical areas including intensive care units. The SAQ is designed to extract clinician's attitudes about safety climate through the six factors of the climate scales. The SAQ measures six specific safety domains: teamwork, job satisfaction, perceptions of management, safety climate, working conditions, and stress recognition.

The survey is a 36-item questionnaire. All items are answered using a five-point Likert scale (Disagree Strongly, Disagree Slightly, Neutral, Agree Slightly, and Strongly Agree). The questionnaire takes approximately 10-15 minutes to complete. Some items are negatively worded. There is one open-ended question at the end of the survey;" What are the top three recommendations for improving patient

safety in this clinical area?" A score of at least 60% is favorable, with a goal of at least 80% agreement or an improvement of 10 points or more is considered statistically significant (Hudson et al., 2009 and Pain et al, 2010).

The SAQ is a valid, reliable (Colla, Bracken, & Kinney, 2005) and psychometrically sound instrument (Sexton et al. 2006) and has been demonstrated to be responsive to interventions (Provonost, Weast, & Rosenstein, 2005; Provonsost, Berenholtz, & Goeschel, 2008; Timmel, Kent, & Holzmueller, 2010; Pettker, Thung, & Norwitz, 2009; Defontes & Surbida, 2004; Hudson, Sexton, & Thomas, 2009). Scale reliability is reported at .90 (Raykov's ρ coefficient). A rigorous six factor multi-level

confirmatory factor analysis revealed satisfactory results of the following: $p<0.0001$, comparative fit index (CFI) =0.90, root mean square error of approximation (RMSEA) =0 .03, and standard root mean square residuals (SRMSR) = .17 (between clinical areas) and SRMSR = 0.04 (within clinical areas) (Sexton et al, 2006). The SAQ has been adapted for various settings including intensive care units (ICU), operating rooms (OR), general care units (medical unit, surgical unit) and ambulatory clinics.

Safety Attitudes Questionnaire Research

The SAQ has been used in a number of research studies. For the purposes of this section studies using the SAQ as a pre and post measure dependent variable will be included. In a collaborative, exploratory study between researchers in hospitals in the U.S. and Switzerland, the variability of SAQ dimension scores within and between clinical areas in both countries was explored (Schwendimann, Zimmerman, Kung, Ausserhofer, and Sexton, 2013). The SAQ was administered to direct patient care clinicians on medical and surgical units in two Swiss and 10 U.S. hospitals. A total of 1370 nurses (93%) and physicians (7%) responded (84% response rate) from 54 clinical units. Results demonstrated that positive responses varied considerably at the unit level within the U.S. and Swiss hospitals with wide ranges in response.

Swiss responses in stress recognition and perceptions of unit management were all below 60%, indicating a need for improvement. Three dimensions differed significantly between countries: stress

recognition, perceptions of management, and safety climate. However, teamwork climate, job satisfaction, and working conditions were not significantly different. Specific responses to questions provide insight into the different findings. Lastly, findings indicated significant differences in safety culture dimensions between U.S. and Swiss clinical units overall and within each country for teamwork climate, safety climate, job satisfaction and perceptions of management (but not working conditions and stress recognition).

This study provides further insight into safety culture dimensions as important elements at the unit level. The authors stated that the study provides empirical evidence that safety culture dimensions vary more within than between countries, and that the main source of variability lies at the unit level. This evidence supports the importance of measuring safety culture at the unit level and using interventions at the unit level to improve quality and safety. The study was limited in the sense that the U.S. was a larger sample and may have contributed to some statistical differences between countries. The study only included medical surgical units and not intensive care units which may be a limitation in generalizing to other environments but overall demonstrated findings that support other research.

Sexton, Berenholtz, Goeschel et al. (2011) evaluated the impact of a comprehensive unit-based safety program (CUSP) in the ICU setting on safety culture using the SAQ. The SAQ was administered at baseline and after two years of exposure to the CUSP program to measure improvements. CUSP is specifically designed to address the elements of a safety culture. Interpretation of results was pre-determined by the SAQ: a score of <60% means "needs improvement" and a $\geq$ 10-point discrepancy in pre-post scores was needed to describe a difference. Seventy-one ICUs across the state of Michigan returned surveys with pre and post response rates of 71% and 73%. Findings revealed that overall means scores significantly improved from 42.5% to 52.2% ($p < 0.001$). The number of units in the "needs improvement" category decreased from 62 to 33. Five of seven safety climate items significantly improved: medical errors are handled appropriately in this area; I receive appropriate feedback about my performance; I am encouraged by my colleagues to report any safety concerns I have; the culture in this clinical area makes it easy to learn from the errors of others; and I know the proper channels to direct

questions regarding patient safety in this clinical area. Non-significant improvements were seen in all ICU's demographics with ICUs in faith-based institutions having a higher mean improvement difference and smaller hospitals improved more than larger hospitals.

The authors concluded that the use of CUSP was associated with a substantial improvement in safety climate but could not draw conclusions about causality. However, the implementation of CUSP over the 2 year period was not evaluated for the extent of implementation. Study results could also be affected by historical issues over the 2-year time period and/or by the voluntary nature of responders. Regardless, this study demonstrated large scale improvements in perceptions of safety culture in ICUs among diverse organizations.

Haynes, Weiser, Berry et al. (2010) used the SAQ as a pre and post intervention survey across 8 international hospitals to assess the relationship between operating room clinicians' attitudes following a checklist based surgical safety intervention to decrease postoperative morbidity and mortality. The operating room SAQ was modified from 58 questions to 6 items related to teamwork climate and safety climate and six additional questions were developed related to the checklist. The 58-item SAQ was deemed impractical for participants to complete. Participants were given 2 weeks to complete paper versions of the study in both the pre and post phases. Interestingly the study did not indicate the length of the implementation phase which was of great interest to this author.

The results of this study indicate that the perception of teamwork and safety climate increased following the checklist intervention and that the change was correlated with improvements in outcomes. A statistically significant mean safety score increased from 3.91 to 4.01 ($p= 0.0127$). Two of the six items also showed a significant increase in scores post intervention: "Briefing OR personnel before a surgical procedure is important for patient safety" ($p= 0.0058$) and "I am encouraged by my colleagues to report any safety concerns I may have" ($p= 0.0225$). The study also indicates a decrease in complication rates of 11% at baseline and 7% following implementation but the decrease was not significant and did not correlate consistently with improvements in processes.

Although given that the authors used the SAQ in a modified manner it limited the results of the findings because they were not taken in the context of the entire SAQ. The study may not be generalizable given the geographical and economic diversity of the areas surveyed. The response to the checklist was very positive. Participants were aware of the study and this may have influenced their responses.

Watts, Percarpio, West, and Mills (2010) demonstrated that the SAQ has good utility as a proxy measure of patient safety following the implementation of medical team training focused on improving communication in 63 Veterans Affairs Medical Centers. The study design allowed an eight month time period between testing. A comparison of survey results response rates (76% pre and 50% post) pre and post medical team training revealed significant changes in post scores, most frequently in perceptions of management with the stress management and job satisfaction categories offering the least change. The authors concluded that the SAQ is a sensitive measure of change in staff safety culture and the psychometric properties of the tool are maintained when used in the implementation of a improvement initiative.

This study provides important insight into the SAQ tool as a pre and post test measure following an intervention. One limitation offered by the authors was that the pre-test scores were skewed to the right offering less opportunity for change in post-test scores. Results of this study still demonstrated some significant findings however high pre-test scores are a concern to be considered. Using more than one tool in a research design may help with this type of limitation.

Paine, Rosenstein, Sexton, Kent, Holzmueller, and Provonost (2010) used the SAQ to measure safety culture over a three-year period following multiple interventions to improve hospital wide safety climate. The intervention of a comprehensive unit-based safety program (CUSP) occurred in 144 clinical units. The unit-based intervention included steps to identify hazards, partner units with senior executives to help fix hazards, learn from defects, implement communication, and teamwork tools. Hospital wide efforts were also employed.

Paine et al. (2010) found, using paired sample t tests, that overall SAQ scores improved significantly in every domain except stress recognition. In 17 of the 144 clinical units, safety scores decreased. Safety culture is unit specific and informal interviews with staff revealed that changes in leadership, unit construction, and implementation of information technology contributed to lower scores. Eighty-two percent of units maintained or improved their scores. This study contributes evidence to the concept that safety culture is very much influenced at the unit level. Findings also suggest that it is important to allow for customization of interventions at the unit level, focus on areas with low scores, provide baseline safety training for staff, and that leadership can be influential. One important limitation to point out is the lengthy time between SAQ administrations which could allow for other factors to influence scores. An important finding in this study is that the SAQ is sensitive to measurement at the unit level. This finding supports the design of the current research proposal.

Recovery of medical errors

The original Eindhoven model of incident causation (van der Schaaf, 1992) was developed from the chemical industry for root cause accident investigation and is influential in this area of study. The Eindhoven model describes three sources of errors: technical failure, organizational failure, and human failure. The failures, alone or in combination, can lead to a chain of events that may cause harm. Unique aspects of this model include the focus on safety mechanisms that prevent errors from occurring and the addition of the term "recovery." Henneman and Gawlinski (2004) adapted the Eindhoven model to describe the nurse's role in human recovery of near-miss situations. Case scenarios were used in the literature to demonstrate how the adapted model could be applied to the health care setting. The model was not empirically tested or verified in a clinical setting.

Henneman, Blank, Gawlinski, and Henneman (2006) used a qualitative descriptive design with focus groups to better understand the strategies use by academic emergency department (ED) nurses in recovering medical errors. The questions for the focus groups were focused on the nurse's role during three phases of error recovery: identifying; interrupting; and correcting the error. Five themes that described nurses' methods to identify errors emerged from this study: surveillance, anticipation, double checking, awareness of the big picture, and experiential knowing. Five themes used to interrupt errors emerged: patient advocacy, offer of assistance, clarification, verbal interruption, and creation of delay. There were two themes used as strategies for correcting errors: assembling the team and involving leadership. This study provided preliminary insight and evidence into the strategies used by ED nurses to identify, intercept and correct errors. Some types of errors were described but none were quantified. The urgency of the ED setting is similar to that of an ICU and so the themes could be considered for adaptation to that setting.

Henneman, Roche, Fisher, Cunningham, Reilly, Nathanson, and Henneman (2010) later described the types and frequency of errors committed or recovered by student nurses in a simulated environment using specific case studies, using the Eindhoven theoretical framework. Fifty students participated in one of two simulated case studies lasting between 15-30 minutes while they carried out assessments and interventions. Sessions were videotaped and reviewed retrospectively by two members of the research team (interrater reliability 95%). The errors were coded based on four rule based categories: coordination, verification, monitoring, and intervention. In both simulation cases students had a low (14%) ability to recover the embedded errors, all students committed at least one error, and errors occurred in all four rule based categories, most frequently in the verification category. Students failed to verify patient

identification, 84% and 88% of the time. These findings are not surprising given the knowledge and experience of the student. The methods used in this study could be replicated with nurses of varying levels of experience and/or with specific specialties and patient populations to identify error prone areas that could lead to interventions to prevent further errors in actual practice.

Hurley et al. (2008) decidedly took a different deductive approach to further explore and understand the thoughts, interpersonal processes, and actions used by nurses in Coronary Care Units (CCU) who had recently intervened to protect patients from potential or actual medical errors. The qualitative processes involved 18 semi-structured interviews of very experienced CCU nurses in two academic medical centers. Questions and responses focused on nurses from the CCU's involvement in near miss events, thoughts actions, strategies, feelings, reflections, outcomes and the environmental context. The study revealed the value of the "invisible role" nurses in CCUs play in keeping patients safe in the critical care setting (p.220). A three stage model of the recovery of medical errors illustrates the process (see Chapter 1, Figure 1.1).

Stage one incorporates the evolving clinical scenario with the knowledge and expertise of the nurse and the clinical context of the ICU environment as the antecedents that lead to the processes and actions in stage two and outcomes in stage three. Important concepts embedded in the knowledge and expertise of the nurse in Stage I are: clinical skills; ethical comportment; and self-efficacy. Clinical skills incorporate the knowledge and evidenced based actions proficiently demonstrated to achieve patient goals.

Benner's definition of ethical comportment was used to describe the skilled know how of the nurse in relating to others in ways that are respectful, responsive, and supportive. Benner further describes ethical comportment as more than just words, intent, beliefs, or values; it

encompasses stance, touch, and orientation. Thoughts and feelings are fused with physical presence and action (Benner, 1996, p.233).

Hurley et al. (2008) found that nurses might use humor, questioning, teaching, or escalation up the chain of command as examples of ethical comportment. Self-efficacy is the last concept in Stage I. Self-efficacy is defined as the personal beliefs of one's ability to plan and carry out patterns of behavior that may contain novel, unpredictable, and stressful features. Despite complexity, uncertainty, and not having all the answers, nurses are still confident about their knowledge of the patient and will step up to advocate for the patient. These concepts may be explored during the PRISM Program case reviews as they relate to the recovery of errors however, for the purposes of the current study they will not be measured.

Stage two identified the processes and actions by which critical thinking is applied to clinical scenarios to identify near misses and errors followed by the interruption and correction of the events through advocacy. Three processes and actions are described in stage II; identify, interrupt, and correct. The three processes and actions may be distinguishable or may appear to occur simultaneously in some cases.

Identify as a concept, occurred through the critical thinking of analysis and synthesis of clinical information that is relevant to the given scenario and formulates in clinical judgment. Contributing factors of the identification process can include experience, surveillance, expertise, and anticipation of outcomes and consequences. *Interrupt* referred to the actions associated with the disruption of an evolving clinical scenario or stepping in to address an error or a near miss situation. Actions associated with the interruption of a clinical scenario can include; knowing how to intervene, being the patient/families voice, communication, and the use of nursing judgment. *Correct* was clear action to resolve an evolving error to prevent harm or further injury

by acting in the best interest of the patient despite any difficulties or barriers. Nursing advocacy is an element associated with the correction of an error or near miss.

Recovered Medical Error Inventory

In a follow up study Dykes, Rothschild, and Hurley (2010) used the content analysis in the structured interviews of the previous study to generate a 25-item survey tool called the Recovered Medical Error Inventory (RMEI). The RMEI measures the incidence, seriousness, and potential lethality of medical errors recovered by critical care nurses. Content was derived from the actual experiences of critical care nurses' recovery of medical errors and aids in quantifying nurse engagement in the identification, interception and recovery of medical errors.. The RMEI was tested with 345 CCRNs. Through psychometric testing the survey tool was shown to be valid and reliable with a total alpha scale of 0.90. There are two subscales with alpha coefficients of 0.88 (mistake) and 0.75 (poor judgment). The RMEI scale will play a key role in the current study, as a pre and post-survey measure to investigate the impact of the Peer Review Impacts Safety and Medical-error Program on the recovery of medical errors. A more detailed review of the RMEI survey tool is in chapter three.

Following the evidence of validity and reliability of the RMEI, Dykes, Rothschild, and Hurley (2010) reported the actual findings of the RMEI survey data. Specifically they reported the frequency, type and potential harm of recovered errors reported by critical care nurses. Over a one year time period, 345 CCRNs reported 18,578 medical errors of which 4183 (22.5 %) were potentially lethal. On average each critical care nurse intervened with an error about once per week (range 1-150). Four causes resulted in almost 25% of errors: aversive symptoms mismanaged; coexisting health issues mismanaged; improper precaution techniques used; and

invasive monitoring or therapy incorrectly timed. The most commonly cited potentially lethal error was an unsafe transfer decision. These findings support other findings discussed earlier in this chapter about the incidence of errors and adverse events.

There were some limitations to this study. The survey responses were self-reported over a one-year period and therefore could be over or under inflated. Subjective judgment about what is and what is not an error could also be a factor. The study focused on recovered error and may miss those that be more serious and result in actual harm.

Interestingly, Marshall (2010) wrote an editorial about this journal article emphasizing the significant role of critical care nurses in preventing medical errors and the extrapolated prevalence of errors. Marshall (2010) also stated that the evidence supports the American Organization of Nurse Executives (AONE) and the role of the nurse executive in leading patient safety by establishing a safety culture that supports governance, evidence-based practice, education and research in collaboration with an interdisciplinary team. The RMEI could be used as a tool for nurse executives to recognize nurse's contribution to patient safety within a healthy work environment.

Overall, this program of research identifies many types of recovered medical errors that could be the subject of case studies used in the current evaluation of the PRISM Program. The study highlights the invisible role that nurses play in keeping patients safe and provides a mechanism to quantify that role. It is important to note that the RMEI survey tool will be used in this author's study as a tool to measure critical care nurse's awareness of the recovery of medical errors, pre and post-implementation of the PRISM Program intervention. Marshall's (2010) editorial also contributed thoughtful remarks about the importance of strong leadership support for a safety culture and the contributions that nurse's make in patient safety. These remarks bring

further support to the concept that AENPR should include nurses at all levels and not just of the same rank for the purposes of this type of peer review.

Recovery of medical error research in nursing

Error detection and recovery are also documented in other research. Wilkinson, Cauble, and Patel (2011) used error detection and recovery to evaluate dialysis nurses' ability to detect and recover from nursing errors using two constructed clinical case studies with a total of twelve embedded errors. The cases were based on actual events but were adapted by expert nurses for the study. A total of 31 registered nurses discussed aloud the two case studies and answered predesigned knowledge-based procedural questions. The discussions were recorded and transcribed. The authors found that procedure based error detection and recovery was significantly higher ($p< 0.05$) with more experienced nurses, however no differences were found with knowledge based errors. This may be related to the fact that dialysis nursing is procedurally based. The study raised concerns about the opportunity for more knowledge based errors to be made by dialysis nurses that may not be detected or recovered.

This is an interesting study methodologically and provides further insight into the degree of experience and knowledge a nurse has in how it contributes to their ability to recognize and recover errors. The study provided examples of specific case studies however the case studies are procedural based and do not promote the need to ask too many questions about root causes. The case studies direct the reader to the error rather than encourage discussion. This may be because the study is designed for one person to read the case study and answer questions rather than a group discussion case review.

Yang, Henry, Dellinger, Yonish, Emerson, and Seifert (2012) assessed the types of errors or potential errors detected and recovered by cardiovascular circulating operating room (OR) nurses during the care of patients undergoing coronary artery or valve surgery. The Eindhoven Model of Incident Classification was used to conceptualize the role nurses play in recovery of error. During 18 surgical procedures there were 200 observations of incidents, of which 94% were deemed to be potentially significant and 75% were considered preventable. Of particular concern was a 46% observed rate related to a break in aseptic technique, 10% infection prevention, and 8% each to counting and skin injury. An average of 11.1 errors or incidents occurred per procedure, 77% of all incidents were intercepted, 23% were mitigated and no adverse outcomes occurred.

This study also used the Rasmussen model for categorizing errors into behavioral or performance classes: skill-based errors, rule-based errors, and knowledge-based errors. Errors were then classified based on the individual (human operator), organizational or technical. This is a simple model for categorizing types of errors and has an ease of application. Overall this was a sound study. The sample size was small but the focus on OR nursing adds to this body of knowledge for the important role that nurses play in patient safety in all areas. In particular this study was able to identify specific safety areas where OR nurses made an important contribution in preventing harm such as infection. This study identified the "invisible role" of OR nursing as an active patient safety advocate and team member in ensuring quality care through the identification, interception and recovery of error.

Summary

This chapter described the literature relevant to the aims of this study. In summary, the prevalence of adverse events, errors, and near misses has not decreased and more must be done

to improve quality care and patient safety. Nurses are uniquely positioned to play a key role in impacting quality and safety and the critical care environment is especially vulnerable due to the complexities of care. Adverse event nurse peer review is one method that may impact patient safety and there is an opportunity to contribute to knowledge in this area. This author seeks to contribute to this knowledge gap through the development of a Peer Review Impacts Safety and Medical-errors (PRISM) Program to determine the impact it may have on nurses' perceptions of safety culture, awareness of the recovery of medical errors and nursing practice.

CHAPTER THREE

DESIGN & METHODS

CHAPTER THREE

DESIGN & METHODS

This chapter describes the methods relevant to the research aims of this dissertation. The chapter is organized into the following sections: study design and methods; site and sampling; measures and instruments; procedures; data analysis; institutional review board approvals.

The purpose of this study was to evaluate the effect of the Peer Review Impacts Safety and Medical-errors (PRISM) Program on critical care nurses' attitudes of safety culture and awareness of the recovery of medical errors. This nurse peer review program was designed to promote the analysis of case study reviews of safety events related to nursing practice in order to promote safety culture, raise awareness of error prevention and recovery, learn from safety events and consider opportunities for improvement in individual practice, unit level or organizational level systems. The PRISM Program is a nurse peer review program that provides an opportunity for critical care nurses to participate in case study reviews that have resulted from a safety event such as near misses, errors, and/or adverse events.

In order to achieve the aims of this study the research questions are:

4. What are the effects of the PRISM program on critical care nurse's attitudes of safety culture in the academic medical center setting?
5. What are the effects of the PRISM Program on critical care nurse's awareness of the recovery of medical errors in the academic medical center setting?

Study Design and Methods

A prospective, quasi-experimental research design using pre-tests and post-tests with an intervention and control group was conducted. Group 1 (control group) consisted of critical care nurses from another adult critical care unit in the same academic medical center. Group 1 conducted usual business. Group 2 (intervention group) received an intervention titled the PRISM Program: an adverse event nurse peer review program. The intervention (independent variable) was administered to a group of critical care nurses (Group 2) on one adult critical care unit in an academic medical center.

For the nurses in Group 1 and Group 2 the attitudes of safety culture were measured using the Safety Attitudes Questionnaire (SAQ) (Sexton, Helmreich, Neilands, Rowan, Vella, Boyden, Roberts, & Thomas, 2006). Their self-reported awareness of the recovery of medical errors was measured using the Recovered Medical Errors Inventory (RMEI) (Dykes, Rothschild, & Hurley, 2010). The SAQ and RMEI were administered to nurses in Groups 1 and 2 pre and post-implementation of the intervention. The pre and post-test results of the SAQ and RMEI surveys were analyzed between and within Groups 1 and Group 2. Post-intervention of the PRISM Program nurses in Group 2 also receive one open-ended question following each survey to further understand self- reported implications of the PRISM Program on nursing practice.

Figure 3.1. Quasi-experimental Research Design

Samples	Dependent variables	Independent variable	Dependent variables
	Pre-intervention		Post-intervention
Control Group	Pre-tests →		→ Post-tests
	•Demographics • Safety Attitudes Questionnaire • Recovered Medical Error Inventory	Conduct usual business	•Demographics • Safety Attitudes Questionnaire • Recovered Medical Error Inventory
Intervention Group	Pre-tests →	***Intervention***	→ Post-tests
	• Demographics • Safety Attitudes Questionnaire • Recovered Medical Error Inventory	Peer Review Impacts Safety and Medical-errors Program: PRISM Program	• Demographics • Safety Attitudes Questionnaire • Recovered Medical Error Inventory • Open ended questions at end of each survey

Site and Sampling

Site. The study was conducted in an academic medical center in the northeastern U.S. In order to promote participation and ease of attendance, the PRSIM Program took place in a conference room on the adult critical care unit participating in the study.

Sample. A non-probability convenience sample of critical care nurses from two adult critical care units in an academic medical center in the northeastern U.S. were selected as participants for this study. Group 1 was designated the control group and Group 2 was designated the intervention group. Critical care nurses from a Medical Intensive Care Unit (MICU) were selected as Group 1 and nurses from a Neurological/Neurosurgical Intensive Care Unit (Neuro ICU) were selected as Group 2. Inclusion criteria for both Groups 1 and 2 included all critical care nurses, regardless of age, gender, race, experience, education, or rank from the two designated units. Nurse Director, clinical nurse specialist, standard hour nurses, per diem nurses, and travel nurses working in the two units were included. Exclusion criteria include all other nurses not working in the two critical care units. A goal of an apriori sample size of more than 52 participants for paired comparison tests (26 nurses per critical care unit) was expected to provide a moderate effect size with the power set at 0.80 (see power analysis section) for two surveys and a total of eight factors.

In order to reduce sampling bias the use of a nonrandom comparison group provides data about the counterfactual inference of what would have happened in the absence of the intervention. A thoughtfully chosen internal comparison group from the same institution, with maximum salient characteristics to the intervention group can aide in the determination of probability conclusions and internal validity including concerns related to selection, historical events, and maturation biases (Shadish, Cook & Campbell, 2002). Considerations for the

characteristics for selection of intervention and control units include but may not be limited to; a large enough sample of nurses to provide power for the study, similar patient population, range of experience, and educational levels. For the purposes of this study the comparison group will not receive the intervention. Group 1 was an internal control group of participants taken from within the same organization and the same nursing specialty: critical care nurses. Internal control groups can assist in obtaining more accurate results (Shadish, Cook & Campbell, 2002). The characteristics of the intervention and control group at the time of selection are displayed below in Table 3.1.

Table 3.1. Characteristics of the Intervention and Control Groups

Unit Characteristics	Control Group	Intervention Group
Patient Population	Medical	Neurological/Neurosurgical
# Beds	18	20
Practice specialty	Adult critical care	Adult critical care
# Nurses	90	95

Measures and Instruments

Demographics. Survey instruments included an introductory statement about the purpose of the study, informed participants of their anonymity, provided information about informed consent, and indicated that completion of the survey served as recognition of participant's informed consent for participation in the research. Demographics were included with each pre and post survey. The following demographics were collected: unit type, gender, years working as a critical care nurse, hours worked per week, highest level of education and certification.

Independent variable.

***Intervention: Peer Review Impacts Safety and Medical-errors (PRISM) Program*.** The PRISM Program (Appendix I.) intervention was the independent variable for this study. The goal of the PRISM Program case study intervention was to provide an opportunity for nurses to engage in a root-cause analysis of an adverse event related to nursing care, using the recovered medical error middle range theory framework to recognize actual and potential opportunities of identification, interruption, and correction of harm in order to learn and apply to practice.

The PRISM Program content consisted of two parts. Part I was an introduction about the rationale and principles of nurse peer review, adverse event nurse peer review, and root cause analysis. Part II was a case study presentation of an adverse safety event related to nursing care for root cause analysis.

The design and subject matter of the PRISM program case studies was informed by the associated adverse event and nurse peer review literature, and a review of actual critical care safety reports. The Recovered Medical Error Inventory (RMEI) survey items are based on common errors previously identified by critical care nurses and these items were also considered during development of the case studies for the PRISM Program. The intervention design incorporate a meta-theory and a middle range theory: Donabedian's meta-theory of structure, process, and outcome (Donabedian, 1976) which is used as an overarching framework guiding the middle range theory of the recovery of medical errors (Hurley, Rothschild, Moore, Snydeman, Dykes, & Fotakis, 2008), as noted in Chapter 1.

Four case studies were created and reviewed by a panel of quality and safety experts using a content validity index (CVI). Based on the CVI reviews, adjustments were made to the case study content until all four experts strongly agreed that all four case studies fully met every

criteria of the CVI. Using a four point scale (strongly agree, moderately agree, moderately disagree and strongly disagree) reviewers were asked to rate the content based on what degree the following concepts were represented in the PRISM Program:

Part I. Introduction Criteria

1. Adequate description of adverse event nurse peer review
2. Adequate description of safety culture
3. Adequate description of root cause analysis
4. Adequate description of recovery of medical error model

Part II. Case Study Criteria

1. Application to the critical care environment
2. Application to critical care nursing practice
3. Association with known prevalence of common safety events (unit, hospital, literature and/or Joint Commission National Patient Safety Goals)
4. Identification, interruption and/or recovery of a significant near miss, error, or adverse event
5. Opportunities for improvement to reduce actual or potential patient harm and error (individual, unit or organizational/system)
6. Disguises any depiction of an actual safety event

In Part I, introductory information informed the intervention group about peer review, peer review principles, safety culture, adverse event peer review, and root cause analysis. Part II began with the initiation of the adverse event nurse peer reviewed case study followed by the root cause analysis of the event. Case content was further developed with specific clinical details

taken from actual harms cases or near miss cases as reported in the acute care setting or in the literature. The final case studies were not actual cases but rather fictional cases created for maximum relevance to the critical care clinical arena. The PRISM Program content is attached as Appendix I.

The four case studies themes developed were:

1. Wrong medication administered to a high acuity patient resulting issues with pressure and blood sugar leading to temporary harm
2. Mislabeling of a blood bank sample resulting in a transfusion reaction and temporary harm
3. Delayed response to physiologic monitoring alarms requiring brief emergency treatment; resulting in temporary harm
4. Patient fall after being left alone on commode resulting in permanent major harm

All presentations utilize the same outline and introduction. Information about the research study and informed consent were included. Following a ten minute introduction, forty minutes was devoted to the case study review and discussion. The final ten minutes focuses on conclusions about nursing practice and lessons learned. Each session took one hour in total.

Group 2 Intervention unit participants were asked on the post-survey demographics if they attended PRISM Program sessions. If participants answered yes, they were asked which sessions they attended. Participants who attended the program were eligible to attend 1-4 sessions.

Dependent variables.

Safety Attitudes Questionnaire. The Safety Attitudes Questionnaire (SAQ) (Appendix II.) was developed by Sexton et al. (2006) at the University of Texas. The SAQ stems from the Intensive Care Management Attitudes Questionnaire which was refined from the aviation industry's Flight Management Attitudes Questionnaire (FMAQ) (Sexton et al., 2006). The survey was initially tested for psychometric properties in 203 various clinical settings, in three countries (United States, United Kingdom, & New Zealand), with respondents totaling n=10,843. The survey has been adapted for specific clinical areas including intensive care units. The SAQ is designed to extract clinician's attitudes about safety climate through the seven factors of the climate scales. The SAQ measures six specific safety domains. The subscales and definitions can be seen in table 3.2.

Table 3.2. Safety Attitude Questionnaire Subscales and Definitions

SAQ Subscale	Definition
Teamwork	Perceived quality of collaboration between personnel
Job satisfaction	Positivity about the work experience
Safety climate	Perceptions of a strong and proactive organizational commitment to safety
Working conditions	Perceived quality of the work environment and logistical support (staffing, equipment, etc…)
Stress recognition	Acknowledgement of how performance is influenced by stressors
Perceptions of hospital management	Approval of hospital managerial action
Perceptions of unit management	Approval of unit managerial action

The survey is a 36-item questionnaire. All items are answered using a five-point Likert scale (Disagree Strongly, Disagree Slightly, Neutral, Agree Slightly, and Strongly Agree). The questionnaire takes approximately 10-15 minutes to complete (Sexton et al., 2006). Some items are negatively worded.

The SAQ is a valid, reliable (Colla, Bracken, & Kinney, 2005) and psychometrically sound instrument (Sexton et al. 2006) and has been demonstrated to be responsive to

interventions (Provonost, Weast, & Rosenstein, 2005; Provonsost, Berenholtz, & Goeschel, 2008; Timmel, Kent, & Holzmueller, 2010; Pettker, Thung, & Norwitz, 2009; Defontes & Surbida, 2004; Hudson, Sexton, & Thomas, 2009). Scale reliability is reported at .90 (Raykov's ρ coefficient). A rigorous six factor multi-level confirmatory factor analysis revealed satisfactory results of the following: $p<.0001$, comparative fit index (CFI) =.90, root mean square error of approximation (RMSEA) = .03, and standard root mean square residuals (SRMSR) = .17 (between clinical areas) and SRMSR = .04 (within clinical areas) (Sexton et al, 2006). The SAQ has been adapted for various settings including intensive care units (ICU), operating rooms (OR), general care units (medical unit, surgical unit) and ambulatory clinics.

Recovered Medical Error Inventory. The Recovered Medical Error Inventory (RMEI) (Appendix III.) is a 50-item scale measuring two subscales; mistakes and poor judgment. The scale repeats the same 25 questions about mistakes and poor judgment as they each relate to the seriousness and frequency of items. Evidence supports construct validity and internal consistency reliability of the REMI and subscales. The RMEI is a valid and reliable tool with a total scale alpha of .9 and subscale alpha coefficients of .88 for mistakes and .75 for poor judgment. A 3-point Likert scale is used to measure the frequency and seriousness of responses. Frequency options are: 1, once during the past year; 2, a few times (2-5) during the past year; 3, many times (>5) during the past year. Seriousness options are: 1, minor (potential for slight negative effect if not prevented or corrected); 2, serious (could lead to sever adverse event); 3, life-threatening (could lead to fatality if not prevented or corrected) (Dykes, et al., 2010).

Through routine surveillance, nurses are in key positions to prevent and intercept near miss events so that errors and patient harm is avoided. The RMEI is a tool developed to quantify critical care nurse's experiences recovering medical errors ideally before they reach the patient.

The measures reflect nurse's surveillance in promoting safe care and preventing hospital acquired conditions and adverse events. The RMEI was initially developed using structured interviews with experienced critical care nurses based on the concept that the recovery of medical errors is an active process consisting of three stages: identification, interruption, and correction (Dykes, Rothschild, & Hurley, 2010; Hurley, et al., 2008; Henneman & Gawlinski, 2004).

Psychometric testing was conducted. A process of content analysis resulted in three stages of prototype development, leading to the final RMEI. First, to distinguish medical errors from quality issues feedback from eighteen critical care nurses at two academic medical centers was sought and used to establish survey items. Second, Prototype II was created from the feedback of 28 critical care nurses on the survey format. Based on this input, 68 situation-specific surveys items were combined into 25 questions with a more general focus. The last phase involved cognitive testing of items and scoring system resulted in Prototype III, the final RMEI.

An initial internet version of the RMEI surveyed 345 critical care nurses. The group was randomly divided into two groups with no difference in demographic characteristics. Group I was used to test potential subscales and reliability. Group II was used to test validation. Correlations within and between groups was used to test the mean differences of two subscales: mistake and poor judgment. The two-factor, 50-item survey explains 34.6% of the variance. Two subscales were created; Factor I (mistake) a 17-item scale and Factor 2 (poor judgment), an 8-item scale. Content and face validity of survey items determined the adjustments to the survey were made according to this feedback. Content analysis was used to analyze interviews with critical care nurses and develop survey items.

Open ended questions. Halligan and Zecevic (2011) challenge researchers to advance the culture of safety through the inclusion of qualitative questions. Methods triangulation uses two or more research methods in one study and may occur at the design or data collection levels (Kimichi, Polivka, & Stevenson, 1991). An open ended question was added to the Group 2 intervention unit post-surveys to attempt to describe the potential impact of the intervention on nurse's practice behaviors. The inclusion criteria for use of the responses to these questions are that the nurses are from the intervention unit only and have attended at least one case study presentation. In order to better understand what nurses learned or applied to their practice from the PRISM Program and to provide some descriptive commentary to the study the following open ended questions were added to the post surveys:

1. What changes have you made in your practice based on participation in the PRISM Program as it relates to safety culture? Please describe.
2. What changes have you made in your practice based on participation in the PRISM Program as it relates to the recovery of errors? Please describe.

Procedure

The study was announced to both nursing groups through emails and flyers, with a 2 week announcement phase. Emails were sent to the nurse directors who forwarded them to their staff nurses and reminder emails with surveys links were sent to unit nurses directors weekly to forward to nurses Flyers were posted throughout the units. Next the pre-tests were administered to Group 1 and Group 2, allowing 4 weeks for completion. Following the 4 week pre-survey period the implementation of the PRISM Program intervention began with Group 2. In both cases the time period was extended from two to four weeks to increase responses rates.

Case studies were scheduled on different days and shifts to maximize opportunities for participation. The total intervention was conducted over a four week time period. Each case study was repeated once and then a new case study was presented. There were a total of eight opportunities offered to participants. A variety of four case studies allowed participants to take part in more than one case study. At the conclusion of the case studies sessions a four week waiting period concluded with distribution of post-surveys. Post-surveys were announced two weeks prior to distribution to inform staff and minimize coercion. Post-surveys were administered to Group 1 and Group 2, allowing four weeks for completion. At the conclusion of the post-survey nurse directors were provided with the iPAD mini incentives for distribution via a random drawing of voluntary participants.

Survey data collection and storage. All surveys were administered as online surveys using the REDCap survey software (Harris, Taylor, Thielke, Payne, Gonzalez & Conde, 2009). REDCap is a Harvard Catalyst approved secure, web-based application for building, administering and managing online surveys and databases. REDCap provides export of data into statistical packages such as SPSS and tracks respondents' pre and post surveys. Emails and posted flyers included an icon application (QC code) for respondents to download to their cell phones. The researcher did not track respondents email addresses to maintain confidentiality.

Every effort was taken to protect nurse's confidentiality. Personally selected code numbers were used to code nurse's data and track responses. The researcher did not know the names of the nurses. Nurses were encouraged to use their day of birth and last three digits of their phone numbers. The codes numbers are kept confidential in an electronic database accessible only to the researcher.

It was important to the aims of the study that all four surveys were completed by as many participants as possible. Incentives were important to encourage responses to complete all pre and post surveys. The incentive of an iPod mini (one for each group) was promoted and raffled at the completion of the study for any amount of participation in any part of a pre or post survey. Promotion of the incentive occurred with emails, flyers, informed consent and during the PRISM Program. Nurses were asked to voluntarily submit their names to their nurse directors on the honor system if they completed any part of a survey. A nurse was randomly selected from Group 1 and Group 2. The iPod mini was provided to two nurses based on a random drawing done at the unit level and overseen by the nurse director. Participants voluntarily submitted their names for the drawing.

Data analysis

Quantitative data analysis.

Data preparation. Data were downloaded from REDCap into Statistical Package for the Social Sciences 17.0 (SPSS®) for analysis. Initial response data was recorded. Incomplete surveys were then eliminated. Demographic, pre and post data were reviewed and revised for level of completion and negatively worded questions were re-coded for SPSS analysis. SAQ and RMEI question level responses were combined into survey subscales. SAQ questions were transformed using the SAQ stipulated computations. A total of eleven new variables were created in the pre and post- survey data sets. The pre and post data sets were then merged for the analysis.

Missing data. Every effort was made to promote the full completion of survey questions however, missing data did occur. Missing data can impact statistical power, statistical conclusion validity, and internal validity. There are a number of factors to consider in relation to missing

data and there are various strategies to employee in fixing missing data problems. The amount and pattern of missing data was examined to determine the best strategy to use. The following options were considered a priori: deletion of the variable; deletion of the participant; pairwise deletion (omitting cases on a variable by variable basis); and imputation (Polit, 2010 p.380). However, these strategies were not used. Instead, all participant' responses were eliminated if they had completed no demographic information or demographic information only. Participants with completed SAQ surveys were retained. Four participants completed half of the RMEI survey that resulted in 2 out of 4 completed factors: seriousness-mistake and seriousness-judgment. The four RMEI surveys and all other completed RMEI surveys were retained.

Data Analysis. Apriori statistical analysis of a two tailed significance was set for an α of 0.05, moderate effect size of 0.40 and power of 0.80. Statistical significance is conservatively set at an alpha ≤ 0.05 to minimize the risk of a Type I error that may reject a true null hypothesis.

The risk of a Type II error or accepting the null hypothesis when it is false is affected by sample size, measurement quality, and the strength of underlying variables. One method to reduce the possibility of a Type II error is to use valid and reliable tools such as the SAQ and RMEI. Sample size of a study is important to the power (1-β) of the study and controlling for adequate power reduces the risk of a Type II error. In consultation with a statistician (Dr. M. Gregas, Boston College, 2014) using the assumption of a standard deviation of 1 for paired tests of difference, Cohen's D effect sizes, a significance level of ≤ 0.05 and 0.80 power a sample size of 52 was calculated. In order to achieve a minimum of a moderate effect size, a goal of this study was to have more than 52 subjects with paired tests. This was an optimistic target that did not occur in this study. This will be discussed more in chapters four and five.

Statistical analysis began with a comparison of unit level and pre and post-test frequency distributions and/or descriptive statistics of demographic data, question level data and subscale data. In collaboration with Dr. Gregas, a linear mixed model (LMM) was created to test the research hypotheses. A linear mixed model (LMM) was created to test the interaction of the change in intervention and control units and the pre and post survey mean scores over time, resulting in one significance value for the model. The LMM compares pre and post-survey results both within and between intervention and control groups simultaneously. The LMM is a powerful, flexible analytical modeling option that not only compares means of the data but the model also incorporates the variances and covariances. This model is effective in studies where subjects are measured over time or under different conditions such as a repeated measures design. Under these conditions the LMM is a useful option because it efficiently makes use of all the data. The LMM allows for statistical control of continuous variables (SPSS® 17, 2016; West, Welch & Gatecki, 2015). The model allowed for more random variance to be removed in the analysis to better evaluate the fixed effects therefore reducing the chance of type I errors in the findings (Quene′ & van den Bergh, 2008).

The LMM was set with the following inputs: subjects – id number; categorical factors – unit type and pre/post surveys; continuous covariates – hours worked and years of experience; fixed effects – unit types and pre/post surveys; interaction – per/post surveys*unit types (*= interaction in SPSS); random effects – intercept included. Hours worked and year of experience were the controlling continuous covariates. The LMM was then applied to each dependent variable for testing. If there was no initial significant finding with the interaction, the model was run again with the dependent variable without the interaction. The findings were then evaluated without the interaction by reviewing the significance of the main effects.

Open ended questions. In addition to the quantitative elements of this study, a qualitative aspect was added to provide subjective voice to the critical care nurses' perspective on the actual impact of the PRISM Program on their practice as it relates to safety culture and the recovery of errors. Open ended questions provide quotes in the words of participants and offer description of participant's perspectives. The following two questions were asked at the end of each survey:

1. SAQ - What changes have you made in your practice based on participation in the PRISM Program as it relates to safety culture? Please describe.
2. RMEI - What changes have you made in your practice based on participation in the PRISM Program as it relates to the recovery of errors? Please describe.

All open-ended responses were transcribed and collated by question and survey. Only intervention unit nurses who participated in the PRISM Program received the questions. The questions offer an opportunity to better understand the essence of the experience of participation in the PRISM Program and the impact it may have had on a nurse's practice. The responses provide descriptors of the experience that cannot be captured in the survey responses.

Issues of rigor and threats to validity and reliability. Theoretical models are at the core of deductive reasoning and serve as a basis for prediction and explanation. Probabilistic models, such as this study, offer a set of initial conditions that determine only the probability of possible outcomes. This study applies an empirical approach to knowledge development in nursing in the area of error detection, interception and recovery of adverse patient events. The proposed quantitative approach seeks to acquire a broader understanding of the phenomenon of how nurses can recognize, intervene and/or prevent patient harms and the factors that influence its perception, occurrence, or impact. Summary predictions are probable and may provide nurses

with reasonable expectations of human responses under certain conditions and how these responses might influence outcomes in positive ways. Predictions may then lead to hypotheses that prompt further testing. The analysis and synthesis of the phenomenon of study required precision and careful consideration of how data are best identified, measured and understood to discern the relationships between properties (Weiss, 1995).

A quasi-experimental design was used to test causal hypotheses about manipulated causes, often using control groups and pretest measures to support a counterfactual inference about what would have happened in the absence of the treatment. A comparison group and pre/post test design aides in the examinations of threats to validity (Shadish, Cook & Campbell, 2002). This study design examines causality through testing the effects of the dependent variable on the measurements of the independent variables. As noted, statistical conclusion validity and the effort to maintain the desired level of risk of a Type I error at $p \leq .05$ will be used in the analysis of the data.

To best understand the effects of the treatment, threats to the validity of the study will be controlled as much as possible. The quasi-experimental comparison design is used when randomization is difficult if not impossible. The study is still classified as experimental because it has internal validity if the two groups are comparable on variables important to the study. Threats to external validity are not considered serious to the study because they do not affect the claim that the treatment caused a difference, however the study findings may then be difficult to generalize (Burns & Grove, 2009).

Anticipating threats to the validity of a study assist the researcher in decision making with regard to study design. Burns and Grove (2009, p.257) state that there are four uncontrolled threats to internal validity when using the pretest and posttest design with a comparison group

and are primarily due to the lack of randomization. The four threats include selection maturation, instrumentation, differential statistical regression, and interaction of selection and history. Selection concerns are being addressed through careful comparison unit data in order to select two units that are as similar as possible in demographics (see Sample section). Maturation of subjects was a concern and thus the timing of surveys and length of the study were important to minimize changes that may influence a participant's response while still allowing time for processing of information. Plans for timing of the intervention attempted to minimize any other unit or organizational projects related to the topic of peer review or error. Efforts were made to collaborate with the nursing leadership of the Intervention unit to determine if others events were occurring during this time that may impact the intervention but there were no such incidents (Shadish, Cook & Campbell, 2002).

It is possible that unplanned changes in maturation can and will occur in and outside the work environment that the researcher would not be able to control for and could impact responses. Such changes would be considered a limitation to the study and will be discussed at a later time in Chapter 5. Maturation threats can be decreased by ensuring that groups are of the same approximate ages and/or years of experience on units. In addition, consideration was also given to the possibility that events could occur between the beginning of the treatment and the posttest that could produce the observed outcome in the absence of the treatment (Shadish, Cook & Campbell, 2002).

Testing and instrumentation can be threats to the internal validity of a study. Valid and reliable instruments have been selected for this study design. The same instruments will be used both pre and posttest. Testing effects can occur when a participant takes a test again. The larger the interval between tests can be a strategy to reduce testing effects (Shadish, Cook, & Campbell,

2002). This study made controlled for the timing interval between testing and the length of time testing was available.

Regression to the mean can occur in quasi-experimental designs when treatments are made available to those with higher scores as compared to those with more average scores. If participants with more extreme scores are used there may be tendency for them to score less extreme on other measures, including retests. Regression toward the mean can be easily confused with the treatment effect. Gathering as much data as possible, adding a pre-test and a control group to the quasi-experimental design reduces those threats (Shadish, Cook & Campbell, 2002, p.161).

Applying social exchange theory to the survey design was important for good response rates. Social exchange theory is a method for motivating participants to respond to surveys and suggests three key elements (Dillman, Smyth, & Christian, 2009 p.23):

1. How can perceived rewards for responding be increased?
2. How can the perceived costs of responding be reduced?
3. How can trust be established so that people believe the rewards will outweigh the costs of responding?

These three elements were incorporated into the study design by providing an incentive for participation (iPAD mini), minimizing survey burden, promoting confidentiality, appealing to nurse's ethical obligation to do no harm to patient's, and promoting patient safety by learning from error.

Institutional Review Board Approvals

Protection of human subjects. This study was approved by the Boston College (Appendix IV.) and Partners (Appendix V.) Institutional Review Boards (IRB). Participants received informed consent for the study in writing in the introduction of all surveys (pre and post) and at the beginning of each PRISM Program case study session. Completion of surveys was considered a proxy for consent. Participants signed an attendance list at the start of each PRISM Program session indicating informed consent and their voluntary attendance. In order to maintain confidentiality participants' names were kept in a locked file in the researcher's office to quantify the numbers of participants only. No transcripts were made of the sessions and only notes of suggestions for improvement in practice were taken.

Pre and post surveys were matched with a participant generated code number in the RedCap survey tool and by demographic information if necessary. Surveys were offered on-line through a secure database and via an internet link only. Participants' email addresses were not used or tracked. Participants received the surveys by emails sent by their nurse director with a link to the survey. A QC code was also provided for scanning and downloading to an electronic device.

Institutional Review Board (IRB) criteria. The study met the IRB criteria per the United States (U.S.) Department of Health and Human Services (HHS) requirements (U.S. HHS, 2015) and the Institutional Review Board requirements for Boston College and the academic medical center. Exposures to unnecessary risks for participation in the study were reasonable and minimized in relation to the benefits; efforts to maintain confidentiality were utilized as previously described. Participants were employees and considered a vulnerable population in the sense that they may feel their practice and knowledge may be exposed to scrutiny by their peers

and leadership during case reviews. The role of this researcher to participate in the study as a researcher and not as the Director of Quality and Safety is an important point and was disclosed to participants prior to case study sessions. There was no coercion from the researcher to complete surveys or participate. In order to protect participants' rights and welfare surveys were sent directly via email as an internet link from nurse directors and not to individual email addresses by the researcher.

Emphasis was placed on the confidentiality of the sessions. Participants were reminded that names of participants should not be mentioned in following conversations about the sessions. There was no taping of the sessions. Safety culture characteristics and a non-punitive environment where the goal is to learn from case reviews were described. The only notes taken from the case study session were ideas for improvement. Participants were informed that agreed upon practice concerns for patient safety issues that arise during PRISM Program case studies may need to be communicated to the appropriate people. Survey data was acquired using the RedCap, a confidential on line survey tool endorsed by the Harvard Catalyst.

Informed consent. Informed consent met the United States (U.S.) Department of Health and Human Services (HHS) requirements (U.S. HHS, 2015) and the Institutional Review Board requirements for Boston College and Partners, the academic medical center where the study took place. Informed consent was provided in English, the language understandable to the participants. The study was announced to the participants 2 weeks prior to the start of the study, allowing time for participants to consider whether or not they were interested in participation and to reduce any sense of undue influence. A statement about the study that included the purpose of the research, duration of participation, description of the procedure, risks and benefits, confidentiality, and compensation, was included with the introductions to both surveys and at the

start of the PRISM Program. Completion of the surveys indicated informed consent. A log of the participants who attended the PRISM Program sessions and received the informed consent was completed and maintained by the principal investigator (PI). Logs are kept in a confidential locked area in the PI's office and will be destroyed following completion of the study. Participants were informed that participation was voluntary and there was no penalty for not participating or for discontinuing participation at any time. The researcher's name and contact information was provided for any questions. Informed consent for this study is provided as Appendix III.

Summary

In conclusion, this chapter has described in detail the methods that were used to address the aims of this research study. The methods were designed to evaluate the Peer Review Impacts Safety and Medical-errors (PRISM) Program on critical care nurses' attitudes of safety culture and awareness of the recovery of medical errors and impact on their nursing practice.

CHAPTER FOUR

RESULTS

CHAPTER FOUR
FINDINGS

This chapter describes the findings from this study that evaluated the effects of an adverse event nursing peer review intervention, the Peer Review Impacts Safety and Medical-errors Program (PRISM), on critical care nurses' perceptions of safety culture and awareness of the recovery of medical errors. This chapter is organized into the following categories: access and retention; description of the participants; statistical and quantitative analysis; and summary.

Specifically, this study compared pre and post-test results from the Safety Attitudes Questionnaire (SAQ) and the Recovery of Medical Error Inventory (RMEI) within the intervention group and between the intervention and control groups. The subscale outcome measures for the SAQ were teamwork, job satisfaction, stress recognition, perceptions of unit and hospital management, safety climate, and working conditions. The subscale outcome measures for the RMEI were the frequency and seriousness of mistakes and poor judgment. Statements from critical care nurses' survey responses describe the impact of the intervention on their thinking and practice. Descriptive demographic results and statistical analysis are reported to address the research questions. Statistical analysis of the survey data was completed using the software Statistical Package for the Social Sciences (SPSS®), version 17.0.

The research questions for this study were:

1. What is the effect of the PRISM program on critical care nurse's attitudes of safety culture in the academic medical center setting?
2. What is the effect of the PRISM Program on critical care nurse's awareness of the recovery of medical errors in the academic medical center setting?

3. What is the critical care nurse's perception of their practice with regard to safety and recovery of errors, following exposure to the PRISM Program? The following two questions were asked:
    a. What changes have you made in your practice based on participation in the PRISM Program as it relates to safety culture? Please describe.
    b. What changes have you made in your practice based on participation in the PRISM Program as it relates to the recovery of errors? Please describe.

Participant Access and Retention

Following Institutional Review Board (IRB) approval and collaboration with unit nursing leadership, a timeline was decided upon for the launch of this study. Two week notifications were sent to eligible staff nurses in the intervention (n= 95) and control (n=90) units. Notifications were sent via email and postings were placed throughout the two units. Pre-surveys were launched via an email to nurses from nursing directors (ND). To protect subject's confidentiality NDs forwarded the emails from the researcher to their staff nurses with links and QC codes for access to the surveys. All surveys were completed through link access to the survey and no email addresses were maintained by the researcher. Over the 2 week period reminder emails were sent weekly to NDs who forwarded the emails to participants.

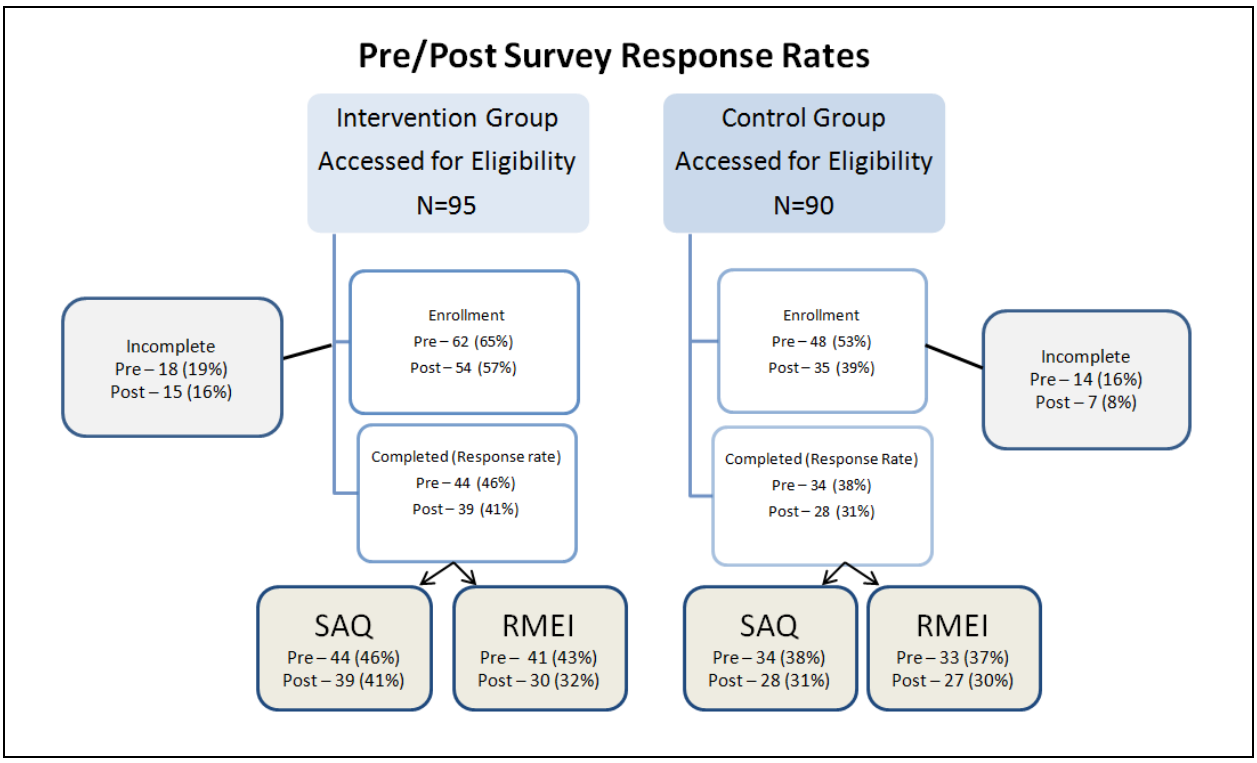
In order to increase access to surveys and obtain as many responses as possible both the pre and post-surveys were kept open for extended periods of time due to lower response rates during the initial 2 week period. In collaboration with unit nursing leadership pre and post-surveys remained open and accessible for 4 weeks with additional email encouragement for completion. Incentives, such as one iPOD mini per unit for those who attempted to complete the survey and candy were used to promote completions. Both the SAQ and RMEI surveys were

included in the same link for ease of access. In addition to the survey link, a 2-D bar code, called a QC Code, was available in the email notifications and on posters for nurses to scan and download the survey, through an app, onto a mobile device for ease of access. The survey could then be completed on nurses' phones if they desired. Instructions were also provided to participants so they could save responses and return to complete the survey at a later time.

Response Rates. Response rates were calculated based on completed SAQ and RMEI surveys and total eligible intervention and control participants. Pre and post Intervention Group SAQ survey response rates were 46% (n=44) and 41% (n=39) and RMEI survey response rates were 43% (n=41) and 32% (n=30) respectively. Pre and post Control Group SAQ survey response rates were 38% (n=34) and 31% (n=28) and RMEI survey response rates were 37% (n=33) and 30% (n=27) respectively. A number of participants initiated the survey by providing demographic information only or partially completed surveys. Ultimately, data from uncompleted surveys were not used in any demographic or survey data analysis and were not included in the final response rates. A complete illustration of Intervention and Control Group eligibility, incomplete surveys and response rates by unit and pre and post-surveys are shown below in Figure 4.1.

Distributing the SAQ and RMEI surveys together in one survey link allowed for a streamlined survey tool however, the result was a survey of 100 and 104 response items for the pre and post-surveys, respectively. Pre-survey response rates were better than post survey response rates by 5-9%. A decrease in survey responses of 1-9% is noted for the second RMEI survey as compared to the SAQ response rates.

Figure 4.1. Accessed for Eligibility, Enrollment and Completed Participant's Survey Results



Description of the Participants

Demographic information was collected from participants at the beginning of the pre and post-surveys. The sample description below summarizes demographic data for participants who completed the pre and post-surveys only. Demographic data from participants who did not complete the surveys is not included. Demographic details of the intervention and control groups are also provided. Demographic data is described using frequency and descriptive measures, significance testing was not conducted. In accordance with the CONSORT (Consolidated Standards of Reporting Trials) statement, significance testing of baseline comparisons in randomized controlled trials should not be conducted because it is considered superfluous and can mislead investigators and readers (de Boer, Waterlander, Kuijper, Steenhuis, & Twisk, 2015). Norman (2010) agrees and goes on to say that even with small sample sizes,

parametric statistics can be used with Likert data with unequal variances and non-normal distributions with no concern for arriving at the wrong conclusions.

Sample description. In the convenience sample the total number of nurse participants was 78 for the pre-survey and 67 for the post-survey. Pre and post-data were not matched to the participants; therefore the pre and post-test groups were independent groups. Pre-survey response rates were 46% for the intervention nurses and 38% for the control nurses. Post-survey response rates decrease to 41% for the intervention group and 31% for the control group. The intervention group had more nurse participant for both surveys. The intervention group had 44 (56%) pre-survey nurse participants and 39 (58%) post-survey nurse participants' surveys. There were more females than male nurses for both the pre (90%) and post (91%) surveys. Overall one third of nurses reported having a certification (pre - 32% and post - 34%). The intervention unit had a higher percentage of nurses that had a certification for both the pre and post-surveys.

The baccalaureate degree was most frequently reported as the highest education by both the pre (78%) and post (85%) survey nurses. Fourteen (14%) percent of pre-survey nurses reported having a degree higher than a baccalaureate degree (masters, doctorate or PhD) and 8% reported having a lower degree (diploma or associate). Post-survey nurses reported 7.5% of degrees higher or lower than the baccalaureate degree. Only two (2.6%) control unit nurses in the pre-survey identified as having doctorate level degrees. Overall more intervention unit nurses reported having a baccalaureate degree or higher than the control unit nurses for both the pre and post-surveys by 2.6% and 3% respectively.

Nurses work hours ranged from 1-40 hours per week with the means ranging from $\bar{X}$ = 33-35.39. The intervention unit nurses' work hour means were greater than the control group

nurses' means by $\bar{X}$ = 2.39 and $\bar{X}$ = 1.53 for the pre and post-surveys respectively. Years of experience ranged from 1- 39 years. Nurses in the intervention group reported more years of experience for both the pre and post-surveys. The mean years of experience for the intervention nurses exceeded the control group nurses by $\bar{X}$ = 0.97 years for the pre-survey and $\bar{X}$ = 4.17 years for the post-survey. A detailed overview of demographic data is provided in Table 4.1.

Table 4.1. Demographic Data

	Intervention Group 1		Control Group 2	
	Pre-survey n=44	Post survey n= 39	Pre-survey n=34	Post-survey n=28
Gender	Male -2 (5%) Female – 42 (95%)	Male – 2 (5%) Female -37 (95%)	Male – 6 (18%) Female – 28 (82%)	Male – 4 (14%) Female – 24 (86%)
Education	Dip/Assoc – 3 (7%) Bacc – 37 (84%) MS – 4 (9%)	Dip/Assoc – 2 (5%) Bacc –35 (90%) MS –2 (5%)	Dip/Assoc – 3 (9%) Bacc –24 (70%) MS –5 (15%) DNP/PhD –2 (6%)	Dip/Assoc – 3 (11%) Bacc – 22 (78%) MS – 3 (11%)
Certification	Yes – 17 (39%)	Yes –16 (41%)	Yes –8 (24%)	Yes – 7 (25%)
Years worked	10.18 (sd 9.27) Range 1-36	11.10 (sd 10.98) Range 1-39	9.21 (sd 8.40) Range 1-35	6.93 (sd 5.45) Range 1-19
Hours worked	35.39 (sd 7.61) Range 1-40	35.03 (sd 6.49) Range 12-40	33.00 (sd 7.77) Range 12-40	33.50 (sd 7.92) Range 12-40

Group 1 - Intervention unit demographics. Nurses in the intervention unit were 95% female and reported having a certification for the pre and post surveys of 38% (n=17) and 41% (n=16). The majority of the nurses in the intervention unit reported a baccalaureate degree of higher for both the pre and post surveys (91% and 92.3%). Years of experience ranged from 1-39 years with a pre survey mean of $\bar{X}$ = 10.16 and a post survey mean of X = 11.10. The mean of work hours was $\bar{X}$ = 35.39 for the pre survey and $\bar{X}$ = 35.03 hours for the post survey. Work hours ranged from 1-40 hours.

Case study participants. A total of 42 nurses (44%) of the 95 eligible nurses participated in the PRISM Program case study sessions (See Table 4.2.). The PRISM Program consisted of

four different case studies. Each case study was offered twice over a four-week period, for a total of eight case study sessions. Case study attendance ranged from 2-8 participants per session, with a mean attendance of $\bar{X}$ = 5.25. The case study sessions offered on the day shift had the most participants (8) and the one case study offered on the night shift at 5AM had the least number of participants (2).

Case study participants and post survey respondents. A total of 20 (51% of all post survey participants) nurses who completed the post survey also reported that they attended at least one case study (48% of those who attended case study sessions). Of the 20 nurses who reported that they attended a case study, 6 reported they attended 2 case studies. Post survey participants reported attending a total of 26 case study sessions. Based on the total of 42 case study participants, 22 (52%) case study participants did not complete the post survey.

Table 4.2. PRISM Program Case Study Participation

	Session A	Session B	Total
Case study #1	7	4	11
Case study #2	2	8	10
Case study #3	5	4	9
Case study #4	6	6	12
Total			**42**

Group 2 - Control unit demographics. The control unit nurses were predominately female for both the pre (82%, n=28) and post (86%, n=24) surveys. Nurses in the control unit reported pre (n=8, 23.5%) and post (n=7, 25%) surveys results for certifications. Most nurses in the control unit reported they had a baccalaureate degree or higher for both surveys (pre=88% and post=89%). The control unit also had 2 nurses with doctorate degrees in the pre-survey only.

Years of experience ranged from 1-35 years. The control unit nurses' mean years of experience for the pre survey were $\bar{X}$ = 9.21 and $\bar{X}$ = 6.93 for the post survey. Nurses' range of hours worked were 12-40 with mean results of $\bar{X}$ = 33 (pre survey) and $\bar{X}$ = 33.50 (post survey).

Treatment fidelity. The PRISM Program treatment was offered to nurses in the intervention unit only and included didactic information and four fictional case studies. Case studies were reviewed for content validity by a panel of four quality and safety experts and the details of the program development can be reviewed in Chapter 3. The same didactic information was presented at each case study followed by a case presentation and discussion. The Principle Investigator (PI) presented all eight case studies. Field notes on case discussion were taken using a fishbone diagram. Case study participation can be viewed in Table 4.2.

The PRISM Program case study sessions were made available to as many nurses as possible. Each case study was offered twice for a total of eight opportunities for the intervention unit nurses to attend sessions. Case study sessions were offered over a four-week period, on different days and at different times. Flexibility with the case study schedule was necessary. Dates and times had to be changed a number of times upon the request of the nursing leadership due to unit based conflicts such as patient volume and acuity. However, not all nurses in the intervention unit participated in a case study session.

Quantitative Data Analysis

A process for preparing the data for analysis was conducted. Incomplete surveys were eliminated, negatively worded questions were rescored and subscales were created. In order to complete the analysis, the two separate pre and post survey data sets were then merged into one dataset for analysis. The SAQ uses a 5-point Likert scale however SAQ subscales were created in accordance with SAQ calculations, resulting in mean percentage scores. RMEI subscales

were calculated from the 3-point Likert scale resulted in mean scores. Following a review of frequency and descriptive demographic data described above, statistical analyses were completed to test the research hypotheses.

To test the research hypotheses, SPSS® 17.0 was used to analyze descriptive and inferential statistics. Significance level was set, a priori, at $p \leq 0.05$. A linear mixed model (LMM) was created to test the interaction within the intervention unit and between the intervention and control units' pre and post survey mean subscale scores over time. All subscales from both the SAQ and RMEI were tested using the LMM. The LMM resulted in one significance value for the model. A non-significant finding generated a re-test of the LMM without the interaction to analyze the main effects of the unit type and the pre and post-test mean scores of the subscales. A significance of $p \leq 0.05$ directed attention to where the significance was occurring for further exploration, either within the intervention group and/or between the intervention and control groups. The dependent variables were then tested individually using this model, while controlling for the two demographic factors that were continuous variables: years as a critical care nurse and hours worked per week. The statistical LMM was set with the following inputs; subjects – identification numbers; categorical factors – unit type and pre/post survey; continuous covariates – experience and hours worked; fixed effects – pre/post survey and unit type; and the interaction –combined pre/post survey and unit type.

Research hypothesis 1. The research hypothesis was: critical care nurse's SAQ scores on the intervention unit post-implementation of the PRISM Program will be higher than pre-intervention scores and higher than the control unit nurse's scores. This research hypothesis was tested using the SAQ survey and calculated subscales that reflect the safety culture attitudes of the intervention and control unit nurses pre and post implementation of the PRISM Program.

The SAQ is a valid and reliable tool and a difference of 10.00 percentage points or greater is considered significant. In this study the analysis showed the difference in mean scores was $\bar{M}$ 11.30 (Sexton, et al., 2006). Details about the SAQ can be found in Chapter 3.

The seven subscales for the SAQ are teamwork, job satisfaction, stress recognition, perceptions of unit and hospital management, safety climate, and working conditions. The reported range of Cronbach's alpha results for the SAQ subscales is 0.74-0.93 (Holden, Watts, & Hinton, 2009). Sexton (2006) reports the Raykov's ρ coefficient as 0.90 indicating strong reliability of the SAQ. A reliability analysis of the survey data from this study showed a range of Cronbach's alpha results of 0.798-0.902, displayed in Table 4.3. These findings demonstrate good internal consistency. The LMM tested the interaction of the change in the pre and post-survey mean scores of the intervention and control nurses over the same time period. If the initial LMM interaction test was not significant then the main effects were explored. Subscale main effects were reported if they were statistically significant. A complete overview of the SAQ subscale findings is provided at then of this section in Table 4.10.

Table 4.3. Cronbach's Alpha Results Using PRISM Program SAQ Survey Data

Subscale	Cronbach's alpha
Teamwork	**0.833**
Job satisfaction	**0.902**
Stress recognition	**0.803**
Perceptions of unit management	**0.882**
Perceptions of hospital management	**0.843**
Safety climate	**0.835**
Working conditions	**0.798**

Total SAQ scores. Descriptive statistics of the total SAQ mean scores showed a decrease in mean scores of $\bar{X}$ =76.80 and $\bar{X}$ =72.21 for the intervention unit pre/post-surveys and an increase in mean scores of $\bar{X}$ =78.85 and $\bar{X}$ =80.35 for the control unit pre/post-surveys (See Table 4.2). There was no significant difference (p = 0.202) within or between the intervention and control group nurses' total SAQ scores using the LMM analysis with the interaction. A follow up analysis examining the main effects using the LMM without the interaction demonstrated that there was no significant difference (p = 0.390) in the pre/post main effects but there was a significant difference between units (p = 0.041) (See Table 4.4). This finding indicates a significant difference in the decrease in the nurses' post scores in the intervention unit compared to the increase in the nurses' post scores in the control unit.

Figure 4.2. Total SAQ Mean Results

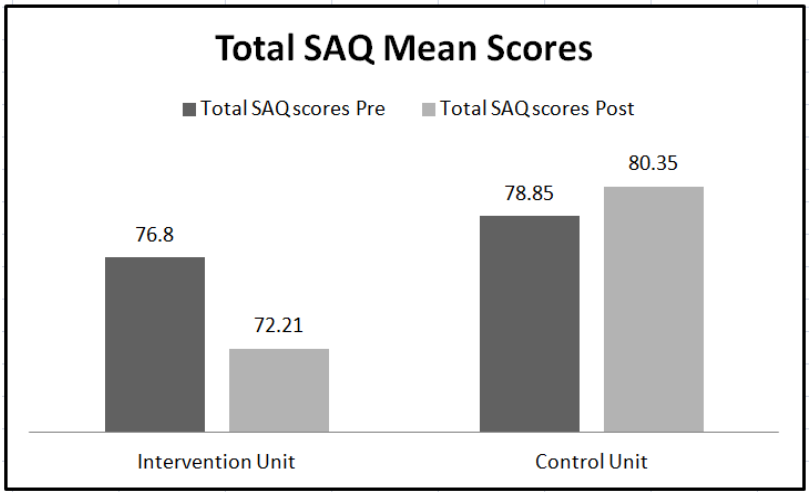


Table 4.4. Main Effects of the SAQ Total Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	76.80	72.21	$p = 0.390$
Control Unit	78.85	80.35	NS
Significance	NS	$p = 0.041$*	

Teamwork. There was no significant difference within the intervention nurses' pre and post-survey scores or between the intervention and control nurses' scores on the teamwork subscale (See Figure 4.2 and Table 4.4). The teamwork post survey mean score for the nurses from the intervention group was lower than the pre survey score ($\bar{X}$ =81.72 to $\bar{X}$ =77.14). Conversely, the control nurses' mean teamwork post survey score increased from $\bar{X}$ =86.40 to $\bar{X}$ =88.54. A further review of the subscale after removing the interaction from the LMM resulted in a significant (p =0.009) finding between units, indicating that the difference between nurses' post-survey scores from the intervention and control units was significant.

Figure 4.3. Teamwork Subscale Mean Results

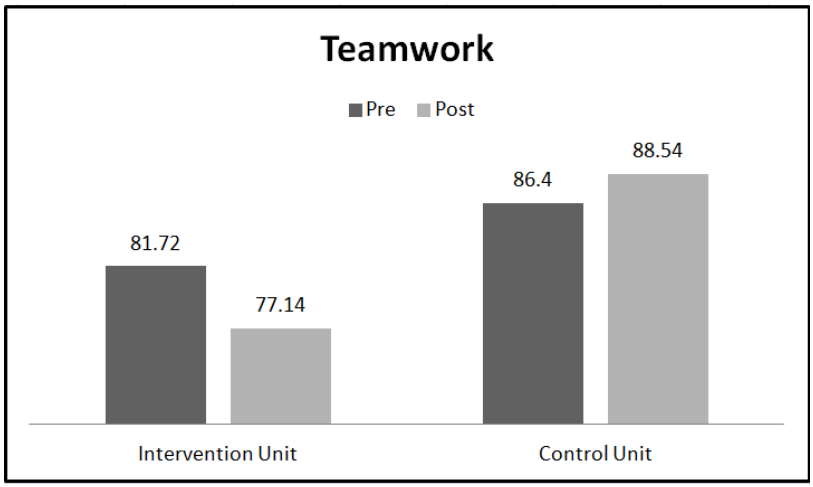


Table 4.5. Main Effects of Teamwork Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	81.72	77.14	$p = 0.556$
Control Unit	86.40	88.54	NS
Significance	NS	$p = 0.009$*	

Job satisfaction. The nurses from the intervention unit job satisfaction mean post survey score increased from $\bar{X} = 75.00$ to $\bar{X} = 77.18$ and in the control group, the nurses' score also increased from $\bar{X} = 85.45$ to $\bar{X} = 90.00$ (See Figure 4.3.). However, there was no significant difference ($p = 0.727$) between the intervention and control nurses or within the intervention nurses' pre and post-test mean scores. Additional testing of the LMM without the interaction demonstrated a significant ($p = 0.001$) finding between the nurses' post-survey scores from the intervention and control units (See Table 4.5.). The difference in the post-survey mean scores is 12.82.

Figure 4.4. Job Satisfaction Subscale Mean Results.

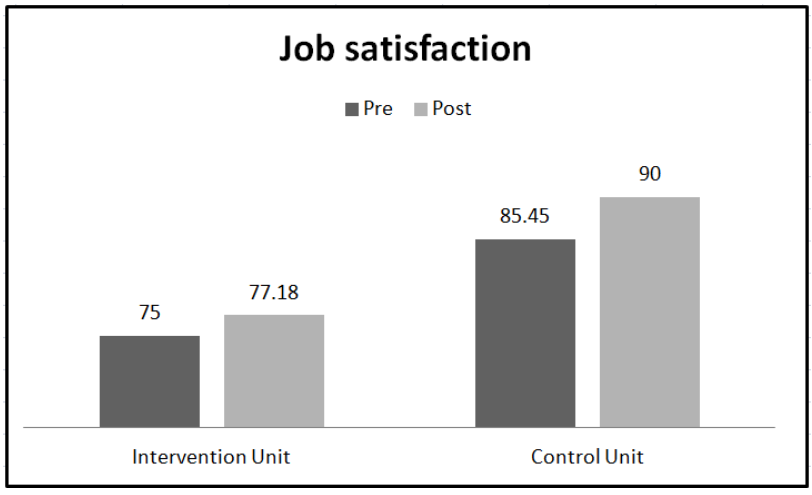


Table 4.6. Main Effects of Job Satisfaction Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	75.00	77.18	$p = 0.342$
Control Unit	85.45	90.00	NS
Significance	NS	$p = 0.001$*	

Stress recognition. The intervention nurses' stress recognition mean post survey score increased following the treatment from $\bar{X}$= 67.15 to $\bar{X}$= 68.59 and conversely the control nurses' mean score decreased from $\bar{X}$= 70.45 to $\bar{X}$= 67.36 (See Figure 4.4.). These scores did not demonstrate a significant difference in mean stress recognition scores within the intervention group or between groups (p = 0.549). A further review of the LMM without the interaction did not result in any significant findings (See Table 4.6.).

Figure 4.5. Stress Recognition Subscale Mean Results

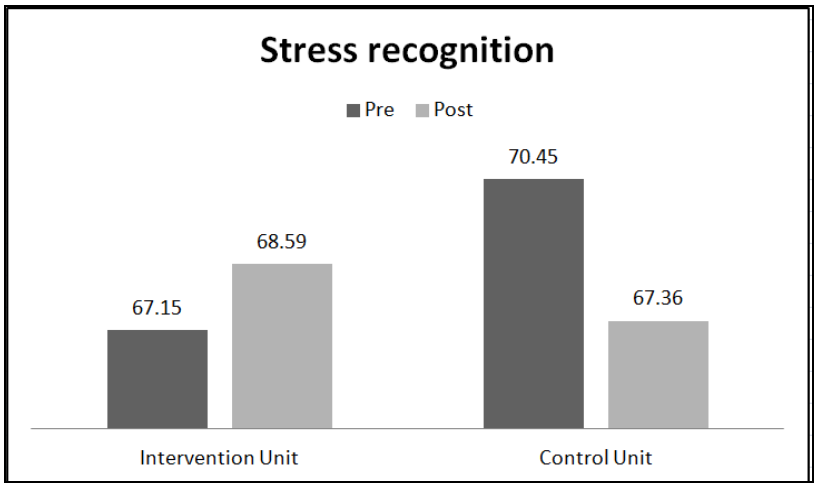


Table 4.7. Main Effects of Stress Recognition Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	67.15	68.59	$p = 0.900$
Control Unit	70.45	67.36	NS
Significance	NS	$p = 0.747$	

Perceptions of unit management. In the intervention group, the nurses' perceptions of unit management mean score decreased from $\bar{X}$= 69.38 to $\bar{X}$= 68.09 while the control nurses' mean score increased from $\bar{X}$= 70.10 to $\bar{X}$= 72.12 (See Figure 4.5.). The interaction effect of the differences within the intervention nurses' mean pre and post survey scores and between intervention and control nurses' mean scores over the same time period was not statistically significant (p = 0.678). There were no statistically significant findings following testing of the LMM without the interaction (unit p = .578 and pre/post p = 0.978) (See Table 4.7.).

Figure 4.6. Unit Management Subscale Mean Results

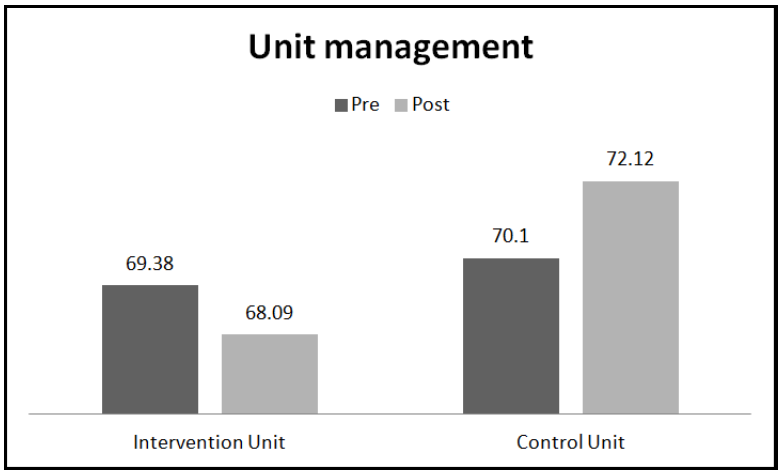


Table 4.8. Main Effects of Unit Management Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	69.38	68.09	$p = 0.978$
Control Unit	70.10	72.12	NS
Significance	NS	$p = 0.578$	

Perceptions of hospital management. The LMM analysis of the subscale of perceptions of hospital management was not significant ($p = 0.251$). Intervention unit nurses' perceptions of the hospital management decreased post intervention from $\bar{X} = 71.46$ to $\bar{X} = 66.53$ and the control unit nurse's perception increased from $\bar{X} = 74.85$ to $\bar{X} = 77.59$ (See Figure 4.6.). A further review of the main effects with the interaction removed from the LMM demonstrated a statistically significant ($p = 0.0400$) finding in scores between nurses' post survey results from the intervention nurses' mean score of 66.53 and the control nurses' post survey mean score of 77.59, a difference of 11.06 (See Table 4.8.).

Figure 4.7. Hospital Management Subscale Mean Results

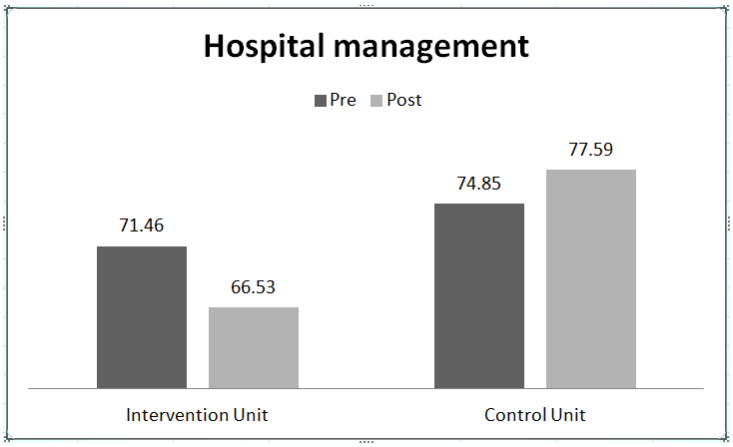


Table 4.9. Main Effects of Perceptions of Hospital Management Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	71.46	66.53	$p = 0.633$
Control Unit	74.85	77.59	NS
Significance	NS	$p = 0.040$*	

Safety climate. The safety climate mean scores for the intervention nurses' decreased from $\bar{X} = 89.29$ to $\bar{X} = 77.01$. The control nurses' safety climate mean score also decreased from $\bar{X} = 92.97$ to $\bar{X} = 87.83$ (See Figure 4.7.). The interaction between the intervention nurses' mean scores and the control nurses' mean scores or the pre and post-test scores was not statistically significant ($p = 0.151$). However, when the interaction was removed from the LMM and the main effects were assessed there were two significant findings (See Table 4.9.). There was a statistically significant difference within the intervention nurses' pre and post mean scores ($p = 0.000$) and between the intervention and control nurses' pre and post mean safety climate scores ($p = 0.006$).

Figure 4.8. Safety Climate Subscale Mean Results

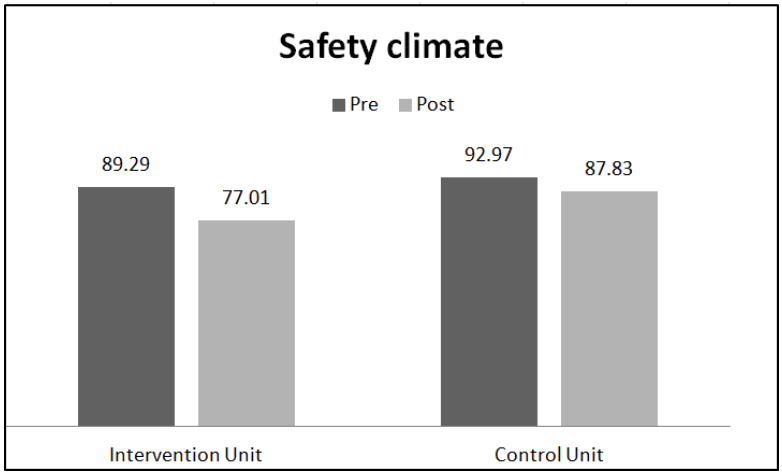


Table 4.10. Main Effects of Safety Climate Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	89.29	77.01	$p = 0.000$*
Control Unit	92.97	87.83	NS
Significance	NS	$p = 0.006$*	

Working conditions. The LMM interaction for working conditions was statistically significant ($p = 0.037$). A significant interaction indicates that there is a statistically significant difference in mean working conditions scores between the control and intervention nurses and within the intervention nurses' pre and post survey scores. Intervention nurses' working conditions post survey mean scores decreased significantly from $\bar{X} = 78.51$ to $\bar{X} = 69.97$ as compared to an increase in the control nurses' mean scores of $\bar{X} = 77.82$ to $\bar{X} = 82.0$ (See Figure 4.8.) . There is also a significant difference between the intervention nurse's post survey perceptions as compared to the control nurse's working conditions perceptions with mean scores of $\bar{X} = 69.97$ and $\bar{X} = 82.18$. There was more variation in the intervention nurses' results with a standard deviation of 18.75-20.69. The control unit's mean scores standard deviation were 16.12 for the pre survey and 11.85 for the post survey.

Figure 4.9. Working Conditions Subscale Mean Results

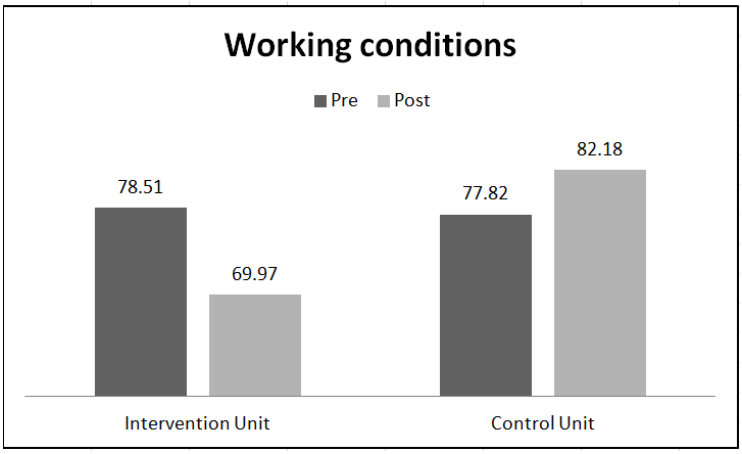


Table 4.11. Summary of Safety Attitudes Questionnaire Analysis

Dependent variable	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28	Significance $P \leq .05$*	Significance without interaction $P \leq .05$*
Teamwork	81.72 (sd 19.40)	86.40 (sd 11.98)	77.14 (sd 22.54)	88.54 (sd 10.18)	0.255	Unit 0.009* Pre/post 0.556
Job satisfaction	75.00 (sd 23.94)	85.45 (sd 14.38)	77.18 (sd 21.67)	90.00 (sd 14.87)	0.727	Unit 0.001* Pre/post 0.342
Stress Recognition	67.15 (sd 23.31)	70.45 (sd 19.15)	68.59 (sd 21.58)	67.36 (sd 24.35)	0.549	Unit 0.747 Pre/post 0.900
Perceptions of unit management	69.38 (sd 24.45)	70.10 (sd 21.70)	68.09 (sd 24.99)	72.12 (sd 20.06)	0.678	Unit 0.578 Pre/post 0.978
Perceptions of hospital management	71.46 (sd 19.98)	74.85 (sd 18.89)	66.53 (sd 21.27)	77.59 (sd 15.34)	0.251	Unit 0.040* Pre/post 0.633
Safety climate	89.29 (sd 14.39)	92.97 (sd 11.31)	77.01 (sd 18.98)	87.83 (sd 10.16)	0.151	Unit 0.006* Pre/post 0.000*
Working conditions	78.51 (sd 18.75)	77.82 (sd 16.12)	69.97 (sd 20.69)	82.18 (sd 11.85)	0.037*	NA

sd = standard deviation

Summary of hypothesis 1. Hypothesis 1was not supported. There was one statistically significant finding within the LMM, working conditions; however the intervention nurses' post-survey results were significantly decreased from pre survey results and were significantly less than the control nurses' mean scores. The original hypothesis was directional with regard to the intervention nurses' post survey scores increasing and that scores would be significantly higher

than the control nurses' post survey scores. In fact, in 6 out of 7 subscales the intervention unit post mean scores decreased from the pre survey mean scores. Stress recognition was the only intervention nurses' mean score that increased. These results are in direct contrast to the control nurses' post mean scores that increased in 5 out of 7 subscales. Stress recognition had an opposite effect in the control unit by decreasing, while increasing in the intervention unit. Control nurses' safety climate scores also decreased but to a lesser degree than the nurses' from the intervention unit. A total summary of the SAQ LMM findings can be viewed in Table 4.10.

Research hypothesis 2. The research hypothesis was: critical care nurses' RMEI scores on the intervention unit post-implementation of the PRISM Program would be higher than pre-intervention scores and higher than the control nurses' scores. This research question was tested using the RMEI survey subscales that reflect a nurse's awareness of the frequency and seriousness of medical errors that may occur in the critical care setting. The LMM tested the interaction of the pre and post-test results of the survey subscales both between and within the intervention and control nurses simultaneously.

The four subscales for the RMEI were frequency-mistake, frequency-poor judgment, seriousness-mistake and seriousness-poor judgment. The subscales are reported to have good internal consistency with Cronbach's alpha results of 0.88 for mistake and 0.75 for poor judgment (Dykes, Rothschild & Hurley, 2010). PRISM Program RMEI survey results indicate a Cronbach's alpha range of 0.849 – 0.974, displayed in Table 4.12. A complete overview of the RMEI LMM findings, with and without the interaction, is provided in Table 4.17.

Table 4.12. Cronbach's Alpha Results Using PRISM Program RMEI Survey Data

Subscale	Cronbach's alpha
Frequency - mistake	**0.849**
Frequency – poor judgment	**0.864**
Seriousness - mistake	**0.974**
Seriousness – poor judgment	**0.948**

Frequency - mistake. The mean frequency-mistake post-survey score for the intervention group nurses increased from $\bar{X}$= 23.73 to $\bar{X}$ = 24.27 and the control group nurses' mean score decreased from $\bar{X}$ = 23.09 to $\bar{X}$ = 22.81 (See Figure 4.9.). However, there was no statistically significant difference in the frequency-mistake scores (p = 0.668) either within the intervention group or between the intervention and control groups (See Table 4.12.).

Figure 4.10. Frequency-Mistake Subscale Mean Results

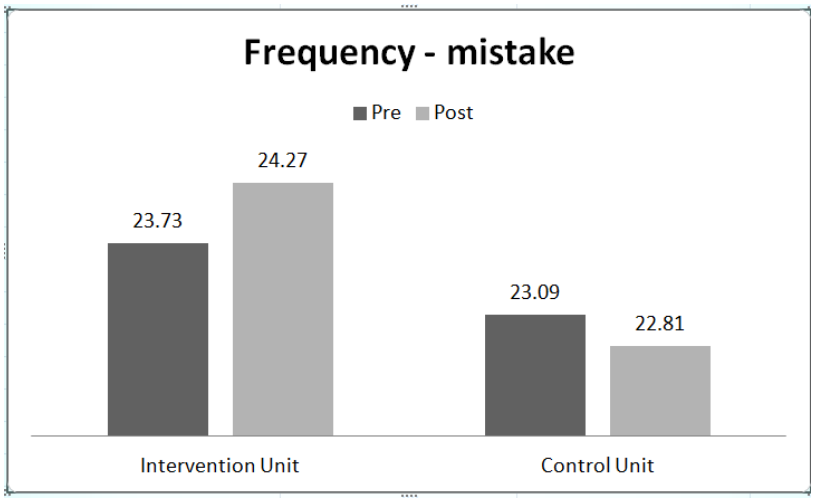


Table 4.13. Main Effects of Frequency - Mistake Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	23.73	24.27	$p = 0.864$
Control Unit	23.09	22.81	NS
Significance	NS	$p = 0.288$	

Frequency - poor judgment. The mean post survey frequency-poor judgment score for the intervention nurses increased from $\bar{X} = 12.63$ to $\bar{X} = 12.87$. Conversely, the control nurses' mean post-survey score decreased from $\bar{X} = 11.64$ to $\bar{X} = 11.44$ (See Figure 4.10.). Yet, there was no statistically significant difference in the frequency-poor judgment scores ($p = 0.753$) (See Table 4.13.).

Figure 4.11. Frequency-Poor Judgment Subscale Mean Results

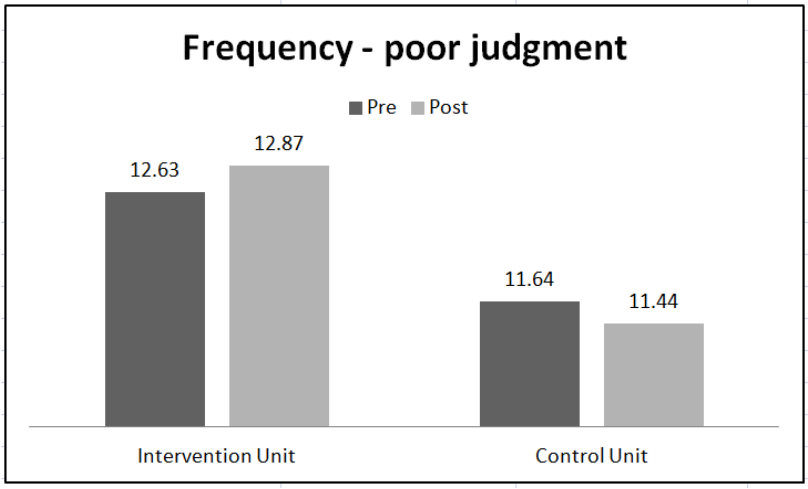


Table 4.14. Main Effects of Frequency – Poor Judgment Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	12.63	12.87	$p = 0.956$
Control Unit	11.64	11.44	NS
Significance	NS	$p = 0.078$	

Seriousness - mistake. Both the intervention nurses and the control nurses' mean post-survey seriousness-mistake scores increased. The intervention nurses' mean score increased from $\bar{X} = 25.45$ to $\bar{X} = 26.27$ and the control nurses' mean score increased from $\bar{X} = 25.03$ to $\bar{X} = 26.77$ (See Figure 4.11.). However, there was no statistically significant difference in the seriousness- mistake score ($p = 0.805$) (See Table 4.14.).

Figure 4.12. Seriousness-Mistake Subscale Mean Results

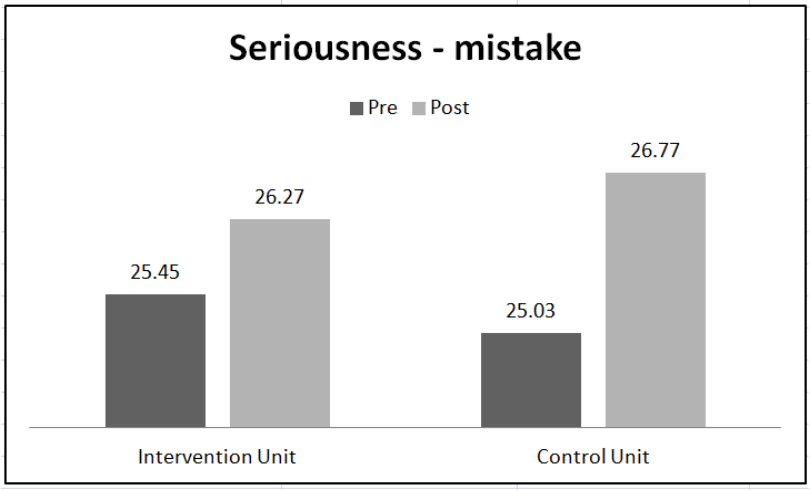


Table 4.15. Main Effects of Seriousness - Mistake Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	25.45	26.27	$p = 0.501$
Control Unit	25.03	26.77	NS
Significance	NS	$p = 0.997$	

Seriousness - poor judgment. There was also an increased in both the intervention nurses and control nurses' post-survey mean seriousness-poor judgment scores. The intervention nurses' mean score increased from $\bar{X} = 12.11$ to $\bar{X} = 12.40$ and the control nurses' mean score increased from $\bar{X} = 11.78$ to $\bar{X} = 12.04$ (See Figure 4.12.). Nonetheless, there was no statistically significant difference in the seriousness-poor judgment scores ($p = 0.983$), between groups and within the intervention group (See Table 4.15.).

Figure 4.13. Seriousness-Poor Judgment Subscale Mean Results

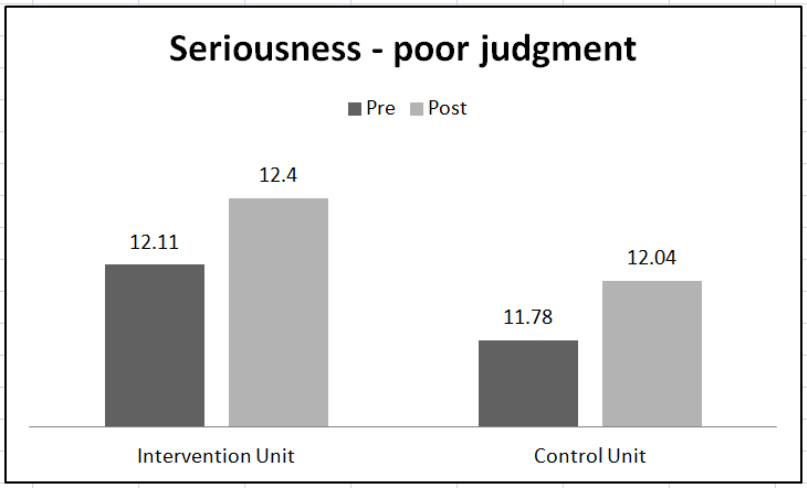


Table 4.16. Main Effects of Seriousness – Poor Judgment Subscale Mean Scores

	Pre survey	Post survey	Significance
Intervention Unit	12.11	12.40	$p = 0.749$
Control Unit	11.78	12.04	NS
Significance	NS	$p = 0.694$	

Table 4.17. Summary of Recovered Medical Error Inventory Analysis

Dependent variable	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28	Significance P ≤ .05*	Significance without interaction P ≤ .05
Frequency - mistake	23.73 (sd 5.37)	23.09 (sd 5.06)	24.27 (sd 5.87)	22.81 (sd 5.01)	0.668	Unit - 0.288 Pre/post - 0.864
Frequency – poor judgment	12.63 (sd 4.19)	11.64 (sd 3.23)	12.87 (sd 4.01)	11.44 (sd 3.62)	0.753	Unit - 0.078 Pre/post - 0.956
Seriousness - Mistake	25.45 (sd 10.04)	25.03 (sd 10.04)	26.27 (sd 9.71)	26.77 (sd 11.60)	0.805	Unit - 0.997 Pre/post - 0.501
Seriousness – poor judgment	12.11 (sd 4.81)	11.78 (sd 4.72)	12.40 (sd 4.62)	12.04 (sd 5.29)	0.983	Unit - 0.694 Pre/post - 0.749

sd = standard deviation

Summary of hypothesis 2. Hypothesis 2 was not supported. Within the LMM there was no statistically significant difference in intervention nurses' post survey mean scores and between the intervention nurses and control nurses' mean scores. There were also no significant findings in any of the main effects following removal of the interaction in the LMM. Hypothesis 2 was directional with a premise that intervention nurses' post mean scores would be higher than pre scores and the mean scores would be higher than the control nurses' mean scores. Although not significant, there was an increase in intervention nurses' post survey mean scores in all four subscales. The intervention nurses' post survey scores were also higher than the control nurses'

scores in 3 of 4 subscales. Seriousness-mistake was the one subscale that was higher in the control nurses' post survey mean scores. A complete overview of the RMEI LMM findings can be seen in Table 4.16.

Research Question Analysis

Research question 3. The research question was: open ended questions will provide insight into further understanding the effect of the PRISM program on intervention unit critical care nurse's practice, as it relates to safety culture and recovery of medical errors. Survey logic was used to provide a descriptive question following the completion of each survey to nurses who stated they participated in at least one PRISM Program case study session. One question was asked the end of each survey. Responses to these questions assist in providing some insight into the thinking of nurses following exposure to the didactic and clinical review of an adverse event case study. There were a total of 20 respondents who completed the post surveys and had participated in PRISM Program case study sessions, six (30%) of these respondents provided comments to the descriptive questions. Of note, 2 provided responses to both questions. One nurse wrote that she made no changes to her practice for both questions.

Question 1. What changes have you made in your practice based on participation in the PRISM Program as it relates to safety culture?

Five (25%) of the 20 nurses who attended a case study session and completed the SAQ post survey added descriptive responses. All of these nurses attended one case study session and one nurse attended two PRISM Program adverse event case study sessions. One of the five nurses stated she made no change in her practice. Four nurses made comments about changes they had made in their practice based on participation in the PRISM Program. The comments were:

1. RN # 1 attended case study #2 wrong blood bank sample: “Double check labs”
2. RN# 2 attended case study #1 wrong medication: “Being more open to discussing errors”
3. RN #3 attended case study #1 wrong medication: Double check everything and ask more questions
4. RN # 4 attended case study #3 delay in response to alarms and #4 patient fall with injury: “When I enter a patient’s room and I know I am going to be unable to answer alarms I try to be cognizant of who might be available to answer other alarms or call bells for me. There are times that a patient must use a bedpan rather than be out of bed (OOB) to a commode because I cannot spare the time to stay with the patient while on the commode and the patient has invasive lines that dictate RN must stay with him, not a tech.”
5. RN #5 attended case study attended case study #3: “None”

Question 2. What changes have you made in your practice based on participation in the PRISM Program as it relates to the recovery of medical errors?

Of the 20 nurse who completed post-test surveys and participated in the PRISM Program case study sessions, three (15%) offered comments about changes in their practice as it related to the recovery of medical errors. One of the three nurses specifically stated she made no changes in her practice. Two nurses made comments about changes they made in their practice. The two nurses attended one case study each and both had attended case study session one about a wrong medication given. The nurses made the following comments:

1. RN #3, attended case study #1 wrong medication: “More diligent with scanning and looking at packaging”

2. RN #5 attended case study #3 delay in response to alarms: “None”
3. RN #6 attended case study #1 wrong medication: “ Triple checking things”

Summary of research question 3. Research question 3 was supported to some degree by comments made by a total of 6 out of 20 nurses who participated in the PRISM Program case study sessions and completed the post-surveys. However, when compared to the overall number of PRISM Program participants of 42, 48% completed post surveys and 6 of the 42 (14%) nurses provided comments. A review of the comments does indicate that nurses reflected on learning from the program that impacted changes in their practice. In summary, the stated changes in practice were related to additional checking, diligent scanning, increased awareness of coverage for alarm responsiveness, and increased openness about discussing errors.

Summary

In summary, hypothesis 1 was not supported even though one of the seven subscales of the SAQ was statistically significant. The hypothesis stated that intervention unit post-survey scores would be higher than pre-survey and control unit scores but the scores were actually lower. Hypothesis 2 was not supported by the findings. There were no significant findings in hypothesis 2 using the LMM testing with or without the interaction. Research question 3 did provide some insight into some nurses’ thinking about participation in the PRISM Program and the impact on their practice. These findings will be discussed in chapter five.

CHAPTER 5

DISCUSSION

CHAPTER FIVE
DISCUSSION

In this chapter, discussion will include the findings from a study that evaluated the effects of an adverse event nursing peer review intervention, the Peer Review Impacts Safety and Medical-errors Program (PRISM), on critical care nurses' perceptions of safety culture and awareness of the recovery of medical errors. The original hypotheses will be discussed within the context of the statistical findings and the theoretical frameworks used in this study. Study limitations will also be discussed along with implications for future research, clinical practice, policy and theory.

The purpose of this study was to determine the effect of the PRISM Program on critical care nurses' attitudes of safety culture and awareness of recovery of medical errors in one critical care unit in an academic medical center setting. The PRISM Program, an adverse event nurse peer review program, was designed to analyze case studies resulting from safety events that were related to nursing care. The program provided an opportunity for nurses to learn about safety culture, peer review principles, and safety events. The PRISM Program provided didactic information about safety culture, raised awareness of error prevention and recovery, and discussed opportunities for improvement in individual practice, unit practice and systems and/or organizational level systems.

This study aimed to significantly reduce errors by increasing nurses' awareness of errors, error prevention strategies, the outcomes of errors, and the importance of nursing assessments and practices related to error prevention. In addition, this study sought to augment our understanding of how participation in an adverse event nurse peer review program affects a nurse's practice, as it relates to patient safety and error prevention.

Summary of findings

The research hypotheses 1 and 2 stated that intervention unit nurses' attitudes of safety culture and awareness of the recovery of medical errors would increase post implementation of the PRISM Program. The Safety Attitudes Questionnaire (SAQ) and the Recovered Medical Error Inventory (RMEI) were employed to provide quantitative measures for the hypotheses. Ultimately, both hypotheses were not supported in the positive direction of increased scores post intervention or as compared to pre intervention unit scores and control unit scores. However, there were unanticipated findings that were statistically significant but were directional in that SAQ post survey scores were less than pre survey and less than the control unit scores. Research question 3 did provide some qualitative insight into nurses' thinking and further implications on their learning and practice following participation in the PRISM Program. These findings will be discussed in detail.

Effect of the PRISM Program on critical care nurses' attitudes of safety culture.

The first research question asked what the effect of the PRISM Program would have on critical care nurses' attitudes of safety culture. The hypothesis then stated that the critical care nurses' post implementation safety culture scores from the intervention unit would be higher than pre scores and higher than the control unit nurses' scores. Scores were measured quantitatively using the valid and psychometrically sound SAQ survey that also demonstrated good internal consistency in this study. A number of studies support the use of the SAQ as a proxy for safety culture and as a tool with good utility for pre and post testing following an intervention. Evidence supports the main source of variability of the SAQ tool lies at the unit level and thus interventions at the unit level can be initiated and measured to improve safety (Schwendimann et al., 2013).

The positive directional aspect of the hypothesis was not supported by the findings. The statistical findings did not demonstrate significant increases in nurses' attitudes of safety culture scores on the SAQ and therefore the hypothesis was not supported. The results were disappointing; however, there were some interesting findings that should be discussed.

There are seven subscales in the SAQ: teamwork, job satisfaction, stress recognition, perceptions of unit and hospital management, working conditions and safety climate. One subscale, working conditions, was statistically significant ($p = 0.037$) using the primary linear mixed model (LMM) analysis with the interaction and controlling for years of experience and hours worked. It is important to note that in this case the nurses' working conditions post survey scores from the intervention unit were significantly less than the pre survey results and less than the results from the nurses in the control unit.

Total SAQ scores. The total SAQ scores provided a broad perspective on the safety attitudes of the nurses in both units. According to Sexton (2006) within each clinical area there is a unique social fabric and the SAQ provides a snapshot of the safety climate (the aggregated attitude of respondents). Therefore SAQ responses can be different between units, even within the same organization.

The pre-survey means total SAQ scores for the intervention ($\bar{X}$= 76.80) and control ($\bar{X}$= 72.21) units were not statistically significantly different. This indicates that the units were reasonable selections for comparison in this study. The LMM with the interaction of the total SAQ scores was also not significant ($p = 0.202$). However, when the interaction was removed and the main effects were examined, there was a statistical significance ($p = 0.041$) between both group's post-survey mean scores. The intervention nurses' mean score decreased by 4.59 and the control nurses' mean score increased by 1.50. The main effects pre and post total SAQ

scores within the intervention unit were not significant. Although the overall LMM was not significant the analysis indicates that these units had different attitudes about safety culture over a three month period. An in-depth review of the subscale findings provides insight into these results.

Working conditions. Working conditions has been defined by Sexton et al. (2006) as the perceived quality of the work environment and logistical support (staffing and equipment). The significant (p = 0.037) decrease in scores on the working conditions subscale in the intervention unit pre/post scores ($\bar{X}$ = 78.51 to $\bar{X}$ = 69.97 mean scores) and post scores between the intervention nurses and control nurses ($\bar{X}$ = 69.97 and $\bar{X}$ = 82.18 mean scores) can be better understood by looking at the items that compose the subscale (see Table 5.1). The questions within the working conditions subscale are related to training of personnel, supervision of trainees and information about diagnostic procedures is available to nurses.

The findings were discussed with the unit leadership to assist with interpreting, validating content and soliciting feedback about the results. Reportedly, there had been concerns from nurses in the intervention unit about residents' inadequate training for the rigor and complexity of the intensive care unit. The perceived lack of training had led to some conflict between nurses and residents. These attitudes are reflected in the significant decrease in the working conditions subscale scores and are indicative of a change in attitudes. The focus on safety culture in the PRISM Program didactic component, the case study reviews and the SAQ questions may have resulted in increased awareness and concern of the problem as a safety issue, thus decreasing working condition scores. The fact that this finding is significant, also in comparison to the control unit, suggests that the SAQ subscale was likely sensitive to this specific issue.

There is a published report of the teamwork climate SAQ subscale being used for large scale patient safety research (Pronovost et al., 2008). Following a baseline SAQ administration, Pronovost et al. (2008) used the teamwork climate subscale measure to determine the impact of a study designed to improve teamwork climate over one year. The working conditions subscale could be tested in a similar way as a quantitative measure to track progress in the intervention unit following strategies to improve attitudes of training new personnel and trainees' supervision. PRISM Program scores could be used as foundational data and the program itself could be used to support learning from safety events related to these issues. Targeted interventions to improve this issue could be implemented and progress measured using this subscale.

Interestingly, since this study ended, nursing and physician leadership from the intervention unit has begun work on interviewing staff about their concerns related to resident trainees. The PRISM Program shed new light on this issue for unit leadership. Efforts are currently underway to improve in this area and the working conditions questions are being used to survey nurse and resident groups to measure progress.

The working conditions subscale also had more of a variance in the post survey standard deviations as compared to the control nurses *(*$\bar{X}$ 20.69/$\bar{X}$ 11.85). During this time period both areas were preparing for and participating in training for implementation of the electronic medical record. This factor is important to note because of the degree to which there was a focus on nursing preparations and training. An unprecedented large number of new nurses were trained to assist in the coverage plans for implementation of the electronic medical record. The data indicate that intervention nurses may have had a different attitude about the large number of nurses training in the unit and the concerns about resident training and supervision than the control nurses. Lastly, the question about how the hospital deals with problem personnel had the

lowest score and the largest difference in pre/post results. Difficulties in working with trainees that may not be adequately supervised or trained can result in communication and behavioral issues and can threaten patient safety.

The fact that throughout this study both the intervention and control unit nurses were participating in such a major change with the initiation of the electronic medical record could be better understood through Barrett's theory of power as knowing participation in change (Barrett, 2010). Barrett describes power as the capacity to knowingly participate in change. Power as knowing participation means being aware of what one is choosing to do, feeling free to do it and doing it intentionally. Power pertains to both individuals and groups. A Power Profile of either a group or person is not static or linear; it varies based on the changing nature of the environment and human field patterning. Barrett's Power as Knowing Participation in Change Tool (PKPCT) could be a measure used in the future in this type of research. The PKPCT may identify different levels of power experienced by different clinical areas during major change and how different ways of knowing influenced power.

Wakefield, McLaws, Whitby and Patton (2010) applied the **Theory of Planned Behavior to patient safety behaviors and found that there are powerful professional subcultures within healthcare and nurses have significantly higher levels of intended engagement in patient safety behaviors than physicians, especially when it is between senior nurses and junior physicians.** Professional Peer Behavior (perceptions about colleagues' patient safety behavior) and Preventive Action Beliefs (beliefs about whether specific patient safety behaviors improve patient safety) were the two strongest predictors of high Patient Safety Behavioral Intent. The findings in this study provide supporting evidence that further education about safety culture could result in changes in nurses' attitudes especially as it relates to interprofessional

training and collaboration. This study only reported baseline measures for use prior to implementing an intervention.

Following exposure to the PRISM program, the attitudes of the intervention unit nurses reflect changes in safety culture but in a negative or critical way than was hypothesized. Given that finding, a logical conclusion to consider is that if a nurse is thinking more critically about structures and processes that the nurse would be better able to influence outcomes. The PRISM Program may have contributed to a level of thinking that was more critical of the status quo and was consistent in a number of other SAQ subscales when the main effects were explored.

Table 5.1. Working Conditions Items - Means/Standard Deviations

Items	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28
All necessary information for diagnostic and therapeutic decisions is routinely available to me	4.22 (sd 1.04)	4.21 (sd 0.687)	4.05 (sd 0.854)	4.40 (sd 0.675)
This hospital constructively deals with problem physicians and employees	3.96 (sd 0.854)	3.64 (sd 1.22)	3.50 (0.941)	3.96 (sd 0.854)
Trainees in my discipline are adequately supervised	4.11 (sd 1.10)	4.56 (sd 0.705)	3.81 (sd 1.07)	4.52 (sd 0.688
This hospital does a good job of training new personnel	4.35 (sd 0.766)	4.17 (sd 0.785)	3.93 (sd 1.02)	4.23 (sd 0.679)

Linear Mixed Model Main effects. The LMM analysis stipulated that if the initial analysis was not significant, the interaction effect would be removed and the analysis run again. The LMM without interaction also controlled for years of experience and hours worked. This was done with all other SAQ subscales (except working conditions) resulting in some main effects that were statistically significant. Differences between the intervention unit and control unit nurses' mean post test scores were statistically significant in teamwork (p = 0.009), job

satisfaction ($p = 0.001$), perceptions of hospital management ($p = 0.040$) and safety climate ($p = 0.006$). Safety climate ($p = 0.000$) also had a significant difference within the intervention nurses' pre and post survey scores. There were no significant differences found in stress recognition and perceptions of unit management.

Paine et al., (2010) reported that safety culture is a unit level phenomenon and they reported that 11.8% of units surveyed with the SAQ over a three year period following implementation of a comprehensive unit-based safety program had a decrease in SAQ scores. The authors attributed the decrease in SAQ scores to changes in management, implementation of information technology and unit construction based on unit focus groups. Incorporating a control group in this quasi-experimental study design aided in uncovering these findings and suggests that a more in depth understanding of how an increased exposure to safety culture knowledge and a root cause analysis of an adverse event may influence safety culture attitudes at the individual and unit level. In the PRISM Program study there are more significant main effect differences between the intervention and control groups than within the intervention unit.

Safety climate. The safety climate subscale is important to the core principles and content of this study. The PRISM Program incorporated the same didactic information into each case study. The information focused on the topics of professionalism, adverse event peer review, characteristics of safety culture, types of errors, nurses' role in the identification, interruption and correction or errors, missed nursing care, root cause analysis and the five rules of causation of error. Wachter's (2012) characteristics of safety culture were described in the didactic information: emphasis on quality and safety over blame and punishment; non-punitive process to avoid punishment for error and instead uncover root causes; human error that are not deliberate result in consoling, education and counseling; promotion of increase reporting for organizational

learning and system improvement. The Leonard and Frankel (2010) model of caregiver behaviors was used to provide guidance for assessing nursing actions related to adverse event analysis and nursing practice. The didactic information was followed by an adverse event case study. The four case study themes were: fall with severe injury; medication error; mislabeled blood bank sample resulting in wrong blood issued; and delayed response to alarm.

Approximately 50% of nurses who completed the post-survey participated in the PRISM Program. Post-surveys were administered 4 weeks after completion of the PRISM Program in order to allow time for discussion to occur with non-participants. Intervention unit nursing leadership reported that nurses did discuss the PRISM Program with nurses who did not attend the program. Nursing leadership validated the rationale for surveying all nurses in the unit, as opposed to only nurses who attended the program.

Safety climate is defined as the perceptions of a strong and proactive organizational commitment to safety (Sexton et al., 2006). Although the safety climate subscale was not significant in the initial LMM analysis, it was statistically significant when the interaction was removed with comparison between the intervention ($\bar{X}$ = 77.01) and control ($\bar{X}$ = 87.83) nurses' post survey safety climate attitudes (p = 0.006) and within the intervention nurses' attitudes pre ($\bar{X}$ = 89.29) and post ($\bar{X}$ = 77.01) survey scores (p = 0.000). In both cases, the intervention unit scores decreased while the control unit scores increased.

The significant decrease in scores within the intervention unit is associated with these subscale items: medical errors are handled appropriately in this unit; I am encouraged by my colleagues to report patient safety concerns; I receive feedback about my performance; and I would feel safe being treated in this unit (See Table 5.2). It seems that the PRISM Program

influenced this study finding. The case studies provided feedback about safety events. The nurses from the intervention unit may have felt they should have more feedback from safety events at the unit level. This study may have increased nurses' awareness of how errors could be handled differently. The PRISM Program provided an opportunity to demonstrate a new way to share safety event information in an effort to learn. The importance of safety event reporting was emphasized as a key signal for learning about cause and system issues. Nurses may have reflected on the importance of reporting, or not reporting, of safety events in their unit and may have some level of concern about their individual or unit level reporting based on this new knowledge about the importance of safety event reporting. Although safety event reporting has continued to increase each year in this organization, filing a safety report is time consuming and admittedly nurses do not always file safety reports on every event or concern. Intervention unit nurses reported a decreased mean score in their response to the item: I would feel safe being treated on this unit. I think this finding suggests a deeper understanding of the complexity of how safety events occur, evolution of a safety event, and a more critical view of the risks associated with being at the point of patient care.

Table 5.2. Safety Climate Items - Means/Standard Deviations

Items	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28
The culture in this unit makes it easy to learn from the errors of others	3.76 (1.23)	4.29 (sd 0.719)	3.79 (sd 1.18)	4.39 (sd 0.615)
Medical errors are handled appropriately in this unit	4.28 (sd 0.981)	4.37 (sd 0.808)	4.14 (sd 1.07)	4.71 (sd 0.529)
I know the proper channels to direct questions regarding patient safety in this unit	4.54 (sd 0.657)	4.69 (sd 0.631)	4.57 (sd 0.703)	4.84 (sd 0.454)
I am encouraged by my colleagues to report any patient safety concerns I may have	4.57 (sd 0.779)	4.54 (sd 0.701)	4.29 (sd 0.995)	4.48 (sd 0.890)
I receive appropriate feedback about my performance	4.00 (sd 1.14)	4.46 (sd 0.852)	3.83 (sd 1.27)	4.33 (sd 0.758)
I would feel safe being treated here as a patient	4.50 (sd 0.810)	4.74 (sd 0.505)	4.38 (sd 0.962)	4.81 (sd 0.477)
In this unit it is difficult to discuss errors	3.63 (sd 1.20)	3.83 (sd 1.04)	3.64 9sd 1.19)	4.16 (sd 1.036)

Teamwork. The SAQ scale definition of teamwork is the perceived quality of collaboration between personnel (Sexton, et al., 2006). Teamwork post-survey scores between units were significantly lower ($p = 0.009$). All intervention nurses' post-survey item scores were less than the control nurses' scores. The largest difference was in two subscale items: nursing input being well received on their unit and disagreements are resolved appropriately (See Table 5.3).

Table 5.3. Teamwork Items- Means/Standard Deviations

Items	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28
It is easy for personnel to ask questions when there is something that they do not understand	4.41 (sd 1.09)	4.66 (sd 0.539)	4.33 (sd 1.05)	4.90 (sd 0.301)
I have the support I need from other personnel to care for patients	4.43 (sd 0.981)	4.51 (sd 0.702)	4.40 (sd 0.912)	4.61 (sd 0.495)
Nurse input is well received in this unit	4.24 (sd 1.18)	4.69 (sd 0.467)	4.17 (sd 1.25)	4.65 (sd 0.661)
It is difficult to speak up if I perceive a problem with patient care (re-coded)	4.04 (sd 1.13)	3.83 (sd 1.043)	3.69 (sd 1.37)	4.19 (sd 1.22)
Disagreements are resolved appropriately (not who is right but what is best for the patient)	3.83 (sd 1.31)	4.19 (sd 0.951)	3.69 (sd 1.14)	4.52 (sd 0.626)
The physicians and nurses here work together as a well-coordinated team	4.20 (sd 1.05)	4.37 (sd 0.731)	4.21 (sd 1.03)	4.48 (sd 0.769)

Job satisfaction. The job satisfaction subscale focuses on positivity about the work experience (Sexton et al., 2006). There is a statistically significant ($p = 0.001$) difference between units with post survey mean scores of $\bar{X} = 77.18$ for the intervention nurses and $\bar{X} =$ 90.00 for the control nurses. Overall, job satisfaction for the nurses on the intervention unit is less than in the control nurses and moral is the lowest score. However, interestingly during this 3-month time frame the job satisfaction scores did increase in the intervention and control units; however a larger increase in the control nurses' scores resulted in the significant difference.

Even though the intervention unit nurses' post survey responses (See Table 5.4) were significantly less than the control unit responses, they were more positive than pre-survey responses and may reflect some level of optimism even in the setting of developing a more critical eye for safety. Nurses could be encouraged by a new and innovative approach to safety that affects their work experience. However, these findings could be related to many factors,

including that the control unit nurses' attitudes are more positive than those of the intervention unit nurses.

Table 5.4. Job Satisfaction Items- Means/Standard Deviations

Items	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28
This hospital is a good place to work	4.09 (sd 1.11)	4.47 (sd 0.825)	4.26 (sd 1.01)	4.80 (sd 0.551)
I am proud to work at this hospital	4.41 (sd 0.858)	4.71 (sd 0.524)	4.43 (sd 0.914)	4.87 (sd 0.434)
Working in this hospital is like being part of a large family	3.83 (sd 1.22)	4.49 (sd 0.818)	4.14 (sd 1.00)	4.70 (sd 0.702)
Moral in this unit is high	3.17 (sd 1.37)	3.77 (sd 0.910)	3.33 (sd 1.26)	4.13 (as 1.02)
I like my job	4.09 (sd 1.19)	4.51 (sd 0.781)	4.40 (sd 0.912)	4.70 (sd 0.651)

Perceptions of hospital management. The SAQ subscale of perceptions of hospital management is defined as the approval of hospital level managerial action (Sexton et al., 2006). There was a significant (p = 0.040) difference between intervention nurses ($\bar{X}$= 66.53) and control nurses' ($\bar{X}$ = 77.59) post survey mean scores. This was the lowest post survey score for the intervention unit. As noted, especially at the time of the post survey, both units were in critical time period of preparations for the implementation of the electronic medical record. During this time, nurses may have perceived communications about the process negatively. Nurses with a more critical understanding of safety culture and adverse events might have been more concerned about the impact of the anticipated change in practice, especially as it related to safety. They may have been concerned about how the electronic medical record implementation could compromise safety with increased distractions leading to less ability to focus on clinical practice. Nurses may feel this was not adequately addressed. This notion is reinforced by the

fact that the control unit scores increased. Item responses (See Table 5.5) indicated a concern for receiving timely information, compromising safety, and support for nurses' daily efforts.

There was no significant finding with the exact same questions that are asked about unit management, so these nurse attitudes are specific to the intervention unit and hospital management. It is possible that there were negative attitudes toward the case study sessions and /or the principle investigator (PI). The PI was introduced as a researcher at Boston College however the PI was also an employee at the director level and if known would have been associated with hospital management. There may be nurse attitudes that feel that case study review should already be happening with actual safety events.

Table 5.5. Perceptions of Hospital Management Items - Means/Standard Deviations

Items	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28
Hospital management supports my daily efforts	3.70 (sd 1.07)	3.97 (sd 0.904)	3.55 (sd 1.06)	4.00 (sd 0.861)
Hospital management doesn't knowingly compromise patient safety	4.33 (sd 0.837)	4.24 (sd 0.819)	3.89 (sd 0.924)	4.36 (sd 0.870)
Hospital management is doing a good job.	3.89 (sd 1.02)	4.09 (sd 0.866)	3.67 (sd 0.927)	4.14 (sd 0.803)
Problem personnel are dealt with constructively	3.40 (sd 1.19)	3.64 (sd 1.22)	3.50 (sd 0.941)	3.96 (sd 0.854)
I get adequate, timely information about events that might effect my work	4.05 (sd 0.939)	4.09 (sd 0.900)	3.79 (sd 0.991)	4.18 (sd 0.905)

Perceptions of unit management. The SAQ subscale of perceptions of unit management is defined as the approval of unit level managerial action (Sexton et al., 2006). There were no significant findings in the LMM with the interaction or without the interaction; either within the intervention unit or between the intervention and control units. Post-survey subscale scores did decrease slightly but not as much as they did in the hospital management subscale scores. It is interesting to compare the hospital and unit management findings because even though the items

were the same, there are differences in responses (See Table 5.6). The unit management post-survey item scores were variable, while the hospital management post-survey item responses all decreased. The largest decrease for both subscales was with the subscale item, " management doesn't knowingly compromise patient safety"; a mean decrease of 0.32 for the unit management and a mean of 0.44 for the hospital management.

As noted, I think these responses demonstrate a different level of criticism about the support the unit was getting during this time of stress with the many preparations and anticipated changes with the upcoming electronic medical record implementation. A higher degree of criticality in intervention unit nurses' attitudes may have been influenced by the PRISM Program and safety culture information. This is in contrast to the control unit post-surveys subscales, where almost all item responses improved. A unit level management presence during the PRISM Program and their support of the study may have influenced the unit level scores in a more positive or neutral direction.

Table 5.6. Perceptions of Unit Management Items - Means/Standard Deviations

Items	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28
Unit management supports my daily efforts	3.70 (sd 1.37)	4.03 (sd 0.904)	3.72 (sd 1.20)	4.07 (sd 1.07)
Unit management doesn't knowingly compromise patient safety	4.30 (sd 1.01)	4.35 (sd 0.849)	3.98 (sd 1.14)	4.55 (sd 0.736)
Unit management is doing a good job.	3.66 (sd 1.38)	3.71 (sd 1.17)	3.67 (sd 1.27)	3.89 (sd 1.10)
Problem personnel are dealt with constructively	3.09 (sd 1.29)	3.56 (sd 1.21)	3.36 (sd 1.25)	3.52 (sd 1.19)
I get adequate, timely information about events that might effect my work	3.86 (sd 1.17)	4.03 (sd 1.14)	3.88 (sd 1.02)	4.07 (sd 0.923)
The levels of staffing in this clinical area are sufficient to handle the number of patients	4.09 (sd 1.07)	3.17 9sd 1.27)	3.90 (sd 1.17)	3.73 (sd 1.14)

Stress recognition. The SAQ stress recognition subscale is defined as the acknowledgment of how performance is influenced by stressors. This domain asks participants

about their workload, fatigue, and tense or hostile situations and the effect on their performance. There were no significant findings related to stress recognition (See Table 5.7). For the intervention unit nurses, the stress recognition subscale was the only subscale that improved with post-survey responses. One may hypothesize, that unit stress could have been a contributing factor to other subscale findings but it does not appear to be the case.

The stress recognition finding does not appear to be consistent with other findings. Another hypothesis relates to Barrett's (2010) theory of power as knowing participation in change may indicate that nurses felt in control and engaged and this decreased their stress level but it did not influence their critical thinking about safety. Of note, Taylor and Pandian (2013) investigated the construct validity of the stress recognition subscale and concluded that it does not fit into the overall safety climate construct of the SAQ. Although the authors felt that stress recognition was an important concept; they recommended removal of the subscale from the instrument.

Table 5.7. Stress Recognition Questions- Means/Standard Deviations of Raw Scores

Items	Intervention Group 1 Pre-survey mean n = 44	Control Group 2 Pre-survey mean n= 34	Intervention Group 1 Post-survey mean n= 39	Control Group 2 Post-survey mean n= 28
When my workload becomes excessive, my performance is impaired	3.96 (sd 1.23)	3.97 (sd 1.29)	3.96 (sd 1.19)	4.13 (sd 0.922)
I am more likely to make errors in tense or hostile situations	3.78 (sd 1.23)	4.00 (sd 0.985)	3.83 (sd 1.15)	3.73 (sd 1.02)
Fatigue impairs my performance during emergency situations	3.07 (sd 1.36)	3.09 (sd 1.26)	3.00 (sd 1.18)	3.00 (sd 1.31)
I am less effective at work when fatigued	4.07 (sd 0.975)	4.26 (sd 0.741)	3.86 (sd 1.10)	4.13 (sd 0.973)

Effect of the PRISM Program on critical care nurses' awareness of the recovery of medical errors

The second research question asked what the effect of the PRISM Program would have on critical care nurses' awareness of the recovery of medical errors. It was hypothesized that the critical care nurses' post implementation RMEI scores would be higher than pre-scores and higher than the control unit nurses' scores. Scores were measured quantitatively using the valid and reliable RMEI survey that also demonstrated good internal consistency in this study. There are two subscales in the RMEI: mistake and poor judgment. The survey subscale questions include types of errors that critical care nurses identify, interrupt and recover. The questions focus on how both are measured based on the frequency that they occur and the seriousness of the error, resulting in four total subscales: frequency-mistake; frequency-poor judgment; seriousness-mistake; and seriousness-poor judgment.

The RMEI demonstrated good internal consistency with this study. Cronbach's alpha results ranged from 0.849 to 0.974. The RMEI subscales were analyzed using the LMM with the interaction. Initial analyses found that none of the subscales were significant. Subscale results were then analyzed using the LMM without the interaction to examine the main effects. The RMEI subscale findings were disappointing; none of the four subscales in the RMEI were significant. One reason may be inadequate power due to a small sample size for this survey. As noted, the initial power calculation was for 52 participants with paired results. Pre survey RMEI sample sizes were 44 and 34 for the intervention and control groups and post survey responses were 39 and 28 for the intervention and control groups.

There were no reported studies found in the literature that have used the RMEI survey tool in a pre/post capacity. Initial testing of the tool was done as a onetime survey. The tool may be

used once or as a repeated measure with measurements further apart than three months, as done in this study. The items are such that a longer period of time to allow exposure to new experiences may be needed in order for a clinician to report differences, if indicated.

Interestingly, both units have closer mean scores and standard deviations than noted with the SAQ. This may mean there was already a heightened awareness of their role in the recovery of medical errors. The lack of significance indicates the intervention and control unit nurses were more similar in their awareness of the frequency and seriousness of medical errors than in their attitudes of safety culture. The SAQ is known to be sensitive at the unit level but we do not have that information about the RMEI.

This study used the PRISM Program to educate intervention unit nurses about safety culture and case studies about errors related to nursing care. Didactic information included information about the recovered medical error model, identification, interruption and recovery of medical errors and types of medical errors. However, this may have been a missed opportunity with the case study presentations. Case study content focused on critical care scenarios that involved or were influenced by nursing practice and not medical practices. The PRISM Program could have included a case study about medical errors or embedded medical error information into case studies. This would have emphasized the importance of the role of the critical care nurse in the surveillance of other disciplines and their advocacy and intervention for patient safety. This is a limitation of this study.

Effect of the PRISM Program on critical care nurses' practice.

The third research question asked what the effect of PRISM Program would be on critical care nurses' reported changes they made in their practice based on participation in the program.

Two open-ended questions were asked at the end of each survey to obtain nurses descriptions of any changes to their practice they had made based on participation in the PRISM Program. The aim was to further understand the impact of the program on the comprehension of new knowledge and how it might be applied to practice.

Of the twenty nurses who attended a PRISM Program case study session and completed the post survey, seven described changes they made in their practice. The comments are listed in detail in chapter four. The comments included: double check labs and triple check, ask more questions, openness to discussing errors, more diligence with scanning of medications and an increased awareness of responsiveness to alarms and the need for back up coverage. Originating in the aviation and chemical industries, safety culture has been long believed to be a predictor of safety performance (Wakefield, et al., 2010). The authors state that behavioral intentions are influenced by attitudes about patient safety that are determined by the following: 1) the individual's belief that the behavior will improve patient safety; 2) the individual has experienced improved safety from the behavior; 3) group norms; 4) motivation to comply; 5) their perceived power and belief that their actions can lead to patient safety. The PRISM Program sought to influence nurses' safety behavior through the introduction of new empirical knowledge, and indirect experiential knowledge by learning from case study reviews and from the experience of others.

Part of the safety culture teaching about blame free, non-punitive approach to error helps us to understand that everyone is vulnerable to human error and we can all learn from the errors and safety events that others experience through the sharing of these events. One nurse (40 hours/week and 10 years of experience) commented on both questions that she made no changes to her practice. These comments are reminders that different nurses will have different

perceptions of their practice, the need to make changes in their practice and the learning gained from teaching that is provided to them.

These questions extend our understanding of the ways in which nurses know and learn. This study extends Carper's (2008) fundamental patterns of knowing, especially as it relates to ethical knowing. Ethical knowing involves judgments about knowing what ought to be done, what is responsible, and what is right. Ethical knowing guides how nurses conduct their practice and is demonstrated in nursing actions known as ethical comportment.

Ethical comportment is also a component in the model of recovering medical errors. Hurley et al. (2008) describe ethical comportment as the embodied skilled know-how of relating to others respectfully and collaboratively. Specifically, in the study ethical comportment was displayed as nurses established professional relationships with physician colleagues over time by developing trust and suing creative communication strategies. The authors noted that collegial relationships were stronger with attending physicians than with house staff. This is an interesting perspective from a critical care qualitative study and may provide insight into some of the differences between the intervention and control units that could be further explored through research.

Nurses described their practice changes as they related to the particular case study session they attended. Even though there were a small number of responses, the responses did indicate a level of reflection of the learning that occurred. The case studies clearly had an impact on these particular nurses. Enhancing a nurses' knowledge about patient safety that leads to behavioral changes in one's clinical practice will ultimately impact patient safety through nurses' actions. The PRISM Program did have an impact on the majority of the nurses that responded. This could be the most important finding of this study.

Summary of PRISM Program discussion

In summary, the findings from this study have revealed that the PRISM Program did impact critical care nurses' attitudes of safety culture but not in the predicted sense that post-survey scores would be higher because in fact, they were lower overall. Using a linear mixed model analysis with an interaction, the PRISM Program's strongest influence on nurses' attitudes of safety culture was with the working conditions subscale. Other subscale LMM main effects with significant findings were safety climate, teamwork, job satisfaction and perceptions of hospital management. There were no significant findings with regard to the RMEI survey results either within the intervention or between the intervention unit and control unit. However, experience with use of the RMEI tool demonstrated strong reliability and practical indications for use. Lastly, important qualitative evidence of comments made by nurses about changes in their practice reflected an understanding of safety culture and increased awareness of how they could learn from safety events and errors to improve their own practice.

Theoretical frameworks

Structure, process and outcomes. The Donabedian theory (2003) of Structure, Process and Outcomes (SPO) served as an overarching meta-theory for this study. The SPO theory is well recognized throughout the quality and safety domain and is also recognized by the American Nurses Credentialing Center (ANCC) as their framework for Magnet recognition (2012). The simplicity and applicability of this theory has sustained and withheld countless amounts of research and process improvement. The SPO theory provides the framework and context for the recovery of medical error middle range theory that was at the core of this research. Foy et al. (2011) called for more safety research to be grounded in theory in order to

provide a basis or vocabulary to describe behaviors, contexts and interventions in a systematic manner. Theory aids in guiding a cumulative understanding of what works and how it works to generalize findings in a meaningful way. Donabedian's SPO theory in conjunction with the recovery of medical error middle range theory provided such a service for this study.

Model of recovery of medical errors theory. As described in chapter1, the recovery of medical errors (RME) theory provided the framework for the detailed design of this study. This study demonstrates that the model can be used to guide research focused on how nurses affect patient safety and recover medical errors. The RME theory and model are further extrapolated to include the RMEI tool which was also used in this study to measure the frequency and seriousness of mistakes and poor judgment mainly by physicians. This study demonstrated good reliability of the tool. To date there has been no evidence uncovered about the use of this theory/ model and so I believe this is the only study that has tested this theory. Finally, this study identified potential indications for use of the tool, suggesting that a three month time period between pre and post-test use is probably too short of a time span.

From a utility perspective I would like to see this theory, model, and inventory further advanced to incorporate the recovery, interruption and recovery of all errors, not just medical errors. A new theory could be derived from this work to broaden the application to include areas beyond the critical care environment. Nurses in all areas are acting as safety nets for their patients with regard to various types of safety risks and with all clinical disciplines, not only by physicians and advanced practitioners but also by nurses, pharmacists, technicians, and therapists, and others. The theory is broad enough that individualized antecedents to clinical scenarios could be identified and incorporated. Identifying additional evidence based antecedents to the clinical scenario could be aligned with a professional practice environment and safety

culture for example: nurse staffing; evidenced based practice; nurse satisfaction; collaborative decision making, and professional development. In addition, the outcomes of the theory could be expanded to highlight the RMEI and other types of adverse events, mortality data, and nurse sensitive indicators such as pressure ulcers, falls with injury and healthcare acquired conditions. Derivations of the RMEI survey tool could identify other recovered errors nurses experience within nursing and with other role groups. In doing so, a new derivation of the RME theory could have broader utility and application for advancing nursing and patient safety research.

Treatment: Peer Review Impacts Medical-errors (PRISM) Program

Consistent with the literature, this study aimed to implement the PRISM Program, an adverse event nurse peer review program, as a strategy to promote safety culture, learn from root causes analyses, and highlight the role of nurses in indentifying, interrupting and recovering errors to result in practice changes and positive patient outcomes. The findings from this study have generated some discussion points about peer review.

Based on the findings and knowledge gained from this study, discourse related to peer review in nursing has important relevance to the discipline and an advancement of peer review terms and guidelines should be considered. In 1988, the American Nurses Association (ANA) put forth principles of peer review that are detailed in chapter 1. It has been almost 30 years since these principles were written. New discourse could capture diverse social, political and culture meaning that reflect the values associated with the mandate nurses have to protect patients through self-regulation of practice and the incorporation of theory driven evidence into practice. It is important to distinguish between the different types of peer review in the literature and in program design. Each type of peer review is important to nursing's autonomy but each type of peer review has different goals and actions. A new contemporary perspective of peer

review is needed and should embrace and advance strategies used to accomplish the goals of reducing patient harm.

The first principle of peer review states that a peer is someone of the same rank. This principle may make sense with regard to evaluative peer review. However, adverse event nurse peer review should allow for inclusion of roles such as nurse leaders and clinical specialist who can facilitate discussion about procedures, policies and standards of care. In addition, leaders can listen to the concerns of nurses and provide guidance and support for improvement initiatives. Diverse nursing and interdisciplinary groups coming together to examine adverse events is reported in the literature (Hiner,et al. 2009; Guger,et al. 2011;Szekendi et al., 2010; Diaz, 2008;) yet definitions of peer review have not been adapted.

Another principle of peer review suggests that feedback is not anonymous. Again, I think this principle makes sense when peer review is part of an evaluative process. However, adverse event peer review programs such as the PRISM Program may often have the responsibility to protect privacy and maintain confidentiality about cases that may contain peer-protected information. In doing so, adverse event peer review would need to anonymous. Anonymity would also allow for broad discussion about cases where nurses in various areas could learn from the same case studies. This is consistent with a number of adverse event peer review programs and nursing morbidity and mortality programs, as reported in the literature (Diaz, 2008; Fujita eta l., 2009; Hitchings, 2008; Hunt, 2008). These authors reported different levels of nurses who participate in their peer review programs including staff nurses; clinical nurse specialist, managers and executive leadership.

The topic of peer review in nursing is not new but there is great opportunity to breathe new life into an old approach to adverse event peer review in nursing. Nurses can take the lead

on advancing a safety agenda in new ways by redefining peer review for nursing and other disciplines to advance a safety agenda. Protecting and advocating for patients is a duty that defines nursing (ANA, 2010). Progress in reducing patient harms is slow and the time is right for nursing to assert our influence and embrace a new innovative approach to nurse peer review.

Limitations

There were a number of limitations to this study. First, the survey response rates were less than expected. Response rates ranged from 31-46% for the SAQ and RMEI pre and post surveys. The surveys were administered together, which may be resulted in survey burden.

Second, 42% of the intervention unit staff participated in a case study and half of post-survey participants attended case study sessions. This is a major limitation of this study. If more cases study participants completed surveys the results may have been different. Many factors were brought to bear on why more nurses did not complete surveys or participate in the PRISM Program including survey burden, unit workload and acuity, and the length of time of the study. The intensive care unit environment is unpredictable in terms of acuity and clinical needs. Case studies were often re-scheduled due to unforeseen circumstances. Nurses could only participate if there was adequate coverage for their patients which limited the number of nurses who could attend sessions at any given time.

Third, the study was implemented during a time of major change due to preparations for implementation of the electronic medical record. The backdrop of this initiative could have influenced the findings despite using a control unit design to adjust for this issue. Studies undertaken in the clinical arena can be challenging when there are real world factors at play. This study could have detected differences in how these groups were reacting differently to this initiative. Fourth, the time frame between surveys was approximately 3 months which was

probably not long enough. As noted, in the case of the RMEI, findings indicate this was not long enough to detect a difference.

Through careful planning, the PI for this study attempted to provide controls in the treatment fidelity for this study. Case study sessions were fictional but based on actual cases. There may have been even more interest in case study participation if the case studies were authentic safety events from the intervention unit. This option will be considered for future research. Lastly, although the didactic information included the recovery of medical error model and the nurse's role in identifying, interrupting and recovering medical errors, there was no case study that focused on a medical error. This was also a limitation.

The didactic information was lengthy and could be shortened if the program were to continue. Providing the safety culture, root-cause analysis and peer review information in advance of the case study session would have allowed for presentation of two case studies, thus increasing exposure to learning from safety events. This also would have provided the didactic information to more nurses.

Implications and recommendations for nursing education, practice, policy and research

Nursing education. Educating nurses about safety culture and their role in the identification, interruption and recovery of adverse events and errors can be accomplished through a peer review process, as evidenced in this study. Adverse event peer review programs are not widespread in nursing but are a commonly held form of educating physicians about adverse events and errors. Programs such as the PRISM Program should be added to an organization's professional development portfolio. Surveying organizational safety culture on a routine basis is a requirement of the Joint Commission (2014) however education about safety

culture is not. Prioritizing education about safety culture through the adoption of a nursing peer review program would demonstrate an important commitment to supporting a transparent, non-punitive approach to error.

Nurses at all educational levels would benefit from safety culture information. Barnsteiner (2011) offered strategies for integrating teachings about the culture of safety into curriculums for undergraduate students. Quality and safety courses and graduate degree programs with a focus on quality and safety have emerged. Instilling safety culture and peer review principles in nursing early in one's career could influence reporting of safety concerns, add to transparency, and promote reflection for practice improvement.

Nursing practice. This study provided a lens into how the PRISM Program impacted critical care nurses' attitudes about safety culture and resulted in reported changes in individual nurses' practice. Although this is a small study, the implications of a program such as this on a more wide spread audience of nurses could have a powerful impact on nursing practice and patient safety. This study and the associated RME theory were focused on critical care nursing practice however the same approach could be used in other nursing specialties and settings. The PRISM Program could be made available to more nurses so they could be exposed to the content and format for reviewing adverse events and learning from them within a safety culture. In different clinical environments nurses could focus on root cause analyses associated with their unique clinical practice to learn from adverse events.

In general the PRISM Program is easily adaptable so that nurse leaders could use the template to create their own case studies and lead discussions at their unit level. The program should be modified to limit the didactic information and create time for two case studies to enhance learning opportunities. Nurses in all areas can learn about safety culture, adverse

events, near misses and patient harms in order to reflect on how they might alter nursing practice to mitigate risk and improve patient safety. Based on the findings of these programs there could be limitless implications for individual, unit based and organizational learning and practice improvements.

Programs could potentially target clinical nurse sensitive indictors (NSIs) such as falls, pressure ulcers, and healthcare acquired conditions to review root causes of these safety events and identify best practices, new evidence and opportunities for improvement. Reviewing NSIs at the unit level or the organizational level could identify new practice improvements that would have an effect on the prevalence and frequency of these harms.

The American Association of Critical Care Nurses (AACN) promotes standards for a Healthy Work Environment (2005). Healthy Work Environment standards include skilled communication, true collaboration, staffing, meaningful recognition and authentic leadership. Research has shown that healthy work environments lead to improved nursing satisfaction and better patient outcomes. Conversely unhealthy work environments have been associated with medical errors, conflict, stress and ineffective care delivery (Ives Erickson, 2010). The PRISM program is a strategy that can contribute to healthy work environments by promoting autonomy and control over practice for nurses. Also, as demonstrated in this study, the use of a valid safety culture tool could provide an effective mechanism for evaluation of a healthy work environment.

Nursing Policy. A new report suggests that death from medical errors in the U.S. are greater than previously thought and estimate that this issue requires greater attention especially given that data is based on actual death certificates, many of which do not include errors; therefore death rates from medical error could be even higher. From a public policy standpoint doing more to impact death from medical errors can be seen as furthering societal goals and

concerns, addressing the values we place on human life (Schlesinger, 2006), and could influence Ziemkiewicz, & Shreve, 2011). Society holds nursing in high regard as a trusted profession. *Protection* is a component of the definition of nursing and is inherent in each domain of the discipline: nursing, health and society. There is a vital connection between nursing knowledge and professional responsibility for the public's health and health policy (Alligood & Miles, 2011). Nursing needs to make these connections clear and support a safety agenda within the discipline and with other disciplines. Leading a revitalized, programmatic safety agenda is an imperative that nurses can own.

Nurses have the knowledge, experience and opportunity to lead and influence in this realm. Of course, nurses are leading patient safety agendas: of their own; on their units; in their organizations; or at the local or national levels but we can do more. Still, aggressive steps should be taken to advance policies and practices that can contribute to learning from errors and adverse events to decrease patient harm and even death. Clearly, more research and evidence is needed. This study has provided one example to address death from medical error by advancing safety culture through adverse event peer review so that nurses better understand their role in the mechanisms of error identification, interruption and recovery through root cause analyses.

Peer review in medicine is a required method of evaluation for academic surgical programs and is typically known as: the morbidity and mortality conference (Pierluissi, 2003; Antonacci, 2009). Evidence shows that a well-designed, peer review process is an effective, self-regulating activity that makes a vital contribution to the quality and safety of care and has the potential to improve patient outcomes (Bechtold, Scott, Nelson, Cox, Dellsperger & Hall, 2007; Kuper, Nedden, Etchells, Shadowitz & Reeves, 2010; Edwards, 2011). Yet, there is no national regulatory body that requires organizations to have an adverse event nursing peer program.

Healthcare organizations should embrace adverse event nurse peer review programs despite regulatory requirements. Regulatory bodies should consider promoting programs that address adverse events for lessons learned. This study provides initial evidence for a nursing adverse event peer review program that with modifications can and should be adapted to incorporate nursing and other disciplines in this process to learn about root causes of error to improve patient outcomes.

The prestigious American Nurses Credentialing Center (ANCC) Magnet model (ANCC, 2014) is an evidenced framework dedicated to the advancement of new nursing knowledge, evidenced based quality care, and care delivery. The elements of the Magnet model create a work environment that supports excellence in nursing practice. Within the exemplary professional practice domain, the ANCC (2014, p. 47) stipulates that nurses at all levels engage in periodic formal performance reviews that include a self appraisal and peer feedback process for assurance of competence and continuous professional development.

The Magnet program has advanced over time and I believe the time is right to promote a new perspective for nursing's autonomy and control over practice in the area of peer review. Consideration should be given to a programmatic approach to peer review in nursing. I recommend that nursing peer review be programmatic and not only about an annual peer evaluation. Incorporating an adverse event nurse peer review program, such as the PRISM Program, into a department wide nurse peer review program should be considered as an effective strategy in further educating nurses about their role and accountability for patient safety. The structure, process and outcomes of an adverse event peer review program lends itself to Magnet element that could provide empirical evidence for a Magnet application and is aligned with advancing professional development, exemplary professional practice and nursing excellence.

Our safety mandate is ready for a paradigm change that nursing can lead. Without question, nurses have the respect, autonomy and control over their practice to greatly influence this crisis.

Nursing research. The evaluation of the PRISM Program demonstrated an impact on critical care nurses' attitudes of safety culture using the SAQ and on nurses' practice however it did not indicate a change in awareness of the recovery of medical errors. One implication for nursing research involves the use of the RMEI and the timing and frequency of its use. Based on the PRISM Program study the tool seemed to be a better tool for a one-time use or with a longer period between administrations. Instead of the 3 month interval used in the PRISM Program study, a recommendation would be to administering the tool once or waiting a year between RMEIs to capture more nursing experience with recovering medical errors.

Based on the response rate and attrition from the pre to the post-surveys, I think survey burden was a factor in this study. Including two surveys together in one link did serve an important purpose for less frequent emails and reminders. However I think two surveys together created a survey of 100 items that required approximately 20 minutes to complete and contributed to lower response rates.

In terms of study design, providing didactic information in an online format to all intervention unit nurses would have allowed for all nurses to receive the peer review and safety culture information in advance. Having more nurses receive baseline knowledge may have altered nurses' attitudes about safety culture even if they had not attended the PRISM Program and the study results may have been different. This also would have allowed for more time to spend on adverse event case studies, including additional case studies, promoting more learning about the root causes that may have led to an increase in reported practice changes.

The SAQ subscales may have good sensitivity of the subscales to issues and interventions and could be used individually, as demonstrated in this study with the working conditions subscale. As mentioned previously, Pronovost et al. (2008) reported using this method with the safety climate subscale in a patient safety study with a large cohort. Using subscales in this manner reduces survey burden and may aid in improving response rates.

Future Research. The evaluation of the effect of the PRISM Program provided enough support for the hypotheses of this study to suggest further research in this area is indicated. Expanding the PRISM Program to include the use of actual cases makes sense and would enhance this work. Research could also focus on evaluating the PRISM Program in the general care area setting. Evaluating the pre and post effects of the PRISM Program on the participants is very important to the quality of future research. To that end, it will be important to identify a tool that can evaluate the effects of the program while reducing survey burden.

Testing the PRISM Program using a longitudinal design with repeated measures might detect how attitudes change over time when exposed to new information. A study design such as this could compare changes in attitudes over time with educational backgrounds, different clinical areas, nurse satisfaction, clinical nurse sensitive indicators and other pertinent independent or demographic variables. This could be done on a larger scale with multiple areas.

As previously discussed, this study also supports the theoretical work of other great nursing thinkers such as Carper and Barrett. Alternate theoretical approaches could be used as conceptual frameworks for future research of adverse event nurse peer review. Another theorist, Beatrice Kalisch (2015), using qualitative research methods identified nine areas of missed nursing care that vary across settings and contribute to errors of omission and patient safety. The areas of missed nursing care are: ambulation; turning; delayed or missed feedings; patient

teaching; discharge planning; emotional support; hygiene; intake and output documentation; and surveillance. Kalisch has identified missed nursing care as errors of omission or actions that have not been taken.

Most often adverse event case reviews focus on errors of commission or actions that result in patient harm. In 2009, Kalisch developed the Missed Nursing Care Survey (MISSCARE survey) to measure missed nursing care and the reasons for the missed care. The tool is reported to psychometrically sound (Kalisch, 2009). The MISSCARE survey is similar to the RMEI in that it is a two-part list of items. Respondents rate the frequency of and the reason for missed nursing care. This tool seems to fill a gap not addressed by the RMEI, when one considers that nurses should measure nursing care. In another study Kalisch (2014) correlated patient reported missed nursing care with adverse events. The concept of missed nursing care was discussed in the didactic information provided in the PRISM Program. However, reviewing cases related to missed nursing care were not addressed. Different types of case reviews describing missed care could be incorporated into the PRISM Program and be evaluated with future research.

Recommendations

The recommendations from the discussion of the findings in this study are summarized below:

- Academic and organizational nursing education about safety culture is needed. Safety culture education can impact nurses' attitudes and lead to reducing patient harm.
- National associations and regulatory bodies should embrace nurse peer review programs.
- A contemporary programmatic approach to nurse peer review is needed and should include discourse that clearly identifies the various types of peer review.

- Nurse leaders should adopt a programmatic approach to nurse peer review. Nurse peer review programs with many different tactics promote the self-regulation of practice and a patient safety agenda. Consideration should be given to nurses leading the way with an interdisciplinary approach to this effort.
- Theory driven research in the areas of peer review and safety culture is needed. The SAQ is a valid and reliable survey tool that demonstrated good utility as a proxy for nurses' attitudes about safety culture in this study. The RMEI needs more research to determine the best timelines for administration and could be expanded to include nurse errors. In addition, a qualitative approach can be used to learn about peer review about peer review and safety culture attitudes from nurses.

Conclusions

This chapter provided discussion about the findings and limitations of this study as well as the implication of this study on nursing theory, education, practice, research and policy. A major finding in this study was a statistically significant effect of the PRISM Program between units and within the intervention unit on critical care nurses' attitudes of safety culture in the working conditions subscale. The statistical analysis also found significance in the main effects of the study again with the intervention unit nurses' attitudes of safety culture in the following subscales: safety climate, teamwork, job satisfaction, and perceptions of hospital management. What was not expected was that following the PRISM Program implementation post-survey scores were lower than pre-survey scores indicating that informed nurses had a more critical view of safety culture and the work environment.

There were no significant findings related to the RMEI survey, either within the intervention unit or between the intervention and control units. However, from a methodological

perspective the theory and survey were tested in a quasi-experimental design and this provided new insight into the utility of this theory and tool. Recommendations from this study include the considerations for derivations of the theory as well as the use of the survey tool as a one-time survey or over a longer length of time than 3 months between pre and post-surveys. Also, the RMEI would be a more useful measure with enhanced case studies that include the nurses' role in the recovery of medical errors.

Of equal importance to the statistical findings were the descriptive comments that nurses provided following participation in the PRISM Program. Although the number of comments was small, the nurses expressed a reflection of what was learned during the case studies and how the teaching impacted their thinking and practice. Nurses expressed a desire to further use surveillance and additional manual checks that placed increased accountability and responsibility for their role in using strategies to keep patient safe and to prevent errors and to prevent patient harm.

At the national level progress to reduce medical errors and patient harm has been slow. Nurses have a powerful opportunity to use innovative methods that will impact patient safety outcomes through education, practice, research and policy. This study was designed to scientifically contribute to a knowledge gap using the PRISM Program. The PRISM Program is a patient safety strategy designed to inform nurses about safety culture and demonstrate the mechanism of how errors occur and ways to identify, interrupt and correct those errors. More research is necessary to further understand how nurses impact patient safety and how the discipline of nursing might further support a patient safety agenda.

REFERENCES

REFERENCES

Agency for Healthcare Research and Quality (2014).Retrieved on October 26, 2014 at: http://psnet.ahrq.gov/primer.aspx?primerID=23

Agency for Healthcare Research and Quality (2014). Retrieved on May 26, 2014 at: http://www.ahrq.gov/professionals/quality-patient safety/patientsafetyculture/hospital/2014/index.html

Agency for Healthcare Research and Quality (2004). Retrieved on March 1, 2014 at: http://www.ahrq.gov/professionals/qualitypatientsafety/patientsafetyculture/hospital/user guide/hospdim.pdf

Alligood, M.R. & Miles, J.M. (2011). Nursing knowledge and health policy in process. *Nursing Science Quarterly* 24 (1): 7-8.

American Association of Critical Care Nurses (2005). *AACN standards for establishing and sustaining healthy work environments: a journey to excellence*. Aliso Viejo, CA: AACN.

American Nurses Association (2010). *Nursing's social policy statement: the essence of the profession.* Silver Springs, MD: American Nurses Association.

American Nurses Association (1988). *Peer review guidelines*. Kansas City, MO: ANA.

American Nurses Credentialing Center (2012). Retrieved on February 12, 2012 at http://www.nursecredentialing.org/Magnet/FindaMagnetFacility.aspx

American Nurses Credentialing Center (2014*). 2014 Magnet Application Manual.* Silver Springs, MD: American Nurses Association.

Antonacci, A.C., Lam, S., Lavarias, V., Homel, P., & Eavey, R.A. (2009). A report card system using error profile analysis and concurrent morbidity and mortality review: surgical outcome analysis, part II. *Journal of Surgical Research* 153(1):95-104.

Barnsteiner, J. (2011). Teaching the culture of safety. *The Online Journal of Issues in Nursing* 16 (3), manuscript 5.

Barr, F. (2010). Nursing Peer Review: raising the Bar on Quality. *American Nurse Today* 5(9): 46-48.

Barrett, E.A.M. (2010). Power as knowing participation in change: what's new and what's next. *Nursing Science Quarterly* 23(1): 47-54. Doi:10.1177/0894318409353797

Bechtold, M.L., Scott, S., Nelson, K., Cox, K.R., Dellsperger, K.C., & Hall, L.W. (2007). Educational quality improvement report: outcomes from a revised M&M format that emphasizes patient safety. *Quality & Safety in HealthCare* at http://www.qshc.bmj.com

Bender, L.C., Klingensmith, M.E., Freeman, B.D., Chapman, W.C., Dunagan, W.C., Gottlieb, J.E., & Hall, B.L. (2009). Anonymous group peer review in surgery morbidity and mortality conference. *American Journal of Surgery* 198(2):270-276.

Benner, P, Tanner, C.A., & Chesla, C.A. (1996). *Expertise in nursing practice: caring, clinical judgment, and ethics*. New York, NY: Springer Publishing.

Beyea, S.C. (2009). Nursing morbidity and mortality conferences. *American periOperative Registered Nurses (AORN) Journal* 89(2) 413-415.

Bowie, P., McCoy, S., McKay, J., & Lough, M. (2005). Learning issues raised by the educational peer review of significant event analysis in general practice. *Quality in Primary Care* 13 (2): 75-83.

Boyd, M. & Watton, K. (2001). A review of nurses' performance of cardiopulmonary resuscitation at cardiac arrests. *Journal for Nurses in Staff Development* 17(5) 248-255.

Branowicki, P., Driscoll, M, Hickey, P., Renaud, K., & Sporing, E. (2011). Exemplary practice through nurse peer review. *Journal of Pediatric Nursing* 26(2):128-136.

Briggs, L., Heath, J., & Kelley, J. (2005). Peer review for advanced practice nurses: What does it really mean? *AACN Clinical Issues* 16(1),pp.3-15.

Bry, K., Stettner, B., & Marks, J. (2006). Through the eyes of your peers. *Nursing Management* (6) pp.20-24.

Burns, N. & Grove, S.K. (2009). *The practice of nursing research: appraisals, synthesis, and generation of evidence 6th ed*. St. Louis, MO: SAUNDERS ELSEVIER.

Carper, B.A. (2008). Nursing's fundamental patterns of knowing. In Chinn, P. & Kramer. M. (Eds.). *Integrated Theory & Knowledge Development in Nursing* St. Louis, MO: Mosby.

Cederblom, D. & Lounsbury, J.W. (1980). An investigation of user acceptance of peer evaluation. *Personnel Psychology* 33,567-579.

Colla, J.B., Bracken, A.C., Kinney, L.M., & Weeks, W.B. (2005). Measuring patient safety climate: a review of surveys. *BMJ Quality and Safety in Healthcare* (14): 364-366. doi:10.1136/qshc.2005.014217

Davis, K.K., Capozzoli, J., & Parks,J. (2009). Implementing peer review: guidelines for managers and staff. *Nursing Administration Quarterly* 33(3) 251-257.

de Boer, M.R., Waterlander, W.E., Kuijper, L.DJ., Steenhus, I. HM, & Twisk, J WS (2015). Testing for baseline differences in randomized controlled trials: an unhealthy research behavior that is hard to eradicate. *International Journal of Behavioral Nutrition and Physical Activity* 12(4) 1-8.

Defontes, J. & Surbida, S. (2004). Preoperative safety briefing project. *The Permanente Journal* 8(2):21-27.

Deis, J.N., Smith, K.M., Warren, M.D., Throop, P.G., Hickson, G.B., Joers, B.J., Deshpande, J.K. (2008). Transforming the morbidity and mortality conference into an instrument for

system-wide improvement. In K.Henriksen (Ed.), J.B. Battles (Ed.), & M.A. Keyes (Ed.) et al., *Advances in patient safety: new directives and alternative approaches* (Vol.2: *Culture and Redesign*). Rockville, MD: Agency for Healthcare Research and Quality.

Department of Health & Human Services Administration (2010). The registered nurse population: initial findings from the 2008 national sample survey of registered nurses, *U.S. Department of Health and Human Services.*

Diaz, L. (2008). Nursing peer review: developing a framework for patient safety. *Journal of Nursing Administration* 38(11) 475-479.

Dillman, D.A., Smyth, J.D., & Christian, L.M. (2009). *Internet, mail, and mixed-mode surveys: the tailored design method 3rd* ed. Hoboken, NJ: John Wiley & Sons.

Donabedian A. (2003) *An introduction to quality assurance in health care.* New York: Oxford University Press.

Donebedian, A. (1976). Forward, in M.Phaneuf, *The nursing audit: self-regulation in nursing practice* (2nd ed., p.8). New York: Appleton-Century-Crofts.

Dracup, K. & Bryan-Brown, C.W. (2003). Nursing morbidity and mortality conferences. *American Journal of Critical Care* 12(6) 492-494.

Dykes, P.C., Rothschild, J.M., & Hurley, A.C. (2010). Medical errors recovered by critical care nurses. *Journal of Nursing Administration* 40 (5): 241-246.

Dykes, P.C., Rothschild, J.M., & Hurley, A.C., (2010). Recovered medical error inventory. *Journal of Nursing Scholarship* 42(3):314-318.

Edwards, M. T. (2010). Clinical peer review program self-evaluation for US hospitals. *American Journal of Medical Quality* 25(6) 474-480.

Edwards, M.T. (2011). Objective impact of clinical peer review on hospital quality & safety.

American Journal of Medical Quality Mar-Apr;26 (2):110-119.

Foy, R., Ovretveit, J., Shekelle, P.G., Pronovost, P.J., Taylor, S.L., Dy, S., Hempel, S., McDonald, K.M., Rubenstein, L.V., & Wachter, R.M. (2011). The role of theory in research to develop and evaluate the implementation of patient safety practices. *BMJ Quality & Safety* 20:453-459. doi:10.1136/bmjqs.2010.047993

Fujita, L.Y., Harris, M., & Johnson, K.G. (2009). Nursing peer review: integrating a model in a shared governance environment. *Journal of Nursing Administration* 39(12) 524-530.

Gaynes, R.P., & Platt, R. (2006). Monitoring patient safety in health care: building the case for surrogate measures. *Joint Commission on Accreditation of Healthcare Organizations* 32(2)95-101.

George, V. & Haag-Heitman, B. (2011). Nursing peer review: the manager's role. *Journal of Nursing Management* 19(2) 254-259.

George,V. & Haag_Heitman, B. (2012). Differentiating peer review and the annual performance review. *Nurse Leader* 10 (1) 26-28.

George, V., & Haag-Heitman, B. (2015). Peer review in nursing: essential components of a model supporting safety and quality. *Journal of Nursing Administration* 45 (7/8): 398-403.

Gore, D.C. (2006). National survey of surgical morbidity & mortality conferences. *American Journal of Surgery* 191 p.708-714.

Grace, P. (2009) *Nursing ethics and professional responsibility in advanced practice*. Sudbury, MA: Jones and Bartlett Publishers.

Griffin, F.A. & Resar, R.K. (2009). Institute for Healthcare Improvement global trigger tool for

measuring adverse events 2nd ed. *IHI innovation series white paper.* Cambridge, MA: Available at: http://www.IHI.org

Groves, R.M., Fowler, F.J., Couper, M.P., Lepkowski, J.M., Singer, E., & Tourangeau (2009). *Survey methodology* 2nd ed. (p.192), Wiley: Hoboken, NJ.

Guger, C., Daum, S., Vacek, l., Angeletti, J.B., O'Malley, J., Curell, K., & Phillips, J. (2011). Nursing morbidity and mortality conferences. *Journal for Nurses in Staff Development* 27(1) 35-38.

Haag-Heitman, B. & George, V. (2011). Nursing peer review: principles and practice. *American Nurse Today* 6(9) 48-52.

Haag-Heitman, B. & George, V. (2011). *Peer review in nursing: principles for successful practice.* Sudbury, MA: Jones and Bartlett Publishers.

Habel, M. (2011). Promoting a culture of safety to prevent medical errors. *Nurse.com/Management*.52-57.

Halligan, M., & Zecevic, A. (2011). Safety concepts in healthcare: a review of concepts, dimensions, and progress. *British Medical Journal Quality and Safety* (20):338-343. doi:10.1136/bmjqs.2010.040964

Harris, P.A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N. & Conde, J.G. (2009). Research electronic data capture (REDCap)- a metadata driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics* 42(2):377-381. doi.org/10.1016/j.jbi.2008.08.018

Hendren, R. (2010). Nurse leaders should champion peer review. *HealthLeaders Media.* Retrieved on 3-10-12 at: www.healthleadersmedia.com/print/NRS-245125/Nurse-Leaders-Should-Champion-Peer-Review

Henneman, E.A. & Gawlinski, A. (2004). A "near-miss" model for describing the nurse's role in the recovery of medical errors. *Journal of Professional Nursing* 20(3) 196-201.

Hitchings, K.S., Davies-Hathen, N., Capuano, T.A., & Morgan, G.(2008). Peer case review sharpens event analysis. *Journal of Nursing Care Quality* 23(4) 296-304.

Holden L.M., Watts, D.D., & Hinton Walker, P. (2009). Patient safety climate in primary care: age matters. *Journal of Patient Safety* 5(1) 23-28.

Hollanda, J. (2007). A role for morbidity and mortality conferences in psychiatry. *Australian Psychiatry.* 15(4):338-342.

Hudson, D.W., Berenholtz, S.M., Thomas, E.J., & Sexton, J.B. (2009). A safety culture primer for the critical care clinician. *Contemporary Critical Care* 7(5): 1-12.

Hunt, V.J. (2008). Implementing a peer review process. *Forum* (5) pp.14-15.

Hurley, A., Rothschild, J.M., Moore, M.L., Snydeman, C., Dykes, P.C., & Fotakis, S. (2008). A model of recovering medical errors in the coronary care unit. *Heart & Lung* 37(3) 219-226.

Institute of Medicine (2011). *The future of nursing: leading change, advancing health*. Washington D.C.: National Academy Press.

Institute of Medicine (2000). *Crossing the quality chasm: a new health system for the 21st Century.* Washington D.C.: National Academy Press.

Ives Erickson, J. (2010). Overview and summary: promoting Healthy Work Environments: a shared responsibility. *Online Journal of Issues in Nursing* 15 (1), Manuscript overview. Doi: 10.3912/OJIN.Vol15No01ManOS

Joint Commission (2016). The Joint Commission Comprehensive Accreditation and

Certification Manual. Retrieved on 11- 6-16 from https://e-dition.jcrinc.com/MainContent.aspx

Kalisch, B.J. & Williams, R.A. (2009). Development and psychometric testing of a tool to measure missed nursing care. *Journal of Nursing Administration* 19 (5):211-219.

Kalish, B.J., Xie, B., & Dabney, B. W. (2014). Patient reported missed nursing care correlated with adverse events. *American Journal of Medical Quality* 29(5): 415-422. doi: 10.1177/1062860613501715 ajmq.sagepub.com

Kalisch, B. J. (2015). *Errors of omission: how missed nursing care imperils patients.* Silver Springs, MD: American Nurses Association.

Kimichi, J., Polivka, B., & Stevenson, J.B. (1991). Triangulation: operational definitions. *Nursing Research* 40(6):364-366.

Krautscheid, L.C. (2014). Defining professional nursing accountability: a literature review. *Journal of Professional Nursing* 30(1) 43-47.

Ksouri, H., Balanant, P.Y., Tadie, J., Heraud, G., Abboud, I., Lerolle, N., Novara, A., Fagon, J.Y., & Faisy, C. (2010). Impact of morbidity and mortality conferences on analysis of mortality and critical events in intensive care practice. *American Journal of Critical Care* 19(2) 135-148.

Kuhn, L.T., Corrigan, J.M., & Donaldson, M.S. (Eds.) (2000*). To err is human: building a safer health system*. Washington D.C.: National Academy Press.

Kuper, A., Nedden, N.Z., Etchells, E., Shadowitz, S., & Reeves,S. (2010). Teaching and learning in morbidity and mortality rounds: an ethnographic study. *Medical Education* 44 p. 559-569.

Landrigan, C.P., Parry, G.J., Bones, C.B., Hackbarth, A.D., Goldman, D.A., & Sharek, P.J.

(2010). Temporal trends in rates of patient harms resulting from medical care. *New England Journal of Medicine* 363: 2124-2134.

Latif, A., Rawat, N., Pustavoitau, A., Provonost, P.J., & Pham, J.C. (2013). National study on the distribution, causes, and consequences of voluntary reported medication errors between the ICU and non-ICU settings. *Critical Care Medicine* 41(2) 389-398.

Lau, H. & Litman, K.C. (2011). Saving lives by studying deaths: using standardized mortality reviews to improve inpatient safety. *The Joint Commission Journal on Quality & Patient Safety* 37(9) 400-408.

Leonard, M.W. & Frankel, A. (2010). The path to safe and reliable healthcare. *Patient Education and Counseling*. 80(3):288-292.

Leape L, Berwick D, Clancy C, Conway J, Gluck P, Lawrence D, Morath J, O'Leary D, O'Neill P, Pinakiewicz D, Isaac T. (2009). Transforming healthcare: a safety imperative. *British Medical Journal of Quality & Safety in Health Care*.18: 424-428.

Levinson, D.R. (2010). *Adverse events in hospitals: national incidence among Medicare beneficiaries.* Washington D.C.: U.S. Department of Health and Human Services, of the Inspector General. Report No. OEI-06-09-00090.

Lutsky, L.A. et al. (1993). Surgical resident peer ratings. *Evaluation Review* 17, 444-456.

Makary, M.A. & Daniel, M. (2016). Medical error – the third leading cause of death in the U.S. *British Medical Journal*: 353:i2139. doi: 10.1136/bmj.i2139.

McDonnell, C., Laxer, R.M., & Roy, L. (2010) Redesigning a morbidity & mortality program in a university-affiliated pediatric anesthesia department. *The Joint Commission Journal on Quality and Patient Safety* 36(3) 117-125.

McKay, J., Murphy, D.J., Bowie, P., Schmuck, M.L., Lough, M., & Eva, K.W. (2007).

Development and testing of an assessment instrument for the formative peer review of significant events. *Quality & Safety in Healthcare* 16(2):150-153.

McKay,J., Shepherd, A., Bowie, P., & Lough, M. (2008). Acceptability and educational impact of a peer feedback model for significant event analysis. *Medical Education* 42 p. 1210-1217.

Meurier, C.E., Vincent, C.A., & Parmar, D.G. (1998). Nurses response to severity dependent errors; a study of the causal attributions made by nurses following an error. *Journal of Advanced Nursing*, 27, 349-354.

Moorer-Whitehead, K. (2010). Heightened individual accountability through peer review. *Nursing Management* (4)pp.24-26.

Morby, S.K. & Skalla,A. (2010). A human care approach to nursing peer review. *Nursing Science Quarterly* 23(4) 297-300.

Murayama, K.M., Derossis, A.M., DaRosa, D.A., Sherman, H.B., & Fryer, J.P. (2002). A critical evaluation of the morbidity and mortality conference. *American Journal of Surgery* 183(3):246-250.

National Coordinating Council for Medication Error Reporting and Prevention (2014). Retrieved on October 26, 2014 at: http://www.nccmerp.org/about-medication-errors

Nolan, S. (2008). Nursing M&M reviews: learning from our outcomes. *RN*. Retrieved 11-20-2011 at **http://www.modernmedicine.com/modernmedicine/Features/Nursing-morbidity-and-mortality-reviews-Learningf/ArticleStandard/Article/detail/482656**

Nolan, S.W., Burkard, J.F., Clark,M.J., Davidson, J.E., & Agan,D.L. (2010). Effect of morbidity and mortality peer review on nurse accountability and ventilator-associated pneumonia rates. *Journal of Nursing Administration* 40 (9):374-383.

Norman, G. (2010). Likert scales, levels of measurement and the laws of statistics. *Advances in Health Science Education*. Published online: 10 February 2010. DOI 10.1007/s10459-010-9222-y

Orl**a**nder, J.D. & Fincke, G. (2003). Morbidity & mortality conference: a survey of academic internal medicine departments. *Journal of General Internal Medicine* 18 p.656-658.

Page, A. (Ed) (2004). *Keeping patients safe: transforming the work environment of nurses.* Washington D.C.: National Academies Press.

Pagano, L.A. & Lookinland, S. (2006). Nursing morbidity and mortality conferences: promoting clinical excellence. *American Journal of Critical Care* 15(1) 78-85.

Pallant, J. (2010). *SPSS survival manual 4th ed*. New York, NY: McGraw-Hill.

Pearson, M., Lee, J.L., Chang, B.L., Elliott, M., Kahn, K.L., & Rubenstein, L.V. (2000). Structured implicit review: a new method for monitoring nursing care quality. *Medical Care* 38(11),pp:1074-1091.

Pederson,A., Crabtree, T., & Ortiz-Tomel, T. (2004). Implementation of the peer review council. *MEDSURG Nursing* 13(3) 172-175.

Peters, E., Slovic, P., Hibbard, J.H., & Tusler, M. (2006). Why worry? Worry, risk perceptions, and willingness to act to reduce medical errors. *Health Psychology*, 25, 144-152.

Pettker, C.M., Thung, S.F., Norwitz, E.R., Buhimschi, C.S., Raab, C.A., Copel, J.A., Kuczynski, E., Lockwood, C.J., & Funai, E.F. (2009). Impact of a comprehensive patient safety strategy on obstetric adverse events. *American Journal of Obstetrics and Gynecology* 5: 492.e1-e8.

Pfeiffer, J.A., Wickline, M.A., Deetz, J., & Berry, E.S. (2012). Assessing RN to RN peer review on clinical units. *Journal of Nursing Management* 20 (3):390-400.

Pierluissi, E., Fischer, M.A., Campbell, A.R., & Landefeld, C.S. (2003). Discussion of medical errors in morbidity & mortality conferences. *Journal of the American Medical Association* 290 (21) 2838-2842.

Powers, M. & Faden, R. (2006). *Social justice: the moral foundations of public health and health policy.* New York, NY: Oxford Press.

Pronovost, P.J., Weast, B., Holzmueller, C.G., Rosenstein, R.P., Kidwell, R.P., Haller, K.B., Feroli, E.R., Sexton, J.B., & Rubin, H.R. (2003). Evaluation of the culture of safety: survey of clinicians and managers in an academic medical center. *Quality and Safety in Health Care* (12): 405-410.

Pronovost, P., Weast, B., Rosenstein, B., Sexton, J.B., Holzmueller, C.G., Paine, L., Davis, R., & Rubin, H.R. (2005). Implementing and validating a comprehensive unit-based safety program. *Journal of Patient Safety* 1(1): 33-40.

Pronovost, P. & Sexton, B. (2005). Assessing safety culture: guidelines and recommendations. *British Medical Journal of Quality & Safety in Healthcare* 14: 231-233.

Pronovost, P.J., Berrenholtz, S.M., Goeschel, C., Thom, I., Watson, S.R., Holzmueller, C.G., Lyon, J.S., Lubomski, L.H., Thompson, D.A., Needham, D., Hyzy, R., Welsh, R., Roth, G., Bander, J., Morlock, L., & Sexton, J.B. (2008). Improving patient safety in intensive care units in Michigan. *Journal of Critical Care* (23): 207-221. doi: 10.1016/j.jcrc.2007.09.002

Quene′, H. & van den Bergh,H. (2008). Examples of mixed-effects modeling with crossed random effects and binomial data. *Journal of Memory and Language* 59: 413-425.

Raia, L. (2011). Peer reviews: taking on new meanings. *Nursing Administration Quarterly*. 35(2):174-177.

Risucci, D.A., Sullivan, T., DiRusso, S., & Savino, J.A. (2003). Assessing educational validity of the morbidity and mortality conference: a pilot study. *Current Surgery* 60 (2): 204-209.

Ropp, P.W. (2011). Establishing a nursing morbidity and mortality conference. *Nursing 2011* (4) 18-19.

Rothschild, J.M., Landrigan, C.P., Cronin, J.W., Kaushal, R., Lockley, S.W., Burdick, E., Stone, P.H., Lilly, C.M., Katz, J.T., Czeisler, C.A., & Bates, D.W. (2005). The critical care safety study: the incidence and nature of adverse events and serious medical errors in intensive care. *Critical Care Medicine* 33(8) 1694-1700. http://www.who.int/patientsafety/taxonomy/PRISMA_Medical.pdf

Rothschild, J.M., Hurley, A.C., Landrigan, C.P., Cronin, J.W., Martell-Waldrop, K., Foskett, C., Burdick, E., Czeisler, C.A., & Bates, D.W. (2006). Recovery from medical errors: the critical care nursing safety net. *Joint Commission Journal on Quality and Patient Safety* 32(2) 63-72.

Schlesinger, M. (2006). Health policy analysis and the search for hidden meaning. *Journal of Health Politics, Policy & Law* 31 (2): 237-249.

Sexton, J.B., Helmreich, R.L., Neilands, T.B., Rowan, K., Vella, K., Boyden, J., Roberts, P.R., & Thomas, E.J. (2006). The safety attitudes questionnaire: psychometric properties, benchmarking data, and emerging research. *BMC Health Services Research* 6(44):1-10. doi:10.1186/1472-6963-6-44

Shadish, W.R., Cook, T.D., & Campbell, D.T. (2002). *Experimental and quasi-experimental for generalized causal inference*. Belmont, CA: Wadsworth.

Shavelson, R.J. (1996). *Statistical reasoning for the behavioral sciences 3rd ed*. Boston, MA: ALLYN and BACON.

Smits, M., Zegers, M., Groenewegen, P., Timmermans, D.R.M., Zwaan, L., van der Wal, G., & Wagner, C. (2010). Exploring the causes of adverse events in hospitals and potential prevention strategies. *BMJ Quality & Safety in Health Care* 19: 1-7. doi: 10.1136/qshc.2008.030736

Sorra, J.S., & Dyer, N. (2010). Multilevel psychometric properties of the AHRQ hospital survey on patient safety culture. *BMC Health Services Research* 10:199, 1-13. Retrieved on 3-2-13 at http://www.biomedcentral.com/1472-6963/10/199.

Statistical Package for the Social Sciences ® 17.0 (2016). Linear mixed model. *Statistical Package for the Social Sciences ® 17.0*. Retrieved from SPSS ® on 8-28-16.

Staveski, S., Leong, K., Graham, K., Pu, L., & Roth, S. (2012). Nursing morbidity and mortality and journal club cycles: paving the way for nursing autonomy, patient safety and evidence-based practice. *AACN Advanced Critical Care*, 23(2):133-141.

Taylor, J.A. & Pandian, R. (2013). A dissonant scale: stress recognition in the SAQ. BioMed Central *Research Notes* 6: 302. http://www.biomedcentral.com/1756-0500/6/302

Thielen, J. (2014). Failure to rescue as the conceptual basis for nursing clinical peer review. *Journal of Nursing Care Quality* 29 (2) 155-163.

Timmel, J., Kent, P.S., Holzmueller, C.G., Paine, L., Schulick, R.D>, & Provonsot, P.J. (2010). Impact of the comprehensive unit-based safety program (CUSP) on the safety culture in a surgical inpatient unit. *Joint Commission Journal of Quality and Patient Safety* 36(6):252-260.

van Dyck, C., Frese, M., Baer, M., & Sonnentag, S. (2005). Organizational error management culture and its impact on performance: a two-study replication. *Journal of Applied Psychology*, 90(6):1228-1240.

van der Schaaf, T.W. (1992). *Near miss reporting in the chemical process industry*. Eindhoven: Technische Universiteit Eindhoven.

Wachter, R.M. (2012). *Understanding patient safety 2nd ed*. New York: McGraw Hill Medical.

Wagner, C. (2010). Exploring the causes of adverse events in hospitals and potential prevention strategies. *Quality & Safety in Health Care*. 19(5):e5.

Wakefiled ,J.G., McLaws, M-L., Whitby, M. & Patton, L.(2010). Patient safety culture: factors that influence clinician involvement in patient safety behaviors. *BMJ Quality and Safety in Health Care* 19: 585-591.

Weiss, S.J. (1995). Contemporary empiricism. In A. Omery. C.E. Kasper, & G.G. Page (Eds.), *In search of nursing science*. Thousand Oaks, CA: SAGE.

West, B.T., Welch, K.B., & Gatecki, A.T. (2015). *Linear Mixed Models: A Practical Guide Using Statistical Software 2nd ed*. Boca Raton, FL: Taylor & Francis Group.

Whitaker, A. & McCanless, L. (1988). Nursing peer review: Monitoring the appropriateness and outcome of nursing care. *Journal of Quality Assurance* 2(2):24-31.

White, KM, & O'Sullivan, A, (Eds). *The Essential Guide to Nursing Practice: Applying ANA's Scope and Standards in Practice and Education*. Silver Springs, MD: American Nurses Association; 2012.

Whitney, K., Haag-Heitman, B., Chisholm, M. & Gale, S. (2016). Nursing peer review perceptions and practices: a survey of chief nurse executives. *Journal of Nursing Administration*. 46 (10): 541-548.

APPENDICES

Appendix I

Safety Attitudes Questionnaire, Recovered Medical Error Inventory including informed consent

---

Confidential

Surveys: Safety Attitudes Questionnaire and Recovered Medical Error Inventory

Please complete the two surveys below: the Safety Attitudes Questionnaire (SAQ) and the Recovered Medical Error Inventory (RMEI).

This nursing research study is being conducted by Colleen Snydeman RN, PhD(c), a doctoral student at Boston College School of Nursing to evaluate the effects of the Peer Review Impacts Safety and Medical-errors (PRISM) Program on critical care nurse's attitudes of safety culture and awareness of the recovery of medical errors. Your participation in this research study will contribute to knowledge about the effects of a nurse peer review program on safety culture and nursing practice as a means of reducing errors to improve patient safety.

The study involves the completion of 2 pre and 2 post-surveys (total 4 surveys). Completion of any portion of the surveys will make participants eligible for a random drawing for an iPAD mini (one per unit). Entry into the drawing is voluntary.

The Safety Attitudes Questionnaire (SAQ) survey includes 36 questions about your attitudes of safety culture and will take approximately 10-15 minutes to complete. The Recovered Medical Error Inventory (RMEI) survey includes 50 questions about your experiences with the frequency and seriousness of medical errors you encounter in your practice. The RMEI will take approximately 15-20 minutes to complete. You may save your responses at any time and return to the survey for completion.

Your responses will be confidential. Tracking pre and post survey completion is done electronically by REDCap using your tracking number. Survey results will be stored electronically in a password protected file with access available only to the researcher.

Your participation is voluntary. You are free to withdraw your participation at any time and your answers will not be recorded. If you wish to withdraw, simply do not complete the survey. Partially completed surveys will not be saved. No risks are anticipated from taking part in this survey.

The results of this survey will be used for scholarly purposes only. Following data analysis you will be provided with information about the study findings. The results from the study may be presented in educational settings, at professional conferences, and the results may be published in a professional journal.

If you have any questions or concerns about this study please contact Colleen Snydeman RN, PhD(c) at colleen.snydeman@partners.org or at 508-328-6468.

By beginning the survey, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty. Thank you for your participation.

Please create a tracking number, that you can easily remember, in order to link your pre and post survey responses using the DAY (1-31) of your birthday with the last 3 numbers of your cell phone. Examples: 9414 or 30992

_____
(Birthday DAY and last 3 numbers of cell phone)

Indicate the type of critical care unit you work in.

- ◯ Burn
- ◯ Cardiac
- ◯ Cardiac Surgical
- ◯ Medical
- ◯ Neurology/Neurosurgery
- ◯ Pediatric
- ◯ Surgical

(type of unit)

Confidential

Demographics

	Male	Female
Gender	○	○

How many years have you worked as a critical care nurse?
_____
(Years in critical care)

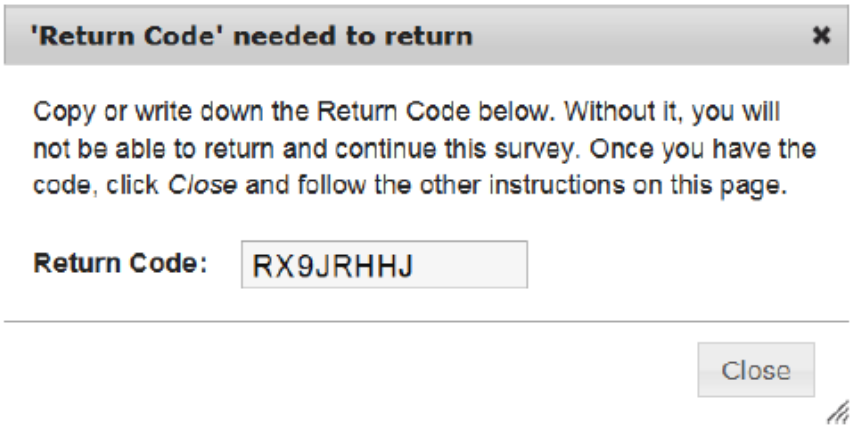
What is your highest level of nursing education?
○ Diploma
○ Associates degree
○ Baccalaureate degree
○ Masters degree
○ Doctor of Nursing Practice
○ Doctor of Philosophy
(Education)

How many hours do you work per week?
_____
(Hours per week)

Do you have a nursing certification?
Example: Critical Care Registered Nurse (CCRN)
○ Yes
○ No
(Certification)

Please indicate your nursing certification
_____
(Nursing Certification)

PLEASE NOTE: You may save and return to your responses at any time however you must record a CODE provided by REDCap that enables you to log back in to your survey. See example attached:



Survey #1 - The Safety Attitudes Questionnaire (SAQ) is a 41 item survey used to measure perceptions of safety culture.

Confidential

	Disagree strongly	Disagree slightly	Neutral	Agree slightly	Agree strongly	Not Applicable
Nurse input is well received in this clinical area.	○	○	○	○	○	○
In this clinical area, it is difficult to speak up if I perceive a problem with patient care.	○	○	○	○	○	○
Disagreements in this clinical area are resolved appropriately (i.e., not who is right but what is best for the patient).	○	○	○	○	○	○
I have the support I need from other personnel to care for patients.	○	○	○	○	○	○
It is easy for personnel here to ask questions when there is something that they do not understand.	○	○	○	○	○	○
The physicians and nurses here work together as a well-coordinated team.	○	○	○	○	○	○
I would feel safe being treated here as a patient.	○	○	○	○	○	○
Medical errors are handled appropriately in this clinical area.	○	○	○	○	○	○
I know the proper channels to direct questions regarding patient safety in this clinical area.	○	○	○	○	○	○
I receive appropriate feedback about my performance.	○	○	○	○	○	○
In this clinical area, it is difficult to discuss errors.	○	○	○	○	○	○
I am encouraged by my colleagues to report any patient safety concerns I may have.	○	○	○	○	○	○
The culture in this clinical area makes it easy to learn from the errors of others.	○	○	○	○	○	○
My suggestions about safety would be acted upon if I expressed them to management.	○	○	○	○	○	○
I like my job.	○	○	○	○	○	○
Working here is like being part of a large family.	○	○	○	○	○	○

This is a good place to work.	○	○	○	○	○	○
I am proud to work in this clinical area.	○	○	○	○	○	○
Morale in this clinical area is high.	○	○	○	○	○	○
When my workload becomes excessive, my performance is impaired.	○	○	○	○	○	○
I am less effective at work when fatigued.	○	○	○	○	○	○
I am more likely to make errors in tense or hostile situations.	○	○	○	○	○	○
Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure).	○	○	○	○	○	○
The levels of staffing in this clinical area are sufficient to handle the number of patients.	○	○	○	○	○	○
This hospital does a good job of training new personnel.	○	○	○	○	○	○
All the necessary information for diagnostic and therapeutic decisions is routinely available to me.	○	○	○	○	○	○
Trainees in my discipline are adequately supervised.	○	○	○	○	○	○
I experience good collaboration with nurses in this clinical area.	○	○	○	○	○	○
I experience good collaboration with staff physicians in this clinical area.	○	○	○	○	○	○
I experience good collaboration with pharmacists in this clinical area.	○	○	○	○	○	○
Communication breakdowns that lead to delays in delivery of care are common.	○	○	○	○	○	○

Please respond to the following questions about unit management.

	Disagree strongly	Disagree slightly	Neutral	Agree slightly	Agree strongly	Not Applicable
Unit management supports my daily efforts	○	○	○	○	○	○
Unit management doesn't knowingly compromise patient safety	○	○	○	○	○	○
Unit management is doing a good job.	○	○	○	○	○	○
Problem personnel are dealt with constructively by our unit management	○	○	○	○	○	○
I get adequate, timely information about events that might affect my work from unit management	○	○	○	○	○	○

Please respond to the following questions about hospital management.

	Disagree strongly	Disagree slightly	Neutral	Agree slightly	Agree strongly	Not Applicable
Hospital management supports my daily efforts.	○	○	○	○	○	○
Hospital management doesn't knowingly compromise patient safety	○	○	○	○	○	○
Hospital management is doing a good job.	○	○	○	○	○	○
Problem personnel are dealt with constructively by hospital management.	○	○	○	○	○	○
I get adequate, timely information about events that might affect my work from hospital management.	○	○	○	○	○	○

Thank you for completing the Safety Attitudes Questionnaire.

Survey #2, the Recovered Medical Error Inventory is composed of 50 questions about the frequency and seriousness of common medical errors you encounter in your practice.

Recovered Medical Error Inventory Survey

Please report the FREQUENCY of your experiences in recovering each of the 25 medical errors listed in the survey during the past year.

	once during the past year	a few (2-5) times during the past year	many (>5) times during the past year
Laboratory data used incorrectly	○	○	○
Medical record data used incorrectly	○	○	○
Wrong medication ordered (wrong dose)	○	○	○
Wrong medication ordered (contraindicated)	○	○	○
Wrong medication ordered (not discontinued)	○	○	○
Flawed physical examination given	○	○	○
Dangerous transfer decision	○	○	○
Wrong electrolyte replacement	○	○	○
Wrong therapy per clinical signs ordered	○	○	○
Coexisting health issues ignored	○	○	○
Wrong medication ordered (wrong patient)	○	○	○
Electrocardiographic strips analyzed incorrectly	○	○	○
Vital signs interpreted incorrectly	○	○	○
Poor precaution technique used	○	○	○
Flawed procedural technique used	○	○	○
Aversive symptoms mismanaged	○	○	○
Prophylactic measures not ordered	○	○	○
Diagnostic test delayed incorrectly	○	○	○
Malfunctioning device misdiagnosed	○	○	○
Clinical condition not considered	○	○	○
Unstable clinical signs missed	○	○	○
Therapeutics or monitoring timed badly	○	○	○

Medication parameters omitted	○	○	○
Dangerous actions used during procedures	○	○	○

Based on your experiences during the past year, please report on the SERIOUSNESS of each of the 25 medical error items in the Recovered Medical Error Inventory.

	Minor (potential for slight negative effect if not prevented or corrected)	Serious (could lead to severe adverse event if not prevented or corrected)	Life-threatening (could lead to fatality if not prevented or corrected)
Laboratory data used incorrectly	○	○	○
Medical record data used incorrectly	○	○	○
Wrong medication ordered (wrong dose)	○	○	○
Wrong medication ordered (contraindicated)	○	○	○
Wrong medication ordered (not discontinued)	○	○	○
Flawed physical examination given	○	○	○
Dangerous transfer decision	○	○	○
Wrong electrolyte replacement	○	○	○
Wrong therapy per clinical signs ordered	○	○	○
Coexisting health issues ignored	○	○	○
Wrong medication ordered)wrong patient	○	○	○
Omitted medication (not ordered)	○	○	○
Electrocardiographic strips analyzed incorrectly	○	○	○
Vital signs interpreted incorrectly	○	○	○
Poor precaution technique used	○	○	○
Flawed procedural technique used	○	○	○
Aversive symptoms mismanaged	○	○	○
Prophylactic measures not rdered	○	○	○
Diagnostic test delayed incorrectly	○	○	○
Malfunctioning device misdiagnosed	○	○	○
Clinical condition not considered	○	○	○
Unstable clinical signs missed	○	○	○
Therapeutics or monitoring timed badly	○	○	○
Medication parameters omitted	○	○	○

Dangerous actions used during procedures	○	○	○

Thank you for completing the Safety Attitudes Questionnaire and the Recovered Medical Error Inventory surveys. Your contributions to nursing science will help provide evidence about nurse's impact on patient safety and error reduction.

Appendix II

Informed Consent

Peer Review Impacts Safety & Medical-errors (PRISM) Program
Informed Consent

- **Study**: Evaluation of the effects of the Peer Review Impacts Safety and Medical-errors (PRISM) Program on critical care nurse's attitudes of safety culture and awareness of the recovery of medical errors.

- This study is being conducted by Colleen Snydeman RN, PhD(c), a doctoral student at Boston College School of Nursing (BCSON) to evaluate the effects of the PRISM Program on critical care nurse's attitudes of safety culture and awareness of the recovery of medical errors. You were selected to participate because you are a critical care nurse in the clinical area selected for the study.
- This study involves the completion of 4 (2 pre-surveys and 2 post-surveys) and participation in the PRISM Program. Four case studies sessions will be held over a four week time period and each session will be repeated once (total of 8 sessions). During the post-surveys you will be asked about how many PRISM Program sessions you attended. The sessions will last approximately one hour and include introductory information and a fictional case study .
- Your participation in this study is voluntary: you are under no obligation to participate. If you wish to withdraw, you may leave the PRISM Program session at any time. If you choose to withdraw, it will in no way affect your relationship with your organization, BCSON, or Ms. Snydeman.
- There are no direct benefits to you for taking part in this study but the information shared in the sessions may provide you with further insight into safety events, nursing practice and/or system improvements.
- The study procedures involve minimal harm and there are no anticipated risks associated with participation in the study. If you feel you have suffered any harm or ill effects from participating in the PRISM Program please contact Colleen Snydeman or the MGH Internal Review Board (IRB) for research. The contact information is below.
- Case study discussions are confidential, no recordings will be taken. A record of signed informed consents will be maintained by the researcher and kept in a locked file. A record of attendance will be kept in a locked cabinet and destroyed following the conclusion of the study. Notes will only be taken related to opportunities for improvement for further follow up, if needed.
- Participants unable to attend the PRISM Program are still eligible to complete the 4 surveys. Completion of all four surveys will make participants eligible for a random drawing for an iPad Mini. Entry in the drawing is voluntary.
- The results of this study will be used for scholarly purposes only. Following data analysis you will be provided with information about the study findings. The results from the study will be presented in educational settings, at professional conferences, and the results may be published in a professional journal.
- If you have any questions or concerns about this study please contact Colleen Snydeman RN, PhD(c) at colleen.snydeman@bc.edu or at 508-328-6468. You may also contact the MGH IRB for research at 617-424-4100.
- By participating in the PRISM program study, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty. Thank you for your participation.

PRISM Program

Appendix III
Institutional Review Board Approvals

BOSTON COLLEGE
Institutional Review Board
Office for Research Protections
Waul House, 3rd Floor
Phone: (617) 552-4778, fax: (617) 552-0498

IRB Protocol Number: 16.075.01e

DATE: October 6, 2015

TO: Colleen Snydeman

CC: Callista Roy

FROM: Office of Research Protections

RE: Evaluation of the effects of the Peer Review Impacts Safety and Medical-errors (PRISM) Program on critical care nurses' attitudes of safety culture and awareness of recovery of medical errors

---

Notice of Evaluation – [Exempt 45 CFR 46. 101(b)] 2

The Office for Research Protections (ORP) has evaluated the project named above. According to the information provided, you intend to evaluate the effects of the PRISM program. This is a minimal risk study.

This study has been granted an exemption from Boston College IRB review in accordance with 45 CFR 46.101 (b) 2. This designation is based on the assumption that the materials that you submitted to the ORP contain a complete and accurate description of all the ways in which human subjects are involved in your research.

This exemption is given with the following conditions:

1. You will conduct the project according to the plans and protocol you submitted;
2. No further contact with the ORP is necessary unless you make changes to your project or adverse events or injuries to subjects occur;
3. If you propose to make any changes in the project, you must submit the changes to the ORP for IRB review; you will not initiate any changes until they have been reviewed and approved by the IRB;
4. If any adverse events or injuries to subjects occur, you will report these immediately to the ORP.

The University appreciates your efforts to conduct research in compliance with the federal

Institutional Review Board Approval
Partners

PARTNERS HEALTHCARE
FOUNDED BY BRIGHAM AND WOMEN'S HOSPITAL AND MASSACHUSETTS GENERAL HOSPITAL

Partners Human Research Committee
116 Huntington Avenue, Suite 1002
Boston, MA 02116
Tel: (617) 424-4100
Fax: (617) 424-4199

Initial Review: Notification of IRB Exemption
Protocol #: 2015P001633/MGH

Date: September 8, 2015

To: Colleen K Snydeman, RN, MSN
MGH
Central Admin-COO / Nursing

From: Partners Human Research Committee
116 Huntington Avenue, Suite 1002
Boston, MA 02116

Title of Protocol:	Evaluation of the effect of the Peer Review Impact Safety and Medical-errors (PRISM) Program on critical care nurses' attitudes of safety culture and awareness of recovery of medical errors
Version Date:	8/4/2015
Sponsor/Funding Support:	None
IRB Review Type:	Expedited
IRB Review Date:	9/8/2015
IRB Review Action:	Exempt

The IRB has determined that this project meets the criteria for exemption 45 CFR 46.101(b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

Continuing review is not required.

Exempt Protocol

As Principal Investigator, you are responsible for the following:

1. Ensuring that this project is conducted in compliance with the exemption determination.
2. Ensuring that all study staff have completed the required human research education requirements through the Collaborative Institutional Training Initiative (CITI).
3. Submission of significant proposed changes to this project to ensure that the project continues to meet the criteria for exemption.

Questions related to this project may be directed to Deena G Segal, DSEGAL@PARTNERS.ORG, 617-424-4114.

Appendix IV
University of Texas
Letter of Permission

Medical School
University of Texas at Houston-Memorial Hermann
Center for Healthcare Quality and Safety

November 11, 2014

Dear Dr. Colleen Snydeman,

You have our permission to use any of the following Safety Attitudes Questionnaires and the corresponding scoring keys:

Safety Attitudes Questionnaire – Short Form
Safety Attitudes Questionnaire – Teamwork and Safety Climate
Safety Attitudes Questionnaire – Ambulatory Version
Safety Attitudes Questionnaire – ICU Version
Safety Attitudes Questionnaire – Labor and Delivery Version
Safety Attitudes Questionnaire – Operating Room Version
Safety Attitudes Questionnaire – Pharmacy Version
Safety Climate Survey

Please note, we do not have editable versions for any of the SAQ surveys but feel free to modify the surveys to meet your research endeavors.

Respectfully,

University of Texas at Houston-Memorial Hermann
Center for Healthcare Quality and Safety Team

6410 Fannin Street
UTPB Suite 1100
Houston, TX 77030
https://med.uth.edu/chqs/

Patricia A. Dykes DNSc, RN, FAAN
[redacted]

Colleen Snydeman RN
Boston College
Connell School of Nursing
Chestnut Hill, MA

December 19, 2013

Dear Colleen,

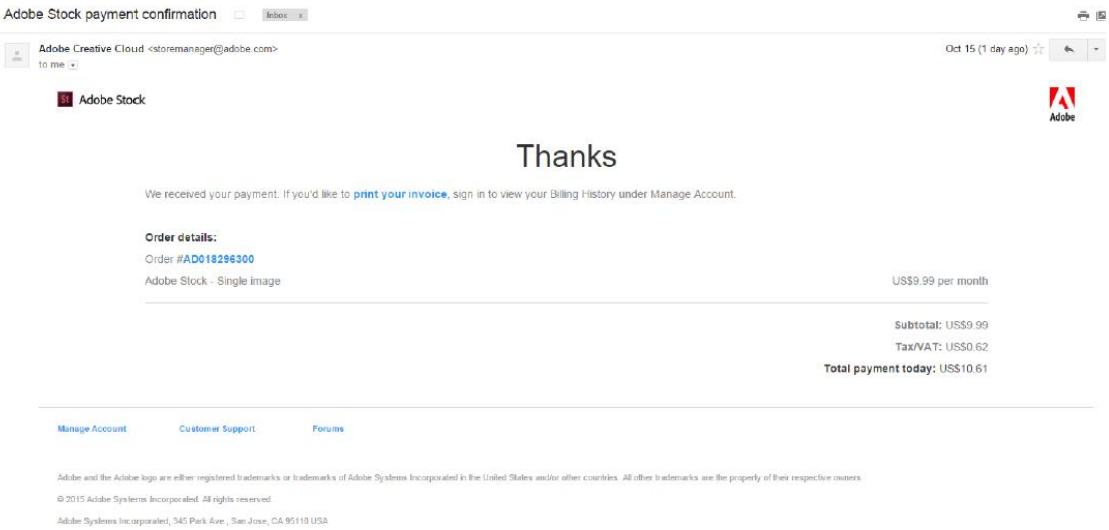
You have my permission to use the Recovered Medical Error Inventory in your doctoral research through Boston College. Please contact me if you have any questions.

Sincerely,

[redacted]
Patricia C. Dykes RN, DNSc, FAAN

Appendix V

Purchase order to use prism logo from Adobe public domain.



Adobe Stock payment confirmation

Adobe Creative Cloud <storemanager@adobe.com>
to me

Oct 15 (1 day ago)

Adobe Stock

Adobe

Thanks

We received your payment. If you'd like to print your invoice, sign in to view your Billing History under Manage Account.

Order details:

Order #AD018296300

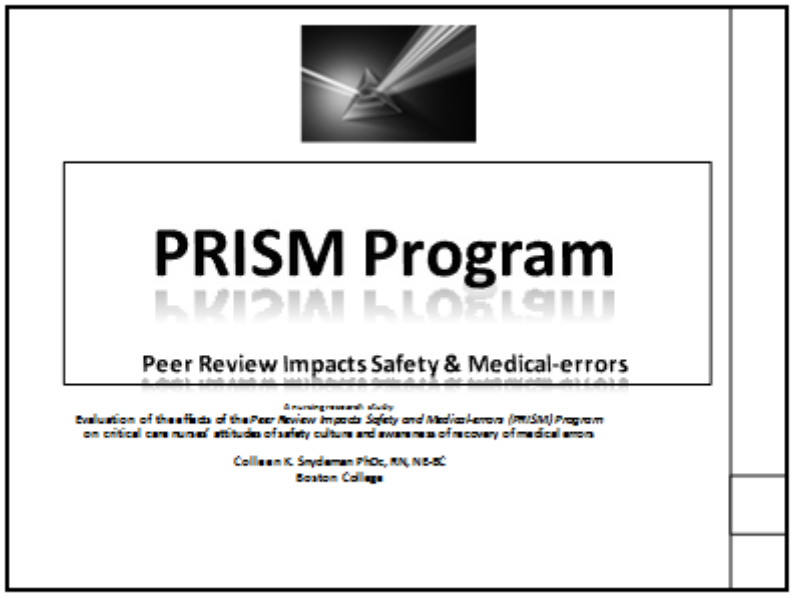
Adobe Stock - Single image — US$9.99 per month

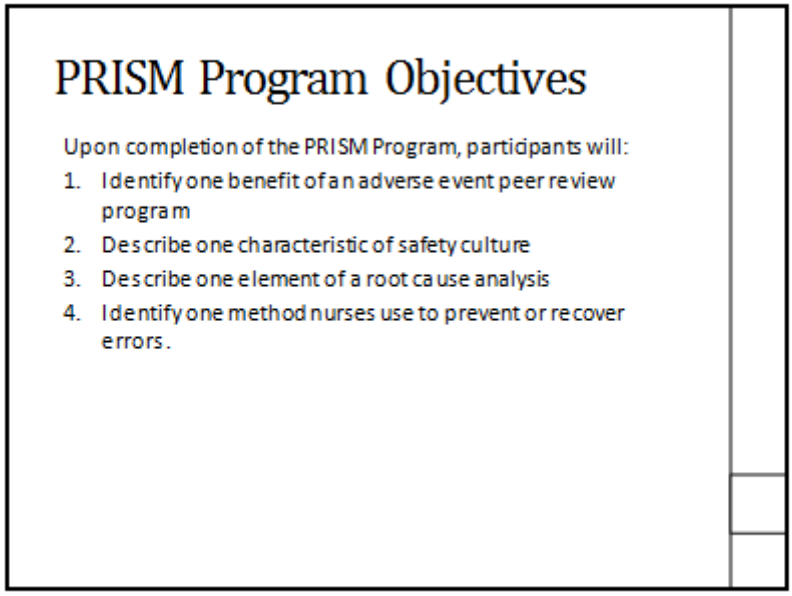
Subtotal: US$9.99
Tax/VAT: US$0.62
Total payment today: US$10.61

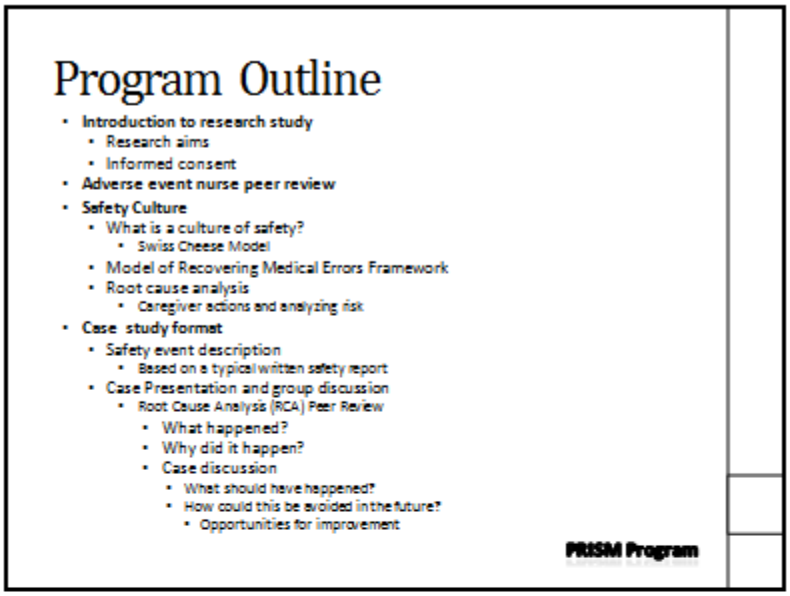
Manage Account Customer Support Forums

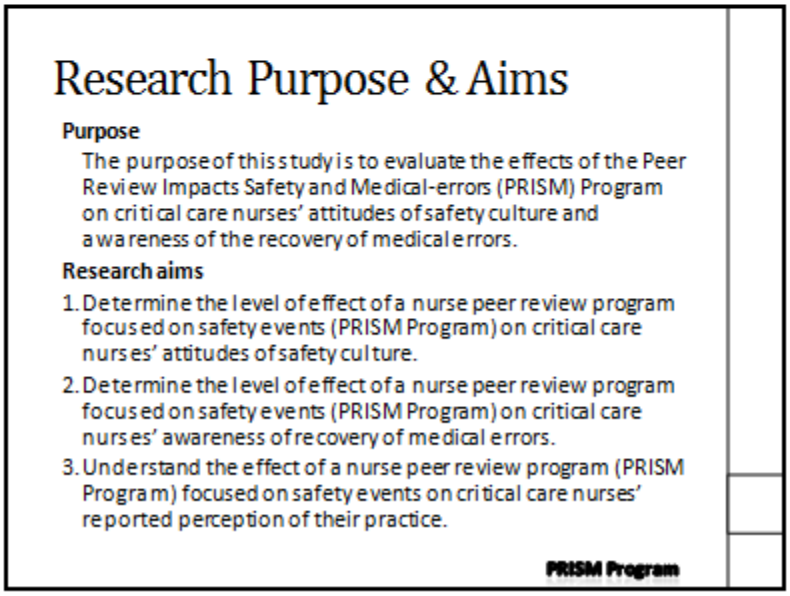
Appendix VI

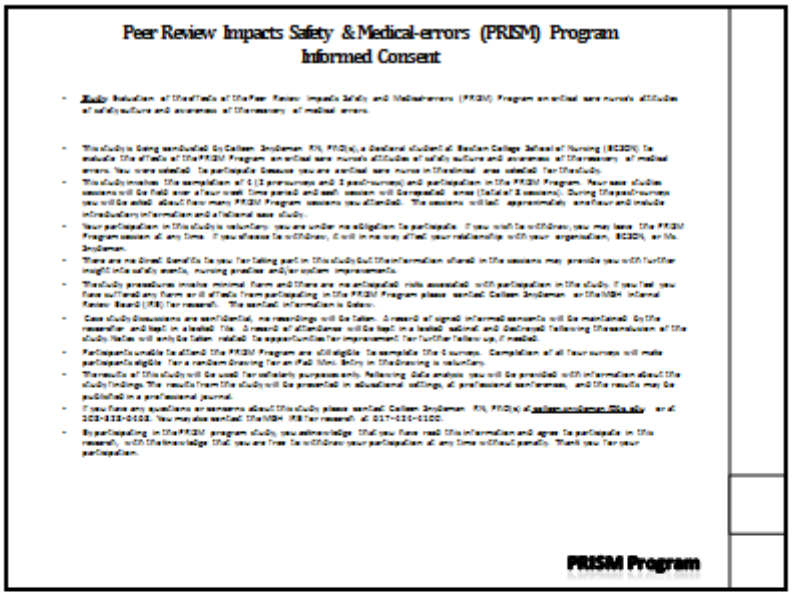
PRISM Program Content






Program Outline
Introduction to research study
Research aims
Informed consent
Adverse event nurse peer review
Safety Culture
What is a culture of safety?
Swiss Cheese Model
Model of Recovering Medical Errors Framework
Root cause analysis
Caregiver actions and analyzing risk
Case study format
Safety event description
Based on a typical written safety report
Case Presentation and group discussion
Root Cause Analysis (RCA) Peer Review
What happened?
Why did it happen?
Case discussion
What should have happened?
How could this be avoided in the future?
Opportunities for improvement
PRISM Program


Research Purpose & Aims
Purpose
The purpose of this study is to evaluate the effects of the Peer Review Impacts Safety and Medical-errors (PRISM) Program on critical care nurses' attitudes of safety culture and awareness of the recovery of medical errors.
Research aims
1. Determine the level of effect of a nurse peer review program focused on safety events (PRISM Program) on critical care nurses' attitudes of safety culture.
2. Determine the level of effect of a nurse peer review program focused on safety events (PRISM Program) on critical care nurses' awareness of recovery of medical errors.
3. Understand the effect of a nurse peer review program (PRISM Program) focused on safety events on critical care nurses' reported perception of their practice.
PRISM Program



Peer Review Impacts Safety & Medical-errors (PRISM) Program
Informed Consent

PRISM Program

Disclosure statement

- All case studies are fictional yet grounded in the literature and/or common safety events:
  - Facts have been changed to disguise references to any actual safety events including: names, gender, locations, and diagnoses have been altered
- Case studies have been tailored to the clinical environment
- Case studies have been created for research purposes

PRISM Program

Adverse Event Nursing Peer Review

Barr (2010), Diaz (2008), Fujita et al, (2009) & Hitchings et al (2007)

The systematic assessing, monitoring and making judgments about the quality of nursing care provided by peers of the same rank, as measured against professional standards of practice.

- ***Promotes professionalism:***
  - Enhances professional accountability
    - Nurses' obligation to monitor the quality of nursing care and ensure standards are maintained
  - Promotes a culture of safety and delivery of safe patient care
  - Provides a confidential, objective, nonjudgmental, non-punitive evaluation of performance for the purposes of identifying opportunities to improve care
- ***Process for examining safety events:***
  - Root cause analysis of adverse events, errors, and near-misses
    - Identifies contributing causes
    - Assesses caregiver actions and analyzing risk
    - Identifies and recommends opportunities for practice and/or system/process improvements

PRISM Program

Safety Culture

Wachter,RM. (2012)

1. Emphasizes quality and safety over blame and punishment
2. Promotes a process where mistakes/errors do not result in automatic punishment but a process to uncover the root causes of error
3. Human errors that are not deliberate or malicious result in coaching, counseling, and education to decrease the likelihood of a repeated error
4. Promotes increase error reporting that leads to organizational learning. System improvements create safer environments for patients and staff

PRISM Program

Swiss Cheese Model of Error Proliferation

Reason, J. (2000)

Nurses as a safety net

- In the setting of the complex critical care environment and nurses' knowledge and expertise, nurses protect patients using a safety net process that aides in preventing and/or mitigating harm.
- The Model for Recovery of Medical Errors (Hurley et al., 2008) includes a 3 step process where nurses might intervene to prevent or mitigate harm.
  - Stages of Recovery of errors :
    - Stage I - Identify errors based on critical thinking
    - Stage II - Interrupt errors by taking action
    - Stage III - Correct errors through advocacy

PRISM Program

Types of errors

Error	Definition	Example
Overuse	Care that could harm more than the expected benefit	Antibiotics for a viral infection
Misuse	Appropriate care but a preventable complication occurs	Pneumo after central line placement
Underuse	Failure to provide care that would be beneficial	Pressure ulcer due to lack of turning
Active	Occur at point of contact btw human and system	Ignoring an alarm
Latent	Occur at blunt end – policies, practices, device & systems that affect care	Wrong medication from pharmacy
Slips	Lapse in concentration due to distraction, fatigue or stress	Missed step in a process
Mistakes	Failure in attentional behavior while actively problem solving	Failure to interpret information or have insufficient knowledge
Errors of commission	Doing something wrong	Giving a patient a med they are allergic to
Errors of omission	Failing to do the right thing	Not giving a patient a medication

Missed Nursing Care (Kalisch, B, 2015)

- Any aspect of standard, required nursing care that is not provided
- Studies are emerging suggest that staffing levels and types impact patient outcomes.
  - Better staffing/fewer adverse outcomes (falls, infections, pressure ulcers)
- 9 areas of missed nursing care:
  1. Ambulation
  2. Turning
  3. Patient teaching
  4. Delayed or missed feeding
  5. Hygiene – bathing
  6. I&O documentation
  7. Emotional support
  8. Discharge planning
  9. Surveillance

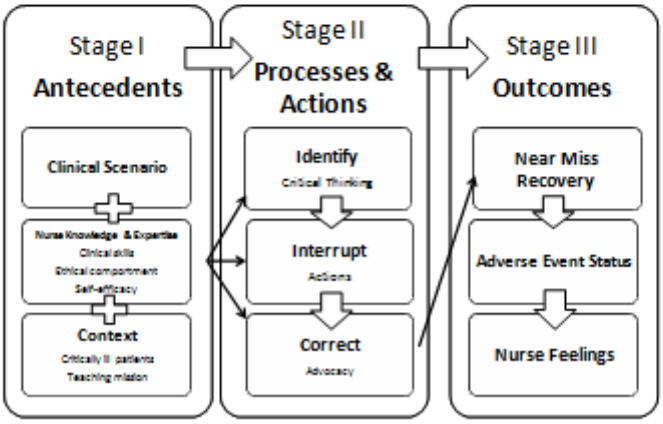
RECOVERY process impacts the outcome of safety event

Outcome	Impact
Near Miss	Harm avoided
Error	Potential for harm
Adverse event	Harm
Nurse's feelings about safety event	Positive/negative feelings based on outcome of safety event

PRISM Program

Model for Recovering Medical Errors

(Hurley et al, 2008)



Root Cause Analysis (RCA)

- Organizational response by healthcare providers to a safety event by investigating the event in question with the intent of eliminating the possibility or reducing the likelihood of a future similar event (National Patient Safety Foundation, 2015).
- Understanding why things go wrong (LaDina, R.J. (2009)
- Identification of problems and opportunities for improvement
  - Problem - a deviation from some performance norm
  - Opportunity - chance to achieve a goal or ideal state
- Events can be chronic or sporadic
  - Chronic - a long standing adverse situation requiring remedy through **changing** norms
  - Sporadic – a sudden adverse change in the status quo requiring remedy through **restoring** norms

PRISM Program

Root Cause Analysis

Investigatory Concepts – 5 Ps

1. **Parts** – physical or tangible
2. **Position** – physical space and point in time
3. **People** - who is involved and has important information about the event
4. **Paper** – documented information
5. **Paradigms** – a set of rules and regulations that define boundaries and tell you what to do to be successful within those boundaries

Types of Causes

1. **Physical** – tangible cause, typically first physical consequence of error and must be validated. Ask how?
2. **Human** – decision errors that result in omission (not doing something) or commission (doing something) of error and trigger a physical root cause. Ask why?
3. **Latent** - organizational systems (policies and procedures) used to make decisions.

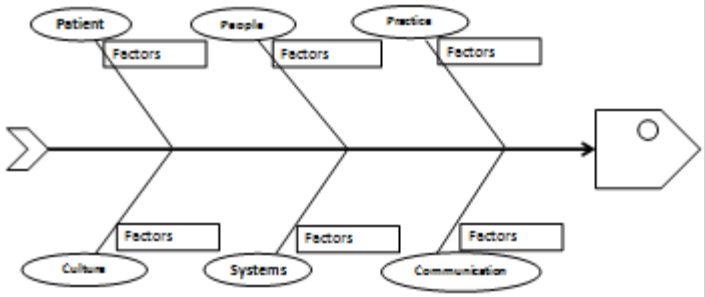
PRISM Program

Five Rules of Causation

1. **Clearly show cause and effect relationship**
   - E.g.: Fatigue due to working 4, 12 hour shifts in a row.
2. **Use specific and accurate descriptors for what occurred, rather than negative and vague words. Avoid negative descriptors**
   - E.g.: Unable to access policy due to TROVE system has limited search functionality.
3. **Human errors must have a preceding cause**
   - E.g.: Drug library categories do not clearly identify when there are multiple concentrations of medications on next screens resulting in potential to select the wrong concentration of high risk medications
4. **Violations of procedure are not root causes but must have a preceding cause**
   - E.g.: Noise and confusion in the medication room increases the likelihood of selecting the wrong medication.
5. **Failure to act is only causal when there is a pre-existing duty to act**
   - E.g.: Assigned scanning times increases the likelihood that wrong continuous infusions will be missed during handoffs.

PRISM Program

RCA Tool: Fishbone Diagram



Other potential contributing factors: environment, equipment, policy, & leadership

PRISM Program

Caregiver behaviors & analyzing risk

Leonard, M.W & Frankel, A (2010)

Behavior:	Human Error	At-Risk-Behavior	Reckless Behavior
Definition	Inadvertent action: slip, lapse or mistake	A choice: risk is not recognized or believed justified	Conscious disregard of unreasonable risk
Manage behaviors through:	• Processes • Procedures • Training • Design • Environment • Choices	• Removing incentives for at-risk-behavior • Creating incentives for healthy behavior • Increase situational awareness	• Corrective action
Help person through:	**Consoling**	**Coaching**	**Counseling**

Case study format

Through case study analysis using a RCA approach we will review and discuss the following:

- Safety event description
  - Based on a typical written safety report
- Case presentation and group discussion
  - Root Cause Analysis (RCA) Peer Review
    - What happened?
    - Why did it happen?
    - Case discussion
      - What should have happened?
      - How could this be avoided in the future?
        - Opportunities for improvement

PRISM Program

PRISM Program

Case Study # 1

Peer Review Impacts Safety & Medical-errors

A nursing research study
Colleen K. Snydeman RN, PhDc, NE-BC
Boston College

Safety event

- *Safety report* – filed by RN caring for patient
- **Severity level 2** - Temporary/minor harm or damage

Safety report statement:

- Mr. Z is a 50 yo male with Type II diabetes, obesity, and alcohol abuse; s/p severe head trauma due to a fall at a construction site while working. On day 6 of his admission he became septic due to a central line associated blood stream infection. Mr Z's blood pressure was very labile ranging from 70's-100 requiring 5-10 mcgs/hr of norepinephrine (Levo) and he was on an insulin drip at 5units per hour. At 08:00 the Levo infusion pump alarmed, requiring a syringe change. When changing the syringe I discovered the syringe was insulin instead of Levo. Mr. Z had been hypotensive for the last two hours with an increasing Levo requirement. MD notified.
- The medication was corrected and blood pressure increased to100 systolic. The most recent blood sugar at 06:30 was 53 and a bolus' of D50 was given. Mr Z.'s condition returned to baseline requirements of Levo and insulin.

PRISM Program

RCA: What happened?

- Nurse helping with acute patient situation
- Syringe on the bedside table assumed to be correct syringe
- Syringe not scanned
- RN believes she read the label as norepineprine
- Insulin syringe was used instead of norepinephrine syringe
- Due to patient acuity the low BP was assumed to be due to sepsis
- At handoff pump readings were checked during 07:00 handoff but not syringe labels
- Other?

PRISM Program

RCA: Why did this happen?

- Patient acuity and concern for emergent blood pressure issue
- RN assisting, not fully knowing the patient/patient's environment
- Labels all look alike
- Handoff - Change of shift check not completed
- Scanning not done but scanning would have picked up an ordered medication
- Other ?

PRISM Program

RCA: Case Discussion

What should have happened?

- Consider:
  - What was the clinical scenario, nurse's knowledge and expertise; context of the critically ill patient and the teaching mission?
  - What was the identification (critical thinking), interception (actions) and correction (advocacy) of the adverse event: patient centered, safe, effective, efficient, equitable, and timely?
  - What were the issues with the patient, people, practice, culture, systems, communication, environment, equipment, policy, leadership, & other?

- What was the outcome of the event?
  - Near miss
  - Human Error – At Risk behavior - Reckless
  - Adverse event
    - Was this event preventable or unpreventable?

- How did staff feel after the adverse event?
  - How can we better support each other when adverse events happen?

How could this be avoided in the future? – opportunities for improvement

- Learning opportunities
  - What might prevent this from happening again?
  - How did/should the adverse event impact one's practice or nursing practice in general?

PRISM Program

PRISM Program

Case study # 2

Peer Review Impacts Safety & Medical-errors

A nursing research study

Colleen K. Snydeman RN, PhDc, NE-BC

Boston College

Safety event

- *Safety report* – filed by RN caring for patient
- **Severity level 2** - Temporary/minor harm or damage

Safety report statement:

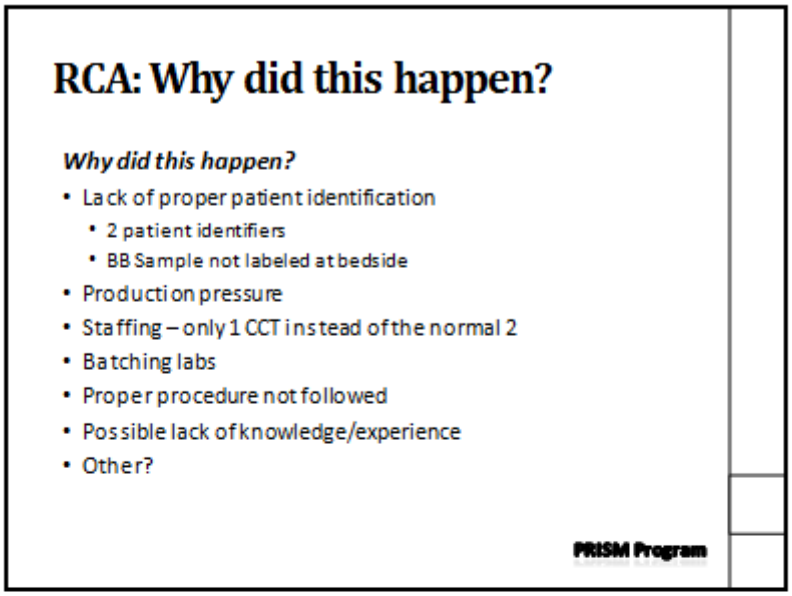
- Ms. C. is a 45 yo active female s/p a hypophysectomy for a pituitary tumor with large nasal blood loss requiring an ICU admission and a blood transfusion. Patient complained of throat tightness within 10 minutes of initiation of blood transfusion. I stopped the blood immediately and alerted the MD. Patient required 0.5 mgs of epinephrine IV and 100 mgs of Benadryl PO. Patient is now stable. Blood and tubing returned to blood bank for testing.

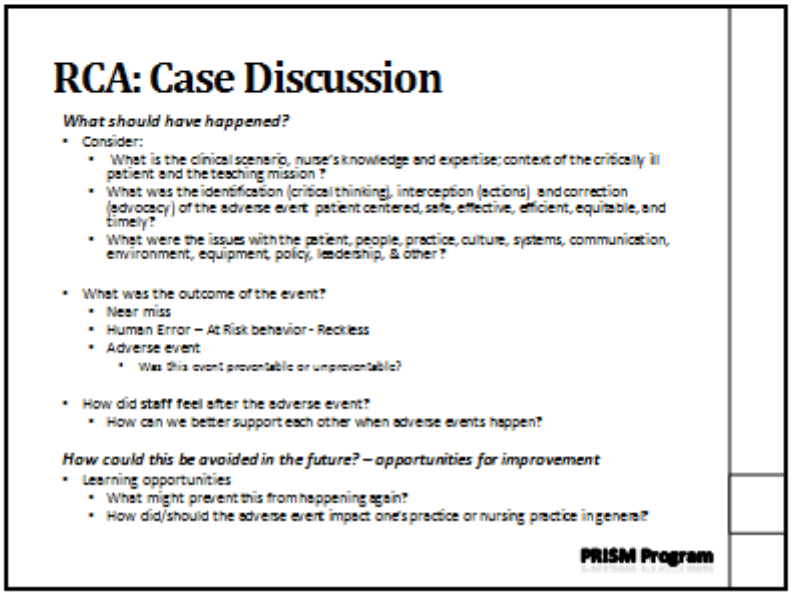
PRISM Program

RCA: What happened?

- Transfusion reaction symptoms triggered Blood Bank analysis of unit of blood and type and cross match sample. New sample was sent for comparison to previous sample
- Blood bank determined that patient was transfused with the wrong unit of blood (received A positive instead of O negative)
- Prior type and cross match sample sent the evening prior was the wrong sample
- It was determined that the patient had been given the wrong unit of blood due to mislabeled type and cross match sample sent evening prior to transfusion
- Type and cross match samples had been sent at same time on 3 different patients
- Unable to determine where labeling occurred
- New type and cross match samples were sent on other 2 patients. Blood bank determined that one other patient also had a mislabeled sample but no blood products had been given to the second patient

PRISM Program


RCA: Why did this happen?
Why did this happen?
Lack of proper patient identification
2 patient identifiers
BB Sample not labeled at bedside
Production pressure
Staffing – only 1 CCT instead of the normal 2
Batching labs
Proper procedure not followed
Possible lack of knowledge/experience
Other?
PRISM Program


RCA: Case Discussion
What should have happened?
Consider:
What is the clinical scenario, nurse's knowledge and expertise; context of the critically ill patient and the teaching mission ?
What was the identification (critical thinking), interception (actions) and correction (advocacy) of the adverse event patient centered, safe, effective, efficient, equitable, and timely?
What were the issues with the patient, people, practice, culture, systems, communication, environment, equipment, policy, leadership, & other?
What was the outcome of the event?
Near miss
Human Error – At Risk behavior - Reckless
Adverse event
Was this event preventable or unpreventable?
How did staff feel after the adverse event?
How can we better support each other when adverse events happen?
How could this be avoided in the future? – opportunities for improvement
Learning opportunities
What might prevent this from happening again?
How did/should the adverse event impact one's practice or nursing practice in general?
PRISM Program

PRISM Program

Case study # 3

Peer Review Impacts Safety & Medical-errors

A nursing research study
Colleen K. Snydeman RN, PhDc, NE-BC
Boston College

Safety event

- *Safety report* – Safety report filed by the Clinical Nurse Specialist after the event
- **Severity level 2** - Temporary/minor harm or damage

Safety report statement:

- Mr. B. is a 25 yo male s/p head trauma from a bike accident 4 weeks ago, now day 3 post-tracheostomy on trach mask for past 8 hours at 40%. RN covering patient stated he responded to ECG bradycardia alarm, found patient with HR of 40, cyanotic with pulse oximeter reading probe off. Review of full disclosure showed a pulse oximetry reading decreasing over 7 minutes but with limited sensing at times, and frequent readings of probe off for approx. 4 minutes and 30 seconds. Bradycardia was alarming for 2 minutes. Patient received brief number of compressions for weak pulse, 100% O2 via ambu and suctioning with return of heart rate/pulse to baseline and O2 sat to low 90's. Patient placed on pressure support. Family notified.

PRISM Program

RCA: *What happened?*

- Pulse oximetry alarms flawed with difficulty reading O2 sat and no escalation of sound
- ECG alerted staff
- Risk of trach mask trial
- Lunch coverage requires RN covering multiple patients at same time.
- Fall risk patient required RN staying with patient while on commode
- Heard ECG alarm for bradycardia on another patient and went to answer alarm
- Other?

PRISM Program

RCA: Why did this happen?

Why did this happen?

- RN coverage
- Pulse oximetry monitoring flaws
- New tracheostomy patients at risk
- Benefits of back up ECG monitoring
- Concerns for leaving other patient, may place them at risk
- Handoffs during coverage
- Knowledge about all patients on unit or just some
- Other?

PRISM Program

RCA: Case Discussion

What should have happened?

- Consider:
  - What was the clinical scenario, nurse's knowledge and expertise; context of the critically ill patient and the teaching mission?
  - What was the identification (critical thinking), interception (actions) and correction (advocacy) of the adverse event patient centered, safe, effective, efficient, equitable, and timely?
  - What were the issues with the patient, people, practice, culture, systems, communication, environment, equipment, policy, leadership, & other?
- What was the outcome of the event?
  - Near miss
  - Human Error – At Risk behavior – Reckless
  - Adverse event
    - Was this event preventable or unpreventable?
- How did staff feel after the adverse event?
  - How can we better support each other when adverse events happen?

How could this be avoided in the future? – opportunities for improvement

- Learning opportunities
  - What might prevent this from happening again?
  - How did/should the adverse event impact one's practice or nursing practice in general?

PRISM Program

PRISM Program

Case study # 4

Peer Review Impacts Safety & Medical-errors

A nursing research study
Colleen K. Snydeman RN, PhDc, NE-BC
Boston College

Safety event

- *Safety report* – Safety report filed by the nurse caring for the patient (second safety report)
- **Severity level 3** - Permanent/major harm or damage
- Reported to Department of Public Health as a Serious Reportable Event

Safety report statement:

- Patient is a 62 yo male with PMH of hypertension, CAD, coronary stents and atrial fibrillation on Coumadin s/p fall at home resulting in a right subdural hematoma, requiring a right hemicraniectomy 2 months ago (wears helmet). Two days ago patient readmitted to Neuro ICU from rehab facility for fever, low blood pressure and mental status changes, with suspected infection of subdural fluid collection.
- At 13:00 while waiting for transfer to general care unit, got patient up to the commode, wearing helmet. Patient told to let me know when done, call light provided. While waiting for patient, called to answer an alarm on another patient (told patient I would be right back). Upon return to room found patient on floor, patient said fell on hip and denied hitting head. MD notified and CT obtained with no changes. Kept overnight in Neuro ICU with sitter (safety report filed).

PRISM Program

RCA: What happened?

- Next day patient alert and oriented in morning. Again patient denied hitting head but had headache during night. Later in day patient confused, somnolent with weak left side. Later wife reports patient told her he did hit his head during fall. Immediate head CT showed diffuse cerebral edema and midline shift. Unsuccessful management of edema and poor neurological status; patient now going to OR for anterior temporal lobectomy for uncal herniation.
- Patient's condition poor, later received trach and peg, follows commands on right side and intermittent on left. Transferred to rehab.

PRISM Program

RCA: Why did this happen?

- Communication contributing factors may related to hitting head and delayed intervention:
  - English was patient's second language (primary Italian)
  - Labile orientation: Patient was at times oriented and at times disoriented
  - Unreliable information about hitting head from patient may be due to altered mental status
  - Complaint of headache (9/10), given oxycodone 5mg without relief, may have been a missed opportunity to further explore cause of headache
- Morse fall scale score 65/High Risk Category
  - History of falling = 25 points
  - Secondary Diagnosis = 15 points
  - Gait = 10 points (weakness)
  - Mental Status = 15 points
  - Total = 65 points
- Experienced nurse, without issues
- Staffing was adequate for shift
  - ? Adequate lunch coverage
- Unclear how patient was on floor
- Altered mental status may have led to impulsivity
  - Reports indicated patient appropriately used call light at rehab and ambulated with 1 assist and walker, RN may have felt ok to leave for short time and could trust patient would call
  - Altered mental status and vulnerable craniotomy status may indicate need to remain with patient
- Environment – nurse had to leave patient without ability for direct observation
- Other?

PRISM Program

RCA: Case Discussion

What should have happened?

- Consider:
  - What was the clinical scenario, nurse's knowledge and expertise; context of the critically ill patient and the teaching mission?
  - What was the identification (critical thinking), interception (actions) and correction (advocacy) of the adverse event patient centered, safe, effective, efficient, equitable, and timely?
  - What were the issues with the patient, people, practice, culture, systems, communication, environment, equipment, policy, leadership, & other

- What was the outcome of the event?
  - Near miss
  - Human Error – At Risk behavior Reckless
  - Adverse event
    - Was this event preventable or unpreventable?

- How did staff feel after the adverse event?
  - How can we better support each other when adverse events happen?

How could this be avoided in the future? – opportunities for improvement

- Learning opportunities
  - What might prevent this from happening again?
  - How did/should the adverse event impact one's practice or nursing practice in general?

PRISM Program

References

- Barr, F. (2010). Nursing Peer Review: raising the Bar on Quality. *American Nurse Today* 5(9): 46-48.
- Diaz, L. (2008). Nursing peer review: developing a framework for patient safety. *Journal of Nursing Administration* 38(11) 475-479.
- Fujita, L.Y., Harris, M., & Johnson, K.G. (2009). Nursing peer review: integrating a model in a shared governance environment. *Journal of Nursing Administration* 39(12) 524-530.
- Hitchings, K.S., Davies-Hathen, N., Capuano, T.A., & Morgan, G.(2008). Peer case review sharpens event analysis. *Journal of Nursing Care Quality* 23(4) 296-304.
- Hurley, A., Rothschild, J.M., Moore, M.L., Snydeman, C., Dykes, P.C., & Fotakis, S. (2008). A model of recovering medical errors in the coronary care unit. *Heart & Lung* 37(3) 219-226.
- Leonard, M.W. & Frankel, A. (2010). The path to safe and reliable healthcare. *Patient Education and Counseling*. 80 (3): 288-292.
- National Patient Safety Foundation (2015). *RCA² Improving root cause analyses and actions to prevent harm*. Boston, MA: NPSF at www.npsf.org
- Reason, J. (2000). Human error: models and management. *British Medical Journal* 320: 768-770.
- Wachter, R.M. (2012). *Understanding patient safety*. New York: McGraw Hill Medical.

PRISM Program