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The Effects of Simulation-based TeamSTEPPS Interprofessional Communication and Teamwork Training on Patient and Provider Outcomes

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The Effects of Simulation-based TeamSTEPPS Interprofessional Communication and Teamwork Training on Patient and Provider Outcomes

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In Nursing

by

Linda Y. Kim

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ABSTRACT OF THE DISSERTATION

The Effects of Simulation-based TeamSTEPPS
Interprofessional Communication and Teamwork Training
on Patient and Provider Outcomes

by

Linda Y. Kim
Doctor of Philosophy in Nursing
University of California, Los Angeles, 2014
Professor Courtney H. Lyder, Chair

The purpose of the study was to evaluate the effects on TeamSTEPPS interdisciplinary communication and teamwork training on provider outcomes (perceptions of communication, teamwork, and patient safety culture) and patient safety outcomes (patient falls and hospital acquired pressure ulcers). The study also evaluated the association between the providers' characteristics (age, gender, ethnicity, primary language, English proficiency, educational level, country of pre-licensure nursing/ MD education, years of U.S. work experience) and provider outcomes.

For the first part of the study, positive trends were noted in patient and provider outcomes following the TeamSTEPPS study; however, the results were not statistically significant. In the

second part of the study, provider characteristics including gender, age, race/ culture, primary language, English proficiency, years of practice in U.S., years of employment in current unit, and country of pre-licensure/ medical education had statistically significant effects on provider outcomes. Nevertheless, future research studies may be strengthened by applying a larger sample size, with more rigorous educational intervention and research methods, over a longer period of time.

Lessons learned from this study may guide development and implementation of evidence-based interventions such as the simulation-based TeamSTEPPS program to improve patient and provider outcomes in other medical-surgical settings. It may also guide development and implementation of policies that establish minimum requirements for safe practice.

The dissertation of Linda Y. Kim is approved.

Donna McNeese-Smith

Linda Searle Leach

Jack Needleman

Courtney H. Lyder, Committee Chair

University of California, Los Angeles

2014

DEDICATION

To my husband, best friend, and tech support,
For your love, support, patience, humor, and
Helping me to realize my dreams.

To Dr. Donna McNeese-Smith, my editor, cheerleader, and role model,
For encouraging me to reach higher and further, and
Inspiring me to strive for greatness.

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PUBLICATIONS AND PRESENTATIONS

Kim, L. (2014). *Provider and patient outcomes of simulation-based TeamSTEPPS training.* Podium and poster presentation, Collaborative Alliance for Nursing Outcomes (CALNOC) Conference, San Diego, CA, October 2014.

Kim, L. (2014). *Patient safety in U.S. and TeamSTEPPS program.* Podium presentation. 2nd Overseas Korean Nurses Association General Assembly and Conference, Burlingame, CA, June 2014.

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Chapter One: Introduction

Background

The report, *To err is human: Building a safer health system*, published in 1999 by the Institute of Medicine (IOM), is credited with prompting national efforts to study and improve safety in health care (Stelfax, Palmisani, Scurlock, Orav, & Bates, 2006). Thirteen years later, the report continues to provide a strong basis for on-going patient safety research.

The report described that preventable medical errors account for approximately 98,000 deaths per year in the U.S.; translating into approximately $29 billion dollars per year in health care costs (Kohn, Corrigan, Donaldson, & McKenzie, 2000). Preventable medical errors also result in more deaths per year than those related to motor vehicular accidents, breast cancer, or AIDS (Kohn et al., 2000).

This troubling data on medical errors has prompted federal and state policy makers, health care organizations, as well as experts on safety from various disciplines to begin addressing the urgent need to improve safety in health care. As a result of recommendations by the IOM and actions by the Agency for Healthcare Research and Quality (AHRQ) to fund additional research on the causes of medical errors and how to prevent them, there has been a huge increase in patient safety research. More specifically, a review of literature revealed that there has been a 58% increase in the number of patient safety publications ($P<0.001$) following the release of the IOM report (Stelfax et al., 2006).

The IOM has also continued to publish a series of reports related to patient safety and quality of care. For instance, the report, *Crossing the quality chasm: A new health system for the 21st century* (IOM, 2001), described that many of the patient safety and quality of care issues

arise as a result of ineffective systems that do not adequately prepare or support health professionals to achieve the best outcomes for their patients.

Several recommendations for building a stronger health system that can deliver state-of-the-art healthcare were discussed in the 2001 IOM report. One recommendation related to building organizational supports for change included developing effective interprofessional teams that actively collaborate and communicate to ensure an appropriate exchange of information and coordination of care. Interprofessional teams are defined as individuals from at least two different disciplines who utilize their expertise to deliver coordinated care to patients (Farrell, Schmitt, & Heinemann, 2001). These interprofessional teams typically include individual members from medicine, nursing, pharmacy, social work, as well as other members from other disciplines involved in delivering care to patients. Effective teamwork is especially relevant as the U.S. faces the growth of a population with increased chronic conditions, requiring the provision of a mix of services over time and across settings (IOM, 2001).

Unfortunately, members of these interprofessional teams continue to be trained in separate disciplines and educational programs, leaving them unprepared to enter practice in complex collaborative settings (Greiner & Knebel, 2003; IOM, 2001). Although there is an emphasis on the need for health professionals to work in interprofessional teams, there has been little training in team-based skills (Greiner & Knebel, 2003).

Several subsequent IOM reports including, *The health professions' education: A bridge to quality* recommended that health professionals be educated in delivering patient-centered care as members of interprofessional teams, emphasizing evidence-based practice, quality improvement approaches, and informatics (Greiner & Knebel, 2003). Additional reports such as

Keeping patients safe: Transforming the work environment of nurses (Page, 2004), also emphasized the need for healthcare organizations to provide formal education and training in interprofessional communication and teamwork for all health care providers on a regular basis to promote patient safety and reduction of errors.

As a result, there has been a substantial increase in the number of studies addressing interprofessional communication and teamwork training. For instance, through the Patient Safety Program, the Department of Defense (DoD) made its initial attempts at developing team training for health care based on the aviation Crew Resource Management model (CRM) (Alonso et al., 2006). In 2006, AHRQ collaborated with the DoD to implement a program called Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) that set the national standard for healthcare team training (King et al., 2008).

There has also been a growing body of health services research addressing nurse-physician communication and teamwork as an important variable in reducing negative patient outcomes and improving the quality of patient care. Despite the increase in this area of health services research, significant research remains to be done, especially related to the evaluation of effectiveness of simulation-based interprofessional trainings such as TeamSTEPPS in improving patient safety outcomes, as well as promoting communication and teamwork between nurses and physicians, and fostering a culture of patient safety.

Problem Statement

Ineffective communication and teamwork among members of the healthcare team are major causes of medical errors associated with negative patient safety outcomes, such as increased length of hospital stay, medication errors, pressure ulcers, and death (Gruenberg et al.,

2006; Knaus, Draper, Wagner, & Zimmerman, 1986; Manojlovich, Antonakos, & Ronis, 2009; Manojlovich, & DeCicco, 2007; Tschannen, & Kalisch, 2009). Furthermore, there was some evidence showing that healthcare providers' characteristics (e.g. lower levels of work experience, education and communication skills) may be linked to ineffective interprofessional communication and teamwork, low self-efficacy, as well as a lack of belief in other providers' ability to deliver safe patient care, and ultimately, negative patient outcomes (Cummins, 2009; Daniel, Chamberlain, & Gordon, 2001; Irvine, Sidani, & Hall, 1998; Kawi, & Xu, 2009; Magnusdottir, 2005; Smith, 2004; Tregunno, Peters, Campbell, & Gordon, 2009).

Recent research studies that have applied interprofessional training programs such as the TeamSTEPPS program reported improvements in communication and teamwork between healthcare providers, as well as their perceptions of patient safety culture (Armour Forse, Bramble, & McQuillan, 2011; Brock et al., 2013; Capella et al., 2010; Deering et al., 2011; Hobgood et al., 2010; Johnson & Kimsey, 2012; Liaw, Zhou, Lau, Siau, & Chan, 2014; Mahoney, Ellis, Garland, Palayo, & Green, 2012; Mayer et al., 2011; Riley, Davis, Miller, Hansen, Sainfort, & Sweet, 2011; Robertson et al., 2010; Sheppard, William, & Klein, 2013; Spiva et al., 2014; Stead et al., 2009; Thomas & Galla, 2013; Weaver et al., 2010). These studies have also found improvements in various patient outcomes, such as reductions in ICU and hospital length of stays, medication and transfusion errors, needle-stick injuries, nosocomial infections, and fall rates (Capella et al., 2010; Deering et al., 2011; Hobgood et al., 2010; Mayer et al., 2011; Spiva et al., 2014;), following implementation of didactic-based TeamSTEPPS program and the TeamSTEPPS program augmented with simulations at various settings including operating rooms, labor and delivery departments, emergency departments, and

intensive care units.

Nevertheless, literature on impacts on both provider and patient outcomes remains limited, especially as it relates to the impact of simulation-based TeamSTEPPS program in the medical/ surgical setting. Hence, the main purpose of this study, was to evaluate the impact of implementation of an interdisciplinary simulation-based TeamSTEPPS training on provider outcomes (i.e. perceptions of interprofessional communication, teamwork, and patient safety culture) and on patient safety outcomes (i.e. patient falls and pressure ulcers) of a medical/surgical unit. A secondary purpose of the study was to investigate possible associations between provider characteristics and provider outcomes of medical/ surgical units and to identify the extent of the associations between the variables. The specific aims of the study were to evaluate:

1a) the difference in patient safety outcomes of the intervention unit as compared to the control unit, at baseline, following the simulation-based TeamSTEPPS intervention, and three months after the intervention;

1b) the change in the intervention unit nurses' perception of communication, teamwork, and patient safety culture as compared to the control unit nurses, at baseline and three months following the simulation-based TeamSTEPPS intervention;

1c) the change in the intervention unit physicians' perception of communication, teamwork, and patient safety culture as compared to the control unit physicians, at baseline, and three months following the simulation-based TeamSTEPPS intervention;

1d) the change in the intervention unit nurses' perception of communication, teamwork, and patient safety culture as compared to intervention unit physicians, at baseline,

following the simulation-based TeamSTEPPS intervention and three months after the intervention;

2a) the association between nurses' characteristics (i.e. age, sex, race/ ethnicity, primary language, English language proficiency, education level, country of pre-licensure nursing education, years of work experience in the U.S., and years of employment in the current hospital and unit) and their perception of communication, teamwork, and patient safety culture; and

2b) the association between physicians' characteristics (i.e. age, sex, race/ ethnicity, primary language, English language proficiency, education level, country of initial medical education, years of work experience in the U.S., and years of experience in the current hospital and unit) and their perception of communication, teamwork, and patient safety culture.

The intervention took place in the medical/surgical unit of Healthcare Organization A, located in the Los Angeles area. Only the participants in the designated medical/surgical intervention unit participated in the TeamSTEPPS training and simulation. The baseline data and data obtained following the intervention were compared to those of a comparable control unit located at Healthcare Organization B, located in the Los Angeles area.

TeamSTEPPS materials are extremely adaptive to meet the needs of each organization (King et al., 2006); hence, there were several ways to implement the trainings, depending on the availability of the staff, resources available, and needs of the organization and team. For this study, the intervention consisted of the didactic TeamSTEPPS program augmented with the simulation skills lab.

The didactic TeamSTEPPS program includes modules on introduction, team structure, leadership, situation monitoring, mutual support, communication and summary. For the purposes of this study, only the mutual support and communication modules were utilized based on the intervention unit's needs assessment.

The simulation component involved application of the TeamSTEPPS tools and strategies presented in the didactic modules. Although optional, the simulation lab was included as part of the intervention, in addition to the didactic TeamSTEPPS to facilitate translation of didactic preparation into clinical performance. Statistically significant differences in outcomes were noted when the didactic TeamSTEPPS program was supplemented with an in-situ simulation program (Riley et al., 2011); hence, this study also included the simulation component. A detailed description of the study intervention is provided in Chapter 4: Methods section of this paper.

Significance to Nursing Science and Practice

This study makes several unique contributions to science and clinical practice. First, the study may add to the current body of literature on the effects of a team training intervention on interprofessional communication and teamwork skills among the participants, as well as the patient safety culture on the units, with an emphasis on patient outcomes. In contrast to previous studies that often only addressed interprofessional communication, teamwork, and/or safety culture as separate variables, this study addressed all three variables in relation to nurse/physician characteristics, as well as actual patient safety outcomes.

Second, identifying relationships between the nurse/physician characteristics and the other study variables provide important insights about the participants' characteristics that may

facilitate or inhibit their response to the interventions. It will also assist in identifying additional strategies that may directly improve patient safety outcomes.

Furthermore, the study has the potential to impact practices that enhance patient safety and improve quality of care in the medical/surgical unit setting. The study specifically assessed the effectiveness of the TeamSTEPPS didactic curriculum and simulation skills practicum aimed at optimizing patient safety outcomes by improving communication and teamwork skills among healthcare professionals in a medical/surgical unit setting. The lessons learned from this study may be applied to facilitate implementation of the TeamSTEPPS program in other healthcare organizations striving to improve interprofessional communication and teamwork, patient safety culture, and patient outcomes.

In addition, the results of this study may enhance healthcare workforce development through a simulation skills practicum to accelerate translation of didactic preparation to improve clinical performance. Simulation-based training in healthcare is gaining acceptance as a method to improve communication, teamwork, and process of care (Eppich, Howard, Vozenilek, & Curran, 2011; Kenaszchuk, MacMillan, van Soeren, & Reeves, 2011; Kim et al., 2011; Paige et al., 2007; Shapiro et al., 2004). Despite its growing acceptance, there are only a few studies that evaluate the effectiveness of simulation-based trainings on improving healthcare providers' communication, teamwork, patient safety culture, and patient safety outcomes. This study also adds to the current body of literature related to the effectiveness of simulation-based training in improving interprofessional communication and teamwork, as well as patient safety culture and patient safety outcomes.

Finally, the knowledge gained from the study may help guide development and

implementation of policies aimed at promoting patient safety and improving quality of care. For instance, the results of this study may provide important insights and empirical evidence about the participants' characteristics that may directly affect patient safety outcomes as well as provider outcomes following the TeamSTEPPS training. Such results may be used to guide development and implementation of policies that establish minimum requirements for practice (e.g. additional training related to U.S. scope of practice, education level, English proficiency, etc.) that impact patient safety and quality of care. The results may also help healthcare facilities to tailor the program applying various strategies to enhance the effectiveness of the training on provider outcomes, based on provider characteristics.

The following sections of this paper present the conceptual framework, a review of the literature and research methods. Chapter Two provides a detailed description of the literature review on TeamSTEPPS. This chapter includes a background discussion on the lessons learned from the aviation industry, previous studies that identified a link between nurse-physician communication and teamwork with patient safety outcomes, barriers to effective nurse-physician communication and teamwork, various interventions aimed at improving nurse-physician communication and teamwork, other interprofessional communication and teamwork training, and concludes with a review of studies that applied the TeamSTEPPS intervention in various settings.

Chapter Three provides the overview of the conceptual and theoretical framework. The philosophical underpinning and definitions of concepts are also presented in Chapter Three.

Chapter Four provides an overview of the research methods. A detailed description of the research design, sample, setting, instruments used, study procedure including data collection and

analysis, implementation of the intervention, study limitations, and plan for dissemination of findings are presented.

The three articles that were generated through this study are presented in Chapter Five. The first article describes the concept analysis of patient safety using the Walker and Avant (2010) method of analysis. The second article includes the results, discussion, and conclusion for specific aims 1a-1d, describing the provider and patient outcomes following the simulation-based TeamSTEPPS study. The third and last article includes the results, discussion, and conclusion for specific aims 2a and 2b, describing the association between provider characteristics and provider outcomes.

Finally, Chapter Six presents the summary of the study and the conclusion. Implications for clinical practice and future research are also presented in this last chapter.

Chapter Two: Literature Review

The following sections describe the review of literature that provides empirical evidence for the positive impact that TeamSTEPPS has shown on provider and patient safety outcomes. The review of literature on TeamSTEPPS is preceded by a background discussion on the lessons learned from the aviation industry, previous studies that identified a link between nurse-physician communication and teamwork with patient safety outcomes, barriers to effective nurse-physician communication and teamwork, various interventions aimed at improving nurse-physician communication and teamwork, other interprofessional communication and teamwork training, and concludes with a review of studies that applied the TeamSTEPPS intervention in various settings.

Background: Lessons learned from the Aviation Industry

Many industries strive to improve safety and quality of service through various continuous quality and performance improvement programs. The aviation industry is a prime example. After recognizing that human factors were responsible for crew performance and safety issues in aviation, the industry began investigating issues of situation awareness, communication, shared mental models of decision making, and whether addressing these issues would improve safety performance (Lyndon, 2006).

The aviation industry implemented the crew resource management (CRM) techniques to manage errors and improve safety performance (McConaughey, 2008). In general, components of the CRM include: 1) managing fatigue, 2) creating and managing teams, 3) recognizing adverse situations, 4) cross checking and communication, 5) developing and applying shared mental models for decision making, and 6) giving and receiving performance feedback (Pruitt &

Liebelt, 2010).

Several commonalities exist between the aviation industry and health care industry, such as both being high risk domains where error and accidents have potentially catastrophic consequences, both industries having identified ineffective communication and collaboration as leading causes of errors, and both having hierarchical systems that deter shared decision making processes (IOM, 2000). Such commonalities have led to IOM's recommendations for adaptation and application of the CRM model to healthcare settings to establish interprofessional team training programs, including the use of simulations for the trainees (IOM, 2000).

Previous studies on simulation-based CRM training in the aviation industry reported improved communication (e.g. planning statements, asking more questions, and repeating commands); development of shared mental models of the situations; and positive changes in attitudes, knowledge and coordinated performance (Bowers, Jentsch, Salas, & Braun, 1998; Stout, Cannon- Bowers, Salas, & Milanovich, 1999; Stout, Salas, & Fowlkes, 1997). With the lessons learned from these studies by the aviation industry, several simulation-based training processes applying the CRM model have been implemented in various healthcare settings as a strategy to improve communication between healthcare providers.

A prime example is the Anesthesia Crisis Resource Management (ACRM) program that emphasizes decision-making and teamwork skills through realistic simulation scenarios (Gaba, Howard, Fish, Smith, & Sowb, 2001). The simulation-based ACRM training consists of curriculum modules and simulation scenarios focusing on development of a thorough case orientation, proper inquiries and assertions, communications and constructive feedback, leadership, appropriate group climate, anticipation and planning, workload management and

distribution, vigilance, and reevaluation actions (Baker, Gustafson, Beaubien, Salas, & Barach, 2005).

The simulation-based ACRM training was specifically designed to help anesthesiologists and nurse anesthetists better manage crises by working with other team members including physicians, nurses, technicians, and other medical professionals (Baker et al., 2005). More recently, in addition to the operating room, the simulation-based ACRM approach has been extended to a wide variety of other healthcare settings including emergency room, critical care, neonatology, and less acute care medical units (Gaba, 2010; Kalisch, Curley, & Stefanov, 2007; Lighthall et al., 2003; Thomas et al., 2007) to successfully improve interprofessional communication and teamwork.

Nurse-Physician Communication, Teamwork and Patient Outcomes

Effective nurse-physician communication and teamwork is crucial for achieving positive patient outcomes and improving the quality of care. Ineffective communication was linked to medication errors (Kohn et al., 2000; Manojlovich & DeCicco, 2007) and various types of patient injuries (The Joint Commission, 2014; Manojlovich et al., 2009; Page, 2004). For instance, nurse-physician communication was predictive of nurse-assessed medication errors (Manojlovich & DeCicco, 2007) and timeliness of communication was inversely related to pressure ulcers (Manojlovich et al., 2009). In addition, the most frequently identified root causes of sentinel events reviewed by The Joint Commission were related to ineffective communication (The Joint Commission, 2014).

Effective nurse-physician teamwork is also linked to lower patient complications and mortality (Knaus, Draper, Wagner, & Zimmerman, 1986; Mazzocco et al., 2009; Wheelan,

Burchill, & Tilin, 2003). In a landmark study comparing 13 ICUs using the Acute Physiology and Chronic Health Evaluation (APACHE) system instrument, effective communication and interaction between critical care RNs and physicians was identified as a critical factor related to predicting patient mortality (Knaus et al., 1986).

Furthermore, staff members of ICU units with lower than predicted mortality rates perceived their teams as functioning at higher stages of group development (Wheelan, Burchill, and Tilin, 2003). The staff members of ICU units with lower than predicted mortality rates also perceived their teams as more structured and organized and perceived team members as less dependent and more trusting than did staff members of ICU units with mortality rates that were higher than predicted (Wheelan et al., 2003).

A study conducted in a surgery department to assess the effect of teamwork on patient outcomes yielded similar results (Mazzocco et al., 2009). Results of the univariate analyses revealed that patients had increased odds of complications or death when information sharing during intraoperative phases, briefing during handoff phases, and information sharing during handoff phases occurred less frequently (Mazzocco et al., 2009). In addition, composite measures of teamwork across all operative phases were significantly associated with complication or death (odds ratio 4.82; 95% CI [1.30–17.87]; Mazzocco et al., 2009), further providing support for effective teamwork as a variable associated with positive patient outcomes.

Barriers to Effective Nurse-Physician Communication and Teamwork

Identification of barriers to effective communication and teamwork is critical so that the potential negative impact on patient outcomes can be minimized through effective interventions. Numerous barriers to effective communication were identified by several researchers including

differing perceptions of communication barriers among providers (Cadogan, Franzi, Osterweil, and Hill, 1999), hospital and societal structures (Schmalenberg et al., 2005), differences in cultures (Hall, 2005), environmental barriers (Tija, Mazor, Field, Meterko, Spenard, & Gurwitz, 2009; Vogwill & Reeves, 2008), differences in providers' communication styles (Vogwill & Reeves, 2008), differences in communication patterns and behaviors (Simpson, James, & Knox, 2006; Tija et al., 2009), and language barriers (Brush, Sochalski, & Berger, 2004; Cummins, 2009; Daniel et al., 2000; Davis & Nichols, 2002; Edwards & Davis, 2006; Magnusdottir, 2005; Smith, 2004; Tregunno et al., 2009; Xu, 2007, 2008). These identified communication barriers will be further discussed.

Differing perceptions of communication barriers among providers. Significant differences in nurses' and physicians' perceptions of barriers to communication effectiveness were identified (Cadogan et al., 1999). Only physicians perceived nursing competence to be a significant barrier (Cadogan et al., 1999). While only nurses perceived physicians to be unpleasant, the lack of physicians valuing nurses' opinions was perceived to be a significant barrier by both physicians and nurses (Cadogan et al., 1999). Although the differences in nurses' and physicians' perceptions of communication barriers were identified through this study, further clarification of the causes of barriers is essential in order to plan appropriate interventions to promote nurse-physician communication (Cadogan et al., 1999).

Hospital and societal structures. Hospital and societal structures were also identified as potential barriers to effective communication. Examples of these hospital and societal structures include different practice structures for physicians and nurses, sexual divisions of labor, differences in educational level and social status, divisions of labor in society, the disease/cure

orientation of physicians as contrasted to the care/holistic approach of nurses, gender role socialization and inequality, and the providers' national cultures (Schmalenberg et al., 2005). These hospital and societal structures further create a division between the two disciplines that negatively impact the providers' abilities to work collaboratively to accomplish optimal patient outcomes.

Differences in cultures. Differences in cultures (i.e. values, beliefs, attitudes, customs, and behaviors) among various healthcare professions were also identified as barriers to effective interprofessional teamwork (Hall, 2005). These cultural factors include social class and gender issues, educational experiences and the socialization process, as well as increasing specialization of professions that occur during the training of healthcare providers in various disciplines (Hall, 2005). These cultural factors reinforce the common values, problem-solving approaches and language/jargon of each profession, creating yet another challenge for providers to effectively communicate with each other and build collaborative relationships (Hall, 2005).

Environmental factors. An environmental factor such as finding a quiet place to communicate with the physician was identified as a common barrier to effective communication between nurses and physicians (Tija et al., 2009; Vogwill & Reeves, 2008). Clear and complete communication between health care providers is a prerequisite for safe patient management; however, noise and distractions make this process challenging (Tija et al., 2009; Vogwill & Reeves, 2008).

Communication styles. In addition to other barriers including noise, illegible writing and language limitations that hampered effective communication between nurses and physicians, their communication styles tended to very different; where most physicians displayed a problem-

solving action-oriented approach, nurses appeared to describe and narrate patient information without necessarily indicating its significance (Vogwill & Reeves, 2008). These differences in communication styles presented as another challenge to interprofessional communication and collaboration related to patient care (Vogwill & Reeves, 2008).

Communication patterns and behaviors. Although nurses and physicians often state that they "worked well together," descriptions of their patterns of communication and behaviors were not always reflective of effective teamwork that are the foundation of a safe care environment (Simpson et al., 2006). For instance, two clinical situations critical to patient safety (fetal assessment and oxytocin administration) were frequent areas of disagreement and sources of mutual frustration among nurses and physicians, often leading to less than optimal communication and teamwork (Simpson et al., 2006).

Other behaviors that may have a detrimental impact on patient safety include a lack of physician openness to communication (e.g. feeling hurried by the physician) and a lack of professionalism (e.g. difficulty reaching the physician and delays in call back) (Tija et al., 2009). Suggestions for future research included identifying methods to improve communication patterns and teamwork behaviors that will enhance patient safety (Simpson et al., 2006; Tija et al., 2009).

Language barriers: English as a second language. One major area of concern related to nurse- physician communication may be regarding providers who speak English as a second language. The link between communication barriers due to lack of English proficiency and patient safety and quality of care have been raised by several scholars (Brush et al., 2004; Magnusdottir, 2005; Tregunno et al., 2009; Xu, 2008).

International medical graduates (IMGs). In the United States, international medical

graduates (IMGs) play an integral role in the health care system, especially with the growth of the aging population, the racially and ethnically diverse population, the worsening workforce shortage (American Medical Association [AMA], 2010; U.S. Department of Health and Human Services, Health Resources and Services Administration [HRSA], 2008), and now with the implementation of the Patient Protection and Affordable Care Act (Educational Commission for Foreign Medical Graduates [ECFMG], 2012).

As of 2007, there were approximately 243,457 IMGs (excluding residents/fellows) constituting approximately 25 percent of practicing physicians in the United States (AMA, 2010). The IMGs are primarily concentrated in New York, California and Florida (AMA, 2010). As of 2011, the top ten countries of citizenship for IMGs other than the United States include India, Philippines, Pakistan, China, Russia and other former Soviet Republics, Iran, Egypt, Syria, and South Korea, respectively (ECFMG, 2012). Among the IMGs who applied for Standard Educational Commission for Foreign Medical Graduates (ECFMG) Certification (a process that verifies the integrity and authenticity of a physician's medical education credentials), 66.4 percent of IMGs reported languages other than English as their native language (ECFMG, 2012).

Overcoming cultural and linguistic challenges has been the source of many debates surrounding IMGs transition into the U.S. health care system (Dorgan, Lang, Floyd, & Kemp, 2009; Gozu, Kern, & Wright, 2009; Meghani & Rajput, 2011). Prior work comparing IMGs and U.S. medical graduates (USMG) suggested that IMGs are not as competent as USMGs in clinical skills (Boulet, Swanson, Cooper, Norcini, & McKinley, 2006) and communication skills (Gozu, Kern, & Wright, 2009; Hall, Keely, Dojeiji, Byszewski, & Marks, 2004). The difference in communication skills competency may be related to the lack of communication training courses

in residency programs for IMGs and interpersonal factors such as dyadic interactions with patients in new healthcare systems, including unfamiliar dialects, new power dynamics, and different rapport-building expectations (Dorgan, Lang, Floyd, & Kemp, 2009). In addition, unfamiliar idioms, nuances, vernacular terms and accents of the English language may contribute to the difference in communication skills competency of the IMGs as compared to the USMGs (Dorgan, Lang, Floyd, & Kemp, 2009; Hall, Keely, Dojeiji, Byszewski, & Marks, 2004).

Effective communication is critical to ensure the safety of patients; however, IMGs' communication barriers may directly affect both their relationships with other healthcare professionals as well as their ability to provide safe and quality patient care (Whelan, 2006). Thus, it is imperative that communication training for IMGs include strategies that address these multilayered challenges described above (Dorgan, Lang, Floyd, & Kemp, 2009).

Internationally educated nurses (IENs). Internationally educated nurses (IENs) face similar challenges as those described above. Over the past several decades, many countries including the United States, as well as other counties around the world such as the United Kingdom (UK), Ireland, Canada, Australia, and New Zealand, have resorted to recruitment of internationally educated nurses (IENs), in response to the global nursing shortage (Aiken, Buchan, Sochalski, Nichols, & Powell, 2004; Brunero, Smith, & Bates, 2008). According to HRSA (2010), there are approximately 165,539 IENs in the United States.

The second and third quarter 2009 data from the Commission on Graduates of Foreign Nursing Schools (CGFNS, 2009), shows that Philippines, Canada, India, United Kingdom, and South Korea (ROK) respectively, had the highest number of nurses who passed the Visa Screen to become eligible to work in the United States. The report from the National Foundation for

American Policy (NFAP, 2007) shows that of all the states employing IENs, California ranks first in the employment of IENs, followed by Florida, New York, Texas, New Jersey and Illinois. As a result, healthcare organizations, especially those within these identified states must assist IENs to overcome challenges associated with transitioning smoothly into the U.S. healthcare settings.

Among the many challenges related to acculturation and transition of IENs into the U.S. healthcare settings, communication barriers were identified as the most challenging and the most common barriers (Cummins, 2009; Daniel et al., 2000; Davis & Nichols, 2002; Edwards & Davis, 2006; Smith, 2004; Tregunno et al., 2009; Xu, 2007). The language barrier is cited most often by the nurses and their employers as the primary challenge of international nurses practicing in the United States (Davis & Nichols, 2002). For example, in the study by Edwards and Davis (2006), "language" was one of the top answers by the IENs to the question, "In what areas do you think you need assistance to practice competently in the U.S.?" Moreover, IENs already employed in the U.S., retrospectively cited English language competency as one of the major priorities when entering the U.S. workforce (Edwards & Davis, 2006).

Communication inadequacy by IENs is associated with a risk to patient safety and quality of care in the current U.S. healthcare context (Xu, 2007). A key concern related to IENs is whether they provide safe, high-quality services to U.S. patients, since safe and quality care involves the nurses' ability to perform specific tasks and their abilities to communicate effectively with patients and other professionals (Brush et al., 2004).

The delivery of healthcare involves the use of many expressions and phrases that may be unfamiliar to those who speak English as a second language (Tregunno et al., 2009). Many IENs

reported having to learn both the general and the professional language (e.g. medical abbreviations, terminology, and names of medications), creating additional stress during the acculturation process (Magnusdottir, 2005). IENs also reported major difficulty with understanding accents, idioms, jargons, and phrases (Kawi & Xu, 2009; Sherman & Eggenberger, 2008; Walters, 2008; Xu, 2007).

Frequent repetition resulted in cognitive fatigue from constant vigilance to what is being said, further adding to the level of stress and frustration by the IENs (Konno, 2006; Tregunno, et al., 2009). Many IENs also described that lack of English language fluency led to anxiety and insecurity because they felt it could be dangerous for their patients (Magnusdottir, 2005). Such examples illustrate how the lack of English language proficiency for IENs pose major challenges to communicating effectively with physicians, colleagues, and patients that may have potential detrimental effects on patient safety (Cummins, 2009; Daniel et al., 2000; Smith, 2004).

The connection between communicative competence of IENs and quality of care/ and patient safety is of clinical and regulatory significance; however, this area is grossly understudied (Xu, 2008). Moreover, no studies to date have determined whether IENs' cultural orientation and technical competence produce differences in patient outcomes when compared with their domestic counterparts including their ability to communicate effectively (Brush et al., 2004). Hence, an assessment of the association between patient outcomes and the providers' characteristics such as the primary language, English language proficiency, and cultural orientation is needed.

Interventions to Improve Nurse-Physician Communication and Teamwork

Several strategies have been proposed to overcome the identified barriers, for both

internationally and U.S. educated healthcare providers. These include structured and standardized communication techniques, healthy work environments, interventions to empower nurses on the front-line, unit-based care teams, multidisciplinary work shift evaluations, structured interprofessional rounds, and interprofessional communication and teamwork training.

Structured and standardized communication techniques. Structured and standardized communication techniques such as SBAR have been applied successfully to facilitate communication between nurses and physicians. Physicians often rely on information about the patients from nurses when making clinical decisions about patient care. Unfortunately, miscommunications occur, especially during critical clinical situations that can negatively affect patients as well as healthcare providers (Compton et al, 2012). SBAR not only facilitates interprofessional communication and clinical decision making when it is used (Compton et al., 2012) it was also shown to improve perceptions of safety culture by the care providers, effective team processes, and safety reporting of the incidence and severity of falls and near misses (Andreoli et al., 2010). These findings have important implications for patient safety and application of structured communication interventions to promote nurse-physician communication and teamwork.

Healthy work environments (HWE). Kanter's (1977, 1993) structural theory of organizational behavior asserts that formal and informal structures in the workplace can empower employees to accomplish their work effectively, reduce job stress and increase organizational commitment. Several studies have provided support for Kanter's theory in nursing populations, as evidenced by positive relationships between structural empowerment and nursing outcomes including work effectiveness (Laschinger & Wong, 1999; Laschinger, Wong,

McMahon, & Kaufmann, 1999b), job satisfaction (Laschinger & Havens, 1996, Laschinger, Finegan, Shamian, 2001a; Manojlovich & Laschinger, 2002), organizational commitment (McDermott et al., 1996; Laschinger et al., 2001a), organizational trust and respect (Falkner & Laschinger, 2008; Laschinger, 2004; Laschinger & Finegan, 2005), reduced job tension (Laschinger et al., 1999b), and reduced burnout (Hatcher & Laschinger 1996).

As such, it is essential to create healthy work environments where the policies, procedures, and systems are designed so that employees are able to meet organizational objectives and achieve personal satisfaction in their work (Disch, 2000). Healthy workplace environments consist of structures that promote workplace empowerment (e.g. opportunity, information, support, and resources) and domains in the hospital environment that support professional nursing practice (e.g. nurse participation in hospital affairs; nursing foundations for quality care; nurse manager ability, leadership, and support of nurses; staffing and resource adequacy; and collegial nurse-physician communication and collaborative relations; American Association of Critical Care Nurses [AACN], 2005; Manojlovich & DeCicco, 2007).

Substantive evidence indicates that HWEs also significantly affect patient outcomes and professional nursing practice (Aiken, Smith, Lake, 1994; Heath, Johanson, & Blake, 2004; Laschinger & Leitner, 2006; Manojlovich & DeCicco, 2007). The variables within the HWEs have a positive effect on patient outcomes such as decrease in medication errors and patient mortality (Aiken, Smith, Lake, 1994; Manojlovich, 2005; Manojlovich & DeCicco, 2007) as well as nurse-physician communication (Manojlovich, 2005; Manojlovich & DeCicco, 2007). Thus, establishment and sustainment of HWE that promotes skilled communication, true collaboration, effective decision-making, appropriate staffing, meaningful recognition, and

authentic leadership is essential for facilitating professional nursing practice and improving outcomes for both nurses and patients. (AACN, 2005; Laschinger & Leitner, 2006; Manojlovich & DeCicco, 2007; Lake, 2002).

Interventions to empower nurses. Various interventions were effective in empowering front-line nursing staff and improving patient outcomes. Examples of such interventions include Transforming Care at the Bedside (TCAB) and the educational intervention designed to encourage nurses to speak-up.

Transforming Care at the Bedside (TCAB). In 2003, a multiphase initiative called TCAB was launched through the Robert Wood Johnson Foundation (RWJF), led by the Institute for Healthcare Improvement (IHI) as a strategy to empower front-line nursing staff (Needleman et al., 2009). The TCAB embodied a participatory, bottoms-up-approach, which incorporated the Model for Improvement strategies that encourages the use of three questions: 1) What are we trying to accomplish? 2) How will we know that a change is an improvement? and 3) What change can we make that will result in improvement? (Pearson et al., 2009). The Model for Improvement also incorporates a trial-and-learning approach emphasizing use of Plan–Do–Study–Act cycles to test and refine changes (Pearson et al., 2009). In addition, TCAB also applied "deep dive" and "snorkel" brainstorming exercises designed to generate new ideas from front-line staff (Pearson et al., 2009).

Following the Phase 2 and 3 of TCAB, participating facilities reported that several patient safety indicators (i.e. falls involving harm and 30 day readmissions) appeared to have improved under the TCAB initiative as evidenced by statistically significant declines in falls ($P < 0.05$ for 2006 and 2007 compared with 2005) and readmissions ($P < 0.001$ for 2007 compared with 2006;

Needleman et al., 2009). Although there was a two percent decline in the nurses' response to a question related to feeling part of an effective work team, pilot unit managers reported that teamwork and vitality improved either greatly (6 of 13 units) or somewhat (7 of 13) and eight managers felt that TCAB played a significant role in or was fully responsible for this change (Needleman et al., 2009).

Educational intervention to encourage nurses to speak-up. Another example of an intervention to empower front-line nursing staff is the educational intervention designed to encourage nurses to speak-up. A quasi-experimental study design was used to evaluate an intervention designed to promote speaking-up behaviors among RNs and positively affect their choice of available behavior options in situations where they felt that patient safety may be in jeopardy (Sayre, McNeese-Smith, Leach & Phillips, 2012a; Sayre, McNeese-Smith, Phillips & Leach, 2012b). The intervention included a video from the CNO and physician leader expressing their commitment to supporting RNs for speaking up when in situations in which patient safety may be in jeopardy, a discussion and generation of a list of organizational obstacles identified by the participating nurses that prevented individual nurses from speaking up, along with an action plan to improve their ability to speak up, and formation of smaller groups to support each other following the classroom session (Sayre et al., 2012a, 2012b).

Following the intervention, statistically significant differences were noted in speaking-up behaviors and scores in the intervention group ($P < .001$), while no significant changes were noted in the control group scores (Sayre et al., 2012a, 2012b). The statistically significant differences in the intervention group's scores demonstrate that an educational intervention focused on speaking-up behaviors can increase an RN's perception of own ability to speak up,

improve nurse-physician communication as well as communication between nurses and other staff, thereby ultimately improving patient safety (Sayre et al., 2012a, 2012b).

Unit based teams. Unit-based teams were effective in improving the frequency and quality of multidisciplinary communication, creating an improved climate for patient safety (Gordon et al., 2011; O'Leary et al., 2009). Unit-based teams as an intervention involved reorganizing resident-physician care teams to be based on specific in-patient units, with residents admitting and caring only for patients on their assigned unit.

Structured interviews of a cross-sectional sample of nurses and physicians before and after an intervention that localized physicians to specific medical patient care units revealed that a higher percentage of patients' nurses and physicians were able to correctly identify one another (93% vs. 71%; $p<0.001$and 58% vs. 36%; $p<0.001$, respectively; O'Leary et al., 2009). Nurses and physicians reported more frequent communication after localization (68% vs. 50%; $p<0.001$ and 74% vs. 61%; $p<0.001$, respectively; O'Leary et al., 2009). In addition, nurse-physician agreement was significantly improved for two aspects of the plan of care (i.e. planned tests and anticipated length of stay; O'Leary et al., 2009).

Similarly, the results of a prospective intervention study with data collected before and at two time points after implementation of pediatric unit-based teams at an urban, tertiary care, freestanding children's hospital revealed that unit-based teams improved the frequency and quality of multidisciplinary communication, which may create an improved climate for patient safety (Gordon et al., 2011). Physicians were more likely to be able to identify the nurse for their patients with the most complex conditions (62.3% vs. 82.8% vs. 82.5%, $P = .05$), to report contacting (27.3% vs. 64.9% vs. 56.9%, $P = .01$) and being contacted by (7.7% vs. 48.2% vs.

55.2%, *P* = .002) that nurse in person, and to believe their patient care concerns were met (44.2% vs. 82.1% vs. 81.8%, *P* = .009; Gordon et al., 2011). Nurses also reported parallel improvements in communication patterns. The mean number times residents were paged per day decreased by 42.1% (19 vs. 10 vs. 11, *P* < .001; Gordon et al., 2011).

Multidisciplinary work shift evaluations. Multidisciplinary work shift evaluations were also effective in improving team communication (Sluiter et al., 2005). A prospective, repeated measurements design was applied in a study at a tertiary care, university-affiliated pediatric intensive care unit (PICU) to evaluate the effect of multidisciplinary work shift evaluation on team communication. Staff members (physicians, nurses, department assistants) working on the same shift participated in the evaluation of how well the working day went and what had happened during work at the department. Six months after implementing the structured multidisciplinary shift evaluations, there was a relative risk reduction of 66% that emerged between pre- and post-evaluation for the chance of experiencing unsatisfactory communication between the staff (Sluiter et al., 2005).

Structured interdisciplinary rounds (SIDR). Another intervention found to be effective in improving the quality of communication and teamwork between nurses and physicians include SIDRs (O'Leary et al., 2010; Vazirani et al., 2005). SIDR combined a structured format for communication and a forum for regular interdisciplinary meetings between nurses, resident physicians, pharmacists, and the unit social worker and case manager to ensure that important elements of patients' plans of care were discussed (O' Leary et al., 2010).

Results of a controlled trial comparing a SIDR intervention medical teaching unit with a similar control unit revealed that SIDR had a positive effect on nurses' ratings of collaboration

and teamwork on a medical teaching unit. Although resident physicians on each unit rated the quality of communication and collaboration with nurses similarly, a greater percentage of nurses gave high ratings to the quality of collaboration with resident physicians on the intervention unit as compared to the control unit (74% vs. 44%; p = 0.02; O'Leary et al., 2010). Providers on the intervention unit rated the teamwork climate significantly higher than the control unit (82.4 ± 11.7 vs. 77.3 ±12.3; p = 0.01; O'Leary et al., 2005). This difference may be explained by higher teamwork climate ratings on the part of nurses on the intervention unit (83.5 ±14.7 vs. 74.2 ± 14.1; p = 0.005; O'Leary et al., 2010).

In another study, the SIDRs were supplemented with an appointment of a hospitalist medical director and a nurse practitioner (Vazirani et al., 2005) in the intervention unit. Overall, the results of the study provided support for the addition of nurse practitioners on in-patient medical teams to facilitate communication and collaboration between staff nurses and physicians. Physicians in the intervention group reported greater collaboration with nurses than did physicians in the control group (P< .001; Vazirani et al., 2005). Physicians in the intervention group reported better collaboration with the nurse practitioners than with the staff nurses (P< .001; Vazirani et al., 2005). Physicians in the intervention group also reported better communication with fellow physicians than did physicians in the control group (P=.006; Vazirani et al., 2005). Nurses in both groups reported similar levels of communication (P= .59) and collaboration (P= .47) with physicians. Nurses in the intervention group reported better communication with nurse practitioners than with physicians (P<.001; Vazirani et al., 2005).

Interprofessional communication and teamwork training. Interprofessional communication and teamwork trainings have become increasingly important areas having been

identified as solutions in several IOM reports on quality, education and patient safety. Since these reports have been published, there has been a growing body of health services research addressing nurse-physician communication and teamwork as an important variable in reducing negative patient outcomes and improving the quality of patient care. Examples of interprofessional communication and teamwork trainings include the MedTeams Program, Development Dimensions International (DDI) Modules, Triad for Optimal Patient Safety (TOPS) Program, and Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS).

MedTeams program. A prospective multi-center study using a quasi-experimental, untreated control group design with one pretest and two posttests following the emergency department (ED) staff training was implemented to evaluate the effectiveness of training and institutionalizing teamwork behaviors drawn from aviation crew resource management (CRM) programs (Morey et al., 2002). The MedTeams program consisted of the Emergency Team Coordination Course (ETCC) classroom instruction focusing on the five Team Dimensions (i.e. maintaining team structure and climate, problem solving strategies, communicating with the team, executing plans and managing workload, and improving team skills) and team-based staffing pattern (i.e. ED physician-nurse-technician team).

The results of the study showed that teamwork training based on CRM was successful in increasing specific teamwork behaviors, as evidenced by a statistically significant improvement in quality of team behaviors between the experimental and control groups following training ($p=.012$; Morey et al., 2002). In addition, the clinical error rate significantly decreased from 30.9 percent to 4.4 percent in the experimental group ($p=.039$), while the experimental groups'

attitudes toward teamwork increased (p=.047) and their assessments of institutional support showed a significant increase (p=.040), indicating a positive effect of the intervention on reducing clinical errors and enhancing staff attitudes toward teamwork (Morey et al., 2002).

A more recent study further provided support for the implementation of an ETCC program to improve ED staff teamwork and patient outcomes. The study by Ajeigbe (2012) examined differences between the intervention group and the control group's perceptions of teamwork, job satisfaction, work environment, autonomy, and control over practice.

Results of the study showed significant differences in scores of the intervention group as compared to the control group (Ajeigbe, 2012). Significant differences in the perception of teamwork ($p = 0.006$), job satisfaction ($p < 0.0001$), work environment ($p = 0.006$), autonomy ($p < 0.0001$), and control over practice ($p < 0.0001$) were noted (Ajeigbe, 2012). Although actual patient outcomes (e.g. incidence of medical and medication errors) were not reported, the study results showed that improved teamwork between ED nurses and physicians is positively associated with increased job satisfaction, perception of work environment, autonomy, and control over practice of both nurses and physicians (Ajeigbe, 2012).

Development Dimensions International (DDI) modules. The training developed by DDI is another example of training focusing on development of interdisciplinary collaborative communication skills (Boyle & Kochinda, 2004). A pretest–posttest, repeated measures design was applied by Boyle and Kochinda (2004) in a study that included data collection and implementation of the collaborative communication intervention during a period of 8 months with ICU nursing and physician leaders in 2 ICUs.

Following a program of six core modules on collaborative communication targeting

leadership, core skills for communication, guiding conflict resolution, helping others adapt to change, teams, and trust, significant improvements were reported in communication skills of ICU nurses and physician leaders (Boyle & Kochinda, 2004). Follow-up paired sample t-tests revealed that the intervention participants' overall satisfaction with leadership skills and overall satisfaction with communication skills increased significantly ($P < .05$; Boyle & Kochinda, 2004). In addition, staff nurses and physicians in the intervention unit reported significantly increased levels of collaborative communication after the intervention (Hotellings MANOVA= 1.31, $P = .013$, $n = 21$; Boyle & Kochinda, 2004).

Triad for Optimal Patient Safety (TOPS) program. TOPS is an additional example of an interprofessional teamwork and communication training program, developed by a multidisciplinary leadership team from the Schools of Medicine, Nursing and Pharmacy at the University of California, San Francisco (UCSF). The TOPS program took place on one inpatient medical unit from each of the three hospital settings: an academic university medical center, a non-teaching community hospital and an integrated healthcare system hospital (Blegan et al., 2010).

The TOPS multidisciplinary training included an introduction to safety culture and local problems from a recognized leader in that setting, a presentation using the "First, Do No Harm" video and facilitated discussion of the ways that individual behaviors and systems can contribute to medical errors, a didactic presentation on teamwork behaviors and communication skills presented by a consultant from aviation safety, small-group role-playing clinical scenarios to provide participants an opportunity to practice new skills and engage in multidisciplinary dialogue, and a facilitated closing session to discuss lessons learned and next steps (Blegen et al.,

2010). In addition, project champions and other unit providers formed multidisciplinary unit-based safety teams called triad Unit Safety Teams (TrUSTs) to serve as the local agents for change and safety awareness on the unit.

Following the training, participants reported significant improvements in the perceptions of patient safety culture, as measured by the AHRQ Hospital Survey on Patient Safety (HSOPS) that addressed questions related to teamwork and communication (Blegen et al., 2010). Results of the HSOPS survey revealed that five post-intervention safety culture dimension scores (e.g. supervisor manager expectations, organizational learning, communication openness, hospital handoffs and transitions, and non-punitive response to error) were higher than pre-intervention scores ($p<0.05$; Blegan et al., 2010).

Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS). Finally, studies where the TeamSTEPPS curriculum was used, reported significant improvements in interprofessional participants' communication skills, collaboration, and attitudes toward working as teams, as well as improved performance and efficiency in patient care. The comprehensive evidenced-based TeamSTEPPS interdisciplinary communication and teamwork training curriculum, based on twenty years of research is readily available to be integrated into any healthcare system (King et al., 2008). Various healthcare facilities have implemented the TeamSTEPPS throughout the nation in order to optimize patient outcomes by improving communication and teamwork skills among healthcare professionals. The following section presents the results of studies that applied TeamSTEPPS as an intervention to improve interdisciplinary communication and teamwork.

A literature search was conducted through PubMed and CINAHL Plus. The search was

limited to English language and peer reviewed journal articles published between 2006-2014 using the term "TeamSTEPPS." Titles and abstracts of 88 articles were reviewed. Two additional articles were obtained as a result of reverse citation search on several key articles. From a list of 90 titles and abstracts, 40 articles were critically reviewed for relevance to the proposed study. Duplicate articles, editorials, opinion pieces, and those not written in the English language were excluded from this review process. Articles on studies that did not provide interventions to the interprofessional team were also excluded. A final list of 16 articles were included in the final analysis and discussed in the following paragraphs. Table 2-1 of Appendix A includes the table of evidence (TOE) on the TeamSTEPPS articles reviewed for this analysis.

TeamSTEPPS is a comprehensive program that could be implemented at various healthcare settings. As such, the studies took place in various healthcare settings across the United States, Australia, Singapore, and combat support hospitals (CSH) in Iraq. The various settings include surgery and/or anesthesia departments (Armour Forse, Bramble, & McQuillan, 2011; Johnson & Kimsey, 2012; Weaver et al., 2010), Obstetric and/or gynecology departments (Johnson & Kimsey, 2012; Riley, Davis, Miller, Hansen, Sainfort, & Sweet, 2011; Sheppard, William, & Klein, 2013), pediatric and surgical ICUs (Mayer et al., 2011), mental health facilities (Mahoney, Ellis, Garland, Palayo, & Green, 2012; Stead et al., 2009), medical/surgical units (Spiva, et al., 2013) and other various departments of acute care hospitals and trauma centers (Capella et al., 2010; Deering et al., 2011; Thomas & Galla, 2013), as well as academic settings (Brock et al., 2013; Liaw, Zhou, Lau, & Chan, 2014; Robertson et al., 2010).

TeamSTEPPS and patient safety outcomes. A majority of the articles reviewed provided support for the association between TeamSTEPPS training and positive patient safety outcomes.

For instance, there was a 60% reduction in patient falls following a TeamSTEPPS intervention (Spiva et al., 2014).

Improvements in a perinatal services department were also reported following the TeamSTEPPS intervention. A statistically significant and persistent improvement of 37% in perinatal morbidity was observed in the intervention group that received the TeamSTEPPS program supplemented with an in-situ simulation (Riley et al., 2011). Patient perspectives of teamwork and communication of the caregivers were also improved, as evidenced by improved patient satisfaction scores (Sheppard, William, & Klein, 2013).

The association between the implementation of TeamSTEPPS and improved patient safety outcomes was also supported in the study that took place in the operating room by Armour Forse, Bramble, and McQuillan (2011). Surgical mortality decreased from 2.7% to 1.0% and surgical morbidity decreased from 20.2% to 11.0% (Armour Forse et al., 2011). In addition, significant improvements were noted for on-time first case starts in the OR, antibiotic administration and discontinuation, administration of venous thromboembolism prophylaxis, and administration of beta- blockers (Armour Forse et al., 2011).

Improvements in patient outcomes were also noted in a study conducted on pediatric and surgical ICUs (Mayer et al., 2011). Following the TeamSTEPPS program, the average time for placing patients on extracorporeal membrane oxygenation (ECMO) decreased significantly; a critical process for patients experiencing acute severe cardiac or pulmonary failure that is potentially reversible and unresponsive to conventional management (Mayer et al., 2011). Furthermore, nosocomial infection rates were lower post-implementation of TeamSTEPPS (Mayer et al., 2011).

Results of a structured trauma team training augmented by simulation also reported improvements in team performance that have an effect on patient outcomes (Capella et al., 2010). The times from arrival to the CT scanner, endotracheal intubation, and to the operating room significantly decreased after the TeamSTEPPS training (Capella et al., 2010), further providing support for the implementation of TeamSTEPPS training as a strategy to improve patient outcomes.

In addition, there was a decrease in the number of near misses and sentinel events following implementation of the TeamSTEPPS program in another study. Johnson and Kimsey (2012) reported that the number of root cause analysis (RCAs) on near misses and sentinel events decreased from 12 at baseline to four RCAs following the implementation of TeamSTEPPS.

Finally, the implementation of the TeamSTEPPS program has proven to yield positive patient outcomes in international settings, including a mental health facility in Australia. The results of the study revealed that in addition to improvements in provider outcomes and perceptions of patient safety culture, patient seclusion rates at the mental health facility were decreased (Stead et al., 2009). Furthermore, decreased communication related errors as well as decreased medication and transfusion errors were reported following the TeamSTEPPS training, even in harsh conditions such as combat support hospitals in Iraq (Deering et al., 2011).

TeamSTEPPS and provider outcomes. In addition to patient outcomes, provider outcomes were improved following the implementation of the TeamSTEPPS program. More specifically, improvements in teamwork (Brock et al., 2013; Capella et al., 2010; Deering et al., 2011; Forse et al., 2011; Hobgood et al., 2010; Mahoney et al., 2011; Mayer et al., 2011; Robertson et al.,

2010; Sheppard et al., 2013; Spiva et al., 2014; Stead et al., 2009; Weaver et al., 2010) and communication effectiveness were reported following the implementation of the TeamSTEPPS program (Bock et al., 2013; Capella et al., 2010; Deering et al., 2011; Forse et al., 2011; Mayer et al., 2011; Robertson et al., 2010; Spiva et al., 2014; Stead et al., 2009). Improvements in providers' perceptions of patient safety culture were also reported following the TeamSTEPPS program, as compared to baseline (Armour forse et al., 2011; Mayer et al., 2011; Riley et al., 2011; Spiva et al., 2014; Stead et al., 2009; Thomas & Galla, 2013; Weaver et al., 2010). Other improvements in provider outcomes such as comfort level regarding speaking out for patient safety (Johnson & Kinsey, 2012), as well as confidence associated with the ability to communicate effectively with other health care providers and attitudes toward interprofessional learning (Liaw et al., 2014) were reported following implementation of the TeamSTEPPS program.

Gaps in Literature

Of the 16 studies reviewed, only six studies augmented the TeamSTEPPS didactic trainings with simulations. Furthermore, there was only one study conducted specifically in the adult acute care, medical/surgical units and no studies that identified specific provider characteristics that may potentially affect patient and or provider outcomes following the TeamSTEPPS training.

As a result, this study evaluated the patient safety outcomes of a medical/surgical unit, in addition to participants' perceptions of interprofessional communication and teamwork, and perceptions of patient safety culture following the simulation-based TeamSTEPPS training.

Chapter Three: Theoretical Framework

Philosophical Underpinning

Empiricism is the view that sensory experience is the source of human ideas (or concepts) and/ or human knowledge (Carlin, 2009). Empiricism exist in several forms, ranging from extreme, which is the position that experience is the only source of knowledge, to a moderate form, which states that sensory experience serves as a source of some knowledge, and finally, a more mild or weaker form, which states that sensory experience may be of some use in developing knowledge, but there is room for interpretation as to its specific value (Rogers, 2005).

Empiricism has been proven beneficial to the development of nursing knowledge. Weiss (1995) stated that empiricism is beneficial to nursing because it provides a systematic structure for both scientific reasoning and substantiation of claims regarding health related responses and nursing care. Similarly, Rogers (2005) stated that nursing practice and research is influenced by empiricism, as sensory data plays an important role in nursing practice and include a variety of visual cues and physiologic measures. Nurse scientists can apply empiricism to form scientific inquiry and experiment so that we can have tangible, concrete knowledge that promotes health, prevents illness, or increases the potential for recovery. Furthermore, reasonable predictions are possible that can provide nurses with estimates of expected human responses under certain conditions of health and illness, as well as how nursing care may serve to influence these responses in beneficial ways (Weiss, 1995).

The empirical approach allows the nurse scientist to examine multiple variables that help to explain situational and individual differences in response patterns and to test theories suggesting multiple, interactive causal factors. Therefore, the empirical approach is appropriate

in identifying the possible associations between the structural, process, and outcome variables in this proposed study.

Definition of Concepts

Numerous studies related to nurse-physician communication, teamwork, and patient safety outcomes have been conducted in the past three decades; however, there is a wide variation in the definition and application of these concepts. Clarification of these concepts are essential so that future researchers may enhance comparability of findings (Lyndon, 2006). The following sections will provide definitions of nurse-physician communication, teamwork, and patient safety outcomes, and patient safety culture as applied in this proposed study.

Nurse-physician communication. The definition of communication is "a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior ("communication," 2012). Whether it is verbal or nonverbal, effective communication is an important precursor to collaboration (Disch, 2012). In fact, communication is often included as a critical attribute for nurse-physician collaboration (Cypress, 2011). For instance, Baggs and Schmitt (1988) described that critical attributes for collaboration include sharing in planning, making decisions, solving problems, setting goals and assuming responsibility, working together cooperatively, coordinating, and communicating openly.

Baggs and Schmitt's (1988) definition was later modified in a study by Boyle and Kochinda (2004). In this subsequent study, collaborative communication was defined as "nurses and physicians working together cooperatively-- sharing responsibility for problem solving, conflict management, decision making, communication, and coordination-- to improve unit outcomes" (Boyle & Kochinda, 2004, p. 61). Critical attributes of collaborative communication

include leadership behaviors that influence staff members toward achievement of unit goals and objectives; communication that is timely, accurate, open, and satisfying; coordination within and between units as well as other parts of the organization that promotes quality outcomes; problem solving/ conflict management, where available expertise is brought to bear in conflicts and problems, so that the best possible solution is developed; and team culture which includes shared norms, values, beliefs, and expectations of the entire staff (Boyle & Kochinda, 2004).

More recently, another definition of nurse-physician communication was suggested by Cypress (2011). Nurse-physician communication is defined as:

> The ability to transmit accurate, comprehensible, consistent, reliable, culturally competent, balanced, repeated information through a common system of symbols, signs, behavior, speech, writing, or signals according to a common set of rules in an open, timely manner toward positive health care outcomes (Cypress, 2011, p. 36).

Cypress (2011) further described that nurse-physician communication includes attributes such as accuracy, understandability, openness, timeliness and availability, reliability, consistency, balance, cultural competence, and repetition.

The definition and attributes suggested by Cypress (2011) were applicable to the operational definition for this study. Nurse-physician communication in this study will be assessed for accuracy, understandability, openness, and timeliness.

Teamwork. Teamwork and collaboration are often used synonymously (Thomas, Sexton, & Helmreich, 2003). The concepts of collaboration and teamwork need to be clarified as there is a wide variation in providers' understanding of the meanings of such concepts (Lyndon, 2006). The lack of a clear definition and ambiguity of the concept has hampered consistent reporting of

studies and translation into clinical practice (Henneman, Lee, & Cohen, 1995).

Several definitions of collaboration are suggested by various scholars; however, the concept of collaboration is generally understood as a joint decision making process among independent parties. For instance, collaborative practice has been defined as “a joint communicating and decision-making process between medical staff and nurses with the goal of satisfying the patient's wellness and illness needs while respecting the unique qualities and abilities of both professions” (Coluccio & Maguire 1983, p.63). Weiss and Davis (1985) defined collaboration as "the interactions between nurse and physician that enable the knowledge and skills of both professions to synergistically influence the patient care provided" (p. 299).

A comprehensive list of defining attributes for collaboration was identified by Henneman et al., (1995). The defining attributes of collaboration include joint venture, cooperative endeavor, willing participation, shared planning and decision making, team approach, contribution of expertise, shared responsibility, non-hierarchical relationships, and shared power, based on knowledge and expertise versus role or title (Henneman et al., 1995).

Although teamwork is often interchanged with collaboration, teamwork is more often described as a joint action by independent groups in order to accomplish common goals, whereas collaboration is described as a joint decision making process. For instance, Xyrichis and Ream’s (2008) concept analysis on teamwork in healthcare resulted in the following definition: A dynamic process involving two or more health professionals with complementary backgrounds and skills, sharing common health goals and exercising concerted physical and mental effort in assessing, planning, or evaluating patient care. This is accomplished through interdependent collaboration, open communication and shared decision-making. This in turn generates value-

added patient, organizational and staff outcomes.

Salas, Cooke, and Rosen (2008) emphasized interdependent interactions by multiple individuals. Salas and colleagues defined teamwork as "the interdependent components of performance required to effectively coordinate the performance of multiple individuals" (Salas, Cooke, & Rosen, 2008, p. 541).

Salas and colleagues further described that teamwork is a set of interrelated knowledge (cognition), attitudes, and skills (behaviors) that are trainable, learnable, and observable (Salas, Cooke, and Rosen, 2008). Knowledge (cognition), attitudes, and skills (behaviors) in leadership, situation monitoring (mutual performance monitoring), mutual support (backup behavior), and communication are core competencies associated with effective teamwork (Alonso et al., 2006). As a result, the definition of teamwork provided by Salas et al. (2008) was applied in this study.

Patient safety culture. Patient safety culture is an important variable that was associated with adverse events in patients; however, this variable is not often examined (Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010). AHRQ previously sponsored development of a hospital survey on patient safety culture (HSOPSC) to assess the safety culture of a hospital or specific units within the hospital (Sorra & Nieva, 2004). In developing this survey, the definition of safety culture provided by the U.K. Health and Safety Commission ([HSC], 1993) was applied. The HSC defined safety culture as the "product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" (HSC, 1993).

A similar definition was offered in another two-phase study (Kirk, Parker, Claridge, Esmail, & Marshall, 2007). The authors of this study defined patient safety culture as "shared

attitudes, beliefs, values and assumptions that underlie how people perceive and act on safety issues in their organizations, and on the potential importance of these shared characteristics to initiating fundamental and sustained changes to patient safety" (Kirk et al., 2007, p. 313). In addition, the authors suggested a framework to assess the safety culture in primary care settings called the Manchester Patient Safety Framework (MaPSaF) that includes dimensions of patient safety culture such as overall commitment to quality; priority given to patient safety; perceptions of the causes of patient safety incidents and their identification; investigating patient safety incidents; organizational learning following a patient safety incident; communication about safety issues; personal management and safety issues; staff education and training about safety issues; and team working around safety issues (Kirk et al., 2007).

More recently, patient safety culture was defined as "the product of nurses' shared values and beliefs towards patient safety" (Feng, Bobay & Weiss, 2008, p.317). It was also described as "a set of common understandings of nurses in viewing patient safety and it emerges from the dynamic reciprocal interaction among people, tasks and systems" (Feng, Bobay & Weiss, 2008, p. 317).

The definitions offered by Kirk et al., (2007) and Feng et al., (2008) both support the initial definition offered by HSC (1993). For the purposes of this proposed study, the definition of patient safety culture provided by the HSC was applied.

Patient safety. Numerous definitions of patient safety have been suggested from the healthcare quality movement, the field of medicine, and the field of nursing. Nevertheless, the concept of patient safety is often used interchangeably with the concept of quality of care. Due to the lack of clear understanding and consistent application of the concept, lists of patient safety

indicators also vary from entity to entity, making consistent collection and measurement of outcomes challenging.

As a result, a concept analysis using the Walker and Avant's (2010) method was conducted to identify the defining attributes and empirical referents of patient safety, as well as to present sample cases in the English language that may lead to a more clear distinction between the concept of patient safety and concept of quality of care. The applicability of CALNOC indicators as empirical referents of patient safety was also explored, in preparation for future research. Following identification of defining attributes and empirical referents, an operational definition of patient safety was developed. For the purposes of this paper, the definition of patient safety is described as the outcome of collaborative efforts by healthcare providers within a well-integrated healthcare system to prevent errors or adverse events, thereby protecting patients from harm or injury. The results of the concept analysis are presented in Chapter Five.

Guiding Theoretical Framework

The proposed study will apply the Donabedian's Quality of Care: Structure-Process-Outcome framework (Donabedien, 1988) and the TeamSTEPPS framework (AHRQ, 2010) as the guiding theoretical frameworks. Application of the two theoretical frameworks in this study will be further discussed in the following paragraphs.

Structure. Structural variables are attributes of the setting where patient care may occur including material (e.g. facilities, equipment, money) or human (e.g. characteristics of providers) resources, and organizational structures (medical staff organization or method of reimbursement) (Donabedien, 1988). For the purposes of this study, structural variables included the providers' characteristics and are depicted in Appendix B, Figure 3-1.

The structural variables for the study included provider characteristics including age, sex, race/ ethnicity, primary language, English language proficiency, education level, country of initial nursing/ medical education, and years of work experience in the U.S. We hypothesized that these participant characteristics would affect patient outcomes and participant's perceptions of communication, teamwork, and patient safety culture.

Process. Process refers to the actual giving and receiving of care (Donabedien, 1988). Although the process of providing and receiving patient care is commonly assessed in health services research, the process of providing and receiving interventions and training to and by healthcare providers must also be evaluated so that continuous improvements can be made in providing optimal patient care. The process variables for this study focused on the components of the TeamSTEPPS curriculum and simulation-based activities, depicted in Figure 3-1.

TeamSTEPPS is an evidence-based framework based on 25 years of research on teams and team performance, ultimately designed to optimize interdisciplinary healthcare team performance (King et al., 2008). The four core teamwork skills include team leadership, situation monitoring, mutual support, and communication. The TeamSTEPPS core curriculum consists of modules focused on developing these four skills (King et al., 2006). These core four skills are depicted in the middle of the TeamSTEPPS triangle logo. The red arrows illustrate a two-way mutual interaction between the four skills and the team-related competencies (AHRQ, 2010). Encircling the four skills is the healthcare team that represents the patient and direct caregivers, as well as others who play a supportive role within the healthcare delivery system (AHRQ, 2010).

Team competencies required for high-performing teams include team knowledge, skills/ performance, and attitudes (KSAs) (AHRQ, 2010). These team competencies: knowledge,

attitude, and skills/ performance resulting from proficiency of the four core skills, are depicted in the corners of the TeamSTEPPS logo (King et al., 2006). Team-related knowledge results in a shared mental model, whereas team-related attitudes result in mutual trust and team orientation (AHRQ, 2010). Team-related skills/ performance result in adaptability, accuracy, productivity, efficiency and safety; critical components of optimal patient care delivery (AHRQ, 2010).

Although simulation skills practicum accelerates translation of didactic preparation to improve clinical performance, it was not depicted in the original TeamSTEPPS framework. Nevertheless, a simulation skills practicum was included in this study as part of the training process and was followed by a debriefing session to summarize the training and to facilitate application of the TeamSTEPPS didactic curriculum into clinical practice. We hypothesized that the TeamSTEPPS training would have a positive effect on patient outcomes and participant's perceptions of communication, teamwork, and patient safety culture.

Outcomes. Outcomes refer to the effects of care or interventions on the health status of patients (Donabedien, 1988). Health status includes improvements in patient's knowledge, as well as changes in behaviors, and attitudes following the care (Donabedien, 1988). For this study, both patient and provider outcomes were assessed. The outcome variables for the proposed study included an assessment of actual patient safety outcomes as well as providers' perceptions of communication and teamwork effectiveness, along with their perception of culture of patient safety on the units following the TeamSTEPPS training. The outcomes variables evaluated in this study are also depicted in Figure 3-1.

Outcomes variables included patient safety outcomes (e.g. patient falls and pressure ulcers) perceptions of communication (e.g. openness, accuracy, timeliness, understanding),

teamwork (e.g. mutual support and communication), and patient safety culture (e.g. overall perceptions of safety, frequency of event reporting, supervisor/manager expectations and actions promoting safety, organizational learning- continuous improvement, teamwork within units, communication openness, feedback and communication about errors, non-punitive response to error, staffing, hospital management support for patient safety, teamwork across hospital units, hospital handoffs and transitions). We hypothesized that the patient and provider outcomes would be improved following the TeamSTEPPS training. We also hypothesized that specific provider characteristics such as providers' age, male sex, ethnicity that is white, English language as primary language, native English language proficiency, higher education level, U.S. as country of pre-licensure nursing/medical education and longer years of experience in U.S. would positively affect patient outcomes and providers' perception of communication, teamwork, and patient safety culture.

Chapter Four: Methods and Procedures

Research Design

Using a quasi-experimental, pretest-posttest repeated measures study design with a comparison group; data were collected at baseline, immediately following the intervention, and three months following the intervention. The quasi-experimental design was appropriate since the study design lacked random selection and assignment of the participants into intervention versus control units. This design was also appropriate for evaluating the effect of the TeamSTEPPS intervention on patient and provider outcomes and comparing the results with a comparable control unit. The intervention group consisted of nurses and physicians of the medical/surgical intervention unit at Healthcare Organization A. The comparable control group consisted of nurses and physicians from a medical/ surgical control unit at Healthcare Organization B.

Population and sample. A convenience sampling method was used to recruit approximately 100 participants, consisting of 40 registered nurses and 10 physicians per group (n=50 per group), ages 21 years or older, both female and male sexes, and of various ethnic/ racial groups. Per power analysis using a repeated measures, within-between interaction multivariate analysis of variance (MANOVA) in G*Power (version 3.1.6), a total sample size of 64 participants would allow detection of large (0.4) effect sizes at an alpha of 0.05 and power of 0.80. The small physician sample size was one of the major limitations of this study; however, the nurse sample size was reasonable in determining the feasibility to continue with the study. The results of both nurse and physician outcomes from this study serve as a guide for larger future studies.

Sample inclusion criteria. All full-time and part-time registered nurses employed on the adult medical/surgical, in-patient units of the study site for at least three months, who provide direct patient care were considered for participation in the study. Physicians who were affiliated with study site for at least three months, on a full time and part time basis, had admitting privileges, and assigned to patients in the medical/surgical unit were considered for participation in the study.

Sample exclusion criteria. All registered nurses and physicians working on non-adult acute care, out-patient units, and those who do not provide direct patient care were excluded from the study. Registered nurses employed through an outside registry or contract through a third party, on a per diem basis, or those who floated to the intervention unit from another unit were excluded from the study. Licensed vocational nurses (LVNs) were not considered for participation due to the limited scope of practice as compared to registered nurses. Those on travel registered nurse/ physician assignments for the entire duration of the study were considered for participation, if they met all other inclusion criteria, at the discretion of the unit administrator and/or PI.

Research setting. The medical/surgical intervention unit was located in a 401-bed, non-profit medical center whose purpose is to provide quality healthcare services, predominantly to the residents of the communities located in the southwest regions of Los Angeles County. Healthcare Organization A offers general acute care services and has approximately 2,700 employees and 900 physicians as part of the medical staff.

The results of an organizational readiness assessment conducted by the principle investigator and the organizational change team members at the intervention site revealed that it

was a good time to implement the TeamSTEPPS program and that the implementation of this program was an appropriate strategy to build a stronger teamwork and safety culture throughout the organization. TeamSTEPPS was a good fit with the safety and quality initiatives currently implemented at this facility (e.g. Magnet Recognition, Central Line Associated Bloodstream Infection Prevention Program, Hospital Acquired Pressure Ulcer Prevention Program, Medication Administration Program) and would continue to reinforce those efforts.

Healthcare organization A also had a strong infrastructure that supports nursing research and evidence-based practice projects. In addition, the medical center's leaders fully supported culture change and the effort required to implement and sustain the TeamSTEPPS initiative. There were also enough resources and personnel to successfully implement the TeamSTEPPS program. Well qualified Clinical Nurse Specialists, nurse educators, managers, and directors were available to serve as coaches to help implement and sustain the TeamSTEPPS program.

The simulation component of the TeamSTEPPS training took place in the simulation lab at Healthcare Organization A that could accommodate approximately 10 participants per session, equipped with necessary simulation equipment, audio/visual equipment. The debriefing sessions took place in a nearby conference room, also equipped with necessary audio/visual equipment and telecommunication devices.

The comparable medical/ surgical control unit at Organization B was located in a medical center with a longstanding tradition of community care. This organization has a 266-in-patient bed capacity, is also a community hospital serving a similar patient population as Organization A, and was also going through the Magnet Journey. The participants of Organization B served as the control group and did not receive the TeamSTEPPS training. The control group participants

were required to complete the surveys only.

Instruments and Measurements

Several instruments were used to measure the study variables. Further explanation of the instruments used to measure patient safety outcomes, nurse and physician characteristics, and perceptions of nurse-physician communication, teamwork, and patient safety culture are described in the following sections.

Patient safety outcomes. The patient safety outcomes were measured by the Collaborative Alliance for Nursing Outcomes (CALNOC) nursing sensitive quality indicators. Two specific outcomes included were patient falls and pressure ulcers. The medical center collects, measures, and reports these two outcomes data to CALNOC on a regular basis. These two outcomes were also chosen for the proposed study due to links associated with interprofessional communication and teamwork from previous studies (Manojlovich et al., 2009; Manojlovich & DeCicco, 2007; Sulla & McMyler, 2007). Although there were no reports of reliability and validity of the data collection tool, the authors described that the CALNOC database continuously accepts data corrections, thus perpetually strengthening reliability and validity of the dataset.

Nurse and physician characteristics. Nurse and physician characteristics including age, sex, race/ ethnicity, primary language, English language proficiency, education level, country of pre-licensure nursing/ medical education, and years of experience in U.S. were measured with a demographic questionnaire. The demographic questionnaire used for this study is included in Appendix C, Figure 4-1.

Previous studies have shown that gender, education preparation, and the nursing culture

may play an important part in nurses' lack of assertive behaviors when communicating with physicians (Timmins & McCabe, 2005a; 2005b). In addition, communication barriers (English proficiency), differences in nursing practice, and cultural differences were factors that contributed to ineffective communication by nurses (Xu, 2007). Furthermore, studies have shown that nurses with greater than six years of experience rated openness of communication and problem solving higher than less experienced nurses (Miller, 2001), thus these characteristics were assessed in relation to other study variables.

A full assessment of the participants' English language proficiency was beyond the scope of this study. Thus, English language proficiency was measured through a self-assessment included in the demographic questionnaire. Significant findings will serve as the basis for more in-depth examination of the English language proficiency as a variable in future studies.

Nurse-physician communication. Perceptions of nurse-physician communication was measured with the general relationships and communication subsection of the ICU Nurse-Physician Questionnaire that includes 22 items relating to the cohesiveness, timeliness and understanding of communication between nurses and physicians (See Appendix C, Figure 4-2). The Content validity of the questionnaire was evaluated through a factor analysis, where 3 identified factors loaded at 0.40 or above with an Eigenvalue well above 1.0 (Shortell, Rousseau, Gilles, Devers, & Simons, 1991). The Cronbach's alpha reliabilities for 22 of the scales ranged from 0.64 to 0.88, showing acceptable reliability (Shortell et al., 1991).

Although developed for use in ICU environments, the tool has been used in other settings, including in a study of medical-surgical nurses (Manojlovich & DeCicco, 2007). Examples of questions on the survey include, "when nurses talk with physicians in this unit, there is a good

deal of understanding" and "in matters pertaining to patient care, nurses call physicians in a timely manner." All items are based on a 5 point scale, ranging from 1 to 5.

Teamwork. Teamwork was measured with the TeamSTEPPS, Teamwork Perceptions Questionnaire (T-TPQ). The T-TPQ is a 35 item questionnaire, comprised of the following constructs: team structure, leadership, situation monitoring, mutual support and communication (See Appendix c, Figure 4-3). For the purposes of this study, only the mutual support and the communication subsections of the questionnaire, consisting of 12 items were utilized.

Cronbach's alpha reliabilities for the constructs ranged from 0.88 to 0.95, showing high reliability (American Institutes for Research [AIR], 2010). Construct independence was also examined by intercorrelating the 5 T-TPQ subscales. Coefficients ranged from 0.57 to 0.79, showing acceptable reliability (AIR, 2010). Convergent validity was demonstrated with the Hospital Survey on Patient Safety Culture (HSOPSC) that resulted in overall T-TPQ correlation coefficient of 0.81 (AIR, 2010). Although the HSOPS questionnaire includes items related to teamwork, the teamwork scales did not partition out the domains of teamwork performance; hence, the T-TPQ was created (AIR, 2010).

Examples of questions on the T-TPQ include "staff assists staff during high workload" and "my supervisor/ manager considers staff input when making decisions about patient care." All items are based on a Likert type scale, ranging from "strongly agree" to "strongly disagree."

Patient safety culture. Perceptions of patient safety culture will be measured by the AHRQ HSOPSC (See Appendix C, Figure 4-4). The HSOPSC includes 42 items and measures the following 12 safety dimensions: overall perceptions of safety, frequency of event reporting, supervisor/manager expectations and actions promoting safety, organizational learning-

continuous improvement, teamwork within units, communication openness, feedback and communication about errors, non-punitive response to error, staffing, hospital management support for patient safety, teamwork across hospital units, and hospital handoffs and transitions. Examples of questions on the HSOPSC include "we are actively doing things to improve patient safety" and "when a mistake is made that could harm the patient, but does not, how often is this reported?" Majority of the items are based on a Likert type scale ranging from "never" to "always" or "strongly agree" or "strongly disagree." Several items are also based on a yes/no or multiple choice type questions.

Each of the patient safety culture dimensions that make up the survey was found to have an acceptable reliability (defined as a Cronbach's alpha greater than or equal to 0.60), with reliability coefficients ranging from 0.63 to 0.84 (AHRQ, 2004). Composite scores were created for the patient safety culture dimensions to assess for content validity, resulting in acceptable ranges of correlations ranging from 0.23 to 0.60 (AHRQ, 2004).

Research Study Procedures

Ethical considerations. Precautions were taken to ensure that potential risks are kept at a minimum. Participants still concerned about the potential risks had the option to stop participating at any time during the study.

Participant recruitment. To announce the TeamSTEPPS initiative and to remind staff members about the surveys, flyers were posted throughout the intervention and control units at the two participating facilities. Information sessions were also held during dayshift and nightshift to provide information about the study and answer any questions related to participation in the program. All interested registered nurses and physicians who met the inclusion criteria were

given a survey packet along with the consent form. Submission of the survey and the signed consent form by the prospective participants were considered consent to participate.

Potential risks. The study involved minimal risk. One possible risk was minor level of discomfort or intimidation related to active participation in simulation-based training with members of other disciplines. The support for the training by the hospital administrators and medical staff was stressed during the training, emphasizing the ramifications of the training to improve patient safety. All participants were reminded to maintain a supportive and respectful environment throughout the training.

Another possible risk included potential loss of the participant's privacy or breach in confidentiality of the data. Strict data security plan was implemented to ensure anonymity of the study participants in regards to their responses on the surveys and maintain confidentiality of the data.

Protection of human subjects. The research involved interaction between study subjects and investigator. The proposed study, however, met categories one and two of research exemptions from the DHHS human subject regulations, section 45 CFR 46.

Exemption #1 was applicable in this study since it involved research conducted in established or commonly accepted educational settings (e.g. training/ conference room at the medical center), involving normal educational practices, such as research on regular and special education instructional strategies, and/or research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods (e.g. Microsoft Office PowerPoint presentations and simulation-based role playing activities). Although the research involved the use of survey procedures and the information obtained were recorded in

such a manner that human subjects could be identified through identifiers linked to the subjects, any disclosure of the human subjects' responses outside the research did not place the subjects at risk of criminal or civil liability or were damaging to the subjects' financial standing, employability, or reputation.

Moreover, strict data security plan was implemented to ensure anonymity of the study participants in regards to their responses on the surveys and maintain confidentiality of the data; therefore, exemption #2 was also applicable. Nevertheless, a UCLA IRB application was obtained along with the IRBs of applicable institutions for activities in accordance with the DHHS regulations.

Data collection. Participation in the study was voluntary and all data was kept confidential by the PI. A unique study identification code (a number and participants' mothers' maiden initials) was provided for each participant once consent was obtained. Each initial participant packet included the survey with the consent form and self-addressed envelopes. All subsequent surveys also included a blank survey and self-addressed envelopes.

For all data entered into an electronic database, all participant identifiers were omitted, encryption or password protection software were used, a secure network server was used to store data, and stand-alone desktop computer was used to store data (not connected to server/internet). For hardcopy data, data were kept in a locked file cabinet with limited access by authorized personnel.

Provider outcome data collection. A composite survey that included the demographic questionnaire, the communication subscale of the ICU Nurse-Physician Questionnaire, the mutual support and communication subscales of the T-TPQ, and HSOPSC, were administered to

the nurses and physicians to assess the providers' perception of communication, teamwork, and patient safety culture on the units.

Provider outcome data were collected prior to the training, immediately following the training, and three months following the training. The hardcopy of the post-intervention surveys were given to the participants along with the self-stamped/ addressed envelopes. Three month follow up surveys were mailed to the participants along with self-stamped/ addressed envelopes affixed with the address labels that the participants filled out at the initial recruitment session when they consented to participate in the study.

Patient outcomes data collection. An electronic version of the unit level CALNOC nursing sensitive quality indicators, with all patient identifiers removed were obtained for the study. The CALNOC patient outcomes data is collected quarterly at the study site; therefore, an electronic copy of the data was obtained from the hospital to be included in the analysis. All data were already aggregated on a unit level by the hospital staff. The CALNOC nursing sensitive quality indicators (i.e. fall and hospital acquired pressure ulcer rates) were collected on the quarters correlating with the provider outcome data collection dates.

Data analysis. Various data analyses were conducted according to the study aims. All data were analyzed using SPSS for Windows version 21.0. Provider demographic data was analyzed using descriptive statistics. Only the number of cases and percentages were calculated since the provider characteristics included categorical data.

For specific aim 1a, quarterly unit level CALNOC falls and HAPU rates were used for the patient outcomes, hence, there were insufficient data to conduct a rigorous statistical analysis. As a result, descriptive statistics were used to evaluate trends in the patient outcome data. For

specific aim 1b-1d, a repeated measures multivariate analysis of variance (MANOVA) was used to evaluate the differences between and within- sample groups, over time. A post-hoc paired-samples *t* test was conducted to compare baseline and post-intervention communication, teamwork, and patient safety culture scores for each of the groups, when statistically significant results were noted within groups. All tests applied a p=0.05 level of significance and were adjusted using the Bonferroni method when applicable.

For specific aims 2 a- 2b, a preliminary analyses of data were performed using analysis of variance (ANOVA) to test for demographic differences between the intervention and control groups and to identify provider characteristics that may have a statistically significant effect on the outcome variables. Multiple regression analysis, using a backward elimination method, was then performed to check for multicollinearity and to identify specific provider characteristic variables that resulted in significant variances in the communication, teamwork, and patient safety culture scores. All variables with a tolerance level lower than .10, variance inflation factor (VIF) greater than 10, and *p*-value greater than .10 were dropped from the model. The remaining variables were included in the final model.

Simulation-based TeamSTEPPS training intervention. The simulation-based TeamSTEPPS training consisted of the two identified modules and simulation skills practicum that was offered only to the intervention group. The participants of the control unit were only required to complete the surveys and did not participate in any other interventions.

The implementation of the TeamSTEPPS training was carried out in three phases. The three phases were: Phase I to determine the organization's readiness to undertake TeamSTEPPS-based initiative, Phase II to plan and implement the TeamSTEPPS-based initiatives, and Phase

III to sustain and spread improvements resulting from TeamSTEPPS-based initiatives.

Phase I. The first phase involved the pre-implementation assessment process to determine the organization's readiness to implement the TeamSTEPPS initiatives. There were several steps to this assessment process. These steps included establishing an organizational-level change team, conducting a site assessment, defining opportunities for improvement, and defining the goal of the interventions.

Establish an organizational-level change team. The organization's leadership support and commitment was critical for successful implementation and sustainment of the TeamSTEPPS-based initiatives. With the early establishment of support and commitment from the leadership team, members of the change team comprised of multidisciplinary staff, who were recruited to lead the initiatives.

Conduct a site assessment. An organizational assessment was conducted to determine the communication and teamwork deficiencies and to identify training needs. During this phase, the researchers and the organizational-level change team determined the organization's leadership support and commitment, potential barriers to implementation, and availability of resources.

Define the opportunity for improvement. A baseline survey consisting of the communication subscale of the ICU Nurse-Physician Questionnaire, the mutual support and communication subscales of the T-TPQ, and HSOPSC, were administered to the nurses and physicians to assess the providers' perception of communication, teamwork, and patient safety culture on their units. The CALNOC quality indicators were also assessed to identify patient safety outcomes that required improvement.

Define the goals of the intervention. During this step, goals of the TeamSTEPPS

intervention were identified. Both provider and patient outcome goals were identified during this phase.

Phase II. Phase II involved planning and implementation of the TeamSTEPPS initiative. During this phase, a customized implementation and action plan determined by the Phase I assessment were developed by the PI in collaboration with the change team, and appropriate stakeholders, followed by the actual implementation of the intervention by the PI.

Planning. During the planning process, time was devoted to development of a unit specific TeamSTEPPS implementation and action plan that detailed how the initiative would be executed to best meet the needs of the unit and organization as a whole. Possible options for implementation included 1) implementation of all the TeamSTEPPS tools and strategies, 2) as a phased-in-approach targeting specific unit/departments, or 3) as a dosing strategy that includes a selection of specific tools introduced at specific intervals (King et al., 2006). For the purposes of this research, a combination of phased-in and dosing approach was applied. The specific units identified for this study was the in-patient medical/ surgical units. The specific TeamSTEPPS tools and strategies to be introduced to the staff were determined by the PI, the change team, and appropriate stakeholders during this stage based on the assessment of the units' needs.

Implementation. TeamSTEPPS materials are extremely adaptive to meet the needs of each organization (King et al., 2006). There were several ways to implement the training sessions, depending on the availability of the staff, resources available, and needs of the organization and team.

For this study, the intervention consisted of a three and a half hour interprofessional communication and teamwork training based on the TeamSTEPPS curricula and simulation-

based skills practicum. The two hour TeamSTEPPS modules targeting communication and mutual support were made available via individual cd's that were distributed to all the participants prior to the simulation session. These two modules were to be completed any time prior to the in-class review of TeamSTEPPS modules and the simulation session.

The full TeamsSTEPPS fundamental curriculum covers PowerPoint presentations on course introduction, team structure, leadership, situation monitoring, mutual support, communication and summary; however only the communication and mutual support modules were used for this study. Video vignettes related to the two modules covered how failures in teamwork and communication can place patients in jeopardy and how successful teams can work to improve patient outcomes.

The in-class review of the TeamSTEPPS modules was held in the conference room near the simulation lab. Following the review, participants were oriented to the simulation lab with the patient simulator, the simulation scenario based on a generic medical/ surgical patient case study (developed by the vendor), and their roles for the simulation scenario. The main participant roles for the scenario included the physician, and two nurses for the handoff process (one going off-shift, one coming on-shift), the unlicensed assistive personnel (UAP), and patient family member at the bedside. All other participants participated as observers. During the 10-minute simulation, the participants applied the TeamSTEPPS tools and strategies presented in the communication and mutual support modules. The simulation session was followed by a 20-minute debriefing session in the conference room.

To accommodate for various work shifts and rotations, as well as a maximum size of approximately 6-10 participants per simulation session, the trainings were offered multiple times.

For a total of 36 potential participants, six training sessions were offered. A make-up session was also offered for those who missed the previously scheduled sessions.

Phase III. Phase III of implementation involves sustainment of improvements obtained through the TeamSTEPPS initiative. On-going support and positive reinforcement from hospital leadership is a critical component of sustainment efforts.

Strategies for sustainment of improvements in provider and patient outcomes include continuous training of curriculum through refresher courses, training of new employees through new hire orientation, and on-going evaluations and feedback from champions and unit leaders. Other strategies to help sustain positive outcomes include recognition of employees through teamwork awards, featuring them in the hospital newsletter, and or a thank you card from hospital leadership, as well as other public recognitions and celebrations.

During this stage, a three-month follow up evaluation was also conducted through a survey process similar to the ones conducted at baseline and after the training. The results of the three-month follow up survey and CALNOC nursing indicators were compared to results from the baseline survey and survey conducted immediately following the training.

Study Limitations

Every effort was made to ensure that the study could be implemented flawlessly and successfully. Nevertheless, there were several limitations to the study. These limitation are further described in the following sections.

Threats to statistical conclusion validity. One main potential threat to statistical conclusion validity was related to the low statistical power due to a small physician sample size. Every effort was made to recruit a larger physician sample size when possible and minimize the

chances of participant attrition. Moreover, the patient safety outcomes were measured at the unit level. The limited data from the medical/ surgical units of two hospitals made it difficult to identify statistical significance even though the trend was indicative of improvement, hence, findings from this study should not be generalized to settings other than medical/ surgical units.

Threats to internal validity. Attrition rates were also a limitation of the study. To control for this threat, frequent survey reminders, including letters/ memos were emailed to the participants and distributed via flyers. The nursing participants were also eligible to received four hours of continuing nursing education credit. In addition, participants were offered a $10 gift card for completing each survey. They were also entered into a raffle for an Apple iPad mini, for attending the simulation session. Nevertheless, several participants dropped out of the study due to various reasons.

Threats to external validity. Even with a comparable control unit located in another facility, the use of a medical/surgical intervention unit from one hospital limits the generalizability of findings. Hence, the results of this study may not be generalized to units other than adult medical/ surgical units and healthcare organizations within the Los Angeles County.

Despite the limitations associated with the sample size, the extraneous variables and other areas of concerns previously discussed, the results of the proposed study provided useful information regarding the effectiveness simulation-based interprofessional communication and teamwork skills training in promoting communication and teamwork between nurses and physicians, fostering a culture of patient safety, as well as improving patient outcomes.

Dissemination of Findings

Dissemination activities will be tailored to the preferences for receiving information of

each target audience (e.g. formal presentations at conferences, including 2014 Collaborative Alliance for Nursing Outcomes (CALNOC) Conference, presentations at seminars and workshops, recordings available via webinar, audio/video streaming available on the internet, etc.). Table 4-1 describes the potential venues, target audiences, and methods of dissemination.

In addition to presentations at conferences and other venues described in Table 4-1, the results of the study will be disseminated in written format via the "three paper option." Journals with the highest impact factors and appropriate target audience will be considered when submitting manuscripts. Authorship will be determined by the student and will be finalized upon completion of the papers in accordance with the Journal of the American Medical Association (JAMA) guidelines. The following list identifies potential peer-reviewed journals for the three manuscripts. The three manuscripts are presented in Chapter 5.

1. Theoretical Concept Paper
    a. Topic: Defining attributes of patient safety through a concept analysis.
        i. Journal: *Journal of Advanced Nursing (JAN).* Peer reviewed journal that targets readers who are committed to advancing practice and professional development on the basis of new knowledge and evidence. JAN has an impact factor of 1.477 and ranked 12th of 99 nursing journals in the 2011 Thomson Reuters Journal Citation Report.
        ii. Journal: *Journal of Nursing Administration (JONA) is a p*eer reviewed journal that is geared to nurse executives, directors of nursing, and nurse managers in hospital, community health, and ambulatory care environments. JONA provides practical, innovative, and solution-

oriented tools and data needed to excel in executive practice in changing healthcare systems. JONA has an impact factor of 1.419 and ranked 15th out of 99 nursing journals in the 2011 Thomson Reuters Journal Citation Report.

2. Data-based Paper #1
    a. Topic: Provider and patient outcome of a simulation-based TeamSTEPPS training.
        i. Journal: *Journal of Nursing Scholarship* is the official journal of the Honor Society of Nursing, Sigma Theta Tau International, and reflects the honor society's dedication to providing the tools necessary to improve nursing care globally. This journal has a target audience comprising of health professionals, faculty and students in 103 countries and has an impact factor of 1.490 and ranked 11th out of 99 nursing journals in the 2011 Thomson Reuters Journal Citation Report.
        ii. Journal: *Journal of Advanced Nursing (JAN)* described above.
3. Data-based Paper #2
    a. Topic: Linking provider characteristics to perceptions of communication effectiveness, teamwork, and patient safety culture.
        i. Journal: *Journal of Nursing Administration (JONA).* Described above.
        ii. Journal: *Journal of Nursing Scholarship*. Described above.

Chapter Five: Results and Discussion

The study generated three articles that will be submitted for the three-paper option for the dissertation. The three articles include: 1) Defining attributes of patient safety through a concept analysis, 2) Provider and patient outcomes of simulation-based TeamSTEPPS training, and 3) Linking provider characteristics to perceptions of communication effectiveness, teamwork, and patient safety culture. These articles are further described in the following sections.

Article One: Defining Attributes of Patient Safety Through a Concept Analysis

The report, *To err is human: Building a safer health system*, published in 1999 by the Institute of Medicine, is credited with prompting national efforts to study and improve safety in healthcare (Stelfax, Palmisani, Scurlock, Orav, & Bates, 2006). Since the publication of the IOM report, various government and private sectors across the nation such as the Agency for Healthcare Research and Quality (AHRQ) and the Joint Commission, were identified as responsible to ensure basic patient safety, establish national patient safety goals, track progress, invest in research focusing on prevention of medical errors, and disseminate information on best practices (Donaldson, 2008).

In addition, numerous alliances of health care organizations and providers such as the National Quality Forum (NQF), the National Center for Nursing Quality (NCNQ), the Hospital Quality Alliance, and the Collaborative Alliance for Nursing Outcomes (CALNOC) have also emerged, endorsing lists of measurable indicators to facilitate collection, monitoring, and reporting of healthcare performance and patient outcomes by hospitals and other healthcare organizations. Unfortunately, these lists of indicators vary from entity to entity, making consistent collection and measurement of outcomes challenging. A comparison of the CALNOC

indicators and the National Database of Nursing Quality Indicators (NDNQI) endorsed by the NCNQ in Appendix D, Table 5-1 illustrates this point. Indicators that are unique only to one organization are distinguished in italics.

Both the CALNOC indicators and the NDNQ indicators reflect the structures, processes, and outcomes of nursing care (Montalvo, 2007; Grove, Burns & Gray, 2013; CALNOC, 2014). Some data are consistently collected by both CALNOC and NDNQI; however, there are some data that are collected by one entity, and not by the other. For instance, CALNOC indicators also include staffing ratios, unit rate of admissions, discharge, and transfers as well as peripherally inserted central catheter (PICC) line insertion practices, central-line associated blood stream infection in PICC (CLABSI-PICC) line rate, and medication administration accuracy prevalence, while NDNQ indicators do not. On the other hand, NDNQ indicators include nurse vacancy rate, pediatric pain assessment/ intervention/ reassessment cycles completed, pediatric peripheral IV infiltration rate, physical/ sexual assault rate, catheter-associated urinary tract infection (CAUTI) rate, central line- associated blood stream infection (CLABSI) rate, ventilator-associated pneumonia (VAP) rate, as well as RN satisfaction surveys that are not included on the list of CALNOC indicators.

Furthermore, a review of literature regarding the relationship between nurse staffing and patient outcomes conducted by Dunton, Gajewski, Klaus, and Pierson (2007), revealed that there were huge variations in the indicator definitions and variety of indicators used among the studies reviewed. Inconsistent terminologies, definitions, and measures of quality of care and patient outcomes create a major challenge when comparing results across studies and have slowed progress in research (Chang, Schyve, Croteau, O'Leary & Loeb, 2005; Clarke & Donaldson,

2008; Gluck 2012).

Having a standardized list of patient safety indicators with agreed definitions is crucial to facilitate description, measurement, and monitoring to improve patient care, conduct epidemiological research, and to inform health policy planning (Sherman et al., 2009); however, even before this process can be initiated, there must be clear mutual understanding of the meanings of the concepts from which indicators are derived. A thorough analysis of the concept of patient safety would promote consistent application and facilitate any taxonomic work for more efficient collection and measurement of standardized patient safety data.

Background

There has been a recent increase in the number of studies being done to clarify the concept and standardize measurement of patient safety, including the work by NQF with its report, *Standardizing a Patient Safety Taxonomy* (NQF, 2008). Nevertheless, patient safety is still conceptualized inconsistently, its taxonomy is underdeveloped, and we do not know enough about what elements to measure and how to measure them (Edozien, 2013). For instance, patient safety can be viewed as an attribute residing under the overarching umbrella of quality healthcare (Mitchell, 2008); however, the two concepts are still applied interchangeably. Furthermore, a review of nursing literature resulted in several concept analyses related to patient safety; however, there were only a few articles that provide a clear explanation of the actual concept. Previous concept analyses were conducted on contracting for safety (Egan, 1997), patient safety culture (Feng, Bobay, & Weiss, 2008), and feeling safe (Mollon, 2014), but there were no analyses conducted on the concept of patient safety, in the English language, that would help distinguish it from the concept of quality of care.

An abstract by Kim (2011) describes the results of an actual concept analysis on patient safety using the Walker and Avant concept analysis process. Unfortunately, the rest of the article is written in the Korean language, which is not practical for non-Korean speakers. The purpose of this concept analysis, therefore, is to identify the defining attributes and empirical referents of patient safety, as well as to present sample cases in the English language that may lead to a clearer distinction between the concept of patient safety and concept of quality of care. The applicability of CALNOC indicators as empirical referents of patient safety will also be explored, in preparation for future research.

The following section describes the results of a concept analysis of patient safety, applying Walker and Avant's concept analysis method. Walker and Avant's (2010) eight steps of concept analysis include 1) selecting a concept, 2) determining the aims or purposes of analysis, 3) identifying all uses of the concept, 4) determining the defining attributes, 5) constructing a model case, 6) constructing borderline, related, contrary, and illegitimate cases, 7) identifying antecedents and consequences, and 8) defining empirical referents.

Data Sources

A literature search was conducted through PubMed and Cumulative Index to Nursing and Allied Health Literature Plus (CINAHL Plus) using the terms "patient safety" in the title and "concept analysis," "attribute," or "definition" in the title and or abstract. All English language articles published between 2002-2014 were considered for the review. The search resulted in 66 articles in PubMed and 10 articles in CINAHL Plus, after duplicate articles were omitted. Six additional articles on patient safety were obtained as a result of reverse citation search on several key articles. Titles and abstracts of 82 articles were critically reviewed. All articles that were not

written in the English-language, published before 2002, or irrelevant to the concept at hand were excluded. A final list of 11 articles was considered for this analysis. In addition, definitions of patient safety were obtained from the AHRQ Patient Safety Network (PSNet) website, World Health Organization (WHO) website, and the Quality and Safety Education for Nurses (QSEN) website, along with Dictionary.com online, Merriam-Webster Dictionary online, and Oxford Dictionaries online to explore both scientific and general uses of the term "patient safety."

Uses of the Concept

The definition of "patient safety" was not available in any of the standard English dictionaries; however, definitions of "patient" and "safety" were available as two separate words. Various dictionaries defined a patient as "a sick individual… under the care and treatment" and as "an individual awaiting or under medical care and treatment" (*"patient,"* 2014a; 2014b; 2014c). It is also defined as a state of being able to "accept or tolerate" or "bearing provocation, annoyance, misfortune, delay, hardship, pain, etc., with fortitude and calm and without complaint, anger, or the like" (*"patient,"* 2014a; 2014b; 2014c).

Safety, on the other hand, was often defined as "the condition of being protected from or unlikely to cause danger, risk, or injury" or "freedom from occurrence or risk of injury, danger, or loss" (*"safety,"* 2014a; 2014b; 2014c). In other contexts, safety was defined as "a device to prevent injury or avert danger," such as a locking device on a gun. It was also defined as a situation in North American football where "a member of the offensive team is tackled behind its own goal line that counts two points for the defensive team" (*"safety,"* 2014b). Finally, it was defined as a billiard shot made without an attempt to score, rather to leave the ball in an unfavorable spot for the opponent (*"safety,"* 2014). Although both scientific and general uses of

the concept of safety have been explored, only those pertinent in the healthcare context were considered for the purposes of this paper.

As it became increasingly important to define patient safety, researchers and scholars began to explore various definitions of patient safety based on their philosophical assumptions (Emanuel *et al.* 2008). Although there are still great variations in the definition for patient safety, efforts are underway to increase standardization (Pronovost, Thomson, Holzmueller, Lubomski, & Morlock, 2005).

A definition of patient safety emerging from the healthcare quality movement was provided in the IOM report, *Patient safety: Achieving a new standard for care*, and was defined as "the prevention of harm to patients" (Aspden, Corrigan, Wolcott, & Erickson, 2004, p.5). A similar definition of patient safety is found in the glossary of terms on the AHRQ PSNet website (2012) and is defined as "freedom from accidental or preventable injuries produced by medical care." A more expanded definition proposed by the AHRQ (2003) is "the absence of the potential for, or the occurrence of, health care associated injury to patients, created by avoiding medical errors as well as taking action to prevent errors from causing injury."

Another definition acknowledges that patient safety is both a way of doing things and an emergent discipline (Emanuel et al., 2008). Emanuel et al. (2008) defined patient safety as a "discipline in the health care sector that applies safety science methods toward the goal of achieving a trustworthy system of health care delivery" (Emanuel et al., 2008, p. 5). Furthermore, Emanuel et al. (2008) added that "patient safety… minimizes the incidence and impact of, and maximizes recovery from, adverse events. Thus, practices or interventions that improve patient safety are those that reduce the occurrence of preventable adverse events" (Emanuel et al. 2008,

p. 5).

From an international healthcare quality perspective, the *Canadian Patient Safety Dictionary* (Davies, Hebert, & Hoffman, 2003) defined patient safety as "the reduction and mitigation of unsafe acts within the healthcare system, as well as through the use of best practices shown to lead to optimal patient outcomes." The World Health Organization also defined patient safety as "the absence of preventable harm to a patient during the process of health care" (WHO, 2014, para. 3). In addition, the WHO also described patient safety as a discipline. Similar to the definition provided by Emanuel et al. (2008), "the discipline of patient safety is the coordinated effort to prevent harm, caused by the process of health care itself, from occurring to patients" (WHO, 2014, para. 3). More recently, the World Alliance for Patient Safety for WHO developed the International Classification for Patient Safety (ICPS) in hopes of improving common international understanding of terms and concepts relevant to patient safety (Runciman, Hibbert, Thomson, Van Der Schaaf, Sherman, & Lewalle, 2009). According to the ICPS, patient safety is "the reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum" (Runcimen et al., 2009).

Similar definitions of patient safety resulting from the healthcare quality movement are also applied in the field of medicine. Gluck (2012) described that there is still no universally accepted definition of patient safety; however, the author did propose several definitions, including the definitions by Aspden et al. (2001), Emanuel et al. (2008), and WHO (2014).

These and other similar definitions were noted in the nursing literature as well. As in the field of medicine and the healthcare quality movement, patient safety in nursing is often defined as an activity that minimizes risk of harm, errors, or injury to patients (Cronenwett et al., 2007,

Mitchell, 2008). In addition, the prevailing principle in the nursing discipline is that although human factors need to be acknowledged, errors often result from system problems. This principle is reflected in the definition provided by QSEN (Cronenwett et al., 2007, QSEN, 2012), where safety is defined as, "minimizing risk of harm to patients and providers through both system effectiveness and individual performance." Furthermore, in defining patient safety, Mitchell (2008) cited the IOM's definition of patient safety, emphasizing a care delivery system that prevents errors, learns from the errors that do occur, and is built on a culture of safety that involves health care professionals, organizations, and patients.

Defining Attributes

Similar defining attributes of patient safety reverberate throughout the literature as well as the definitions discussed above. The defining attributes most frequently associated with the concept of patient safety in the reviewed literature include 1) prevention or reduction of errors and adverse events, 2) protection of patients from harm or injury, and 3) collaborative efforts by individual healthcare providers as well as a strong, well-integrated healthcare system.

Again, it is important to keep in mind that medical errors or adverse events are not always the results of an individual healthcare provider's incompetence or mistakes; rather, they are often the results of systems failures (Kohn et al., 2000). The proximal error preceding an adverse event may often be considered related to human error, but the underlying causes of errors are usually found at the system level and are due to system flaws (Woolf, 2004). Healthcare systems and organizations as well as direct healthcare providers must ensure that mechanisms are in place to prevent or reduce errors and adverse events and protect patients from harm or injury.

Sample Cases

The next step in Walker and Avant's (2010) concept analysis process is a presentation of cases that represent a pure exemplar of the concept, as well as cases that are similar or contrary to it. These sample cases are helpful in gaining a better understanding of what the concept of patient safety is and what it is not. The following sections describe examples of the uses of the concept that demonstrate all the defining attributes (model case), some or similar attributes (related case), or when it clearly lacks all of the defining attributes (contrary case) of patient safety. Invented and illegitimate cases are often presented along with the borderline, related, and contrary cases as part of the Walker and Avant (2010) concept analysis process. For the purposes of this paper, these two examples were omitted since the other cases provide sufficient examples to illustrate the defining attributes of patient safety.

Model case. A model case is an example from real life, found in literature, or one that is constructed to demonstrate all of the defining attributes of the concept (Walker & Avant, 2010).

> Mr. P, an 86-year-old male is transferred to the acute rehabilitation unit from the medical/surgical unit post-op hip repair surgery related to a fall injury. He has a history of Parkinson's disease, rheumatoid arthritis with contractures in both hands, visual impairment, postural hypotension, and is in a wheelchair. Following an assessment of fall risk, the nurse placed a fall risk sign above the patient's bed and implemented interventions per hospital policy and protocol including moving the patient to a room closest to the nursing station, placing the call light within the patient's reach, instructing the patient to call the nurse for assistance when getting out of bed, positioning the bed in lowest position with brakes locked, raising bed side-rails up, and placing floor pads at the bedside. The nurse increased the frequency of rounds to check the patient for toileting needs, pain and overall condition. In addition, the patient's medications, nutrition, and treatment orders were reviewed in collaboration with a physician, a pharmacist, and other disciplinary team members during the interdisciplinary team rounds.

In this model case, immediate actions were taken by the nurse to protect the patient from harm such as positioning the bed in lowest position with brakes locked, raising bed side-rails up,

and placing floor pads at the bedside. Measures to prevent or reduce errors and adverse events include placing fall risk sign at the head of the patient's bed to communicate patient's status to other staff and visitors who may provide additional assistance, increasing the frequency of rounds in anticipation of patient needs, and reviewing patient's treatment orders with the interdisciplinary team to eliminate or minimize treatment regimens that can increase the risk of falls or injury from falls and promote regimens that facilitate the patient's healing process. The collaborative effort is evident in the existence of the hospital's policies and procedures related to fall prevention and implementation of interdisciplinary team rounds.

Borderline case. Borderline cases help to tease out the defining attributes that most closely represent the concept of patient safety (Walker & Avant, 2010). Borderline cases contain most of the defining attributes of patient safety in the example, but not all of them (Walker & Avant, 2010).

> Nurse A is assigned to work in a busy Internal Medicine Clinic. She recently attended an educational session on infection control techniques and the importance of hand washing. She noticed that the clinic physician Dr. T, went from patient to patient without washing his hands. Later that morning, she encounters Dr. T in the corridor and addresses him saying that she attended the hand-washing seminar and noticed he did not always follow procedure. Dr. T appears irritated by the comment, but washes his hands after visiting the next patient. Dr. T then complains to the nursing supervisor about Nurse A.

In this example, the prevention of error and adverse events and protecting patients from harm or injury is evident, but the collaborative effort is missing. Collaboration involves "a joint communicating and decision-making process between medical staff and nurses with the goal of satisfying the patient's wellness and illness needs while respecting the unique qualities and abilities of both professions" (Coluccio & Maguire, 1983, p.63). Collaborative effort is also based on attributes such as cooperative endeavor, willing participation, shared planning and

decision making, shared responsibility, non-hierarchical relationships, and shared power, based on knowledge and expertise versus role or title (Henneman et al., 1995) but, these qualities are clearly missing in Dr. T's actions.

Related case. The related cases are those that demonstrate ideas that are similar to the main concept, but that differ when examined closely (Walker & Avant, 2010). The concept of patient safety is similar to, but different from, the concept of quality of care (Gluck, 2012). Patient safety is the minimum set of standards that any healthcare system and providers must meet. Quality care not only includes patient safety as one of its defining attributes, it also includes other positive attributes such as patient care that is timely, effective, efficient, equitable, and patient centered (IOM, 2001).

> Two members of the GI Laboratory are assessing an elderly patient who has just had conscious sedation for a colonoscopy. The monitor shows supraventricular tachycardia (SVT) at a rate of 150 and a blood pressure of 76/48. The nurse calls out the vital signs while the physician continues to monitor the rhythm. Another nurse passing by the room hears the call-out, steps in the room, and seeing the blood pressure, asks, "Do you want a code cart in here?" When the patient lost consciousness and became unresponsive, resuscitation efforts are initiated immediately. After a successful resuscitation, the patient was transferred to the ICU.

In this quality care scenario, the defining attributes of protecting the patient and collaborative efforts are illustrated. Although the patient's declining condition is not related to a direct error caused by the healthcare provider or the healthcare system, potential adverse events or injury are prevented through effective communication efforts of the nurse and physician and the ability of the second nurse to be aware of what was happening with the team. In addition, the scenario includes other positive attributes of quality care such as patient care that is safe, timely, effective, efficient, and patient centered.

Contrary case. Contrary cases are clear examples of "not the concept" (Walker & Avant

2010). The defining attributes of prevention or reduction of errors and adverse events, protection of patient from harm or injury, and collaborative efforts are clearly missing in this example.

> It is ordered that M.J., a patient admitted for an upper GI bleed, is to receive a unit of blood run over 4 hours. Nurse M, who is caring for M.J., is anxious to get started hanging the unit of blood since it was delivered to the unit 20 minutes earlier. Hospital protocol requires two nurses to verify that the correct patient is receiving the correct blood product and type before hanging the unit. At this time, another patient in the unit is being resuscitated, and staff availability is limited. Nurse S agrees to double check and verify the patient with nurse M as soon as she finishes assisting in the resuscitation, but Nurse S is asked to assist with another task during the resuscitation. As a result, Nurse M decides to hang the blood without the double check to prevent further delay. Shortly after the blood is hung, the patient spikes a temperature and experiences shaking chills. Nurse M has inadvertently hung blood for another patient named M.J.

This contrary case is an example of a combination of individual healthcare provider's error and the systems failures that result in adverse events and threaten patient safety. Although Nurse S was unavailable, Nurse M could have approached other nurses on the unit who were not directly involved with the resuscitation. In addition, Nurse M's decision to hang the blood without the double check exemplifies how the nurse's erroneous judgment can result in adverse events. Regardless of the existing hospital protocol related to blood transfusion, there were other systems-related failures such as issues related to limited nurse staffing and lack of a final patient verification process (e.g. matching bar coding on the patient's identification band and the blood product) that further led to this adverse event, causing harm and injury to the patient.

Antecedents

Antecedents are events that must occur prior to the occurrence of the concept (Walker & Avant 2010). One antecedent of patient safety is interaction between patients, healthcare providers and the environment where patient care is delivered. This interaction must occur in order for patient safety issues to occur. When the interaction between patients, the healthcare

provider and the environment where patient care is delivered functions well together, the combination serves as a system of defenses to the occurrence of preventable adverse events; however, when vulnerabilities exist within these components and they interact in such a way that the weaknesses overlap, preventable adverse events may occur (Henriksen, Dayton, Keyes, Carayon & Hughes, 2008). The Swiss Cheese Model of Accident Causation by Reason). The Swiss Cheese Model of Accident Causation by Reason (2000) illustrates this point (Figure 5-1).

According to the Swiss Cheese Model of Accident Causation (Reason, 2000), there are multiple layers in a healthcare system that protect patients against error. Each of these layers may have weaknesses or gaps. In most cases, even when the weaknesses or gaps in some layers have occurred, the other layers will remain protective. For a patient to be harmed, weaknesses or gaps in each layer must line up, allowing error to reach the patient.

Nearly all adverse events involve a combination of both the active and latent sets of factors. Active failures (i.e. slips, lapses, fumbles, mistakes, and procedural violations) are the unsafe acts committed by people who are in direct contact with the patient or system (Reason 1990). Latent conditions arise from decisions made by designers, builders, policy and procedure writers, and top-level management and can lead to two kinds of adverse effects: 1) error provoking conditions in the workplace (e.g. time pressure, understaffing, inadequate equipment, fatigue, and inexperience) and 2) long-lasting holes or weaknesses in the defenses such as untrustworthy alarms and indicators, unworkable procedures, design and construction deficiencies (Reason 2000). Latent conditions may lie dormant within the system before they combine with active failures and local triggers to create an accident opportunity (Reason, 2000).

When a sufficient number of holes created by active failures and latent conditions

become aligned, adverse events will occur (Henriksen et al., 2008). Hence, a comprehensive patient safety program should focus on both active and latent factors at various layers of the healthcare system (i.e. the person, the team, the task, the workplace, and the institution as a whole) to ensure a maximum level of patient protection from harm (Reason, 1990).

Consequences

Consequences on the other hand, are events or incidents that occur as a result of the occurrence of the concept (Walker & Avant, 2010). The consequences or outcomes of patient safety can be positive or negative. For instance, if patient safety was observed, the patient will be free from injury and may even experience positive outcomes such as regaining health, improved quality of life, and well-being. On the contrary, with the absence of patient safety, patients may experience injury or adverse events that lead to deteriorated health conditions, increased complications, and even death.

Empirical Referents

Identification of empirical referents is the final step of the concept analysis process (Walker & Avant, 2010). Empirical referents are not tools to measure the concept; rather, they are the means by which to recognize or measure the defining attributes and help determine the existence of a concept (Walker & Avant, 2010). Empirical referents for patient safety then, should include indicators that measure 1) prevention or reduction of errors and adverse events, 2) protection of patients from harm or injury, and 3) collaborative efforts by individual healthcare providers as well as a strong, well-integrated healthcare system.

Donabedian's (1988) structure-process-outcome model is often applied as a framework for examining quality and patient outcomes. Table 5-2 in Appendix D describes the CALNOC

indicators in relation to the structure-process-outcome model. The CALNOC structural indicators including hours of nursing care, skill mix, RN education level and years of experience, nurse-to-patient ratios, and unit rate of admissions, reflect the collaborative efforts by the healthcare providers and healthcare system to establish minimum qualifications and practice standards that would prevent errors or adverse events and protect patients from potential harm.

The CALNOC process indicators reflect nursing actions, including completion of falls and hospital acquired pressure ulcer risk assessments and implementation of protocols, as well as adherence to medication administration accuracy safe practices and evidence-based PICC line insertion practices to prevent adverse events and protect patients from potential harm. Although the nurses are ultimately at the front line of care delivery, it requires the collaborative effort of other healthcare providers including unlicensed assistive personnel, dieticians, pharmacists, physical therapists, as well as efficient structures in place that will ensure patients are protected from harm at all times.

Finally, the list of CALNOC outcome indicators include the rate of hospital acquired pressure ulcers, falls, restraint use, central line –associated blood stream infections in PICC lines, and medication administration error rates. A low rate of the identified negative outcome indicators is a direct reflection of the effectiveness of the structural factors put in place through collaborative efforts by healthcare providers and the healthcare system as well as the processes carried out by healthcare providers to prevent the occurrence of adverse events and protect patients from potential harm or injury. Hence, the application of CALNOC indicators as empirical referents would facilitate the measurement of previously identified defining attributes of patient safety.

Discussion

Through a rigorous concept analysis process suggested by Walker and Avant (2010), a conceptual analysis of patient safety was undertaken to identify defining attributes and present sample cases that helped to distinguish the concept of patient safety from the concept of quality care. Although the two concepts are often used interchangeably, the results of the analysis showed that they have different defining attributes that distinguish one from the other. The primary emphasis of patient safety is the prevention of the negative aspects of care that can potentially harm patients, while the emphasis of quality care is promoting the positive aspects of care.

Based on this concept analysis, the defining attributes of patient safety included 1) prevention or reduction of errors and adverse events, 2) protection of patients from harm or injury, and 3) collaborative efforts by individual healthcare providers as well as a strong, well-integrated healthcare system. Hence, an operational definition of patient safety can be described as the outcome of collaborative efforts by healthcare providers within a well-integrated healthcare system to prevent errors or adverse events, thereby protecting patients from harm or injury.

This concept analysis also provided an opportunity to assess the applicability of the CALNOC indicators as empirical referents for patient safety. The results of the analysis showed that the CALNOC indicators could be applied effectively to assess which elements of patient safety were present or absent.

As such, the CALNOC indicators could be used to measure patient safety outcomes in future research. For instance, specific CALNOC indicators could be used to measure outcomes

in a study evaluating the effects of an intervention (i.e. increased staffing, medication administration accuracy safety practices, and interdisciplinary teamwork and communication trainings) implemented to improve patient safety. The CALNOC indicators could be measured pre and post implementation of the intervention to assess the amount of change that has occurred in the patient safety outcomes. Improved indicator scores would demonstrate a positive effect of the intervention on patient safety outcomes.

Limitations

Several limitations were noted despite the rigorous and precise analysis process. There are numerous lists of indicators endorsed by various organizations that could potentially be applied as empirical referents of patient safety; however, only the CALNOC indicators were assessed for the purposes of this paper. In addition, the results of this analysis may not be applicable in other countries, as defining attributes, sample cases, and empirical referents were presented in relation to U.S. healthcare practices and context and these may not be applicable where there are cultural, contextual, and societal differences. Development of a conceptual model and framework that can be applied in an international context would remedy these limitations and strengthen future patient safety research.

Conclusion

The consistent use of key concepts with agreed definitions and preferred terms, along with a comprehensive patient safety classification, will promote better understanding of patient safety information. Consistent use will also facilitate standardization of relevant data for collection, aggregation and analysis for comparison and tracking over time (Runciman et al., 2009). Although the results of this concept analysis make a contribution towards that goal,

further examination of the concept of patient safety would be beneficial.

Article Two: Provider and Patient Outcomes of Simulation-based TeamSTEPPS Training

Ineffective communication and teamwork among members of the interprofessional healthcare team has been identified as a major cause of medical errors and negative patient safety outcomes, including increased length of hospital stays, medication errors, falls, pressure ulcers, death, and other sentinel events (Gruenberg et al., 2006; Knaus, Draper, Wagner, & Zimmerman, 1986; Manojlovich, Antonakos, & Ronis, 2009; Manojlovich, & DeCicco, 2007; Spiva et al., 2014; The Joint Commission, 2014; Tschannen, & Kalisch, 2009). Despite its importance, there has been little training in collaborative communication and team-based skills among healthcare providers (Greiner & Knebel, 2003). Members of these interprofessional teams continued to be trained in separate disciplines and educational programs, leaving them unprepared to enter practice in complex collaborative settings (Greiner & Knebel, 2003; IOM, 2001).

Following recommendations by the Institute of Medicine (IOM) and other patient safety experts (Greiner & Knebel, 2003; IOM, 2001; Page, 2004) emphasizing the need for healthcare organizations to provide collaborative interprofessional communication and teamwork training for all health care providers on a regular basis, there has been an increase in the number of such training programs as a strategy to promote patient safety and reduce errors. Examples of these training programs include the MedTeams program, the Triad for Optimal Patient Safety (TOPS) program, and the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) program.

The TeamSTEPPS is an evidence-based teamwork program developed by the Agency for Healthcare Research and Quality (AHRQ) and the US Department of Defense (DoD) to optimize patient outcomes by improving interprofessional communication and teamwork. Recent research

studies that have applied interprofessional TeamSTEPPS program reported improvements in communication and teamwork between healthcare providers, as well as their perceptions of patient safety culture (Armour Forse, Bramble, & McQuillan, 2011; Brock et al., 2013; Capella et al., 2010; Deering et al., 2011; Hobgood et al., 2010; Johnson & Kimsey, 2012; Liaw, Zhou, Lau, Siau, & Chan, 2014; Mahoney, Ellis, Garland, Palayo, & Green, 2012; Mayer et al., 2011; Riley, Davis, Miller, Hansen, Sainfort, & Sweet, 2011; Robertson et al., 2010; Sheppard, William, & Klein, 2013; Spiva et al., 2014; Stead et al., 2009; Thomas & Galla, 2013; Weaver et al., 2010). These studies have also found improvements in various patient outcomes, such as reductions in ICU and hospital length of stays, medication and transfusion errors, needle-stick injuries, nosocomial infections, and fall rates (Capella et al., 2010; Deering et al., 2011; Hobgood et al., 2010; Mayer et al., 2011; Spiva et al., 2014;), following implementation of didactic-based TeamSTEPPS program and the TeamSTEPPS program augmented with simulations at various settings including operating rooms, labor and delivery departments, emergency departments, and intensive care units.

Nevertheless, literature on impacts on both provider and patient outcomes remains limited, especially as it relates to the impact of interprofessional simulation-based TeamSTEPPS program in the medical/ surgical setting. Hence, the purpose of this pilot study, was to evaluate the impact of implementation of an interdisciplinary simulation-based TeamSTEPPS training on provider outcomes (i.e. perceptions of interprofessional communication, teamwork, and patient safety culture) and on patient safety outcomes (i.e. patient falls and pressure ulcers) of a medical/surgical unit.

Method

Research Design and Sample

A quasi-experimental, pretest-posttest repeated measures study design was used for this pilot study. This was a multi-site study conducted at two comparable healthcare organizations within the Los Angeles County. A convenience sampling method was used to recruit 81 participants. All physicians and full-time and part-time registered nurses, 21 years or older, with a minimum of three months of affiliation or employment history at the hospital, providing direct patient care in the medical/ surgical unit, were considered for participation. A final sample of 61 participants was included in the pilot study.

Ethical Considerations

Institutional review board approvals were obtained from the University of California, Los Angeles (UCLA) and all applicable institutions prior to the pilot study. Participants consenting to the study returned the signed consent form along with the first survey. Participation in the study was on a voluntary basis; hence, participants concerned about potential risks had the option to opt out of participation at any time during the study.

Intervention

The comprehensive TeamSTEPPS curriculum includes modules on five core concepts, including team structure, communication, leading teams, situation monitoring, and mutual support. For the purposes of this pilot study, only the communication and the mutual support modules along with applicable video vignettes were utilized. As a result, the intervention consisted of a three and a half hour interprofessional communication and teamwork training session, based on the TeamSTEPPS curricula and simulation-based skills practicum. The two-

hour TeamSTEPPS modules on communication and mutual support were made available to the participants via CD, to be completed any time prior to the one hour thirty minute in-class review of TeamSTEPPS modules and simulation session. The CDs included PowerPoints on communication and mutual support modules, along with video vignettes that covered examples of TeamSTEPPS strategies covered in the modules.

The participants were asked to attend one of the six simulation sessions held on various dates and times to accommodate physician preferences and nurses on different shifts and rotations. The in-class review of the TeamSTEPPS modules was held in the conference room near the simulation lab. Following the review, participants were oriented to the simulation lab with the patient simulator, the simulation scenario based on a generic medical/ surgical patient case study (developed by the vendor), and their roles for the simulation scenario. The main participant roles for the scenario included the physician, and two nurses for the handoff process (one going off-shift, one coming on-shift), the unlicensed assistive personnel (UAP), and patient family member at the bedside. All other participants participated as observers. During the 10-minute simulation, the participants applied the TeamSTEPPS tools and strategies presented in the communication and mutual support modules. The simulation session was followed by a 20-minute debriefing session in the conference room.

Data Collection

All data were collected using the same survey at various time points. For the intervention group, a survey was collected at baseline, following the intervention, and three-months post intervention. The surveys for the control group were collected at the same months correlating with the intervention group's baseline and three month post-intervention surveys.

Instruments and Measurements

Several different instruments were used to measure patient safety outcomes and provider outcomes. The provider outcomes were measured through a survey that included a demographic questionnaire, the communication subsection of the ICU Nurse-Physician Questionnaire, the TeamSTEPPS Teamwork Perceptions Questionnaire (T-TPQ), and the AHRQ Hospital Survey on Patient Safety Culture (HSOPSC). Patient Outcomes were measured using the Collaborative Alliance for Nursing Outcomes (CALNOC) nursing sensitive quality indicators.

Provider characteristics. The provider characteristics were measured through a demographic questionnaire. Nurse and physician characteristics measured in this study included age, sex, race/ ethnicity, primary language, English language proficiency, education level, country of pre-licensure nursing/ medical education, and years of experience in the U.S.

Nurse-physician communication. Perceptions of nurse-physician communication were measured through the general relationships and communication subsection of the ICU Nurse-Physician Questionnaire that included 22 items related to the cohesiveness, timeliness and understanding of communication between nurses and physicians. The Content validity of the questionnaire was evaluated through a factor analysis, where three identified factors loaded at 0.40 or above with an Eigenvalue well above 1.0 (Shortell, Rousseau, Gilles, Devers, & Simons, 1991). The Cronbach's alpha reliabilities for the 22 items of the scales ranged from 0.60 to 0.70, showing acceptable reliability (Shortell et al., 1991). Although developed for use in ICU environments, the tool has been used in other settings, including in a study of medical-surgical nurses (Manojlovich & DeCicco, 2007). Examples of questions on the survey include, "when nurses talk with physicians in this unit, there is a good deal of understanding" and "in matters

pertaining to patient care, nurses call physicians in a timely manner." All items are based on a Likert type scale, ranging from "strongly agree" to "strongly disagree" and "very satisfied" to "very dissatisfied."

Teamwork. Teamwork was measured with the TeamSTEPPS, Teamwork Perceptions Questionnaire (T-TPQ). The T-TPQ is a 35-item questionnaire, comprised of the following constructs: team structure, leadership, situation monitoring, mutual support and communication. For this study, only the mutual support and the communication subsections of the questionnaire, consisting of 12 items were utilized. Cronbach's alpha reliabilities for the constructs ranged from 0.88 to 0.95, showing high reliability (American Institutes for Research [AIR], 2010). Construct independence was also examined by intercorrelating the five T-TPQ subscales. Coefficients ranged from 0.57 to 0.77, showing acceptable reliability (AIR, 2010). Convergent validity was demonstrated by comparing the T-TPQ with validated items from the HSOPSC. This pilot test resulted in overall T-TPQ correlation coefficient of 0.81 (AIR, 2010). Examples of questions on the T-TPQ include "staff assists staff during high workload" and "my supervisor/ manager considers staff input when making decisions about patient care." All items are based on a Likert type scale, ranging from "strongly agree" to "strongly disagree."

Patient safety culture. Perceptions of patient safety culture were measured with the AHRQ- HSOPSC. The HSOPSC includes 42 items and measures the following 12 safety dimensions: overall perceptions of safety, frequency of event reporting, supervisor/manager expectations and actions promoting safety, organizational learning- continuous improvement, teamwork within units, communication openness, feedback and communication about errors, non-punitive response to error, staffing, hospital management support for patient safety,

teamwork across hospital units, and hospital handoffs and transitions. Examples of questions on the HSOPSC include "we are actively doing things to improve patient safety" and "when a mistake is made that could harm the patient, but does not, how often is this reported?" A majority of the items are based on a Likert type scale ranging from "never" to "always" or "strongly agree" or "strongly disagree." Several items are also based on a yes/no or multiple choice type questions. Each of the patient safety culture dimensions that make up the survey was found to have an acceptable reliability, with reliability coefficients ranging from 0.63 to 0.84 (AHRQ, 2004). Composite scores were created for the patient safety culture dimensions to assess for content validity, resulting in acceptable ranges of correlations ranging from 0.23 to 0.60 (AHRQ, 2004).

Patient safety outcomes. The patient safety outcomes were measured by the quarterly, unit level patient fall rates (per 1000 patient days) and hospital acquired pressure ulcer (HAPU) prevalence rates that are part of the CALNOC nursing sensitive quality indicators. The medical center collects, measures, and reports these two outcomes data to CALNOC on a regular basis using an automated Excel data submission spreadsheet. Although there were no specific reports of reliability and validity of the data collection tool, the authors described that data are continuously checked for reliability and validity using various methods (Aydin et al., 2004). For instance, content validity is attained through the systematic research-based measure selection and refinement process, ongoing since 1996 and validated by the state and national acceptance of CALNOC measures (Aydin et al., 2004). In addition, CALNOC database continuously accepts data corrections, which helps to strengthen the reliability and validity of the dataset (Center for Nursing Research and Innovation, 2012).

Data Analysis

All data were analyzed using SPSS for Windows version 21.0. Because quarterly unit level CALNOC falls and HAPU rates were used for the patient outcomes, there were insufficient data to conduct a rigorous statistical analysis; therefore, descriptive statistics were calculated to evaluate trends in the patient outcome data. Provider demographic data was analyzed using descriptive statistics. Only the number of cases and percentages were calculated since the characteristics included categorical data. Repeated measures multivariate analysis of variance (MANOVA) was used to evaluate the differences between and within- sample groups and effects over time. Paired-samples *t* test was conducted to compare baseline and post-intervention communication, teamwork, and patient safety culture scores for each of the groups. All tests applied a p=0.05 level of significance and were adjusted using the Bonferroni method when applicable.

Results

Provider Demographics

No statistically significant differences were noted in the characteristics of the intervention and control groups (p >0.05). In total, 81 participants initially consented to participate in the pilot study. There was a final sample of 61 participants (intervention n=25, control n=36), after 20 participants either self-dropped or were dropped by the PI for various reasons.

Nursing participants was comprised mostly of females (n=42, 87.5%), of Asian/Pacific Islander/Filipino ethnic background (n=32, 66.7%), and ages ranging between 21-30 years old (n= 15, 31.3%) and 31-40 years old (n=14, 29.2%). They were mostly baccalaureate-prepared nurses (n=30, 62.5%), who received their pre-licensure nursing education in the U.S. (n=35,

74.5%), and identified English as their primary language (n=31, 64.6%) with advanced (n=19, 39.6%) or native speaker proficiency (n=20, 41.7%). Years of employment at the current hospital primarily ranged from one to five years (n=15, 31.3%), followed by six to ten years (n=12, 25.0%). Years of employment at the current unit were closely reflective of the years of employment at the current hospital, where the majority ranged between one to five years (n=17, 35.4%) and six to ten years (n=12, 25.0%).

Physician participants were comprised of eight males (61.5%) and five females (38.5%), of Asian/Pacific Islander/Filipino ethnic background (n=9, 69.2%), and age primarily ranging between 31-40 years old (n=10, 76.9%). A majority of the physicians received their medical education in the U.S. (n=12, 92.3%). All the physicians held a MD degree, identified English as the primary language, and had native English speaker proficiency (n=13, 100%). Finally, years of employment at the current hospital and current unit ranged primarily between one to five years (n=9, 69.2%) and (n=10, 76.9%) respectively.

Intervention RN vs. Control RN

The results (Figure 5-2) showed there were no statistically significant differences between the communication, teamwork, and patient safety mean scores of the intervention group RN and the control group RNs $F(3,44)=.994$, $p=.968$; however, there were significant differences for within-sample groups over time $F(3,44)=.746$, $p=.005$. Post hoc tests revealed that the intervention RN perception of patient safety culture $t(19)=-2.173$, $p=.043$ was not statistically significant when the p-value was adjusted according to the Bonferroni method; however, the control RN groups' communication scores $t(27)=-2.727$, $p=.011$ were found to be statistically significant different from baseline ($M=3.6715$, $SD=.51326$) to three months post-intervention

(*M*=3.8291, *SD*=.47583). This difference in means was extremely small, however, and may not have any significant clinical relevance.

Intervention MDs vs. Control MDs

There were no statistically significant differences in the communication, teamwork, and patient safety culture mean scores between the intervention group MDs and control group MDs $F(3,9)=.731$, $p=.398$. In addition, no statistical significance was found within-sample groups over time $F(3,9)=.690$, $p=.318$ (Figure 5-3).

Intervention RNs vs. Intervention MDs

Finally, there were no statistically significant differences in the communication, teamwork, and patient safety culture mean scores between the intervention RNs and intervention MDs $F(3,21)=.867$, $p=.380$. Furthermore, there were no statistically significant difference within-sample groups over time $F(6,18)=.744$, $p=.622$ (Figure 5-4).

Patient Outcomes: Falls & HAPUs

The patient outcome results showed that there was initially a 27% decrease in the intervention unit's fall rates, from 2.81 at baseline to 2.04 at post-intervention, and then a 69% decrease at three months post-intervention to 0.86, as compared to baseline. The control unit's baseline fall rate of 2.09 decreased 19% to 1.69 at post-intervention, but increased to 3.25 at three months post-intervention, surpassing the baseline rate by 35% (Figure 5-5).

The intervention unit's HAPU rate initially increased 14% from 5.17 at baseline to 6.67 at post-intervention, whereas the control unit HAPU rate decreased 58% from 2.16 at baseline to 0.09 at post-intervention. The intervention unit HAPU rate equaled zero at three months post-intervention, which was a 100% decrease from baseline. The control unit HAPU rate was 0.48 at

three months post-intervention, which was a 77% decrease from baseline (Figure 5-5).

Discussion

Provider Outcomes

Although there were small improvements seen in a majority of the nurse and physician provider outcomes following the training, the results of this pilot study did not provide sufficient evidence to support our hypothesis that the simulation-based TeamSTEPPS training improved provider outcomes. The small improvements noted in the provider outcomes were not statistically significant. In addition, the mean differences in the pre-training and post-training results between the groups were also extremely small, showing that the training may only have had a trivial effect, especially on the provider perceptions of communication, teamwork, and patient safety culture.

In addition, the trends in the control unit were paralleled by the trends in the intervention unit. Even without receiving the training, the control unit participant's scores mirrored those of the participants in the intervention unit. One possible explanation is that the participant's familiarity with the instrument due to retesting may have influenced the scores. The same surveys were used at baseline and for follow up, which may have led to an increase in the scores. Another possible explanation is that the control group scores may have increased due to the Hawthorne effect, as reported by Armor Forse et al. (2011). The effect of knowing that the participants were being evaluated and compared to another group may have altered the control group results. In either case, the extremely small differences in mean scores of both the intervention group and the control group reveal that the magnitude of the effect of the training may not have been substantial.

One of the greatest challenges with TeamSTEPPS implementation has been not having a long enough period of education time for the nurses and physicians to be exposed to this content. The entire fundamental TeamSTEPPS modules are usually presented over an average of eight hours of training, presented all in one day, or using a dosing strategy where a selection of TeamSTEPPS tools are introduced at specific intervals. Due to time constraints of this pilot study, only two of the five core fundamental TeamSTEPPS modules were implemented. These modules included the communication module and the mutual support module that took approximately two hours to complete. Although there was an additional one-hour, in-class review of the two modules prior to the simulation session, the magnitude of the effect may have been greater if the comprehensive TeamSTEPPS, including all five modules, were implemented in-person by the TeamSTEPPS trainer. It may also have had a bigger impact on the unit and the team if the education was presented to the entire unit staff, over a longer period of time, as compared to the condensed version via CD as presented in this training. Additional follow up at nine months and after one year may also yield data that provide stronger support for the TeamSTEPPS training effectiveness, as the participants would have more time to apply the skills and strategies acquired through the training.

Another great challenge was related to recruiting participants for this pilot study since participation was on a voluntary basis. Similar to other studies, recruitment of physicians was especially challenging (Sheppard, 2012; Thomas & Galla, 2013). Several strategies were applied to recruit as many participants as possible, such as inviting potential participants to the planning group meetings, holding lunch hour and nightshift information and recruitment sessions, holding two training sessions per day on several days throughout the week to accommodate nurses on

various shifts and rotations, and holding training sessions at times throughout the day that physicians identified as being the most ideal time for them to attend. In addition, $10 gift cards were provided to the participants as a sign of appreciation for completing each of the surveys and their names were entered into a drawing for a tablet type computer after participating in the simulation session. In spite of these efforts, there were a limited number of participants, especially physicians, who volunteered for the pilot study. Additional strategies to ensure greater participation in the future may include offering the initial training as part of the nursing unit's mandatory competencies on patient safety and offering follow-up training as a mandatory annual review of competencies. Participation may also be improved by offering continuing medical education (CME) credit for the physicians, perhaps as part of a medical staff meeting.

Furthermore, 66.7% of the nurses and 69.2% of the physicians in this pilot study were of the Asian/Pacific Islander ethnicity. A healthcare provider's culture is often linked to their perception of and/ or actual communication and teamwork (Garon, 2012; Hojat et al., 2001; Robinson, Gorman, Slimmer, & Yudkowsky, 2010; Xu & Davidhizar, 2005). For instance, Asian/ Pacific Islander cultural values of collectivism, respect for those with more authority, and need to save face often affect Asian/ Pacific Islander nurses' communication patterns and styles (Xu & David). Moreover, women in many cultures, including the Asian/ Pacific Islander culture, are taught not to speak up or challenge authority (Garon, 2012). Yet, in another study, cultural barriers, including attributing particular stereotypical traits based on ethnicity (i.e. a physician speaking to an Asian/ Pacific Islander nurse in a different manner/ tone as compared to a Caucasian nurse), was associated with interprofessional communication problems (Robinson et al., 2010).

Finally, Hojat et al., (2001) explained that attitudes toward nurse-physician collaboration could be shaped by the predominant cultural norms of the healthcare provider, including gender norms and traditional roles of physicians and nurses within that culture. As such, cultural factors may also have contributed to perceptions of communication effectiveness, teamwork, and patient safety culture in this pilot study.

Nonetheless, one unexpected positive outcome of the training was that it generated interest and support for simulation-based trainings by the hospitalist physicians. Simulation-based training in healthcare is gaining acceptance as a method to improve communication, teamwork, and process of care (Eppich, Howard, Vozenilek, & Curran, 2011; Kenaszchuk, MacMillan, van Soeren, & Reeves, 2011; Kim et al., 2011; Paige et al., 2007; Shapiro et al., 2004). Consequently, several hospitalist physicians who participated in the simulation-based TeamSTEPPS training scheduled follow-up orientation and future training sessions in the simulation-lab, as a means of enhancing the quality of medical and nursing training and improving patient safety outcomes.

Patient Outcomes

Despite the notable improvements in falls and pressure ulcer rates, there was insufficient evidence to show that the simulation-based TeamSTEPPS training had a positive effect on patient outcomes due to several extraneous variables of this pilot study. It would certainly have been easier to evaluate the impact of this training on patient outcomes if the training was delivered to the entire staff since they are all part of the team who cared for the patients in the unit. Yet, the training could only be offered on a voluntary basis for various reasons; hence, some staff chose not to participate. As a result, it is not possible to attribute the improvements

seen in the patient outcomes solely to the training, even though more than 50% of the entire intervention unit nursing staff and several hospitalist physicians participated in the study. Further investigation of the extraneous variables is needed before determining training effectiveness.

Limitations

The small sample size and limited patient outcome data were major limitation of the pilot study. The extremely small sample size, especially among the physician groups, made it difficult to identify statistical significance, even though the trend may have been indicative of improvement. The quarterly unit level fall rates and the pressure ulcer prevalence rates available at the time of the pilot study also limited the ability to conduct parametric statistical procedures that would have made it possible to draw inferences about the effects of the training on patient outcomes.

Furthermore, direct correlation between the simulation-based TeamSTEPPS training and study outcomes could not be made due to methodological constraints, including the convenience sampling method and lack of randomization of participants into intervention and control groups, as well as other extraneous variables that may have contributed to the outcomes. Future studies across a larger sample of participants and medical/surgical units, with the entire staff participating in the intervention, applying rigorous research methodologies would yield a more robust data base that may provider stronger support for training effectiveness.

Conclusion

Implementation of the TeamSTEPPS program has resulted in positive provider and patient outcomes in both national and international settings; however, the results of this pilot study did not provide strong support regarding those findings due to several limitations.

Nevertheless, important lessons learned from this pilot study may facilitate future implementation of a stronger simulation-based TeamSTEPPS training at this and other healthcare organizations as a strategy to improve perceptions of interprofessional communication and teamwork, patient safety culture, as well as patient outcomes. Future studies that implement the entire TeamSTEPPS program, augmented with the simulation practicum, to all the staff in the intervention unit, applying more rigorous training and research methodologies, over an extended period of time may provide stronger evidence supporting training effectiveness.

Article Three: Linking Provider Characteristics to Perceptions of Communication Effectiveness, Teamwork, and Patient Safety Culture

Effective nurse-physician communication and teamwork were identified, in previous research, as important variables in reducing negative patient outcomes such as medication errors, pressure ulcers, extended length of stay, increased patient complications, mortality, and other sentinel events (Gruenberg et al., 2006; Knause, Draper, Wagner, & Zimmerman, 1986; Kohn, Corrigan, & Donaldson, 2000; Manojlovich, Antonakos, & Ronis, 2009; Manojlovich & DiCicco, 2007; Mazzocco et al., 2009; Tschannen & Kalisch, 2009; The Joint Commission; 2014; Wheelan, Burchill, & Tilin, 2003). In addition, patient safety culture was found to be associated with patient outcomes such as reduced adverse events, hospital acquired pressure ulcers, readmission rates, and mortality (Hansen, Williams, & Singer, 2011; Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010; Pronovost & Sexton, 2005; Singer, Lin, Falwell, Gaba, & Baker, 2009; Taylor et al., 2012), as well as improvements in patient and family satisfaction (Dodek et al., 2012; Gearhart, 2008).

As such, identification of factors that affect inter-professional communication, teamwork, and patient safety is critical so that the potential negative impact on patient outcomes can be minimized through effective interventions. In light of this, there has been a growing body of research investigating various factors associated with healthcare providers' perception of and/ or actual communication and teamwork skills and patient safety culture (Doran, Sidani, Keatings, & Doidge, 2002; El-Jardali, Sheikh, Garcia, Jamal, & Abdo, 2014; Hojat et al., 2001; Kalisch & Lee, 2009; Kim, An, Kim, & Yoon, 2007; Magnusdottir, 2005; Miller, 2001; Robinson, Gorman, Slimmer, Yudkowsky, 2010; Sterchi, 2007; Tregunno, Peters, Campbell, & Gordon, 2009; Tschannen & Lee, 2012). Nevertheless, much more research is needed to identify specific factors

that promote or inhibit provider outcomes such as perceptions of communication effectiveness, teamwork, and patient safety culture. This information then can be used to guide tailored provider interventions, thus enhancing intervention effectiveness aimed at improving patient safety and quality of patient care.

Background

Previous studies have applied Donabedien's structure-process-outcomes framework (Donabedien, 1988) as a guideline for investigating the impact of various structural and process factors on provider and patient outcomes. For instance, structural variables including organizational structures (e.g. medical staff organization or method of reimbursement), materials or environmental variables (e.g. facilities, equipment, money), and human variables (e.g. characteristics of provider) are often assessed in relations to both provider and patient outcomes using this framework (Donabedien, 1988). Hence, previous studies have investigated the effects of different practice structures for physicians and nurses, the disease/cure orientation of physicians as contrasted to the care/holistic approach of nurses, differences in social status, sexual divisions of labor, and gender role socialization and inequality (Hall, 2005; Schmalenberg et al., 2005), as well as healthy workplace environments (Aiken, Smith, & Lake, 1994; Heath, Johanson, & Blake, 2004), and provider characteristics (Doran et al., 2002; El-Jardali et al., 2014; Hojat et al., 2001; Kim et al., 2007; Miller, 2001; Kalisch & Lee, 2009; Sterchi, 2007; Tschannen & Lee, 2012) on both provider and patient outcomes.

Various provider characteristics have been linked to provider outcomes such as perceptions of and or actual communication, teamwork, and patient safety culture (Doran et al., 2002; El-Jardali et al., 2014; Hojat et al., 2001; Kalisch & Lee, 2009; Kim et al., 2007;

Magnusdottir, 2005; Miller, 2001; Robinson et al., 2010; Sterchi, 2007; Tregunno et al., 2009; Tschannen & Lee, 2012). For instance, English proficiency and culture were associated with communication effectiveness (Magnusdottir, 2005; Robinson et al., 2010; Tregunno et al., 2009) and provider's age was associated with productivity and collaboration (Wheelan et al., 2003). Provider's age and gender were also associated with patient safety (El-Jardali et al., 2014).

Although there is a consensus in literature, that provider characteristics are associated with provider outcomes such as perceptions of and or actual communication, teamwork, and patient safety culture, there is a lack of consensus in identification of specific characteristics that improve or hinder these outcomes. Previous research often reported mixed results on the exact effect that a specific characteristic has on the outcomes. For instance, less work experience was associated with higher quality of nurse communication in one study (Doran et al., 2002), while more work experience was associated with higher levels of nurse communication in other studies (Miller, 2001; Tschannen & Lee, 2012).

Further discord was noted in studies investigating the association between providers' work experience and their perceptions of teamwork and patient safety culture. Recent studies showed that staff with less experience had higher teamwork scores (Kalisch & Lee, 2009; Sterchi, 2007), contrasting the results of an earlier study which showed that more work experience was associated with better care coordination (Doran et al., 2002). Furthermore, more work experience was associated with higher patient safety climate in one study (El-Jardali et al., 2014), while less work experience was associated with positive attitudes about patient safety in another study (Kim et al., 2007).

In addition, specific provider characteristics had different effects on various provider

outcomes. While a characteristic may have a positive effect on one outcome, it may also have a negative effect on another outcome. For instance, providers' education had varying effects on provider perceptions of teamwork and patient safety culture. While educational preparation was found to have a positive effect on communication patterns among nursing staff in one study (Doran et al, 2002), nurses with higher levels of education preparation (i.e. masters' degrees) perceived their level of teamwork and or patient safety to be less than did other staff members (Wheelan et la., 2003; El-Jardali et al., 2014). Furthermore, being a nurse, as compared to a physician, was associated with more negative perceptions of communication effectiveness in one study (Miller, 2001), while being a nurse was associated with more positive attitudes toward nurse-physician collaboration in another study (Hojat et al., 2001).

Finally, these studies were often conducted in settings other than medical/ surgical settings or in countries other than the U.S. (El-Jardali et al., 2014; Hojat et al., 2001; Kim et al., 2007). Although previous research provides some useful information regarding provider characteristics that may help improve outcomes, further research is needed to validate these results when applied in medical/surgical settings in the U.S.

Despite the number of previous studies, there is still a lack of clear understanding on the effects of provider characteristics on actual or perceptions of provider communication effectiveness, teamwork, and patient safety culture. Much more work is needed to gain a clear and better understanding on how various provider characteristics affect these provider outcomes, especially as they relate to the medical/ surgical settings in the U.S. These results then can be used to facilitate implementation of effective strategies based on provider characteristics to promote patient safety and improve quality of care. The purpose of this study, therefore, was to

investigate possible associations between specific characteristics and perceptions of communication, teamwork, and patient safety culture of healthcare providers in medical/ surgical units located in the Los Angeles area.

Methods

Study Design and Participants

This study applied a cross-sectional design to perform a secondary data analysis on data that were collected as part of a multi-site study to evaluate the effects of a simulation-based training program on provider and patient outcomes. The study was carried out on two medical/ surgical units in two comparable hospitals located in Los Angeles County and involved a final convenience sample of 61 nurse and physician participants. All Registered Nurses and hospitalist physicians who met the inclusion criteria of 21 years of age or older, were employed by one of the two participating hospitals on a full-time or part-time basis for at least three months, and who provided direct patient care in the applicable medical/ surgical unit were considered for participation in the study.

Instruments and Measurements

Several instruments were combined into one survey instrument for distribution to the study participants. The combined instrument was used to measure provider characteristics and their perceptions of communication, teamwork, and patient safety culture.

Provider characteristics. Providers' characteristics were measured using a demographic questionnaire that included items related to providers' gender, age, race, country of pre-licensure education, highest education level, years of practice in the U.S., employment at current hospital, employment in the current unit, primary language, and level of English proficiency. All nurses'

characteristics, except employment at the current hospital, were included in the analysis since that variable trended toward collinearity with years of practice in the U.S. For the MDs, highest level of education, primary language, and English proficiency were excluded from the analysis since all physicians had an MD degree and identified themselves as native or comparable to native English speakers, so there was no variation in this dimension. Years of employment at current hospital were found to be collinear with employment in the current unit; therefore, it was also removed from the analysis.

Nurse-physician communication. Perceptions of nurse-physician communication were measured through a subsection of the ICU Nurse-Physician Questionnaire (Shortell, Rousseau, Gillies, Devers, & Simons, 1991). This questionnaire has also been used in other studies that evaluated communication effectiveness between nurses and physicians in medical-surgical units (Manojlovich & DiCicco, 2007). The questionnaire has evidence of reliability and validity, where all the factors included in the factor analysis loaded at 0.40 or above with an Eigenvalue well above 1.0, showing content validity (Shortell et al., 1991). Acceptable levels of reliability were also noted for the communication subsection with Cronbach's alphas ranging from 0.64 to 0.88 (Shortell et al., 1991). All items are based on a Likert type scale, ranging from "strongly agree" to "strongly disagree" and "very satisfied" to "very dissatisfied."

Teamwork. The TeamSTEPPS, Teamwork Attitudes Questionnaire (T-TAQ), is comprised of five constructs including team structure, leadership, situation monitoring, mutual support and communication and was used to measure providers' perception of teamwork. For this study, only the mutual support and the communication subsections of the questionnaire, consisting of 12 items were utilized. High reliability of the constructs was demonstrated by

Cronbach's alpha reliabilities ranging from 0.88 to 0.95, while convergent validity was demonstrated by an overall T-TPQ correlation coefficient of 0.81 when compared with validated items from the Hospital Survey on Patient Safety Culture (HSOPSC, American Institutes for Research, 2010). All items were based on a Likert-type scale, ranging from "strongly agree" to "strongly disagree."

Patient safety culture. Perceptions of patient safety culture were also measured with the HSOPSC. The HSOPSC measured 12 safety dimensions: overall perceptions of safety, frequency of event reporting, supervisor/manager expectations and actions promoting safety, organizational learning- continuous improvement, teamwork within units, communication openness, feedback and communication about errors, non-punitive response to error, staffing, hospital management support for patient safety, teamwork across hospital units, and hospital handoffs and transitions. The HSOPSC was found to have an acceptable reliability, with reliability coefficients ranging from 0.63 to 0.84, as well as acceptable content validity with correlations ranging from 0.23 to 0.60 (Agency for Healthcare Research and Quality, 2004). Most of the items were based on a Likert-type scale ranging from "never" to "always" or "strongly agree" or "strongly disagree," while several items were based on a "yes" or "no" or multiple-choice-type questions.

Data Collection

Institutional review board (IRB) approvals were obtained from the University of California, Los Angeles (UCLA) and applicable hospitals as part of a larger study. Although the surveys were collected at baseline, post-intervention, and three-months post intervention as part of the larger study, only the three-month post intervention survey that included the demographic

questionnaire, the communication subscale of the ICU Nurse-Physician Questionnaire, T-TPQ, and HSOPSC was used to investigate the associations between provider characteristics and perceptions of communication, teamwork, and patient safety culture.

Data Analysis

All analyses were conducted using the SPSS version 21 software. Descriptive statistics were used to analyze the demographic data. Preliminary analyses of data were performed, using analysis of variance (ANOVA) to test for demographic differences between the intervention and control groups and to identify provider characteristics that may have a statistically significant effect on the outcome variables. Since there were no statistically significant differences between the two groups, the control and intervention group participants were pooled together according to their occupation (e.g. nurses and physicians), due to the limited sample size. Multiple regression analysis was performed using the enter method, to identify specific provider characteristic variables that resulted in significant variances in the communication, teamwork, and patient safety culture perception scores. Categorical variables were recoded using dummy variables. For categories with dichotomous variables, the variable that came last alphabetically was chosen as the default reference group by the SPSS software (i.e. for female vs. male gender, male assigned as the reference group). For categories with multiple variables, the variable with the largest sample size were manually assigned as the reference group.

Results

Provider demographics are described in Table 5-3 of Appendix D. No statistically significant differences were found between the intervention and control group participants ($p>.05$).

Only the provider characteristics that had significant effects on provider perceptions are described in Table 5-4. For each category of characteristics (i.e. gender, race, age), a specific characteristic was identified as the reference (constant) group and was compared with other characteristics within that category. These reference (constant) characteristics include: male gender, Asian/PI/ Filipino race, age 31-40 years old, 1-5 years practice in U.S., employed 1-5 years in current unit, language other than English as primary language, native English speaking proficiency, pre-licensure nursing education in U.S., and bachelor degree as highest education level obtained.

Communication

Results from this study show that there were significant relationships between nurses' race, age, and years of nursing practice in the U.S. and their perceptions of communication $F(25,22)=2.065$, $p=.045$. These predictors accounted for about 70% of the variance in the nurse communication perception scores ($R^2= .701$). More specifically, the results of the analysis revealed that age range between 51 to 60 years ($b=1.346$, $p=.045$) demonstrated significantly positive effects on communication perception scores after controlling for all other variables in the model. On the other hand, Hispanic/ Latino ($b=-.430$, $p=.038$) or "other" race ($b=-.914$, $p=.018$), and nursing practice greater than 20 years in the U.S. ($b=-1.343$, $p=.027$) demonstrated significantly negative effects on communication perception scores, after controlling for all other variables in the model. No physician characteristics were found to have significant effects on their perceptions of communication in this study.

Teamwork

Significant relationships were found between nurses' gender, age, race, years of nursing

practice in the U.S., years of employment in the current unit, English proficiency levels and their perceptions of teamwork $F(25,22)=3.925$, $p=.001$, accounting for almost 82% ($R^2= .817$) of the variance in teamwork perception scores (Table 5-3). After controlling for all other variables in the model, White/Caucasian ($b=.427$, $p=.007$) or Black/ African American race ($b=.1.128$, $p=.049$), age range 51 to 60 ($b=1.297$, $p=.012$) and 61 to 70 ($b=.1.422$, $p=.003$), general English proficiency ($b=.467$, $p=.025$), and advanced English proficiency ($b=.721$, $p=.001$) demonstrated significantly positive effects on nurses' teamwork perception scores. Characteristics that had significantly negative effects on nurses' teamwork perception scores were female gender ($b=-.719$, $p<.001$), six to ten years of practice in the U.S. ($b=-1.271$, $p<.001$), 11 to 15 years of practice in the U.S. ($b=-1.326$, $p<.001$), 16 to20 years of practice in the U.S. ($b=-1.172$, $p=.003$), greater than 20 years of practice in the U.S. ($b=-1.690$, $p=.004$), less than one year of employment in current unit ($b=-1.507$, $p=.001$), one to five years of employment in current unit ($b=-.996$, $p=.001$), 16-20 years of employment in current unit (b=-1.361, p=.004), greater than 20 years of employment in the current unit ($b=-2.157$, $p<.001$), and primary language other than English ($b=-.625$, $p=.003$). No physician characteristics were found to have significant effects on their perceptions of teamwork in this study.

Patient Safety Culture

There were no nurse characteristics that had a significant effect on their perceptions of patient safety culture in this study. Furthermore, there were also no physician characteristics that had a significant effect on their perceptions of patient safety culture.

Discussion

The results of this study identified several nurse characteristics that had significant effects

on their perceptions of communication and teamwork. These characteristics include race/ culture, gender, age, years of practice in U.S., years of employment in current unit, primary language, and English proficiency. There were no nurse characteristics that had significant effects on their perception of patient safety culture. In addition, there were no physician characteristics that had significant effects on their perceptions of communication, teamwork, or patient safety culture.

Among the characteristics that had significant effects on their perceptions of communication, the healthcare provider's race must be emphasized, especially in Los Angeles where minority nurses make up 65% of the nursing workforce (California Healthcare Foundation, 2010), in contrast to other parts of the U.S. where white nurses make up the majority (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2010). There are both opportunities as well as challenges of having such a culturally diverse nursing workforce. While patients may benefit from receiving culturally competent care by nurses with the same cultural backgrounds, it may pose a unique set of challenges for the nurses, especially as it relates to interprofessional communication and collaboration with other healthcare providers.

Cultural background is believed to influence healthcare providers' perception of and/ or actual communication and teamwork. (Garon, 2012; Hojat et al., 2003; Magnusdottir, 2005; Robinson et al., 2010; Xu & Davidhizar, 2005). For instance, Asian cultural values of collectivism and respect for those with more authority often affect Asian nurses' communication patterns and styles (Xu & Davidhizar, 2005). In many cultures, including the Hispanic culture, women, especially those who are younger, are taught not to speak up (Garon, 2012). Such factors may also have caused significant variations in this study participants' perceptions of

communication and teamwork. As expected, nurses in this study who identified themselves as white/ Caucasian or black/ African American also had higher teamwork perception scores as compared to Asian/ Pacific Islander (PI)/ Filipino nurses; however, nurses who identified themselves as Hispanic/ Latino or "other" race had lower communication perception scores as compared to the Asian/PI/ Filipino nurses in this study. One possible explanation for this variation may be that almost 65% of the participants were Asian/PI/Filipino. Perhaps Asian/PI/Filipino nurses felt communication and teamwork were better because they were the majority. In addition, there was a higher percentage of Asian/PI/Filipino nurses between the age of 51-60 and 61-70 as compared to the Hispanic and "other" nurses, which was a characteristic associated with higher communication and teamwork perception scores. Finally, it is possible that older nurses between 51-70 years of age may have perceived that communication and teamwork were better because they may have had a greater impact on communication and teamwork as compared to the younger nurses. Younger nurses may often refrain from speaking up, out of "respect" for the older nurses. As a result, the younger nurses, especially Hispanic/ Latino and nurses who identified themselves as "other" race may have perceived communication and teamwork to be less effective. For the purposes of this study, characteristics were only analyzed for effects on providers' perceptions; however, future studies investigating the relationship between specific characteristics and its moderating effects could provide more detailed information of provider characteristics that may improve or hinder outcomes (i.e. effects of both Asian/PI/Filipino race and age 51-60 on provider's perception).

Another expected result was related to the nurses' gender. In this study, nurses' female gender was significantly associated with lower teamwork perception scores. Despite the fact that

nursing has evolved as a profession, a long history of class differences and gender issues underlies current challenges to collaborative teamwork in health care (Hall, 2005). These results suggest that gender issues still may affect balance of power and be a source of conflict between professions; however, it may be worthwhile to continue investigating the changes in dynamics between nurses and physicians as more men become nurses and more women become physicians.

Years of employment in current unit also yielded some interesting results. The results of this study showed that years of employment in the same unit and perceptions of teamwork may not be linearly related. Perceptions of teamwork were higher for those employed on the unit for 6-15 years, relative to those employed on the unit for five or fewer years, and about the same for those employed on the unit 16-20 years. This is not surprising since nurses who work in the same units over an extended period, often develop routines and practices that help them work more efficiently and collaboratively as a group. What is surprising is that nurses with greater than 20 years of employment in the current unit had significantly lower teamwork perception scores relative to those employed on the unit for five or fewer years. It is possible that this negative association may be due to long-term, negative effects on the nurses' attitudes toward collaboration, resulting from years of conflicts with opposing physician attitudes, as some studies suggest (Hojat et al., 2003; Sterchi, 2007). On closer examination of the study data, however, there was only one nurse participant in this study with greater than 20 years of employment in the current unit and this nurse had an unusually lower score (outlier); therefore, these study results should be interpreted with caution. This outlier score may also explain the slight downward trend associated with practice time in the U.S.

Greater than 20 years of practice in the U.S. was also associated with lower

communication perception scores relative to nurses with less years of practice in the U.S. Previous studies that investigated the association between work experience and communication have reported mixed results (Doran et al., 2002; Miller, 2001; Tschannen & Lee, 2012). Furthermore, these studies have failed to identify the specific years of work experience that were associated with the perceptions of communication effectiveness. Although the results from this study identified the specific years of work experience associated with lower perceptions of communication effectiveness, the reason for this negative association is unclear. Again, the negative association may be attributed to the outlier score; however, further research would help validate this result and to explore other plausible explanations for such an association.

Finally, English as the primary language and English proficiency levels did not show any significant relationships with perception of communication effectiveness in this study. Perhaps this is because the majority of the nurses in this study rated their English proficiency level at advanced professional or native speaker proficiency level. For the purposes of this study, native speaker proficiency (level 5) is the highest level of English proficiency and is the ability to comprehend and speak English as a primary language or at the equivalent level as a highly articulate, well-educated native speaker and reflects the cultural standards of the country where the language is natively spoken. Next highest level is advanced professional proficiency (level 4), which is the ability to understand all forms and styles of speech and speak the language fluently and accurately on all levels normally pertinent to professional needs. General professional proficiency (level 3) is the next level, which is the ability to understand the essentials of all speech in a standard dialect and speak the language with sufficient structural accuracy and vocabulary to participate effectively in most formal and informal conversations on practical,

social, and professional topics. Next two levels would reflect some level of communication barriers. Limited working proficiency (level 2), is sufficient comprehension to understand conversations and satisfy routine social demands and limited job requirements. Finally, elementary proficiency (level 1) is sufficient comprehension to understand utterances about basic issues and maintain very simple face-to-face conversations on familiar topics. In this study, none of the participants rated their English proficiency below the general professional proficiency level. In other words, the English language did not appear to be a communication barrier for these participants.

On the other hand, English as a primary language and English proficiency did have a significant relationship with perception of teamwork. Nurses who reported English as a primary language had higher perceptions of teamwork scores as compared to those who reported "other" language as a primary language. In addition, nurses who reported general and advanced professional English proficiency had higher teamwork perception scores as compared to those who reported native speaker proficiency. Although it may not be unusual to see a positive association between English as a primary language and teamwork perception scores, it was unclear why nurses with general or advanced professional proficiency had higher teamwork perception scores as compared to those with native speaker proficiency. Future research applying a qualitative research method would help provide a better understanding of the differences noted in the various levels of English proficiency.

Limitations

One major limitation of the study was related to the small physician sample size, which may have prevented the detection of statistically significant relationships between the physician

variables. Another limitation is that there was only one nurse participant who had greater than 20 years of employment in the current unit with significantly lower perception (outlier) scores that may have substantially influenced the regression results. The correlation between the years of practice in the U.S. and years of employment on the current unit may have also been another factor that influenced these results. As such, the results from this regression should be interpreted with caution. Furthermore, approximately 65% of the participants were Asian/ PI/ Filipino and the data were collected in only two facilities using a convenience sampling method; thus, generalizability is limited to medical/ surgical settings with similar provider characteristics. Despite these limitations, the lessons learned from this study may be used to strengthen future studies identifying specific provider characteristics associated with perceptions of and/or actual communication, teamwork, and patient safety culture, using a larger sample size and greater number of medical/ surgical units.

Implications for Healthcare Organization Administrators and Educators

Based on the results of this and previous research findings, it would be helpful to tailor healthcare provider interventions and educational training according to specific provider characteristics in order to maximize results and allocate scarce resources more effectively. Although interprofessional communication and teamwork training such as Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) program was found to be effective in improving provider and patient outcomes when implemented in various healthcare settings (Armour Forse, Bramble, & McQuillan, 2011; Capella et al., 2010; Deering et al., 2011; Hobgood et al., 2010; Mahoney, Ellis, Garland, Palayo, & Green, 2012; Mayer et al., 2011; Riley, Davis, Miller, Hansen, Sainfort, & Sweet, 2011; Stead et al., 2009; Thomas & Galla, 2013;

Weaver et al., 2010), they may yield different results when implemented in medical/ surgical settings comprised of highly diverse group of healthcare providers.

Communication and teamwork training is often provided applying a typical large-group pedagogic teaching method; however, educators may optimize the training outcomes by varying their teaching to meet the learning styles and individual needs of the students (Chant, Jenkinson, Randle, & Russel, 2002; Davies, Rutledge, & Davies, 1997; Fielding & Llewelyn, 1987). Such a strategy is especially relevant when there is a high percentage of staff members who practiced or received their pre-licensure education in another country and/or have different cultural backgrounds, or for new graduates who may have lower levels of competencies as compared to more experienced staff.

Hence, hospital administrators and educators should evaluate the healthcare providers' characteristics prior to implementing such interventions. It may be helpful to hold more frequent, smaller group sessions that accommodate various cultural backgrounds and levels of competencies. It may also be helpful to supplement such interventions with additional training, such as assertiveness training, especially in organizations where there is a high percentage of Asian/ PI/ Filipino and or Hispanic/Latino healthcare providers. In addition, various communication, teamwork, and patient safety educational opportunities can also be tailored according to staff with various years of tenure (i.e. intensive training at new hire orientation, brief annual review, and intensive training for those employed >20 years) instead of offering a generic house-wide training to all staff at all levels of professional tenure.

Conclusion

Interprofessional communication and teamwork, as well as culture of patient safety will

continue to be of great importance as the U.S. faces the growth of a population with increased chronic conditions, requiring the provision of a mix of services over time and across settings (Institute of Medicine, 2001). Thus, strategies to improve and strengthen interprofessional communication and teamwork training, along with continued research investigating specific factors, including provider characteristics that distract from or improve these provider outcomes, is essential for ensuring patient safety and quality healthcare.

Chapter Six: Article Summaries, Implications, and Conclusion

The previous chapter described the three articles that were generated from results of this study. This chapter presents the summaries of the three articles, the implications for clinical practice and future research, and the conclusion.

Summary of Article One

Through a rigorous concept analysis process suggested by Walker and Avant (2010), a conceptual analysis of patient safety was undertaken to identify defining attributes and present sample cases that helped to distinguish the concept of patient safety from the concept of quality care. Based on this concept analysis, the defining attributes of patient safety included 1) prevention or reduction of errors and adverse events, 2) protection of patients from harm or injury, and 3) collaborative efforts by individual healthcare providers as well as a strong, well-integrated healthcare system. Hence, an operational definition of patient safety can be described as the outcome of collaborative efforts by healthcare providers within a well-integrated healthcare system to prevent errors or adverse events, thereby protecting patients from harm or injury.

This concept analysis also provided an opportunity to assess the applicability of the CALNOC indicators as empirical referents for patient safety. The results of the analysis showed that the CALNOC indicators could be applied effectively to measure patient safety.

Summary of Article Two

Recent research studies that have applied the TeamSTEPPS program reported improvements in communication and teamwork between healthcare providers, as well as their perceptions of patient safety culture (Armour Forse, Bramble, & McQuillan, 2011; Brock et al.,

2013; Capella et al., 2010; Deering et al., 2011; Hobgood et al., 2010; Johnson & Kimsey, 2012; Liaw, Zhou, Lau, Siau, & Chan, 2014; Mahoney, Ellis, Garland, Palayo, & Green, 2012; Mayer et al., 2011; Riley, Davis, Miller, Hansen, Sainfort, & Sweet, 2011; Robertson et al., 2010; Sheppard, William, & Klein, 2013; Spiva et al., 2014; Stead et al., 2009; Thomas & Galla, 2013; Weaver et al., 2010); however, literature on the impact of the interprofessional simulation-based TeamSTEPPS program on both provider and patient outcomes in the medical/ surgical setting remains limited. As a result, the purpose of this pilot study was to evaluate the impact of implementation of an interdisciplinary simulation-based TeamSTEPPS training on provider outcomes (i.e. perceptions of interprofessional communication, teamwork, and patient safety culture) and on patient safety outcomes (i.e. patient falls and pressure ulcers) of a medical/surgical unit.

Despite the small improvements seen in a majority of the nurse and physician provider outcomes following the training, as well as notable improvements in falls and pressure ulcer rates, the results of this pilot study did not provide sufficient evidence to support our hypothesis that the simulation-based TeamSTEPPS training has a significant effect on improving provider and patient outcomes. The small improvements noted in the provider outcomes were not statistically significant. In addition, the mean differences in the pre-training and post-training results between the groups were also extremely small, showing that the training may only have had a trivial effect, especially on the provider perceptions of communication, teamwork, and patient safety culture.

Finally, there was also insufficient evidence to show that the simulation-based TeamSTEPPS training had a positive effect on patient outcomes due to several extraneous

variables of this pilot study. The quarterly unit level fall rates and the pressure ulcer prevalence rates available at the time of the pilot study limited the ability to conduct parametric statistical procedures that would have made it possible to draw inferences about the effects of the training on patient outcomes. In addition, the training was offered on a voluntary basis; hence, not all staff from the unit participated in the intervention. As a result, it is not possible to attribute the improvements seen in the patient outcomes solely to the training. Although the study results did not provide strong support for the simulation-based TeamSTEPPS as a strategy to improve provider and patient outcomes, lessons learned from this pilot study may facilitate future implementation of a stronger simulation-based TeamSTEPPS training at this and other healthcare organizations as a strategy to improve perceptions of interprofessional communication and teamwork, patient safety culture, as well as patient outcomes.

Summary of Article Three

Identification of factors such as provider characteristics that affect inter-professional communication, teamwork, and patient safety is critical so that the potential negative impact on patient outcomes can be minimized through effective interventions. Despite the number of previous studies, more research is needed to gain a clear and better understanding on how various provider characteristics affect these provider outcomes, especially as they relate to the medical/ surgical settings in the U.S. The purpose of this study, therefore, was to investigate possible associations between specific characteristics and perceptions of communication, teamwork, and patient safety culture of healthcare providers in medical/ surgical units located in the Los Angeles area.

The results of this study identified several nurse characteristics that had significant effects

on their perceptions of communication and teamwork. These characteristics include race/ culture, gender, age, years of practice in U.S., years of employment in current unit, primary language, and English proficiency. There were no nurse characteristics that had significant effects on their perception of patient safety culture. In addition, there were no physician characteristics that had significant effects on their perceptions of communication, teamwork, or patient safety culture.

Although previous studies have shown that interprofessional communication and teamwork training, such as the TeamSTEPPS program, was effective in improving provider and patient outcomes when implemented in various healthcare settings (44-52), they may yield different results when implemented in medical/ surgical settings comprised of a highly diverse group of healthcare providers. Tailored healthcare provider interventions and educational training according to specific provider characteristics in addition to supplemental training, such as assertiveness training, would enhance communication and teamwork training effectiveness.

Implications for Healthcare Organization Administrators and Educators

The results of this study provide several types of helpful information that may be used to guide implementation of training programs to improve collaborative interprofessional communication and teamwork training for nurses and physicians. First, the results of this concept analysis may be used to guide development of a conceptual model and framework that could facilitate consistent measurement of patient safety across settings.

Second, important lessons learned from this pilot study may facilitate future implementation of a stronger simulation-based TeamSTEPPS training at this and other healthcare organizations as a strategy to improve perceptions of interprofessional communication and teamwork, patient safety culture, as well as patient outcomes. Future studies that implement

the entire TeamSTEPPS program, augmented with the simulation practicum, to all the staff in the intervention unit, applying more rigorous training and research methodologies, over an extended period of time may provide stronger evidence supporting training effectiveness.

Third, the results of this study provided important insights about specific provider characteristics associated with higher and lower levels of communication and teamwork. It would be helpful for healthcare organization administrators and educators to provide various communication, teamwork, and patient safety educational opportunities in smaller groups that are tailored according to staff with various years of tenure, levels of competencies, age group, and even culture, whenever it is possible. It may also be helpful to supplement such interventions with additional training, such as assertiveness training, especially in organizations with culturally diverse healthcare providers. Such strategies may help maximize training results and improve effectiveness.

Conclusion

In conclusion, the findings from this study make a contribution to patient safety research focusing on interprofessional communication and teamwork as a strategy to improve provider and patient outcomes. Nevertheless, on-going research identifying effective interventions and strategies to improve interprofessional communication, teamwork, and a culture of patient safety will continue to be of great importance as the U.S. faces the growth of a population with increased chronic conditions, requiring the provision of a mix of services over time and across settings (IOM, 2001).

Appendix A

Table 2-1

Table of Evidence: TeamSTEPPS

	Source	Setting / Participants	TeamSTEPPS Method	Outcomes Measured	Results
1.	Armour Forse, R. A., Bramble, J. D., & McQuillan, R. (2011). Team training can improve operating room performance. *Surgery, 150*(4), 771-778. doi:10.1016/j.surg.2011.07.076	• U.S. • Operating Room • Interdisciplinary Team: Scrub technicians, Registered Nurses, CRNAs, Anesthesiologists, Surgeons, Anesthesiology and Surgical Resident Staff	Intervention : Didactic TeamSTEPPS	Patient Outcomes: • OR first case starts • Surgical Quality Improvement Program measures (antibiotic administration; venous thromboembolism administration; and beta blocker administration) • Patient satisfaction Provider Outcomes: • Communication • Perceptions of team attributes: team foundation, team functioning, team performance, team skills, team leadership, team climate and atmosphere, and team identity • Patient safety culture	There was significant improvement in OR first case starts, Surgical Quality Improvement Program measures (antibiotic administration; venous thromboembolism administration; and beta blocker administration), and patient satisfaction (willingness to recommend). Overall surgical morbidity and mortality both significantly improved indicating a significant change in the overall OR culture. There was a significant improvement in the OR staff team work and OR communications.
2.	Brock, D., Abu-Rish, E., Chiu, C. R., Hammer, D., Wilson, S., Vorvick, L., . . . Zierler, B. (2013). Interprofessional education in team communication: working together to improve patient safety. *BMJ Qual Saf, 22*(5), 414-423. doi: 10.1136/ bmjqs-2012-000952	• U.S. • Academic Setting • Medical, Nursing, Pharmacy, Physician Assistant (PA) students	Intervention: Didactic TeamSTEPPS and Simulation	Provider Outcomes: • Attitudes towards teamwork: team structure, leadership, situational awareness, mutual support and communication • Attitudes, motivation, utility and self-efficacy toward interprofessional team skills • Frequency of key communication behaviors • Understanding of key concepts	Significant attitudinal shifts for TeamSTEPPS skills included, team structure, situation monitoring, mutual support, and communication. There was no significant change in the leadership score. Significant positive changes in attitudes and motivation toward working in teams , saw greater value/utility of training, and felt able to implement the skills they had learned/ self-efficacy. Significant shifts reported for knowledge of TeamSTEPPS, advocating for patients, and communicating in interprofessional teams.
3.	Capella, J., Smith, S., Philp, A., Putnam, T., Gilbert, C., Fry, W., . . . Remine, S. (2010). Teamwork Training Improves the Clinical Care of Trauma Patients. *Journal of Surgical Education, 67*(6), 439-443. doi:10.1016/j.jsurg.2	• U.S. • Level 1 Trauma Center • Interdisciplinary Team: Surgery Residents, Faculty, Nurses	Intervention: Didactic TeamSTEPPS and Simulation	Patient Outcomes: • Injury Severity Scores (ISSs) • ICU LOS • Hospital LOS • Complication rate • Mortality rate • Predicted to Survive w/ TRISS • Times from arrival to FAST • Times from arrival to CT • Time to endotracheal (ET)	ISSs: times from arrival to CT scanner, ET intubation, and operating room decreased significantly after training. ICU LOS, hospital LOS, complication rate, and mortality rate and times from arrival to FAST examination and time in the ED were not significantly different between the 2 groups. Team performance also improved

	010.06.006			• intubation • Time to OR • Time in the ED Provider Outcomes: • Team performance: leadership, situation monitoring, mutual support, communication	significantly across all domains of teamwork as described in TeamSTEPPS.
4.	Deering, S., Rosen, M. A., Ludi, V., Munroe, M., Pocrnich, A., Laky, C., & Napolitano, P. G. (2011). On the front lines of patient safety: Implementation and evaluation of team training in Iraq. *Joint Commission Journal on Quality and Patient Safety, 37*(8), 350-351AP.	• Iraq • Combat Support Hospitalsprovidi ng various levels of care (Levels 1-4) • Interdisciplinary Team: Surgeons, Nurse Anesthetists, Nurses, Medics, Support staff	Intervention: Didactic TeamSTEPPS	Patient/ Clinical Outcomes: • Patient Safety Reports • Medication/ Transfusion Errors • Needle-stick Injuries/ Exposures Provider Outcomes: • TeamSTEPPS competencies: leadership, communication, situation monitoring, mutual support	There were significant decreases in the rates of communication-related errors, medication and transfusion errors, and needle-stick incidents. Although the rate of patient safety event reports did not decrease significantly, the types of errors attributable to communication issues decreased significantly.
5.	Hobgood, C., Sherwood, G., Frush, K., Hollar, D., Maynard, L., Foster, B., . . . Taekman, J. (2010). Teamwork training with nursing and medical students: Does the method matter? Results of an interinstitutional, interdisciplinary collaboration. *Quality and Safety in Health Care, 19*(6), 1-6. doi:10.1136/qshc.2008.031732	• U.S. • Academic Setting • Nursing and Medical Students	Interventions: • Traditional didactic TeamSTEPPS lecture • Didactic TeamSTEPPS and Video scenario w/ audience response system lecture • Didactic TeamSTEPPS and Low-fidelity simulation (role play) • Didactic TeamSTEPPS and High-fidelity human-patient simulation	Provider Outcomes: • Teamwork knowledge, skills, attitude	Participants' attitudes towards teamwork improved significantly from pre- to post-test in all four cohorts. Participant scores on the knowledge post-test were significantly higher than pre-test scores. There were no significant differences between the four cohorts in SPE and MHPTS ratings of teamwork skills.
6.	Johnson, H. L., & Kimsey, D. (2012). Patient safety: break the silence. *AORN J, 95*(5), 591-601. doi: 10.1016/j.aorn.2012.03.002	• U.S. • Anesthesia, Surgery and Obstetrics/ Gynecology (OB/GYN), Perioperative Services • Surgeons, Anesthetists, Obstetricians, Gynecologists, Surgical and OB/GYN residents, Advanced practice	Intervention: Didactic TeamSTEPPS	Patient Outcomes: • Root Cause Analysis (RCAs) on near misses and sentinel events Provider Outcomes: • Comfort levels regarding speaking out for patient safety	Number of RCAs decreased to four as compared to 12 at baseline. 78% of participants believed that they were better able to question decisions or actions of those with more authority. 75% stated that they were no longer afraid to ask questions when something did not seem right.

		clinicians, Certified RN anesthetists, OR staff members (RNs, surgical techs), Ancillary staff members			
7.	Liaw, S. Y., Zhou, W. T., Lau, T. C., Siau, C., & Chan, S. W. (2014). An interprofessional communication training using simulation to enhance safe care for a deteriorating patient. *Nurse Educ Today, 34*(2), 259-264. doi: 10.1016 /j.nedt.2013.02.019	• Singapore • Nursing and medical students	Interventions: Modified Didactic TeamSTEPPS and High-Fidelity Simulation	Provider Outcomes: • Confidence associated with the ability to communicate effectively with other health care providers • Perception towards interprofessional learning	Both medical and nursing groups demonstrated significant improvements in self-confidence and perception scores.
8.	Mahoney, J. S., Ellis, T. E., Garland, G., Palyo, N., & Greene, P. K. (2012). Supporting a psychiatric hospital culture of safety. *J Am Psychiatr Nurses Assoc, 18*(5), 299-306. doi: 10.1177/1078390312 460577	• U.S. • Psychiatric facility • Psychiatrists, physicians, nurses, social workers, other clinical/ non-clinical mental health professionals	Intervention: Didactic TeamSTEPPS	Provider Outcomes: • Perceptions of team attributes: team foundation, team functioning, team performance, team skills, team leadership, team climate and atmosphere, and team identity	TeamSTEPPS was successfully implemented, and changes in all team attributes trended in a positive direction with 5 of 7 subscales reaching significance- team foundation, team functioning, team performance, team skills, and climate and atmosphere
9.	Mayer, C. M., Cluff, L., Lin, W.-T., Willis, T. S., Stafford, R. E., Williams, C., . . . Amoozegar, J. B. (2011). Evaluating efforts to optimize TeamSTEPPS implementation in surgical and pediatric intensive care units. *Joint Commission Journal on Quality and Patient Safety, 37*(8), 365-363AP.	• U.S. • Pediatric & Surgical ICUs • Interdisciplinary Team: Attending Physicians, Registered Nurses, Respiratory Therapists	Intervention: Didactic TeamSTEPPS	Patient Outcomes: • Average Time for Placing Patients on ECMO. • Length of RRT Events. • Nosocomial infections Provider Outcomes: • Teamwork skills: leadership, communication, situation monitoring, mutual support • Patient Safety Culture	Improved staff perceptions of teamwork and communication openness in both units reported. Average time for placing patients on extracorporeal membrane oxygenation (ECMO) decreased significantly. Average duration of adult surgery rapid response team events was longer at post-implementation. The rate of nosocomial infections was below the upper control limits in both the PICU and the SICU.
10.	Riley, W., Davis, S., Miller, K., Hansen, H., Sainfort, F., & Sweet, R. (2011). Didactic and simulation nontechnical skills team training to improve perinatal patient outcomes in a community hospital. *Joint Commission Journal on Quality*	• U.S. • Perinatal Units • Interdisciplinary team: ObGyn Practitioners, Family Practitioners, Pediatricians, Registered Nurses, CRNAs, Physician	Intervention: • Didactic TeamSTEPPS • Didactic TeamSTEPPS and Simulation	Patient Outcomes: • Perinatal morbidity mortality Provider Outcome: • Patient safety culture	Statistically significant improvement in perinatal morbidity in didactic & simulation group. No statistically significant differences in the didactic-only or the control hospitals. No statistically significant changes in perception of culture of safety.

	and Patient Safety, 37(8), 357-364.	Assistants			
11.	Robertson, B., Kaplan, B., Atallah, H., Higgins, M., Lewitt, M. J., & Ander, D. S. (2010). The Use of simulation and a modified TeamSTEPPS curriculum for medical and nursing student team training. *Simulation in Healthcare, 5*(6), 332-337.	• U.S. • Academic setting • Nursing and Medical Students	Intervention: Modified Didactic TeamSTEPPS and Simulation	Provider Outcomes: • Team skills Knowledge • Team skills Attitude • Recognition of Team Skills	Students improved their knowledge of vital team and communication skills, attitudes toward working as teams, and were able to identify effective team skills.
12.	Sheppard, F., Williams, M., & Klein, V. R. (2013). TeamSTEPPS and patient safety in healthcare. *J Healthc Risk Manag, 32*(3), 5-10. doi: 10.1002/ jhrm.21099	• U.S. • Perinatal services • All clinical and nonclinical hospital employees	Intervention: Didactic TeamSTEPPS	Patient Outcomes: • Patients and families perspective of the teamwork and communication of the caregivers Provider Outcomes: • Team competencies: leadership, communication, situation monitoring, mutual support	Improvement in patients' perception of their care was also found. 8 of the 10 facilities, there was marked improvement in the TeamSTEPPS skills of Leadership, Situation Monitoring, Mutual Support, and Communication.
13.	Spiva, L., Robertson, B., Delk, M. L., Patrick, S., Kimrey, M. M., Green, B., & Gallagher, E. (2014). Effectiveness of team training on fall prevention. *J Nurs Care Qual, 29*(2), 164-173. doi: 10.1097/ NCQ.0b013e3182a98247	• U.S. • Medical/ surgical units acute care hospitals • Registered Nurses, Pharmacists, Physical Therapists, Physicians	Intervention: Didactic TeamSTEPPS	Patient Outcomes: • Patient fall rate Provider Outcomes: • Patient Safety Culture • Teamwork attitudes: team structure, leadership, situational monitoring, mutual support, and communication: TeamSTEPPS Teamwork Attitudes	60% fall reduction rate was reported in the intervention group. The intervention group questionnaire scores improved on all measures except teamwork perception, while observations revealed an improvement in communication compared with the control group.
14.	Stead K., Kumar, S., Schultz, T. J., Tiver, S., Pirone, C. J., Adams, R. J., & Wareham, C. A. (2009). Teams communicating through STEPPS. *The Medical Journal of Australia, 11*, S128–S132.	• Australia • Mental Health facilities • Interdisciplinary clinical staff	Intervention: Didactic TeamSTEPPS	Patient Outcome: • Seclusion rate (sole confinement of a person for their safety or safety of others) Provider Outcomes: • Teamwork • Communication • Patient safety culture	Reduced seclusion rates. Also, significant improvement in two dimensions of patient safety culture (frequency of event reporting, and organizational learning) and increase in the total knowledge, skill, attitude (KSA) to teamwork and communication.
15.	Thomas, L., & Galla, C. (2013). Building a culture of safety through team training and engagement. *BMJ Qual Saf, 22*(5), 425-434. doi: 10.1136/bmjqs-2012-001011	• U.S. • North Shore LIJ Health System (NSLIJHS): Acute care and long-term care facilities, outpatient areas. • All hospital staff	Intervention: Didactic TeamSTEPPS	Provider Outcomes: • Patient safety culture	Significant improvement in dimensions of 'Feedback and Communication about Error' 'Frequency of Events Reported', 'Hospital Handoff and Transitions', 'Staffing' and 'Teamwork across the Units'. Area of strength with scores >75% : 'Organizational Learning' and 'Teamwork

					within Units'.
16.	Weaver, S. J., Rosen, M. A., Diaz Granados, D., Lazzara, E. H., Lyons, R., Salas, E., . . . King, H. B. (2010). Does teamwork improve performance in the operating room? A multilevel evaluation. *Joint Commission Journal on Quality and Patient Safety, 36*(3), 133-142.	• U.S. • Operating Room • Interdisciplinary Team: Surgeons, CRNA, Nurses, Surgical Techs, Anesthesiologists, Physician Assistants	Intervention: Didactic TeamSTEPPS and Low Fi Simulation (role playing)	Provider Outcomes: • Reactions (degree participants liked training & believed would help with their job) • Learning (degree training content was acquired • Behavior (degree learned behaviors transferred to job) • Results (degree teamwork behaviors enacted on the job produce safety/ quality)	Significant increases in the quantity and quality of presurgical procedure briefings and use of quality teamwork behaviors. Increases were also found in perceptions of patient safety culture and teamwork attitudes.

Appendix B

Figure 3-1. TeamSTEPPS Effectiveness Theoretical Framework

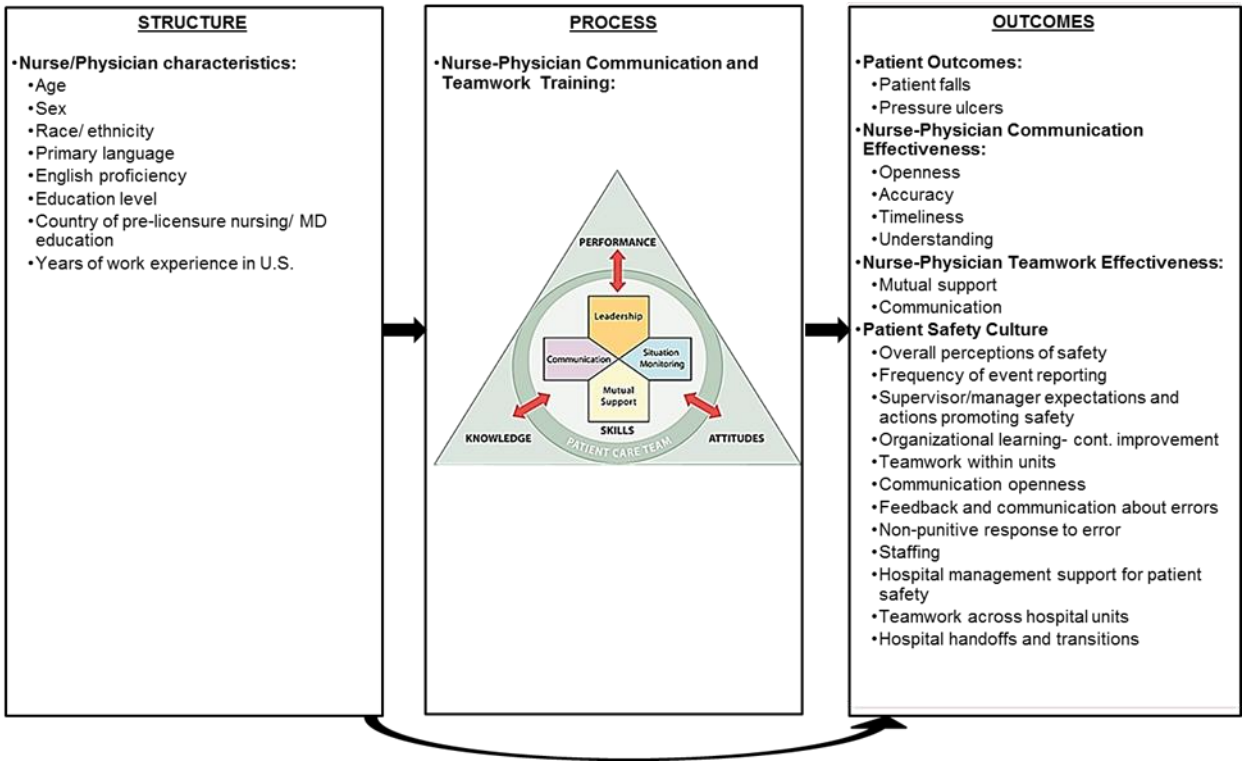

Figure 3-1. Adapted from Donabedian's Quality of Care: Structure-Process-Outcomes Framework and TeamSTEPPS Framework

Appendix C

Table 4-1

Research Dissemination Plan

Venue	Target Audience	Method
Conferences:		
1) 2012/2013 Western Institute of Nursing (WIN) Conference 2) 2012/2013 National Patient Safety Foundation- Annual Patient Safety Congress 3) 2012/2013 Collaborative Alliance for Nursing Outcomes (CALNOC) Conference 4) 2013 International Council of Nurses (ICN) 25th Quadrennial Congress	1) Staff nurses, nursing faculty, nurse scholars/ researchers, student researchers 2) Nurses and physicians, nursing/physician faculty engaged in undergraduate and graduate medical education, pharmacists, and other clinical professionals, hospital and health system administrators, Patient safety officers, health services/ patient safety researchers 3) Staff nurses, nursing faculty, nurse scholars/ researchers, student researchers, hospital and health system administrators 4) International nurses, nursing faculty, nurse scholars/ researchers, student researchers, hospital and health system administrators	1) Poster presentations and discussion, written abstract 2) Poster/ podium presentations and discussion, written abstract 3) Poster/ podium presentations and discussion, written abstract 4) Poster/ podium presentations and discussion, written abstract
Seminars and Workshops:		
1) At medical centers such as those in the UCLA Health Systems, and other hospitals, especially interested in implementing TeamSTEPPS or other simulation-based interdiscip. training 2) Nursing Grand-Rounds 3) Professional nursing/ healthcare organizations 4) Other political/ community organizations	1, 2 & 3) Nurses and physicians, pharmacists, and other clinical professionals, hospital and health system administrators, Patient safety officers 4) Policy makers, Community leaders/ members, general public and their caregivers	1, 2 & 3) PowerPoint presentations and discussion, written abstract/ peer reviewed journal articles, recordings available via webinar, audio/video streaming available on the internet or cd/dvd 4) Poster/ PowerPoint presentations and discussion, written abstract, peer reviewed journal articles, and or brochures/ handouts with key points, recordings available via webinar, audio/video streaming available on the internet or cd/dvd
Academic courses:		
1) Quality Improvement and Population-Based Quality of Practice 2) Systems Based Learning Course 3) Inter-professional Applied Learning Program to Improve Patient Safety	1) Nursing students 2 & 3) interprofessional students: students in nursing, medical students, pharmacy, social worker, public health, and other clinical/ health systems departments	1, 2 & 3) PowerPoint presentation and discussion, written abstract/ peer reviewed journal articles, recordings available via webinar, audio/video streaming available on the

		internet or cd/dvd
Professional Meetings:		
1) UCLA Patient Safety Institute Director/ Advisory Board meetings 2) Cultivating a Culture of Civility Program- UCLA Health Services 3) Professional nursing organizations	1 & 2) Directors/ Board/ committee members, nurses and physicians, hospital and health system administrators, researchers, pre/post-doc research students 3) Staff nurses, nursing faculty, nurse scholars/ researchers, student researchers, hospital and health system administrators	1, 2 & 3) Face-to-face meeting and discussion, PowerPoint presentation, written abstract/ peer reviewed journal articles, recordings available via webinar, audio/video streaming available on the internet or cd/dvd
Computer-based discussion lists:		
1) AHRQ TeamSTEPPS webpage: *Implementation stories*	1) Practicing nurses and physicians, nursing/physician faculty engaged in undergraduate and graduate medical education, pharmacists, and other clinical professionals, hospital and health system administrators, Patient safety officers	1) Written abstract/ peer reviewed journal articles, recordings available via webinar, audio/video streaming available on the internet or cd/dvd
Potential Peer Reviewed Journals:		
1) Theoretical Concept Paper: Concept analysis on "patient safety" a) *Research in Nursing & Health* b) *Journal of Advanced Nursing* c) *Journal of Nursing Administration* 2) Data-based Paper #1: Evaluating the Effects of Simulation-based TeamSTEPPS interdisciplinary Communication and Teamwork Training on Patient and Provider outcomes. a) *Journal of Nursing Scholarship* b) *Health Services Research* c) *BMJ Quality & Safety (prev. Quality & Safety in Healthcare)* 3) Data-based Paper #2: Linking provider characteristics to their perception of communication effectiveness, teamwork, and patient safety culture following the simulation-based TeamSTEPPS intervention. a) *Journal of Nursing Scholarship* b) *Health Services Research* c) *BMJ Quality & Safety (prev. Quality & Safety in Healthcare)*	1a) Nursing and other health disciplines. Journal provides a wide range of nursing research and theory that will inform practice 1b) Nurses and other health care professionals who are committed to advancing practice and professional development on the basis of new knowledge and evidence 1c) Academics, clinicians, healthcare managers and policy makers to encourage the science of improvement, debate, and new thinking on improving the quality of healthcare 2a) Health professionals, faculty and students in 103 countries dedicated to improving global health 2b) Health services researchers, managers, policymakers, providers, and students by publishing articles that expand understanding of the wide-ranging field of health care and help improve the health of individuals and communities 2c) Academics, clinicians, healthcare managers and policy makers to encourage the science of improvement, debate, and new thinking on improving the quality of healthcare 3a, b & c) Same as 2a, b & c	1, 2 & 3) Written abstract/ peer reviewed journal articles

Figure 4-1. Demographic Questionnaire

1. Occupation

☐ a. Registered Nurse ☐ b. Physician

☐ c. Other: _____

2. Sex

☐ a. Male ☐ b. Female

3. Age Range

☐ a. 21-30 ☐ d. 51-60

☐ b. 31-40 ☐ e. 61-70

☐ c. 41-50 ☐ f. 71 or older

4. Race/ Ethnicity

☐ a. White ☐ d. Asian/ PI: _____

☐ b. Black/ African American ☐ e. American Indian/Alaska Native

☐ c. Hispanic/ Latino:_____ ☐ f. Other: _____

5. Country of Pre-licensure Nursing / Medical Education

☐ a. United States ☐ b. Other: _____

6. Highest Level of Education Received

☐ a. Associate Degree ☐ d. PhD/ MD/Other Doctoral Degree

☐ b. Bachelor Degree ☐ e. Post-Doctorate

☐ c. Master Degree ☐ f. Other: _____

7. How long have you practiced as a nurse/ physician in the U.S.?

☐ a. Less than 1 year ☐ d. 11 to 15 years

☐ b. 1 to 5 years ☐ e. 16 to 20 years

☐ c. 6 to 10 years ☐ f. 21 years or more

8. How long have you worked in/ been affiliated with this hospital?

☐ a. Less than 1 year ☐ d. 11 to 15 years

☐ b. 1 to 5 years ☐ e. 16 to 20 years

☐ c. 6 to 10 years ☐ f. 21 years or more

9. How long have you worked in your current hospital work area/unit?

☐ a. Less than 1 year ☐ d. 11 to 15 years

☐ b. 1 to 5 years

☐ c. 6 to 10 years

☐ e. 16 to 20 years

☐ f. 21 years or more

10. Primary Language

☐ a. English

☐ b. Other: _____

11. English Language Proficiency

☐ 0 **No Proficiency**

☐ 1 **Elementary Proficiency:**
Sufficient comprehension to understand utterances about basic issues and maintain very simple face-to-face conversations on familiar topics.

☐ 2 **Limited Working Proficiency:**
Sufficient comprehension to understand conversations and satisfy routine social demands and limited job requirements.

☐ 3 **General Professional Proficiency:**
Able to understand the essentials of all speech in a standard dialect and speak the language with sufficient structural accuracy and vocabulary to participate effectively in most formal and informal conversations on practical, social, and professional topics.

☐ 4 **Advanced Professional Proficiency:**
Able to understand all forms and styles of speech and speak the language fluently and accurately on all levels normally pertinent to professional needs.

☐ 5 **Native Speaker/ Functionally Native Proficiency:**
English is the primary language or Comprehension and speaking proficiency is functionally equivalent to that of a highly articulate, well-educated native speaker and reflects the cultural standards of the country where the language is natively spoken.

Figure 4-2. Communication Subsection of the ICU Nurse-Physician Questionnaire

For each of the following statements, please circle the number under the response that best reflects your judgment.

Statement		Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
General Relationships and Communications: These statements refer to general relationships and communications within the unit.						
1.	I get information on the status of patients when I need it.	1	2	3	4	5
2.	This unit has goals and objectives different from my own.	1	2	3	4	5
3.	Physicians are readily available for consultation.	1	2	3	4	5
4.	When a patient's status changes, I get relevant information quickly.	1	2	3	4	5
5.	I take pride in being associated with this unit.	1	2	3	4	5
6.	Nurses have a good understanding of physician goals.	1	2	3	4	5
7.	There are needless delays in relaying information regarding patient care.	1	2	3	4	5
8.	I identify with the goals and objectives of this unit	1	2	3	4	5
9.	Physicians have a good understanding of nursing objectives.	1	2	3	4	5
10.	I feel I am part of this unit team.	1	2	3	4	5
11.	In matters pertaining to patient care, nurses call physicians in a timely manner.	1	2	3	4	5
12.	Nurses have a good understanding of physicians' treatment plans.	1	2	3	4	5
13.	If I had a chance to do the same kind of work for the same pay in another unit of this hospital, I wouldn't go.	1	2	3	4	5
14.	Nursing care plans are well understood by physicians in this unit.	1	2	3	4	5

15. Overall, how satisfied are you with the communications in this unit? Circle the appropriate response.

Statement	Strongly Dissatisfied 1	Dissatisfied 2	Neither Satisfied / Dissatisfied 3	Satisfied 4	Very Satisfied 5
(a) nurse-to-nurse	1	2	3	4	5
(b) physician-to-physician	1	2	3	4	5
(c) between nurses and physicians	1	2	3	4	5
(d) between patients and unit nurses	1	2	3	4	5
(e) between patients and unit physicians	1	2	3	4	5
(f) between patients' families and unit nurses	1	2	3	4	5
(g) between patients' families and unit physicians	1	2	3	4	5

16. The space below is provided for any additional comments you wish to make regarding your unit in general or your personal experience with working in the unit.

Thank you very much for your help and cooperation in answering this questionnaire! Please return in the addressed postage paid envelope provided.

Figure 4-3. TeamSTEPPS Teamwork Attitudes Questionnaire

TeamSTEPPS

TeamSTEPPS™ Teamwork Attitudes Questionnaire

The purpose of this survey is to measure your impressions of various components of teamwork as it relates to patient care and safety.

Instructions: Please respond to the questions below by placing a check mark (√) in the box that corresponds to your level of agreement from *Strongly Disagree* to *Strongly Agree*. Please select only one response for each question.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Communication					
1. Teams that do not communicate effectively significantly increase their risk of committing errors.					
2. Poor communication is the most common cause of reported errors.					
3. Adverse events may be reduced by maintaining an information exchange with patients and their families.					
4. I prefer to work with team members who ask questions about information I provide.					
5. It is important to have a standardized method for sharing when handing off patients.					
6. It is nearly impossible to train individuals how to be better communicators.					
Mutual Support					
7. To be effective, team members should understand the work of their fellow team members.					
8. Asking for assistance from a team member is a sign that an individual does not know how to do his/ her job effectively.					
9. Providing assistance to team members is a sign that an individual does not have enough work to do.					
10. Offering to help a fellow team member with his/ her individual work task is an effective tool for improving team performance.					
11. It is appropriate to continue to assert a patient safety concern until you are certain that it has been heard.					
12. Personal conflicts between team members do not affect patient safety.					

Figure 4-4. Hospital Survey on Patient Safety

Hospital Survey on Patient Safety

Instructions

This survey asks for your opinions about patient safety issues, medical error, and event reporting in your hospital and will take about 10 to 15 minutes to complete.

If you do not wish to answer a question, or if a question does not apply to you, you may leave your answer blank.

- *An "event" is defined as any type of error, mistake, incident, accident, or deviation, regardless of whether or not it results in patient harm.*
- *"Patient safety" is defined as the avoidance and prevention of patient injuries or adverse events resulting from the processes of health care delivery.*

SECTION A: Your Work Area/Unit

In this survey, think of your "unit" as the work area, department, or clinical area of the hospital where you spend *most* of your work time or provide *most* of your clinical services.

What is your primary work area or unit in this hospital? Select ONE answer.

- ☐ a. Many different hospital units/No specific unit
- ☐ b. Medicine (non-surgical)
- ☐ c. Surgery
- ☐ d. Obstetrics
- ☐ e. Pediatrics
- ☐ f. Emergency department
- ☐ g. Intensive care unit (any type)
- ☐ h. Psychiatry/mental health
- ☐ i. Rehabilitation
- ☐ j. Pharmacy
- ☐ k. Laboratory
- ☐ l. Radiology
- ☐ m. Anesthesiology
- ☐ n. Other, please specify: _____

Please indicate your agreement or disagreement with the following statements about your work area/unit.

Think about your hospital work area/unit...	**Strongly Disagree** ▼	**Disagree** ▼	**Neither** ▼	**Agree** ▼	**Strongly Agree** ▼
1. People support one another in this unit	☐1	☐2	☐3	☐4	☐5
2. We have enough staff to handle the workload	☐1	☐2	☐3	☐4	☐5
3. When a lot of work needs to be done quickly, we work together as a team to get the work done	☐1	☐2	☐3	☐4	☐5
4. In this unit, people treat each other with respect	☐1	☐2	☐3	☐4	☐5
5. Staff in this unit work longer hours than is best for patient care	☐1	☐2	☐3	☐4	☐5

SECTION A: Your Work Area/Unit (continued)

Think about your hospital work area/unit...	Strongly Disagree ▼	Disagree ▼	Neither ▼	Agree ▼	Strongly Agree ▼
6. We are actively doing things to improve patient safety	☐1	☐2	☐3	☐4	☐5
7. We use more agency/temporary staff than is best for patient care	☐1	☐2	☐3	☐4	☐5
8. Staff feel like their mistakes are held against them	☐1	☐2	☐3	☐4	☐5
9. Mistakes have led to positive changes here	☐1	☐2	☐3	☐4	☐5
10. It is just by chance that more serious mistakes don't happen around here	☐1	☐2	☐3	☐4	☐5
11. When one area in this unit gets really busy, others help out	☐1	☐2	☐3	☐4	☐5
12. When an event is reported, it feels like the person is being written up, not the problem	☐1	☐2	☐3	☐4	☐5
13. After we make changes to improve patient safety, we evaluate their effectiveness	☐1	☐2	☐3	☐4	☐5
14. We work in "crisis mode" trying to do too much, too quickly	☐1	☐2	☐3	☐4	☐5
15. Patient safety is never sacrificed to get more work done	☐1	☐2	☐3	☐4	☐5
16. Staff worry that mistakes they make are kept in their personnel file	☐1	☐2	☐3	☐4	☐5
17. We have patient safety problems in this unit	☐1	☐2	☐3	☐4	☐5
18. Our procedures and systems are good at preventing errors from happening	☐1	☐2	☐3	☐4	☐5

SECTION B: Your Supervisor/Manager

Please indicate your agreement or disagreement with the following statements about your immediate supervisor/manager or person to whom you directly report.

	Strongly Disagree ▼	Disagree ▼	Neither ▼	Agree ▼	Strongly Agree ▼
1. My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures	☐1	☐2	☐3	☐4	☐5
2. My supervisor/manager seriously considers staff suggestions for improving patient safety	☐1	☐2	☐3	☐4	☐5
3. Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts	☐1	☐2	☐3	☐4	☐5
4. My supervisor/manager overlooks patient safety problems that happen over and over	☐1	☐2	☐3	☐4	☐5

SECTION C: Communications

How often do the following things happen in your work area/unit?

Think about your hospital work area/unit...	**Never**	**Rarely**	**Some-times**	**Most of the time**	**Always**
1. We are given feedback about changes put into place based on event reports	☐1	☐2	☐3	☐4	☐5
2. Staff will freely speak up if they see something that may negatively affect patient care	☐1	☐2	☐3	☐4	☐5
3. We are informed about errors that happen in this unit	☐1	☐2	☐3	☐4	☐5
4. Staff feel free to question the decisions or actions of those with more authority	☐1	☐2	☐3	☐4	☐5
5. In this unit, we discuss ways to prevent errors from happening again	☐1	☐2	☐3	☐4	☐5
6. Staff are afraid to ask questions when something does not seem right	☐1	☐2	☐3	☐4	☐5

SECTION D: Frequency of Events Reported

In your hospital work area/unit, when the following mistakes happen, *how often are they reported?*

	Never	**Rarely**	**Some-times**	**Most of the time**	**Always**
1. When a mistake is made, but is *caught and corrected before affecting the patient*, how often is this reported?	☐1	☐2	☐3	☐4	☐5
2. When a mistake is made, but has *no potential to harm the patient*, how often is this reported?	☐1	☐2	☐3	☐4	☐5
3. When a mistake is made that *could harm the patient*, but does not, how often is this reported?	☐1	☐2	☐3	☐4	☐5

SECTION E: Patient Safety Grade

Please give your work area/unit in this hospital an overall grade on patient safety.

☐	☐	☐	☐	☐
A Excellent	**B** Very Good	**C** Acceptable	**D** Poor	**E** Failing

SECTION F: Your Hospital

Please indicate your agreement or disagreement with the following statements about your hospital.

Think about your hospital...	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
1. Hospital management provides a work climate that promotes patient safety	☐1	☐2	☐3	☐4	☐5
2. Hospital units do not coordinate well with each other	☐1	☐2	☐3	☐4	☐5
3. Things "fall between the cracks" when transferring patients from one unit to another	☐1	☐2	☐3	☐4	☐5
4. There is good cooperation among hospital units that need to work together	☐1	☐2	☐3	☐4	☐5

SECTION F: Your Hospital (continued)

Think about your hospital...	Strongly Disagree ▼	Disagree ▼	Neither ▼	Agree ▼	Strongly Agree ▼
5. Important patient care information is often lost during shift changes	☐1	☐2	☐3	☐4	☐5
6. It is often unpleasant to work with staff from other hospital units	☐1	☐2	☐3	☐4	☐5
7. Problems often occur in the exchange of information across hospital units	☐1	☐2	☐3	☐4	☐5
8. The actions of hospital management show that patient safety is a top priority	☐1	☐2	☐3	☐4	☐5
9. Hospital management seems interested in patient safety only after an adverse event happens	☐1	☐2	☐3	☐4	☐5
10. Hospital units work well together to provide the best care for patients	☐1	☐2	☐3	☐4	☐5
11. Shift changes are problematic for patients in this hospital	☐1	☐2	☐3	☐4	☐5

SECTION G: Number of Events Reported

In the past 12 months, how many event reports have you filled out and submitted?

- ☐ a. No event reports
- ☐ b. 1 to 2 event reports
- ☐ c. 3 to 5 event reports
- ☐ d. 6 to 10 event reports
- ☐ e. 11 to 20 event reports
- ☐ f. 21 event reports or more

Appendix D

Table 5-1

CALNOC Nursing Sensitive Indicators versus NDNQI

Measures	CALNOC Indicators	NDNQ Indicators
Structural Measures	1. Hours of Nursing Care per Patient Days (RN, LPN/LVN, UAP)	1. Nursing Hours per Patient Day (RN, LPN/LVN, UAP)
	2. Skill Mix	2. Skill Mix (RN, LPN/LVN, UAP, % of total nursing hours Supplied by Agency Staff)
	3. Voluntary Turnover	3. VoluntaryTurnover
	4. RN Education, Experience, Years of Service	4. RN Education /Certification
	5. Percent Contracted Hours	*5. Nurse Vacancy Rate*
	6. Nurse/ Patient Ratios	
	7. Unit Rate of Admissions, Discharges and Transfers	
Process Measures	1. Falls & Hospital Acquired Pressure Ulcers (Risk Assessment & Protocol Implementation)	1. Falls and Falls with Injury
		2. Pressure Ulcer Prevalence (community, hospital, unit)
	2. Medication Administration Accuracy Safe Practices	*3. Pediatric Pain Assessment, Intervention, Reassessment (AIR) Cycle*
	3. PICC Line Insertion Practices	*4. RN Satisfaction Survey (Practice Env., Job Satisfaction, Job Satisfaction-Short Form)*
Outcome Measures	1. Hospital Acquired Pressure Ulcer by Stage	1. Pressure Ulcer Prevalence
	2. Falls and Falls with Injury	2. Falls and Falls with Injury
	3. Restraint Prevalence	3. Restraint Prevalence
	4. CLABSI in PICC Lines	*4. Pediatric Peripheral IV Infiltration Rate*
	5. Medication Administration Accuracy	*5. Psychiatric Physical/Sexual Assault Rate*
	Nurse Safe Practices Finding & Error Rates	*6. RN Satisfaction Survey*
		7. CAUTI
		8. CLABSI
		9. VAP

CALNOC= Collaborative Alliance for Nursing Outcomes, NDNQI= National Database of Nursing Quality Indicators, RN= Registered Nurse, LPN= Licensed Practical Nurse, LVN= Licensed Vocational Nurse, UAP= Unlicensed Assistive Personnel, PICC= Peripherally inserted central catheter, IV= Intravenous, CLABSI= Central Line-Associated Blood Stream Infections, CAUTI= Catheter-associated urinary tract infection, VAP= Ventilator-associated pneumonia

Table 5-2

CALNOC Structure-Process-Outcome Nursing Sensitive Indicators as Empirical Referents

Structural Measures	Process Measures	Outcome Measures
1. Hours of Nursing Care per Patient Days (RN, LVN, UAP)	1. Falls & Hospital Acquired Pressure Ulcers (Risk Assessment & Protocol Implementation)	1. Hospital Acquired Pressure Ulcer by Stage
2. Skill Mix	2. Medication Administration Accuracy Safe Practices	2. Falls and Falls with Injury
3. Voluntary Turnover	3. PICC Line Insertion Practices	3. Restraint Prevalence
4. RN Education, Experience, Years of Service		4. CLABSI in PICCLines
5. Percent Contracted Hours		5. Medication Administration Accuracy Nurse Safe Practices Finding & Error Rates
6. Nurse/ Patient Ratios		
7. Unit Rate of Admissions, Discharges and Transfers		

CLABSI= Central Line-associated Blood Stream Infection, PICC= Peripherally inserted central catheter

Table 5-3

Provider Demographics

Variable		RN		MD	
		n	%	n	%
		48.0	78.7	13.0	21.3
Group	Intervention	20.0	41.7	5.0	38.5
	Control	28.0	58.3	8.0	61.5
Sex	Male	5.0	10.4	8.0	61.5
	Female	43.0	89.6	5.0	38.5
Age Range: Years	21-30	14.0	29.2	2.0	15.4
	31-40	14.0	29.2	10.0	76.9
	41-50	13.0	27.1	1.0	7.7
	51-60	5.0	10.4		
	61-70	2.0	4.2		
Race	White	8.0	16.7	3.0	23.1
	Black	1.0	2.1		
	Hispanic/ Latino	5.0	10.4	1.0	7.7
	Asian/ Pacific Islander	31.0	64.6	9.0	69.2
	Other	3.0	6.3		
Country of Pre-licensure Education	US	34.0	70.8	1.0	7.7
	Other	14.0	29.2		
Highest Level of Education	Associate Degree	16.0	33.3		
	Bachelor Degree	29.0	60.4		
	Master Degree	3.0	6.3		
	PhD/ MD/ Other Doctorate Degree			13.0	100.0
	Post-Doctorate Degree				
Practice in U.S.: Years	<1 yr	4.0	8.3	6.0	46.2
	1-5 yrs	14.0	29.2	5.0	38.5
	6-10 yrs	10.0	20.8	1.0	7.7
	11-15 yrs	9.0	18.8	1.0	7.7
	16-20 yrs	5.0	10.4		
	>20 yrs	6.0	12.5		
Employment in Current Hospital: Years	<1 yr	4.0	8.3	2.0	15.4
	1-5 yrs	14.0	29.2	9.0	69.2
	6-10 yrs	12.0	25.0	1.0	7.7
	11-15 yrs	9.0	18.8		
	16-20 yrs	6.0	12.5	1.0	7.7
	>20 yrs	3.0	6.3		
Employment in Current Unit: Years	<1 yr	6.0	12.5	2.0	15.4
	1-5 yrs	16.0	33.3	10.0	76.9
	6-10 yrs	12.0	25.0		
	11-15 yrs	9.0	18.8		
	16-20 yrs	4.0	8.3	1.0	7.7
	>20 yrs	1.0	2.1		
Primary Language	English	31.0	64.6	13.0	100.0
	Other	17.0	35.4		
English Proficiency	General Professional Proficiency	9.0	18.8		
	Advanced Professional Proficiency	19.0	39.6		
	Native Speaker/ Functionally Native	20.0	41.7	13.0	100.0

Note. *N* =61. Means and standard deviations were not calculated due to inclusion of categorical variables.

Table 5-4

Multiple regression Analysis Predicting Perceptions of Communication, Teamwork, and Patient Safety Culture from Provider Characteristics

			Provider Perceptions											
			Communication				Teamwork				Patient Safety Culture			
Predictors		*n*	*m*	*sd*	R^2	*b*	*m*	*sd*	R^2	*b*	*m*	*sd*	R^2	*b*
RN		48	3.822	0.433	0.701*	3.775	4.496	0.4152	0.817**	4.330	3.8852	0.443	0.639†	4.077
	Gender (Constant: Male)	5												
	Female	43								-0.719***				
	Race (Constant: Asian/PI/Filipino)	31												
	White/ Caucasian	8								0.427**				
	Black/ African American	1								1.128*				
	Hispanic/ Latino	5				-0.430*								
	Other	3				-0.914*								
	Age (Constant: Age 31-40 yrs)	14												
	Age 21 to 30 yrs	14												
	Age 41-50 yrs	13												
	Age 51 to 60 yrs	5				1.346*				1.297*				
	Age 61 to 70 yrs	2								1.422**				
	Practice in US (Constant: 1-5 yrs)	14												
	<1 yr	4												
	6-10 yrs	10								-1.271***				
	11-15 yrs	9								-1.326***				
	16-20 yrs	5								-1.172**				
	> 20 yrs	6				-1.343*				-1.690**				
	Employed in Current Unit (Constant: 1-5 yrs)	16												
	< 1 yr	6												
	6-10 yrs	12								1.134***				
	11-15 yrs	9								0.996**				
	16-20 yrs	4												
	>20 yrs	1								-1.161*				
	Primary Language (Constant: Other)	17												
	English	31								0.625**				
	English Proficiency (Constant: Native Speaker)	20												
	General Professional Proficiency	9								.467*				
	Advanced Professional Proficiency	19								.721**				
MD		13	3.832	.399	0.827†	3.262	4.423	.358	0.742†	4.000	3.650	.491	0.847†	2.738

Note. †p >.05. *p <.05. **p <.01. ***p <.001. Only statistically significant (p <.05) predictors are listed in the table.

Figure 5-1. Swiss Cheese Model of Accident Causation

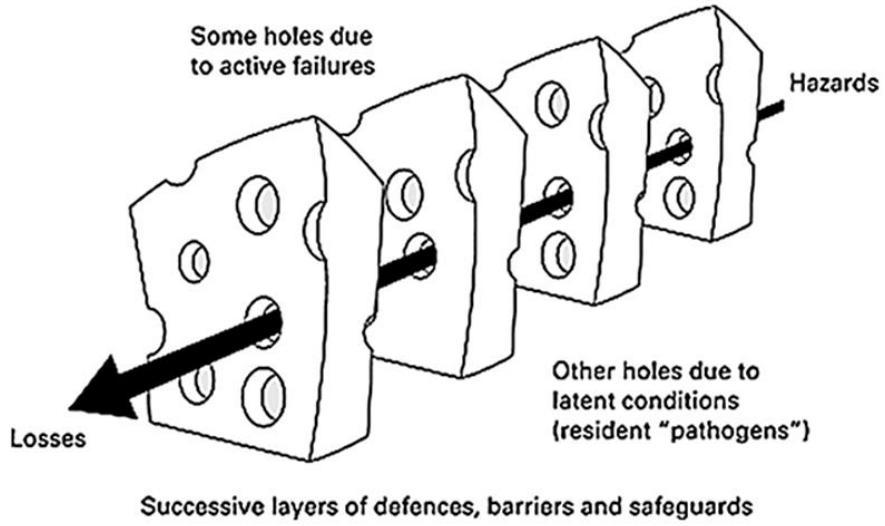

Figure 5-1. Reason, J., Carthey, J., & deLeval, M. (2001). Diagnosing "vulnerable system syndrome": An essential prerequisite to effective risk management. *Qual Health Care*, *10*(Suppl. II), ii21-ii25. Reprinted with permission of the BMJ Publishing Group.

Figure 5-2. Intervention RN vs. Control RN

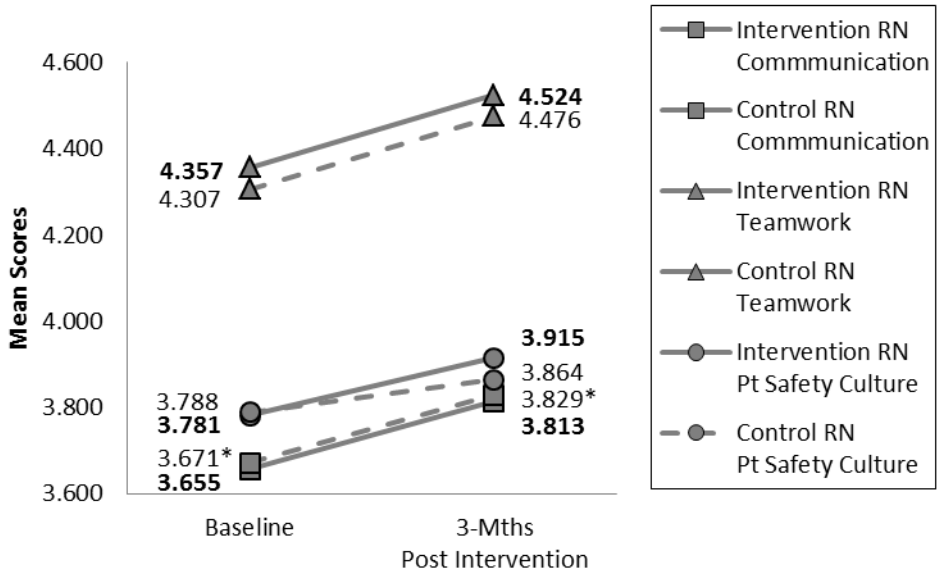

Figure 5-2. Intervention RN vs. control RN at baseline and three months post-intervention. *Statistically significant different mean score from baseline to 3 months post-intervention, $t(27)=-2.727$, $p<.017$.

Figure 5-3. Intervention MD vs. Control MD

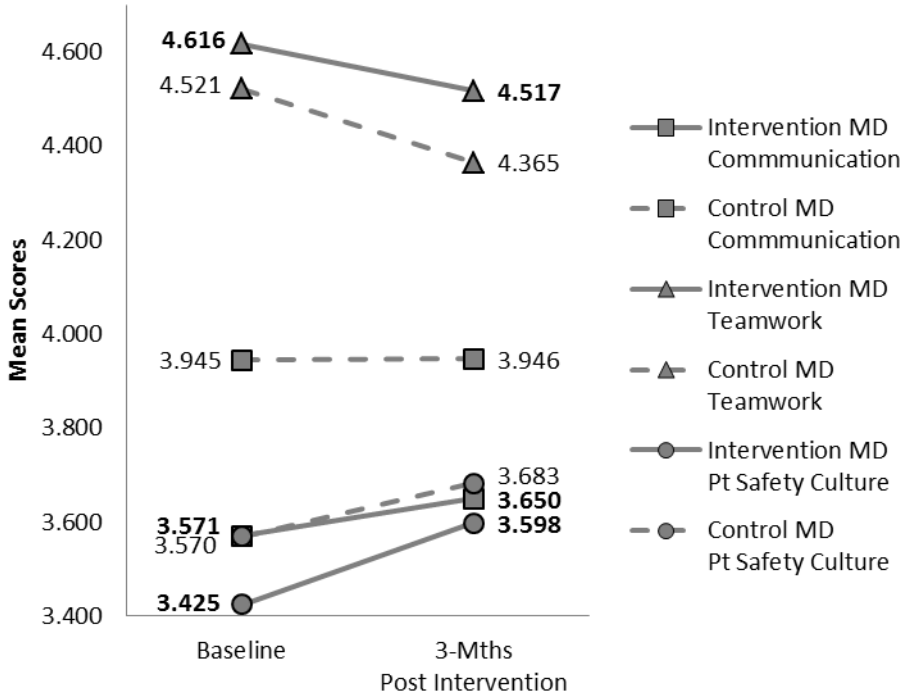

Figure 5-3. Intervention MD vs. control MD at baseline and three months post-intervention. No statistically significant results found, $p>.05$.

Figure 5-4. Intervention RN vs Intervention MD

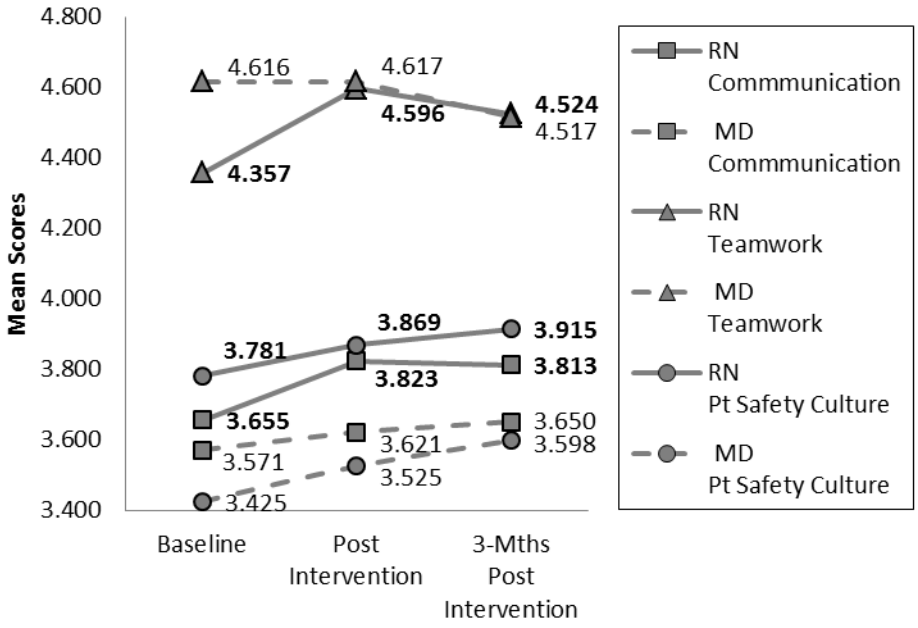

Figure 5-4. Intervention RN vs. intervention MD at baseline, post-intervention, and three months post-intervention. No statistically significant differences found, $p>.05$.

Figure 5-5. Intervention Falls & HAPUs vs. Control Falls & HAPUs

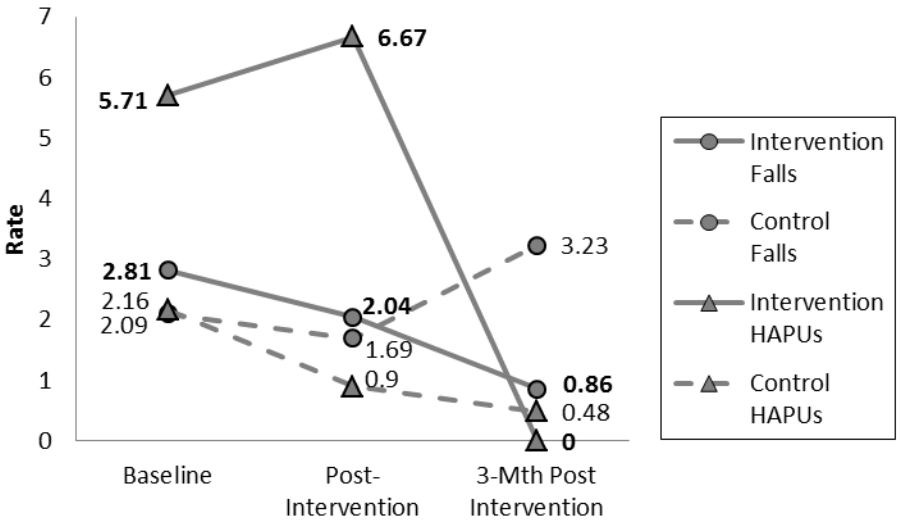

Figure 5-5. Intervention unit fall rate and HAPU rate vs. control unit fall rate and HAPU rate, at baseline, post-intervention, and three months post-intervention. 2nd- 4th Quarter, 2013 rates, measured at unit level.

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