

IDENTIFYING STAFF-LEVEL CORRELATES AND FACTORS OF NURSING
TEAMWORK IN A MILITARY HOSPITAL

by

Carla Dickinson

Dissertation submitted to the Faculty of the
Daniel K. Inouye Graduate School of Nursing
Uniformed Services University of the Health Sciences
In partial fulfillment of the requirements for the degree of
Doctor of Philosophy 2016

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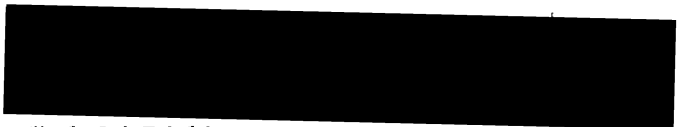
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ABSTRACT

Identifying Staff -Level Correlates and Factors of Nursing Teamwork in a Military Hospital

Carla Dickinson, 2016

Chair: Penny F. Pierce, PhD, RN, FAAN Professor and Director PhD in Nursing Science Program

Despite a system wide focus on team STEPPS training, the perception of teamwork is lower in military hospitals than in civilian hospitals (DoD, 2014). Furthermore, lower perceptions of teamwork in military hospitals have persisted over the past 10 years. Studies of nursing teamwork indicate that characteristics of the nursing staff may influence nursing teamwork (Kalisch & Lee, 2009; Kalisch & Lee, 2013). Military nurses are more likely to be male, have expanded roles, and have less experience than civilians (Patrician et al., 2010). The military is a hierarchical organization and each military service has a unique mission, which may further influence nursing teamwork. However, little is known about nursing teamwork in military hospitals and what staff (gender, nursing role, experience, absenteeism, staffing adequacy) and military characteristics (personnel category, service affiliation, pay grade, and perception of leadership behavior) are associated with nursing teamwork in this setting.

This conceptually driven cross-sectional study using survey methodology was used to identify correlates and factors of nursing teamwork from a convenience sample of approximately 703 nursing staff of 15 patient care units at a large military hospital resulting in a 32.3% return rate. After exclusion of 39 incomplete surveys, the final sample size for data analysis was 185 surveys.

Multiple regression analysis was used to explore factors of nursing teamwork from staff characteristics and military characteristics. Leadership behavior was calculated as a composite score and as leadership factor scores (leading and being a member). Separate regression models for the leadership composite score and leadership factor scores (leading and being a member) were built.

The findings indicated that regression models were significant at $p < .001$, and explained 45% to 48% of the variance in nursing teamwork. The significant variables for the models were nursing role, staffing adequacy, personnel category, and leadership behavior. Leadership behavior alone explained about 40% of the variance in nursing teamwork. A variety of leadership behaviors are important for nursing teamwork. Nurse managers may be able to improve teamwork on patient care units by adapting their leadership behaviors to mitigate short term staffing deficiencies and differences attributable to individual characteristics.

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DEDICATION

This dissertation is dedicated to nursing staff. Thank you for all that you do for patients each day.

ABSTRACT

Identifying Staff -Level Correlates and Factors of Nursing Teamwork in a Military Hospital

Carla Dickinson, 2016

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The findings indicated that regression models were significant at $p < .001$, and explained 45% to 48% of the variance in nursing teamwork. The significant variables for the models were nursing role, staffing adequacy, personnel category, and leadership behavior. Leadership behavior alone explained about 40% of the variance in nursing teamwork. A variety of leadership behaviors are important for nursing teamwork. Nurse managers may be able to improve teamwork on patient care units by adapting their leadership behaviors to mitigate short term staffing deficiencies and differences attributable to individual characteristics.

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CHAPTER 1: Introduction

Recent concerns about outcomes from child birth and surgery prompted an investigative review of military healthcare by the media (La Franiere & Lehren, 2014). In response, the Military Health System Review Group was formed to assess the patient safety culture and compliance with Military Health System (MHS) standards for access and quality (DoD, 2014). Findings from these reviews indicate variability across military hospitals in measures of quality and patient safety and lower averages than civilian hospitals on perceptions of staffing adequacy and teamwork within units as measured by the national Hospital Survey on Patient Safety (HSOPS). Since effective nursing teamwork has been linked to fewer medical errors and omissions in nursing care in previous studies (Ausserhofer et al., 2014; Ball, Murrells, Rafferty, Morrow, & Griffiths, 2014; Catchpole et al., 2007; Kalisch, Curley, & Stefanov, 2007; Kalisch & Lee, 2010; Kalisch & Xie, 2014) identifying factors that improve nursing teamwork is a timely initiative for military hospitals.

Experts in the field of team effectiveness recognize three strategies to improve teamwork 1) selecting individuals for the team who possess teamwork competencies 2) conducting team training, and 3) modifying contextual factors (e.g. tasks, workflow, or structure) to facilitate teamwork (Salas, Sims, & Burke, 2005). The primary strategy used in the MHS since 2007 has been team training through Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS®). Training of teamwork skills through TeamSTEPPS® is a key patient safety initiative of the MHS and underpins the patient safety and quality programs. Despite this enterprise approach to team training, poor perceptions of teamwork have persisted in military hospitals (DoD, 2014).

However, the strategy of modifying contextual factors in the inpatient setting to improve teamwork has not been explored in the MHS. This study will examine nursing teamwork in the military hospital setting. The goal of this study is to determine contextual factors related to nursing teamwork in military hospitals.

BACKGROUND AND SIGNIFICANCE

Military nursing provides inpatient care for approximately 1.2 million patients annually within more than 56 medical centers, community hospitals, or deployed settings (e.g. battlefield, hospital ship, or in flight) (DHA, 2012). While the care provided in deployed settings is credited with improvements in health, the care provided in hospital settings has been scrutinized in the media based on patient care outcomes and malpractice claims of more than \$100 million annually (La Franiere & Lehren, 2014). The New York Times reported that military hospitals perform worse than civilian hospitals in quality indicators related to birth injuries and surgical complications. In addition, the MHS was criticized for a lack of accountability for preventing medical errors because of processes that allow underreporting of sentinel events and laws (e.g. Federal Tort Claims Act, Feres Doctrine) that exempt the MHS from malpractice claims of active duty service members. The media reports that poor teamwork including communication and coordination is a contributing factor to the medical errors in the MHS. This presumption of the media is backed by evidence in the literature.

Studies conducted in civilian hospitals indicate that poor teamwork negatively impacts important healthcare outcomes. Patient care units that have poor teamwork report more medical errors (e.g. patient falls, pressure ulcers) (Catchpole et al., 2007; Kalisch et al., 2007) and omissions in nursing care (Ausserhofer et al., 2014; Ball et al.,

2014; Kalisch & Lee, 2010; Kalisch & Xie, 2014). In addition to patient outcomes, patient care units with poor teamwork report negative staff outcomes such as lower levels of satisfaction (Havig, Skogstad, Veenstra, & Romøren, 2011; Kalisch, Lee, & Rochman, 2010; Rafferty, Ball, & Aiken, 2001), increased turnover (Brunetto, Farr-Wharton, & Shacklock, 2011), and more conflict among team members (Kalisch, 2011).

Findings from the Military Health System Review, also revealed that teamwork is an area of concern within the MHS (DoD, 2014). An analysis of the HSOPS Comparative Database shows a 10-year trend of lower perceptions of teamwork in military hospitals than in civilian hospitals within health systems comparable to the MHS (e.g. Geisinger Health System, Intermountain Healthcare, Kaiser Permanente). Specifically, the MHS has lower scores than civilian hospitals on the teamwork within unit dimension of patient safety culture. The “teamwork within units” score is a measure of the extent to which people support one another, work together as a team, treat each other with respect, and provide assistance when needed (Sorra & Nieva, 2004). Given the relationship between nursing teamwork and patient safety, identifying factors that contribute to effective nursing teamwork is key to the development of strategies to improve patient outcomes in military hospitals.

CONCEPTUAL FRAMEWORK

The conceptual framework for this study (figure 1) is based on the work of Kalisch and colleagues (Kalisch & Lee, 2009; Kalisch & Lee, 2013) who identified contextual variables (hospital type, unit type, work hours, gender, nursing role, experience, absenteeism, and staffing), that influence nursing teamwork in the acute care

setting. As applied in this study, the conceptual framework depicts the relationship between contextual variables and nursing teamwork in a military setting.

The unique mission of the military to support overseas operations shapes available human resources and the organizational structure of military hospitals. As such, nursing team members in military hospitals may be further distinguished by certain characteristics such as personnel category, service affiliation, and pay grade. In addition the military hospital has a hierarchical organizational structure in which the nurse manager oversees the operations within a patient care unit. The team leadership model suggests that these contextual factors also influences teamwork behaviors (Morgeson, DeRue, & Karam, 2009; Morgeson, Lindoerfer, & Loring, 2010). Therefore, the conceptual framework was adapted to include variables (personnel category, service affiliation, pay grade, and perceived leadership behavior) that may be important in the military hospital setting.

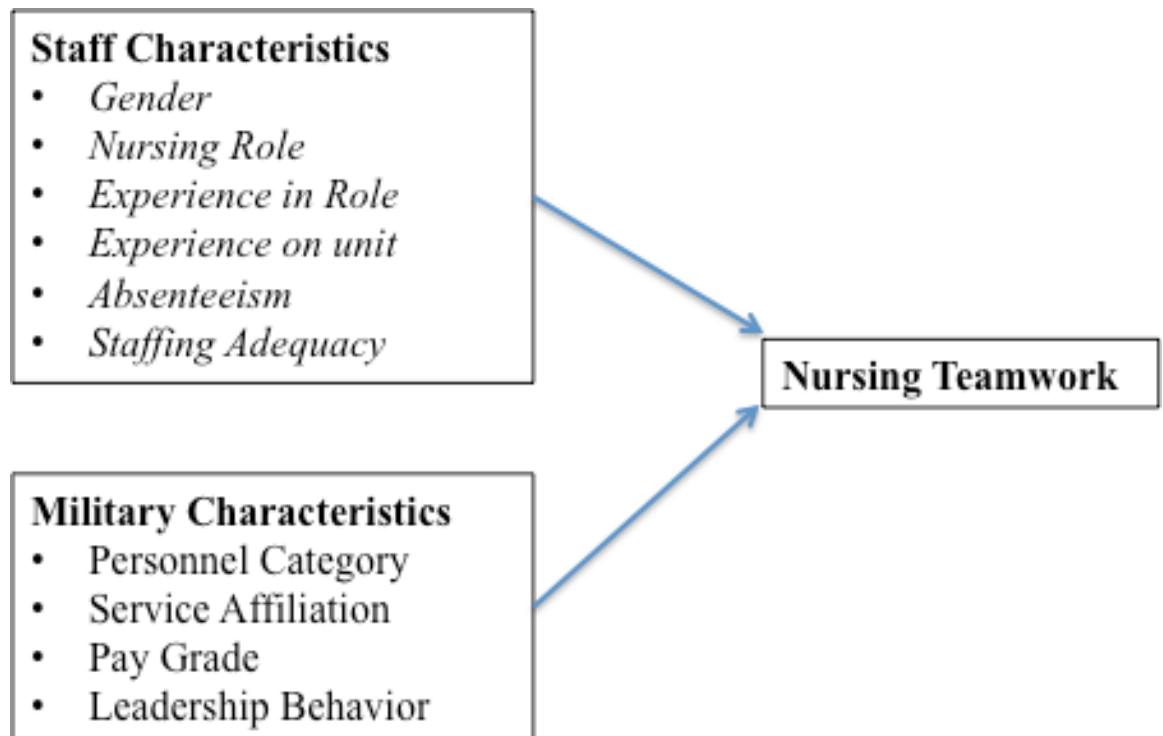


Figure 1. Study framework for correlates and factors of nursing teamwork in a military hospital.

Variables in italics have been tested in previous studies of nursing teamwork in a population of civilian nurses. Adapted from “Variations of Nursing Teamwork by Hospital, Patient Unit, and Staff Characteristics,” by B. Kalisch and K.H. Lee, 2013, *Applied Nursing Research*, 26, p.2. Copyright 2013 by Elsevier Inc.

Nursing Teamwork

Teamwork refers to the interaction among members of the nursing team who are providing care to a patient or group of patients. A nursing team consists of at least one RN and another nursing staff member (RN, LPN, NA) who work together on a given patient care unit in an acute care hospital setting (Kalisch & Lee, 2009; Kalisch, Lee, & Salas, 2010).

Nursing teamwork is measured by a set of behavioral indicators of trust, team orientation, backup, shared mental model, and team leadership important for nursing team members on a patient care unit (Kalisch, Lee, & Salas, 2010). Studies of nursing teamwork indicate that several staff characteristics (e.g. gender, nursing role, experience, absenteeism, staffing adequacy) are related to nursing teamwork on patient care units of civilian hospitals (Kalisch & Lee, 2009; Kalisch & Lee, 2013).

Gender

Women report higher levels of nursing teamwork when compared to men (Kalisch & Lee, 2009). Conversely, this relationship has not held when gender is included with other nursing characteristic variables (e.g. nursing role, experience, absenteeism, and staffing adequacy) in a regression model (Kalisch, Lee, & Rochman, 2010; Kalisch & Lee, 2013). However, these studies were conducted in civilian hospitals

where nurses are primarily female. A larger proportion of the nursing staff in military hospitals is male (34%) when compared to the national nursing population (10%) (Patrician, Shang, & Lake, 2010). The relationship between gender and nursing teamwork has not been examined on patient care units that had a larger portion of males.

Nursing role

Nursing team members who are directly involved in performing patient care tasks appraise teamwork differently than other nursing team members. Studies of nursing teamwork indicate that nurse managers and unit clerks perceive teamwork to be better than RN staff nurses, LPN staff nurses, and nursing assistants (Kalisch & Lee, 2012, 2013). The role of nurse managers and unit clerks is primarily administrative. Although they may have interaction with patients, the majority of their tasks involve coordinating care and managing aspects of the patient care unit. In contrast, the primary role of staff nurses is to provide direct patient care and they depend on other team members to complete patient care tasks. The patient care tasks that staff nurses perform independently are based on nursing licensure.

The extent to which staff nurses are restricted by nursing licensure and scope of practice may also influence the appraisal of nursing teamwork among staff nurses. The licensure and scope of practice of RN staff nurses permits them to independently perform nursing tasks for patients. The licensure of LPNs is more restricted. For example they are not permitted to administer intravenous medications, and must depend on the RN to complete this patient care task. The practice of NAs is the most restrictive; they work under the licensure of the other nursing team members to provide basic nursing care. Thus, the nursing role of individual staff nurses is an important consideration for how

nursing care tasks are completed within the team. Teams comprised of members who are dependent on others to complete tasks require commensurate teamwork behaviors. Prior studies of nursing teamwork indicate that the NA nursing role in particular influences teamwork on patient care units. Nursing teams with fewer NAs have better perceptions of nursing teamwork, while the number of RNs or LPNS does not impact the perception of nursing teamwork at the unit level (Kalisch, Russell, & Lee, 2013).

This relationship may not hold in military hospitals where enlisted NAs develop knowledge and skills beyond that of their civilian counterparts (Patrician et al., 2010). Medics, corpsman, and technicians have a role as first responder in the deployed setting and as an assistant in the hospital or clinic setting. The training and certifications required for this expanded role allows military enlisted NAs to perform additional patient care tasks in military hospitals. The enlisted nursing staff may use algorithms approved by licensed medical and nursing staff to independently treat patients under certain conditions (e.g. illness or injury with an established treatment protocol).

Experience

As nurses gain experience their evaluation of teamwork changes. Nursing personnel with less than six months of experience perceive teamwork to be better than nurses with more than six months of experience (Kalisch & Lee, 2009; Kalisch & Lee, 2013). The relationship holds when experience is measured as time working in the nursing role and time working on a specific patient care unit. This finding has implications for measuring nursing teamwork and interpreting results in military hospitals where policies and procedures guide the amount of time military personnel work in a specific role or on a specific unit.

Military nursing personnel often work in a direct patient care role on a medical surgical unit during their first few years of nursing practice (Patrician et al., 2010). As they gain experience in their nursing role, they move to specialty units or into advanced practice clinical, administrative, and leadership positions. Consequently, medical surgical units are staffed with military nurses that have little experience in their role as a staff nurse. Nursing personnel who move to specialty units (e.g. ED or ICU) may work as a staff nurse longer than those who move into other roles (e.g. advanced practice, administrative, leadership). Regardless, military normally move out of the staff nurse role in less than 10 years, depending on the type of unit and policies of the parent service (e.g. Air Force, Army, or Navy). An additional consequence of these transfers is that military nurses also have little experience working on a specific patient care unit. Furthermore, transitions to another patient care unit or role often occur in conjunction with a move to a different military hospital.

Typically, military nurses move to different geographic locations about every 3–4 years (Patrician et al., 2010). Frequent moves are required to support professional development, national security objectives, and humanitarian efforts. Moves are often triggered by the education and training required to work on specialty units, or in advanced practice clinical, administrative, and leadership roles. Career progression also requires military education, training, and duties in addition to professional development in a nursing role. Military professional development builds the skills required to deliver nursing care in a deployed environment, which is the primary mission of the military.

The frequent turnover of military has implications for the evaluation of teamwork on patient care units. Approximately half of the nursing staff on patient care units is

military. Consequently, patient care units are staffed with a large portion of nurses that have little experience in their nursing role and with working on the same unit. Studies of nursing teamwork in civilian settings indicate that nurses evaluate teamwork differently based on experience (Kalisch & Lee, 2009). Because military comprise a large portion of the nursing team, excluding inexperienced nurses based on studies conducted in civilian settings may skew study results. In military settings the inexperienced staff is most likely to be military who hone teamwork skills during military training. Thus patient care units in military hospitals are staffed with nurses who have experience with working in teams but less experience in their role and working on their patient care unit. It is unknown if the evaluation of teamwork varies with experience in military hospitals. A better understanding of this relationship is important because nursing teams in military hospitals must quickly engage in effective teamwork behaviors with new team members.

Absenteeism

A moderate amount of absenteeism may signal that a nurse is having difficulty working within the nursing team. Nursing staff that miss 2-6 days or shifts in a three-month timeframe score lower on measures of nursing teamwork than their peers (Kalisch & Lee, 2013). Nurses who miss fewer shifts or more shifts during a three-month timeframe do not differ in their appraisal of nursing teamwork. However, this study was conducted in a civilian hospital. Absenteeism may be appraised differently in military hospitals because of policies and procedures (sick leave, staffing, and training absences) that guide absence from work.

The structure of annual sick leave policies is different for federal civilians and military nursing staff. Federal civilians are able to use annual sick leave to miss a

scheduled shift by calling in sick. In addition, they are not required to seek treatment or to have medical documentation to support the need for an unscheduled absence of less than 72 hours. In contrast, military personnel are required to seek medical attention, often during established “sick call” hours, prior to missing a shift for illness. In addition, military are required to have medical documentation that grants permission to stay at home (i.e. quarters) as their “place of duty” for a specified period of time. Thus, the procedures guiding sick leave for military are more stringent.

If extra nursing staff is required due to patient workload, it is typically the military nursing staff who will be called in or remain on duty longer to cover for the unplanned absence. The military are not paid for working more hours and may not be compensated with an additional day off for covering extra hours. For these reasons civilians calling in sick may be viewed negatively by military nursing personnel when it occurs frequently or requires military to cover an extra shift.

Military may have planned absences because of training or military readiness. While military may perceive frequent planned absences for training as part of military duty, civilians may perceive the absences as excessive. For these reasons comparison of absenteeism between military and civilians hospitals is difficult. The relationship between absenteeism and perceived leadership has not been tested in military hospitals where absenteeism may be viewed differently by military and civilian personnel.

Staffing adequacy

Nurses who report that staffing is adequate for their shift also report better nursing teamwork (Kalisch & Lee, 2009; Kalisch & Lee, 2013; Kalisch, Russell, et al., 2013).

When staffing is adequate, team members are able to adapt to fluctuations in workload by

monitoring one another and providing assistance as needed rather than focusing solely on their own work (Kalisch, Gosselin, & Choi, 2012). In addition, communication and coordination among RNs and NAs is improved (Kalisch, 2011). Their relationship is characterized by trust and a shared understanding of one another's roles and responsibilities. For these reasons adequate staffing is fundamental to effective nursing teamwork. However, staffing may be problematic for military hospitals.

Findings from the Hospital Survey on Patient Safety Culture (HSOPS) indicate that 48% of respondents in military hospitals perceive staffing to be adequate compared to 57% of respondents in civilian hospitals (DoD, 2014). However, the relationship between perceived staffing adequacy and nursing teamwork has not been tested in a military hospital.

Personnel category

Nursing teams in military hospitals are comprised of two broad types of staff; military and civilian. Military differs in gender, nursing role, and experience from the national nursing population (Patrician et al., 2010). On the other hand, civilians are similar to the national nursing population on these characteristics. Furthermore, the policies and procedures that guide human resource practices also differ between military and civilians. Building skills and meeting the mission often results in little choice as to geographical location, work assignment, or work hours for military personnel. In contrast, civilians are generally able to choose the hospital and patient care unit they work in, and negotiate their work hours.

Providing care for patients abroad and in austere environments is a primary mission for military nursing staff. These patients may have injuries and illnesses that are

unusual for nurses trained at U.S. Universities. For example multiple injuries are often sustained from blasts and military grade weapons and these injuries may differ from those sustained from automobile accidents or hand guns. Additionally, nurses may provide care for patients with illnesses endemic to the deployed region such as hemorrhagic fever and leishmaniasis. Thus, military nurses require a wide range of skills and knowledge (e.g. military service-specific, job-specific, leadership training, and field training) to provide safe care for patients in these environments. Because of demographic and employment characteristics, military nursing staff and civilian nursing staff working together in the same military hospital may differ in their perceptions of nursing teamwork. Therefore, personnel category (e.g. civilian or military) may be an important characteristic of nursing staff in military hospitals.

Service affiliation

Nursing teams in military hospitals are increasingly comprised of members from different military services (Air Force, Army, or Navy). Air Force, Army, and Navy nurses have been indoctrinated through the policies and procedures of the parent service to have norms for appearance and behavior (L. Wong, Bliese, & McGurk, 2003).

The standards for appearance guide expected behavior and vary based on the parent service. The military uniform is a readily observable characteristic that represents a salient and observable social cue for which military policies and procedures to follow. Individual characteristics that invoke social cues facilitate coordination among team members (Fisher, 2012). For example, the combat uniform quickly became the duty uniform for Army during Operation Iraqi Freedom and Operation Enduring Freedom to project an image of the Army at war and show support to deployed troops. The wearing

of the combat uniform also signaled to members of the Army that the focus was the war mission. In contrast, the Air Force and Navy wore business attire during the initial years to project a professional appearance. Variations in uniform among the Air Force, Army, and Navy are common. For example, the Air Force may wear earrings as part of any uniform whereas Army may only wear earrings as part of the uniform designated for business wear.

The service affiliation of military personnel also guides the types of tasks that unlicensed military personnel may perform in an acute care setting. For example, Air Force technicians and Navy corpsmen may administer medications once competency of medication administration is documented; Army medics are not authorized to administer medications on a patient care unit. These differences change the dependencies that unlicensed military personnel on others. The policies and procedures of the different services may influence the interactions of nursing team members.

Pay grade

The military is predicated on a hierarchical structure where military rank is commensurate with pay and status. Officers are at the top of the hierarchy. They are expected to possess expert knowledge and are responsible for mission success or failure commensurate with their rank (U.S.Army, 2012). The role of the enlisted is to execute orders and to maintain standards and discipline. Military pay grade represents status and power. Within the officer and enlisted ranks those with lower pay grades comply with orders from those with higher pay grades.

In addition the military hospital has a hierarchical organizational structure in which the nurse manager oversees the operations within a patient care unit. The nurse

manager is typically the highest ranking officer, although the position may also be held by a civilian nurse. The remainder of the nursing team is comprised of RN, LPN, and NA staff nurses. RN staff nurses may be civilian or officers. Officers in the RN staff nurse role have less military rank than the nurse manager. Their role is equivalent to civilian RN staff nurses; however, they have a bachelor or higher degree. While enlisted may hold a bachelor or higher degree in nursing or another discipline, they have a different role and pay grade. Enlisted work in the LPN staff nurse or NA roles and have lower rank than officers. Civilian staff nurses (RN, LPN, and NAs) earn pay based on their nursing role; therefore they are differentiated by status, but they do not have rank within a military hospital. However, nursing team members may appraise teamwork differently based on status. Trust is built when team members help each other with tasks (De Jong, Van der Vegt, & Molleman, 2007). Additionally, lower status team members are more likely to perceive teamwork as delegation of tasks from higher status members (Weinberg, Cooney-Miner, Perloff, Babington, & Avgar, 2011).

Leadership

The military emphasizes the use of leadership to accomplish the mission and develop the military force. Air Force Doctrine Document 1-1 (8 November 2011), Army Doctrine Publication 6-22 (1 August 2012), and the Navy Leadership Competency Model (<http://www.netc.navy.mil/centers/cppd/>) (2014) outline the leadership philosophy of each military service. The team leadership model supports that contextual factors such as organizational policies and procedures, status, and hierarchy influences team dynamics (Morgeson et al., 2009; Morgeson et al., 2010). Thus, the relationship between leadership

and nursing teamwork is particularly relevant in the context of military hospitals; however, this association has not been tested.

STATEMENT OF THE PROBLEM

Despite a system wide focus on team training, the perception of teamwork, as measured by the HSOPS, is lower in military hospitals than in civilian hospitals (DoD, 2014). Furthermore, lower perceptions of teamwork in military hospitals have persisted over the past 10 years. Studies of nursing teamwork indicate that contextual factors (e.g. hospital type, hospital size, unit type, gender, age, education, nursing role, experience, absenteeism, and staffing) are associated with nursing teamwork (Kalisch & Lee, 2009; Kalisch & Lee, 2013).

These studies are germane to military and civilian hospitals; however, there may be differences that are important to consider. Nurses in military hospitals can be differentiated from one another by characteristics such as personnel category (military or civilian), service affiliation (Air Force, Army, Navy), and pay grade (officer ranks, enlisted ranks). Military nursing teams are also comprised of a larger portion of males and military personnel with less experience than civilian personnel in their nursing role and on their patient care unit (Patrician et al., 2010). Furthermore, enlisted nursing personnel have expanded roles. Yet, little is known about nursing teamwork in military hospitals and if these contextual variables are associated with nursing teamwork in military hospitals.

PURPOSE

The purpose of this conceptually driven cross-sectional study is to identify correlates and factors associated with nursing teamwork in a military hospital setting.

Identifying staff characteristics and military characteristics that are associated with nursing teamwork will provide direction for future studies in the military and other settings and allow for the development of strategies required to improve nursing teamwork.

AIMS AND RESEARCH QUESTIONS

Aim 1: Identify staff characteristics and military characteristics associated with nursing teamwork

Question 1: What is the relationship between staff characteristics (gender, nursing role, absenteeism, experience, perceived staff adequacy) and nursing teamwork?

Question 2: What is the relationship between military characteristics (personnel category, service affiliation, pay grade, and perceived leadership behavior of the nurse manager) and nursing teamwork?

Aim 2: Test the revised nursing teamwork model

Question 1: What staff characteristics and military characteristics contribute to overall nursing teamwork in a military hospital?

CHAPTER SUMMARY

The characteristics of nursing team members and the context in which they work is important for effective teamwork behaviors. The literature indicates that staff characteristics (e.g. gender, nursing role, experience, absenteeism, and staffing adequacy) are associated with nursing teamwork (Kalisch & Lee, 2009; Kalisch & Lee, 2013). Furthermore, the team leadership model supports that contextual factors such as organizational policies and procedures, status, and hierarchy influences team dynamics

(Morgeson et al., 2009; Morgeson et al., 2010). However, these factors have not been studied in a military hospital setting.

This study will advance the science underpinning our understanding of how teams function in a military hospital setting. A better understanding of which staff characteristics and military characteristics are associated with nursing teamwork may improve the sustainment of team training and provide insight into factors that shape nursing teamwork in military hospitals. The study results will add to the current research on nursing teamwork, predominately conducted in civilian facilities, by focusing the team setting in the military hospital. The results can be used to improve nursing teamwork through future development of interventions aimed at improving nursing teamwork in the military hospital setting.

CHAPTER 2: Literature Review

The conceptual model presented in chapter 1 specifies the concepts explored in this study. The model depicts that nursing teamwork is influenced by characteristics of nurses on the team. The literature supporting these concepts and their relationship to nursing teamwork is presented in this chapter. The chapter begins with a description of healthcare teams. Next, the literature is presented using a team effectiveness framework to organize the inputs, team processes, and outcomes of effective nursing teams. The framework builds from the general literature to the healthcare literature.

A gap in the healthcare team literature is the effectiveness of teams on patient care units, where patients receive the majority of their hospital care. Studies of nursing teams have begun to address this gap by defining nursing teamwork and identifying correlates and factors and outcomes of nursing teamwork on patient care units. A small amount of literature supports that staff characteristics (gender, nursing role, experience absenteeism, staffing adequacy) are related to nursing teamwork in civilian hospitals. A gap in this literature is the relationship between staff characteristics and nursing teamwork in a military hospital. Additional contextual factors may impact nursing staff in military hospitals. Therefore, the literature that supports the importance of military characteristics (personnel category, service affiliation, pay grade, leadership behavior) is also presented. The relationship between military characteristics and nursing teamwork has not been explored.

HEALTHCARE TEAMS

A team is defined as two or more individuals with specified roles interacting adaptively, interdependently, and dynamically toward a common and valued goal (Salas, Dickinson, Converse, & Tannenbaum, 1992). The Agency for Healthcare Research and Quality (AHRQ) conceptualizes a healthcare team as the patient, direct caregivers, and those who support direct care within the healthcare delivery system (AHRQ, 2015). This broad conceptualization encompasses a wide range of healthcare workers including physicians, dentists, allied healthcare workers, nurses, and administrative and support personnel who are responsible in some way for the care of an individual patient. Regardless of the patient care role, individual team members (e.g. physicians, nurses, pharmacists) share a common goal to provide safe patient care. The healthcare team is more effective when interaction among team members supports the common goal.

Improving the coordination and collaboration of healthcare teams became a salient topic more than a decade ago when the Institute of Medicine estimated that between 44,000 and 98,000 deaths occur annually as a result of medical error (Kohn, Corrigan, & Donaldson, 2000). The estimated prevalence of medical errors has not decreased over time (Classen et al., 2011; Landrigan et al., 2010) and costs approximately \$17.1 billion each year (Van Den Bos et al., 2011). Public concern about the prevalence and costs attributed to medical error resulted in efforts across the U.S. to improve the effectiveness of healthcare teams (Baker, Day, & Salas, 2006; Baker, Gustafson, Beaubien, Salas, & Barach, 2005).

THEORETICAL FOUNDATIONS

Team effectiveness is the capacity of a team to accomplish its goals and includes the social processes within the team and the final product produced by the team. The

input-process-outcome (IPO) model (figure 2) is the basic framework used to study team effectiveness as it was described 50 years ago and organizes variables into input, process, or outcome variables (Hackman, 1987; McGrath, 1964). The premise of the IPO model is that inputs (e.g. demographics, role, experience, staffing, service affiliation, pay grade, leadership) shape group states and interaction processes (e.g. trust, team orientation, backup behavior, shared mental models, team leadership), which in turn impact outcomes (e.g. errors of commission, errors of omission, satisfaction, conflict). The IPO model remains important and provides the basic framework for newer conceptualization of team effectiveness (Salas, Cooke, & Rosen, 2008). Over the years, researchers have updated the model to reflect the dynamic nature of teams, developed input, process, and outcome variables and adapted the basic framework for specific settings.

While the IPO model depicts team effectiveness as static, researchers have recognized that teams are dynamic (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Marks, Mathieu, & Zaccaro, 2001). For example not only do inputs influence processes, which in turn influence outcomes, but processes can also influence inputs, and outcomes can influence inputs and processes. Furthermore, processes can include variables that involve team member action as well as cognitive, motivational, or affective states (Ilgen et al., 2005). For this reason team effectiveness frameworks also use Input-Mediator-Outcome (IMO) or Input-Mediator-Input-Outcome (IMIO) frameworks to depict relevant variables. Additionally, the processes (or mediators) important for the team may change depending on the tasks the team is performing (Marks et al., 2001). For example, nursing teams engage in different activities when planning patient care (e.g. change of shift), transitioning between major tasks (e.g. huddles after vital signs and AM care), and when

delivering patient care; the nursing team cycles through planning phases, transitioning phases, action phases, and team maintenance phases throughout a shift. While the dynamics of a team is important this literature review depicts the process as static to illustrate input, process, and outcome variables and the adaptation of the basic IPO framework for the healthcare setting.

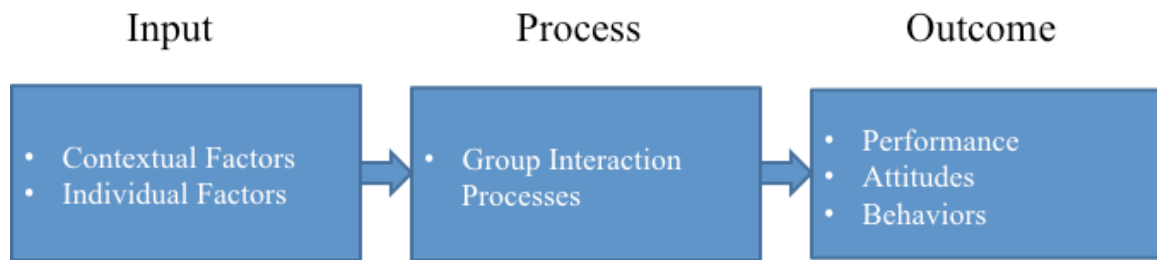


Figure 2. The input-process-outcome (IPO) model.

Adapted from “A Normative Model of Team Effectiveness,” by R. Hackman, 1983, *Technical Report #2, Research Program on Group Effectiveness*. Yale School of Organization and management

Inputs of the framework include contextual factors and individual factors (figure 3). Scholars recognize that teams operate in a context that facilitates or hinders their functioning (Bell, 2007; Campion, Medsker, & Higgs, 1993; Cohen & Bailey, 1997; Morgeson et al., 2009; Morgeson et al., 2010). Context includes features of the organization in which the team is nested (e.g. hierarchical structure, leadership, policies and procedures, military service cultures) and factors from outside of the organization (e.g. the nursing shortage, overseas military operations) that may impact the team (Mathieu, Maynard, Rapp, & Gilson, 2008).

Leadership is an important contextual factor for team effectiveness (Burke et al., 2006; Fleishman et al., 1992; Zaccaro, Rittman, & Marks, 2002). Leaders provide resources and vision for the team. They also develop team members, build cohesion, and

guide the team to accomplish tasks and goals. Findings from a meta analysis support that leadership behaviors that focus on developing the team (person focused) are positively related to attitudes such as satisfaction and team commitment (Burke et al., 2006). The same meta analysis found that leadership behaviors that guide task accomplishment (task-focused behaviors) are positively related to improved performance. Although leadership is an important contextual factor, frameworks of healthcare team effectiveness and nursing team effectiveness have not included leadership as an input variable. Therefore, leadership is further described in a nursing and military context following the descriptions of the healthcare team and nursing team effectiveness frameworks. Leadership was also added as an input for the study framework.

The interaction among team members can also be shaped by individual factors such as demographics, roles, education, and experience (Bell, 2007; Campion et al., 1993; Cohen & Bailey, 1997). Generally, studies of individual factors are concerned with the diversity of the team and how the distribution of an individual factor within a team influences team effectiveness. For example a study of gender and teamwork suggest that gender diversity improves the team's ability for complex problem solving (Wegge, Roth, Neubach, Schmidt, & Kanfer, 2008). Teams that have a mixture of males and females perform better on problem solving tasks. The relationship was more pronounced in larger groups than in smaller groups. Additionally, teams that contain female members are more collaborative those that do not (Bear & Woolley, 2011). Collectively, these findings suggest that gender influences group interaction processes and performance. Gender diverse teams may perform better on complex tasks and collaborate more than gender homogeneous teams.

Input



Figure 3. Inputs of effective teams.

Adapted from “Developing Team Leadership Capability,” by F. Morgeson, D. Linoerfer, and D. Loring, 2010. *The Center for Creative Leadership Handbook of Leadership Development*, 122, p. 289.

The process variables of the team effectiveness framework have been further developed over the years. Early theoretical frameworks often used a single variable to denote group interaction processes. The variable was commonly referred to as teamwork. However, there was variation in the definition and concept of teamwork across studies (Salas et al., 2005). As a result the concept of teamwork lacked clarity.

Responding to the need for conceptual clarity, Salas and colleagues (2005) defined teamwork and identified a core set of teamwork variables based on existing literature of team effectiveness. Teamwork was defined as “a set of interrelated thoughts, actions, and feelings of each team member that are needed to function as a team and that

combine to facilitate coordinated, adaptive performance and task objectives resulting in value-added outcomes” (Salas et al., 2005). They further identified a core set of team process variables common to most teams (figure 4).

Process

- 
- Team Leadership
 - Mutual Performance Monitoring
 - Team Orientation
 - Backup Behavior
 - Adaptability
 - Mutual Trust
 - Shared Mental Models
 - Closed Loop Communication

Figure 4. Group interaction processes of effective teams.

Adapted from “ Is There a “Big Five” in Teamwork?,” by E. Salas, D. Sims, and C. Burke, 2005. *Small Group Research*, 36, p. 555.

Collectively, the team process variables are referred to as teamwork and denote different dimensions of the concept. The definitions and behavioral indicators of each dimension of teamwork further described Salas and colleagues (2005), are listed in Table 1.

Table 1. Definitions and behavioral indicators of teamwork

Dimension	Definition	Behavioral Indicators
Team Leadership	Ability to direct and coordinate the activities of other team members, assess team performance, assign, tasks, develop team	• Facilitate team problem solving • Provide performance expectations and acceptable interaction patterns

Table 1. Definitions and behavioral indicators of teamwork

	knowledge, skills, and abilities, motivate team members, plan and organize, and establish a positive atmosphere.	• Synchronize and combine individual team member contributions • Seek and evaluate information that affects team functioning • Clarify team member roles • Engage in preparatory meetings and feedback sessions with the team
Mutual Performance Monitoring	The ability to develop common understandings of the team environment and apply appropriate task strategies to accurately monitor teammate performance	• Identifying mistakes and lapses in other team members actions • Providing feedback regarding team member actions to facilitate self-correction
Team Orientation	Propensity to take other's behaviors into account during group interaction and the belief in the importance of the team's goals over individual member's goals.	• Taking into account alternative solutions provided by teammates and appraising that input to determine what is most correct • Increased task involvement, information sharing, strategizing, and participatory goal setting
Backup Behavior	Ability to anticipate other team member's needs through accurate knowledge about their responsibilities. This includes the ability to shift workload among members to achieve balance during high periods of workload or pressure.	• Recognition by potential backup providers that there is a workload distribution problem in their team • Shifting of work responsibilities to underutilized team members • Completion of the whole task or parts of the tasks by other team members
Adaptability	Ability to adjust strategies based on information gathered from the environment through the use of backup behavior and reallocation of intra-team resources. Altering a course of action or team repertoire in response to changing	• Identify cues that a change has occurred, assign meanings to that change, and develop a new plan to deal with the changes • Identify opportunities for improvement and innovation for habitual or routine practices

Table 1. Definitions and behavioral indicators of teamwork

	conditions (internal or external).	• Remain vigilant to changes in the internal and external environment of the team
Mutual Trust	The shared belief that team members will perform their roles and protect the interests of their teammates	• Information sharing • Willingness to admit mistakes and accept feedback
Shared Mental Models	An organizing knowledge structure of the relationships among the task and the team is engaged in and how the team members will interact	• Anticipating and predicting each other's needs • Identify changes in the team, task, or teammates and implicitly adjusting strategies as needed
Closed Loop Communication	The exchanges of information between a sender and a receiver irrespective of the medium	• Following up with team members to ensure message was received • Acknowledging that a message was received • Clarifying with the sender of the message that the message received is the same as the intended message

Outcomes of the team effectiveness framework include performance, attitudes, and behaviors (figure 5). Ideally, others outside of the team (e.g. managers and customers) rate performance (Cohen & Bailey, 1997). Ratings of team performance include productivity, efficiency, and quality. Productivity refers to quantitative counts of some unit that a team produces (e.g. number of patients seen by a provider). Efficiency is also a quantitative count of units produced. However, efficiency also incorporates an established standard or benchmark into the measure (e.g. average length of stay, adjusted for case mix). Quality refers to an assessment of the value or worth of the product the team produces (e.g. patient satisfaction, patient safety indicators).

Attitudes and behaviors refer to the impact on team members. Attitudes are indicators of how the team is meeting individual needs (Cohen & Bailey, 1997). They include satisfaction, commitment to the job and organization, and trust. Behaviors are indicators of the willingness of team members to continue working together as a team. They include absenteeism and turnover.

Outcome

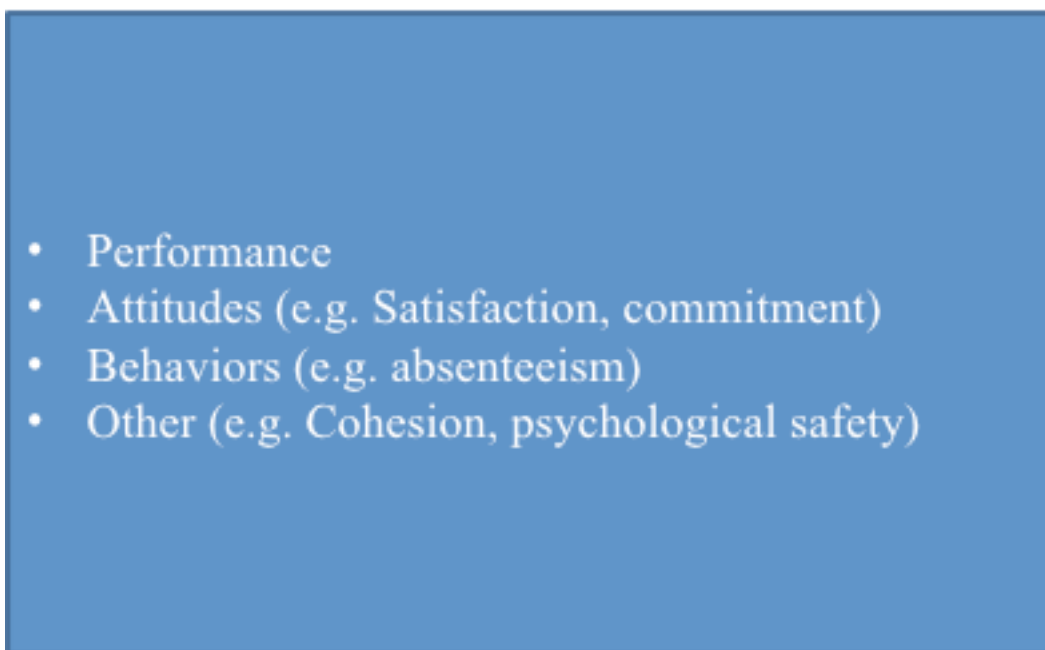


Figure 5. Outcomes of effective teams.

Adapted from “Criteria Issues and Team Effectiveness,” by J. Mathiew and L. Gilson, 2012. *The Oxford Handbook of Organizational Psychology*, 2, p. 914.

HEALTHCARE TEAM EFFECTIVENESS

Reviews of the healthcare team effectiveness literature concluded that few studies referenced a conceptual framework or specified conceptual definitions of team processes or performance (Hull et al., 2012; Lemieux-Charles & McGuire, 2006; Manser, 2009; Schmutz & Manser, 2013). As a result scholars have adapted the basic team

effectiveness framework to the healthcare setting (S. J. Weaver, Feitosa, Salas, Seddon, & Vozenilek, 2013). Figure 6 depicts the inputs, processes, and outcomes that may be important in models of healthcare team effectiveness.

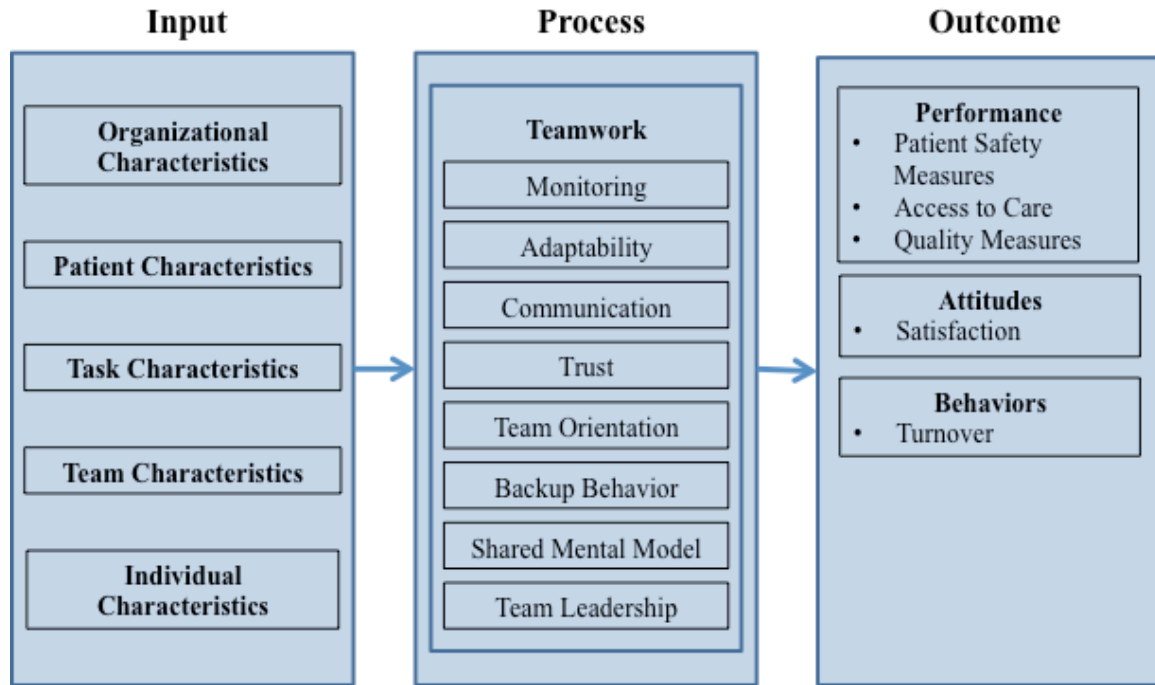


Figure 6. Framework for healthcare team effectiveness.

Adapted from “The Theoretical Drivers and Models of Team Performance and Effectiveness for patient Safety,” by S. Weaver, J. Feitosa, E. Salas, R. Seddon, and J. Vozenilek 2013, *Improving Patient Safety Through Teamwork and Team Training*, pp. 9-17. Copyright 2013 by Oxford University Press.

Characteristics of the organization (e.g. policies and procedures, organizational structure, leadership, training), task (e.g. complexity), team (e.g. composition), and individual are important inputs for team effectiveness frameworks (Bell, 2007; Campion et al., 1993; Cohen & Bailey, 1997; Hackman, 1987; Marks et al., 2001; Mathieu et al., 2008; Morgeson et al., 2010; Salas et al., 1992). Therefore, these inputs were retained in team effectiveness frameworks used in the healthcare setting. Additionally, patient characteristics were added as an input that may influence teamwork in the healthcare

setting. For example a patient with complex medical diagnosis may require more communication among team members than a patient who is relatively healthy and requires preventive health checkups. Although the framework includes several inputs, studies of healthcare teams have focused on a small number of inputs, mainly organizational characteristics and team characteristics. Studies that use an IPO framework to quantify the link between inputs, teamwork, and healthcare outcomes are even less common.

Studies of patient safety culture are beginning to emphasize the influence of input variables on process variables (e.g. teamwork). Organizational characteristics such as training and a patient safety culture support ongoing teamwork and healthcare outcomes. Patient safety culture and teamwork are interrelated and team training is an intervention to improve both. Team training has been shown to improve the safety culture of an organization (Jones, Skinner, High, & Reiter-Palmon, 2013). Hospitals that received a standardized team training intervention (TeamSTEPPS) scored higher on the Hospital Survey on Patient Safety Culture Survey (HSOPS) compared to non-intervention hospitals. The HSOPS is a psychometrically sound instrument developed by the AHRQ to assess safety culture within hospitals (Sorra & Dyer, 2010). Moreover, higher scores on the HSOPS persisted one year after the team training intervention (Jones et al., 2013). Conceptually, a climate of teamwork, as measured by the HSOPS, is a dimension of patient safety culture (Jones et al., 2013). Studies of patient safety culture indicate that organizations with better perceptions of patient safety as measured by the HSOPS also have better perceptions of teamwork (Jones et al., 2013; S. J. Weaver, Lubomksi, et al., 2013). The authors concluded that contextual factors that support teamwork (e.g.

organizational characteristics, task characteristics, team characteristics, individual characteristics) are important for the sustainment of effective teamwork skills developed during training. Limitations of the studies are a low survey response rates, small sample sizes, incomplete reporting of outcomes, and the lack of studies framed by a conceptual model (S. J. Weaver, Lubomksi, et al., 2013).

Process variables of the healthcare team effectiveness framework are grounded in the work of Salas and colleagues (2005) who identified and described a core set of teamwork processes that influence team effectiveness. This conceptualization of teamwork was adopted by the AHRQ and underpins the teamwork competencies which are the focus of TeamSTEPPS® training. Although complex models of healthcare team effectiveness have additional process variables (Weaver, Feitosa, Salas, Seddon, & Voznilek, 2013), the process variables in figure 6 are commonly trained and studied in healthcare. Empirical evidence also supports that healthcare teams that engage in these team processes have better outcomes.

Healthcare teams effectively interact have better performance, clinical outcomes, and a more positive patient safety culture (AHRQ, 2015). Systematic reviews of the literature empirically support the association between effective teamwork and outcomes. Effective teamwork is important for the prevention of errors in the operating room, intensive care, and emergency settings (Hull et al., 2012; Manser, 2009; Schmutz & Manser, 2013). Observational studies and retrospective reviews of adverse events indicate that problems with communication and teamwork are contributing factors to error and delays in care (Manser, 2009). In the operating room, poor teamwork resulted in a higher rate of technical surgical errors and increased operating time (Hull et al.,

2012). Conversely, when teamwork is effective diagnostic accuracy, economy of motion, better surgical technique and anesthesia induction, and better decision-making occur (Hull et al., 2012; Manser, 2009; Schmutz & Manser, 2013). These reviews provide an overview of the relationship between teamwork and performance; however they have some limitations. The literature was not mature enough in two reviews for the authors to conduct a meta-analysis on specific indicators of performance (Hull et al., 2012; Manser, 2009). Effective teamwork is also associated with better clinical outcomes such as reductions in postoperative complications, reduced length of stay, lower morbidity and mortality rates, and fewer falls (Hull et al., 2012; Manser, 2009; Schmutz & Manser, 2013). A longitudinal study of teamwork in the Veterans Health Administration (VHA), found that effective teamwork was associated with lower surgical mortality in a large national cohort study (Neily et al., 2010).

Overall, studies of healthcare team effectiveness support a link among organizational characteristics (training, patient safety culture), teamwork, and healthcare outcomes. A gap in the healthcare team literature is the effectiveness of teams outside of the operating room or emergency departments. Studies of healthcare teams are concentrated in the operating room or emergency department settings and frequently exclude members of the team such as nurses and anesthesia (Hull et al., 2012). Importantly, few studies address the effectiveness of teams on patient care units, where patients receive the majority of their hospital care. In addition, the outcomes of nursing teams that potentially influence patient outcomes (falls, pressure ulcers, missed care) and staff outcomes (turnover) are not addressed in studies of operating room or emergency teams.

NURSING TEAM EFFECTIVENESS

Studies of nursing teamwork have begun to address this gap. The emphasis of these studies has been on the systematic study of inputs, nursing teamwork processes, and outcomes of interest to nursing in the patient care setting (including operating room and emergency room). Based on the nursing teamwork literature, a framework for nursing team effectiveness is depicted in figure 7.

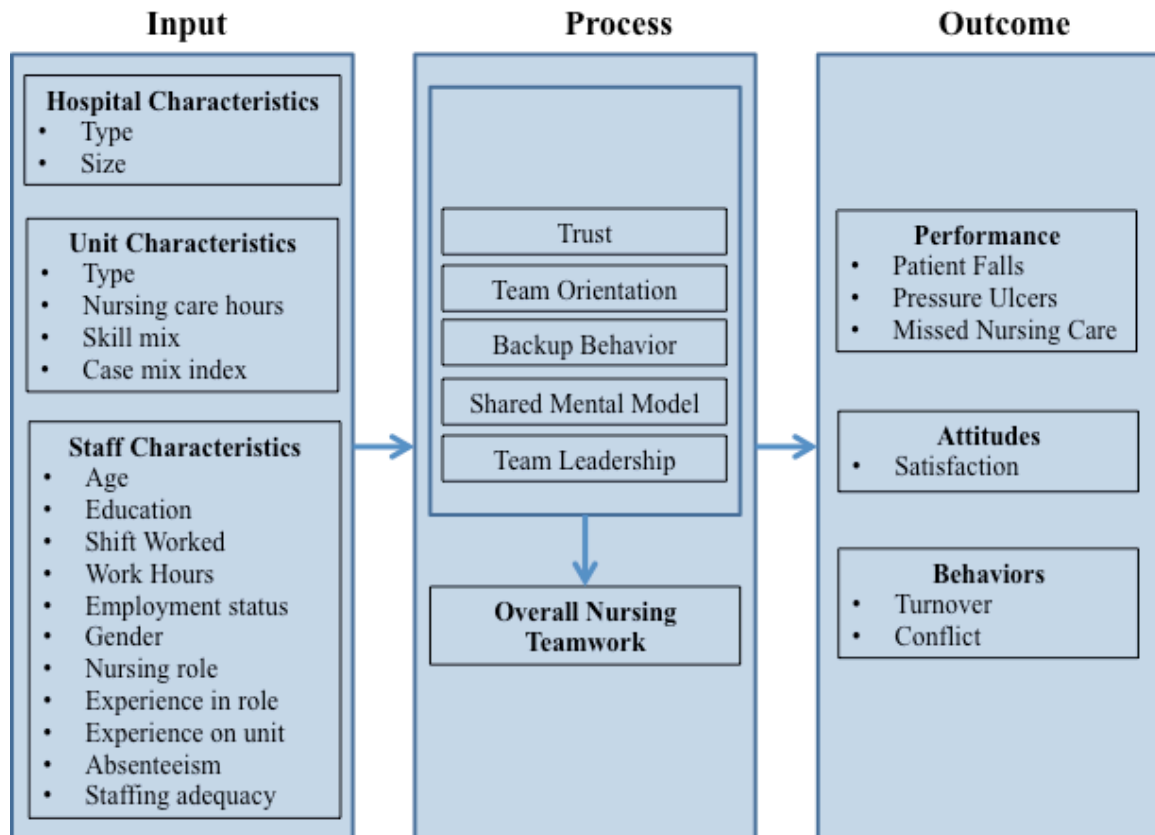


Figure 7. Framework for nursing team effectiveness.

Adapted from “Variations of Nursing Teamwork by Hospital, Patient Unit, and Staff Characteristics,” by B. Kalisch and K. H. Lee, 2013, *Applied Nursing Research*, 26, p. 2. Copyright 2013 by Elsevier Inc.

The teamwork environment of nurses is shaped by factors outside of the hospital setting such as the aging population, restructuring of healthcare, and the nursing

workforce (Keeping Patients Safe, 2004). Notably, the aging population is affecting healthcare organizations. Patients are living longer with chronic illnesses and the need for and cost of healthcare is increasing beyond capacity. Efforts to increase capacity and reduce cost such as shorter hospital stays, and changes in work design create challenging work demands for nursing staff. For example frequent patient turnover increases the workload of the nursing team. Additionally, the composition of the nursing team may be impacted as a cost saving measure (e.g. reduction in the number of RNs hired, use of part time and contract personnel). The work hours of nurses has also changed. Nurses are working longer shifts and more overtime. These work demands have a noticeable impact on the nursing workforce. Hospitals experience high turnover and problems with recruitment and retention. Furthermore, the nursing workforce is also aging as the need for nursing care increases. A large cohort of nurses is age 41-50 years and will reach retirement age within the next 2 decades. These contextual factors shape hospital, unit, and staff characteristics and are captured as inputs to the framework depicted in figure 7.

Process variables are based on the concept of teamwork advanced by Salas and colleagues (2005). Kalisch and colleagues adapted the concept through a series of studies to describe and measure routine nursing teamwork in an inpatient setting (Aarons & Sommerfeld, 2012; Kalisch, Lee, & Salas, 2010; Kalisch, Weaver, & Salas, 2009). In the initial study, data gathered from focus groups were used to understand nurse's perceptions of teamwork behaviors in the inpatient setting (Kalisch et al., 2009). These data were used in a subsequent study to develop a measure for nursing teamwork (Kalisch, Lee, & Salas, 2010). The nursing teamwork concept includes five dimensions of teamwork (team leadership, team orientation, back-up behavior, trust, and shared

mental models) that nurses identified as important on a patient care unit. The dimensions combined form overall nursing teamwork. A comparison of the initial teamwork dimensions and nursing teamwork dimensions are in Table 2. Three of the teamwork dimensions (mutual performance monitoring, adaptability, closed loop communication) of the initial teamwork concept described by Salas and colleagues (2005) were not discernable in the qualitative and qualitative studies to derive the nursing teamwork concept (Kalisch, Lee, & Salas, 2010; Kalisch et al., 2009). The relationships between inputs and nursing teamwork were tested in subsequent studies (Kalisch & Lee, 2009; Kalisch, Lee, & Rochman, 2010; Kalisch & Lee, 2010, 2011, 2013; Kalisch, Russell, et al., 2013).

Table 2. Definitions and behavioral indicators of teamwork and nursing teamwork

Dimension	Definition	Behavioral Indicators	Nursing Behavioral Indicators
Team Leadership	Ability to direct and coordinate the activities of other team members, assess team performance, assign, tasks, develop team knowledge, skills, and abilities, motivate team members, plan and organize, and establish a positive atmosphere.	• Facilitate team problem solving • Provide performance expectations and acceptable interaction patterns • Synchronize and combine individual team member contributions • Seek and evaluate information that affects team functioning • Clarify team member roles • Engage in preparatory meetings and feedback sessions with the team	• Charge nurses or team leaders monitoring the progress of the team • Charge nurse or team leaders balance team workload • Extended plan to deal with changes in the workload • Charge nurses or team leaders give clear and relevant directions

Table 2. Definitions and behavioral indicators of teamwork and nursing teamwork

Mutual Performance Monitoring	The ability to develop common understandings of the team environment and apply appropriate task strategies to accurately monitor teammate performance	• Identifying mistakes and lapses in other team members actions • Providing feedback regarding team member actions to facilitate self-correction	
Team Orientation	Propensity to take other's behaviors into account during group interaction and the belief in the importance of the team's goals over individual member's goals.	• Taking into account alternative solutions provided by teammates and appraising that input to determine what is most correct • Increased task involvement, information sharing, strategizing, and participatory goal setting	• Conflict avoidance • Dominated by staff members with strong personalities • Complaint by oncoming shift staff about incomplete work • Judgmental feedback • Defensive response • Extra break time • Focusing on their own work than working together • Nursing assistants and nurses not working well together • Ignoring mistakes and annoying behavior
Backup Behavior	Ability to anticipate other team member's needs through accurate knowledge about their responsibilities. This includes the ability to	• Recognition by potential backup providers that there is a workload distribution problem in their team • Shifting of work responsibilities to	• Noticing a member falling behind • Pitching in together to get the work done • Keeping an eye out for each other without falling behind

Table 2. Definitions and behavioral indicators of teamwork and nursing teamwork

	shift workload among members to achieve balance during high periods of workload or pressure.	underutilized team members • Completion of the whole task or parts of the tasks by other team members	• Charge nurses or team leaders assist team members • Knowing when assistance is needed before being asked • Response to other team members' patients
Adaptability	Ability to adjust strategies based on information gathered from the environment through the use of backup behavior and reallocation of intra-team resources. Altering a course of action or team repertoire in response to changing conditions (internal or external).	• Identify cues that a change has occurred, assign meanings to that change, and develop a new plan to deal with the changes • Identify opportunities for improvement and innovation for habitual or routine practices • Remain vigilant to changes in the internal and external environment of the team	
Mutual Trust	The shared belief that team members will perform their roles and protect the interests of their teammates	• Information sharing • Willingness to admit mistakes and accept feedback	• Clarifying the intended message with one another • Constructive feedback • Sharing ideas and information • Engaging in changes to make improvements • Trust • Fair reallocation of responsibilities • Communication of expectation

Table 2. Definitions and behavioral indicators of teamwork and nursing teamwork

Shared Mental Models	An organizing knowledge structure of the relationships among the task and the team is engaged in and how the team members will interact	• Anticipating and predicting each other's needs • Identify changes in the team, task, or teammates and implicitly adjusting strategies as needed	• Understanding of own responsibilities throughout the shift • Understanding of others' role and responsibilities • The shift change reports contain necessary information • Awareness of the strengths and weaknesses of other team members
Closed Loop Communication	The exchanges of information between a sender and a receiver irrespective of the medium	• Following up with team members to ensure message was received • Acknowledging that a message was received • Clarifying with the sender of the message that the message received is the same as the intended message	

Characteristics of the hospital such as the type of hospital and size of the hospital are contextual factors that influence nursing team interactions. Nurses who work in community hospitals or smaller hospitals score higher on nursing teamwork measures than nurses who work in academic medical centers or large hospitals (Kalisch & Lee, 2009). Academic medical centers and large hospitals are typically more complex organizations and may have additional contextual factors that hinder a team's ability to collectively perform a task (Kalisch & Lee, 2011; Kalisch & Lee, 2013). Studies that

tested the relationship between hospital characteristics and nursing teamwork are reported in Table 3.

Table 3. Relationship between hospital characteristics and nursing teamwork

Study	Hospital Characteristic	Results
Kalisch and Lee (2009)	Hospital type	Hospital type was significantly related to overall nursing teamwork, team orientation, back up behavior, trust, shared mental model $p < .05$. Team leadership was not significant by hospital type. Community hospitals scored higher than academic medical centers.
Kalisch and Lee (2011)	Hospital size	Hospital size was significantly related to overall teamwork, $p < .05$ in that smaller hospitals scored higher on teamwork than larger hospitals.
Kalisch and Lee (2013)	Hospital size	Hospital size was significantly related to overall nursing teamwork, team orientation, back up behavior, trust, shared mental models, $p < .01$. Team leadership was not significant by hospital type. Small sized hospitals (< 150 beds) scored higher than larger hospitals. Medium sized hospitals (150-399 beds) scored higher than large hospitals (≥ 400 beds).

Unit characteristics also influence nursing teamwork (Table 4). Studies of nursing teams indicate that teamwork varies based on the type of unit and staffing of the unit (Kalisch & Lee 2009; Kalisch & Lee, 2011, Kalisch, Russel, & Lee, 2013). For example specialty care units score higher on nursing teamwork measures than medical surgical units. Reasons for these differences have not been explored. However, the extant literature supports that task characteristics are important inputs; some tasks require different levels of interaction among members (Saavedra, Early, & Van Dyne, 1993, Shaw, Duffy, and Stark, 2000). It is plausible that patient care tasks on specialty care units require a team to interact more closely than the patient care tasks on medical

surgical units. Another unit characteristic that influences nursing teamwork is staffing. Studies of nursing teamwork indicate that several staffing factors (e.g. the number of patients cared for by an individual nurse, the number of NA, and RNs on the nursing team, and the hours per patient day (HPPD) are related to nursing teamwork (Kalisch & Lee, 2009; Kalisch & Lee, 2011). Hours per patient day is a widely used staffing indicator calculated as the overall time expended by nurses (RN, LPNs, NAs) providing direct patient care on a specific patient care unit. Importantly, studies indicate that the number of NAs on patient care teams was negatively related to nursing teamwork (Kalisch, Russell, et al., 2013). Specifically, a higher number of NAs seem to negatively impact perceptions of shared mental models, team leadership, team orientation, backup behavior and trust. In this same study no relationship was found between nursing teamwork and the total number of staff, the total number of RNs, or the total number of LPNs.

Table 4. Relationship between unit characteristics and nursing teamwork

Study	Unit Characteristic	Results
Kalisch and Lee (2009)	Unit Type	Unit type was significantly related to overall nursing teamwork, team leadership, team orientation, back up behavior, trust, shared mental model $p < .001$. Types of units arranged from highest to lowest score are maternity, pediatric and other, intensive and intermediate care, adult medical surgical, emergency, survival flight, and transport teams.
Kalisch and Lee (2013)	Unit Type	Unit type was significantly related to overall nursing teamwork, team leadership, team orientation, back up behavior, trust, shared mental model $p < .01$. Types of units arranged from highest to lowest score: highest score psychiatric,

Kalisch, Russell, and Lee (2013)	Unit Size (Number of RNs, Number of NAs, Total number of nurses, average daily census)	perioperative; middle score ICU, pediatric, and maternity; lowest score medical surgical, intermediate, and rehabilitation, ED Total number of NAs and average daily census were negatively correlated with a units overall nursing teamwork score, team leadership, team orientation, back up behavior, trust, shared mental model. Number of NAs explains 15% of variance in unit teamwork score and 37% of the variance in the backup behavior. The number of RNs and total number of nurses was not significantly related to the unit overall nursing teamwork score.
Kalisch and Lee (2011)	Staffing (hours per patient day [HPPD], RN hours per patient day [RN, HPPD], skill mix, and unit level case mix index [CMI])	Staffing (HPPD, RN HPPD, and skill mix) was positively correlated with overall nursing teamwork. A predictive model with HPPD, skill mix, CMI, and hospital size accounted for 33% of the variance in overall nursing teamwork.
Kalisch and Lee (2011)	Staffing predictive model (HPPD, skill mix, CMI and hospital size)	HPPD was associated with a higher score on back up behavior, shared mental model, and team leadership. There was no association with trust or team orientation
Kalisch and Lee (2011)	Staffing predictive model (HPPD, skill mix, CMI and hospital size)	Skill mix was associated with higher scores on team orientation, back up behavior, and team leadership. There was no association with trust and shared mental models
Kalisch and Lee (2011)	Staffing predictive model (HPPD, skill mix, CMI and unit size)	Units in larger hospitals had lower scores on team orientation, backup behavior, and team leadership. There was no association with trust and shared mental models.

Studies of the relationship between staff characteristics and nursing teamwork are summarized in Table 5. Of the demographic factors tested (age, gender, education level), gender was the only factor associated with nursing teamwork (Kalisch & Lee, 2013; Kalisch, Russell, et al., 2013). In a comparative study of nursing teams, men reported lower perceptions of teamwork when compared to women (Kalisch & Lee, 2009). Men and women differed on the overall nursing teamwork and shared mental model scores. Later studies using hierarchical modeling indicate that teamwork does not vary based on gender (Kalisch & Lee, 2013).

Work factors such as the shift work, hours worked, employment status, and staffing adequacy have also been tested in studies of nursing teamwork. Nurses who work night shift appraise teamwork differently than nurses on other shifts. A plausible explanation is that less coordination is required to care for patient during night shift. Other departments in the hospital are typically off duty and physicians do not typically come to the patient care unit to see a patient unless necessary. However, contextual factors that differ during night shift have not been explored. Several factors may impact a nurse's perception of staffing for a shift including the number of patients cared for by an individual nurse, the number of RNs on the nursing team, and the hours per patient day (HPPD) (Kalisch & Lee, 2009; Kalisch & Lee, 2011). HPPD is a widely used staffing indicator calculated as the overall time expended by nurses (RN, LPNs, NAs) providing direct patient care on a specific patient care unit. Furthermore, fluctuations in workload during a shift influence nursing teamwork.

Table 5. Relationship between staff characteristics and nursing teamwork

Study	Staff Characteristic	Results
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Kalisch and Lee (2009)	Age	Significantly different for shared mental models in that the mean score for the older group (55 years old or more) was significantly higher than the 35-44 years old group.
Kalisch and Lee (2009)	Education	Not significantly different
Kalisch and Lee (2009)	Ethnicity	Not significantly different
Kalisch and Lee (2009)	Shift Worked	Nurses on day, evening, night and rotating shifts differed significantly on overall teamwork score, team leadership, and backup behavior. The night shift reported the highest scores on team leadership and backup behavior.
Kalisch and Lee (2009)	Work Hours	Nurses who worked 8 or 10 hours per shift reported significantly higher scores on team leadership than nurses who worked 12 or more hours or a combination of shifts
Kalisch and Lee (2009)	Employment Status	Nurses who work less than 30 hours per week reported significantly higher scores on overall nursing teamwork, team leadership, team orientation, back up behavior, trust, shared mental model.
Kalisch and Lee (2009)	Gender	Significantly different for overall nursing teamwork score in that the mean score for men was significantly lower than that of women.
Kalisch and Lee (2009)	Overtime in the last 3 months	Nurses who did not work overtime in the last three months reported significantly higher scores on overall nursing teamwork, team leadership, team orientation, back up behavior, trust, shared mental model.
Kalisch and Lee (2009)	Experience in Role	Staff with less than 6 months of experience scored higher on overall nursing teamwork, team orientation, trust, shared mental models. Nurses did not differ by experience on team leadership or back up behavior.
Kalisch and Lee (2009)	Experience on Unit	Staff with less than 6 months of experience scored higher on overall nursing teamwork, team leadership,

		team orientation, trust, shared mental models. Nurses did not differ by experience on back up behavior.
Kalisch and Lee (2009)	Absenteeism in the last three months	
Kalisch and Lee (2009)	Staffing Adequacy	Nurses who report that staffing is adequate 100% of the time scored significantly higher on overall nursing teamwork, team leadership, team orientation, backup behavior, trust, shared mental models.
Kalisch & Lee (2013)	Gender, Age, Shift, and Overtime	Did not significantly differ on overall nursing teamwork score
Kalisch & Lee (2013)	Model (nursing role, full time equivalency, work hours, experience on unit, absenteeism, staffing adequacy, and unit type)	Model explained 18% of variance in overall nursing teamwork. Nursing Role: Nursing leaders and unit secretaries scored higher on overall nursing teamwork, team leadership, backup behavior, shared mental models. NAs scored lower on team orientation than RNs. Full time equivalency: reported lower scores on team orientation and shared mental models. Work hours: night shift reported higher scores on team leadership, team orientation, backup behavior, and trust. Experience on unit: positively related to team orientation Absenteeism: nurses who missed two to six shifts in the past three months reported lower scores on team orientation, backup behavior and trust. Staffing adequacy: positively related to overall nursing teamwork, team leadership, team orientation, backup behavior, trust and shared mental models Unit type: psychiatric units scored highest; then ICU; medical surgical, intermediate, rehabilitation scored lowest on overall nursing teamwork

Nursing teamwork varies by nursing role (Kalisch & Lee, 2013). Nursing team members in leadership and administrative roles perceive teamwork to be better than nursing staff in direct patient care roles (Kalisch & Lee, 2013). The differences were noted in overall nursing teamwork, and its five factors (backup behavior, shared mental model, trust, team leadership, and team orientation). Among the direct care nursing roles, LPNs perceived teamwork to be lower than RNs or NAs. This difference was noted in the team orientation factor of nursing teamwork (Kalisch & Lee, 2013).

Nursing staff with less than 6 months experience in their nursing role had higher levels of teamwork, shared mental models, trust, and team orientation than nurses with more experience (Kalisch & Lee, 2009). Less than 6 months experience on the unit was also associated with higher levels of nursing teamwork. Experience on the unit was associated with overall nursing teamwork and four factors (shared mental models, team leadership, team orientation and trust) (Kalisch & Lee, 2009). However, other studies showed no relationship between experience and nursing teamwork (Kalisch & Lee, 2013).

Absenteeism is also related to nursing teamwork (Kalisch & Lee, 2013). Nurse who missed two to six shifts in the past three months reported lower scores on team orientation, backup behavior and trust. Reasons for this relationship have not been explored. However, the nursing workforce is aging. The average age of RNs is 45 years old. Nursing is a physically demanding profession; it is plausible that nurses who require more assistance with physically demanding tasks are absent because of minor injuries.

Several characteristics of the hospital, unit, and nursing staff are related to effective teamwork on patient care units. Empirical evidence supports that teamwork is

better in smaller hospitals and when staffing is adequate to meet the demands of patient care (Kalisch & Lee, 2009; Kalisch, Lee, & Rochman, 2010; Kalisch & Lee, 2010, 2011, 2013; Kalisch, Russell, et al., 2013). Individual differences such as gender, work factors, nursing role, and experience are also related to nursing teamwork. Understanding the factors that contribute to effective nursing teamwork may improve healthcare outcomes.

Teams that have lower levels of teamwork report more medical errors (e.g. patient falls, pressure ulcers) (Catchpole et al., 2007; Kalisch et al., 2007) and omissions in nursing care (Ausserhofer et al., 2014; Ball et al., 2014; Kalisch & Lee, 2010; Kalisch & Xie, 2014). In addition to patient outcomes, teams with lower levels of teamwork report worse staff outcomes such as lower levels of satisfaction (Havig, Skogstad, Veenstra, et al., 2011; Kalisch, Lee, & Rochman, 2010; Rafferty et al., 2001) increased turnover (Brunetto et al., 2011), and more conflict among team members (Kalisch, 2011). Subsequently, identifying factors that contribute to effective nursing teamwork is important to better understand strategies that can be used to improve patient and staff outcomes.

LEADERSHIP AND TEAMWORK

Theoretical and empirical evidence supports that leadership is an important contextual factor for team effectiveness (Burke et al., 2006; Fleishman et al., 1992; Morgeson et al., 2009; Zaccaro et al., 2002). Likewise, studies support that the leadership behaviors of nurse managers influence the teamwork environment of nurses on patient care units (Cummings et al., 2010; Patrician et al., 2010; C. Wong & Cummings, 2007). Staff who report that their nurse manager is a “good leader” and manager also report a more positive work environment (Patrician et al., 2010).

Leadership behaviors of nurse managers that are person-focused (e.g. establishing a supportive social climate, training, and development) influence affective states of nurses (Cummings et al., 2010). Person-focused leadership behaviors are positively related to team climate, collaboration, satisfaction, and group cohesion (Ibid). Leaders who engage in person focused behaviors have satisfied followers who perceive them as effective (Castner, Foltz-Ramos, Schwartz, & Ceravolo, 2012). These leaders support the desire of nursing staff to be acknowledged, respected, and valued (Cameron, Harbison, Lambert, & Dickson, 2012). Leaders who provide this support are perceived as good leaders and cultivate an environment that supports teamwork (DeChurch, Hiller, Murase, Doty, & Salas, 2010). Leadership behaviors that are person-focused create an environment that is empowering (Müllern & Nordin, 2012), supports team innovation (Aarons & Sommerfeld, 2012), and adoption of evidence-based practice. Furthermore, person-focused leadership behaviors increase role clarity and decrease role ambiguity (House & Aditya, 1997), which have been shown to be barriers to nursing teamwork (Kalisch, 2011). While person-focused behaviors influence the affective and motivational states of team members, task-focused leadership behaviors provide structure.

Leadership behaviors that are task-focused (e.g. defining role responsibilities, organizing work) help teams develop norms and coordinate patient care. Studies of leadership of nurses found that task focused leadership behaviors enhance team climate and group processes and decrease role conflict in nursing teams (Cummings et al., 2010). Teams that work in complex environments or come together for a short period of time also benefit from task-focused leadership behaviors (Aitken et al., 2011; Cummings et al.,

2010; Scott, VandenBeld, & Cummings, 2011). For example, members of national disaster teams prefer clear command structures and clearly defined roles (Aitken et al., 2011). Using a multilevel approach, Havig, Skogstad, Kjekshus, and Romoren (2011) found that task-focused leadership behaviors were related to job satisfaction at individual and patient care unit levels. Contrary to previous studies (e.g., (DeRue, Nahrgang, Wellman, & Humphrey, 2011; Judge & Piccolo, 2004), the relationship between task-focused leadership behaviors and job satisfaction was stronger than for person focused leadership behaviors in their sample. The stronger effect of task-focused leadership behaviors on job satisfaction was particularly high in patient care units with high turnover suggesting that teams with low staff stability may require task-focused leadership behaviors. High turnover is typical of nursing teams in military settings, which may influence the type of leadership behaviors that are most effective in creating a supportive teamwork environment. Nurse managers in a military setting may also apply specific leadership behaviors developed through experience working in their branch of military service (Air Force, Army, Navy).

The military is a hierarchical organization and is grounded in formal leadership processes. Formal and informal leadership processes help teams overcome contextual challenges and to regulate teamwork behaviors in pursuit of team goals (Morgeson et al., 2009; Morgeson et al., 2010). The military specifies leadership responsibilities through policies and builds leadership skills through procedures and training. Officers are expected to possess expert knowledge and are responsible for mission success or failure (ADRP 6-22). The role of the enlisted is to execute military orders and to maintain standards and discipline.

To determine leadership behaviors that are important to the military, the following leadership policy doctrines were reviewed: Air Force Doctrine Document 1-1 (8 November 2011), Army Doctrine Publication 6-22 (1 August 2012), and the Navy Leadership Competency Model (<http://www.netc.navy.mil/centers/cppd/>) (2014). Table 6 outlines the Air Force, Army, and Navy core leadership competencies.

The military leadership competencies emphasize the significance of planning and providing organization and structure within military teams. Order and consistency is maintained through activities such as planning, organizing, staffing, and controlling (Kotter, 1999). The importance of these activities for the Air Force, Army, and Navy are reflected by the leadership competencies listed under the categories “organization,” “achieves,” “accomplishing mission,” and “resource stewardship”.

In addition to producing order and consistency, leaders must also be able to produce change and movement of teams by influencing followers. Change and movement are produced through activities such as establishing direction, aligning people, and motivating and inspiring (Kotter, 1999). Leadership competencies listed under the categories “personal,” “people/team,” “leads,” “develops,” “leading people,” “leading change,” “working with people,” reflect the importance of leadership activities that produce change and movement.

Table 6. Leadership Competencies

Air Force (AFDD 1-1)	Army (ADP 6-22)	Navy (Navy Leadership Competency Model)
Personal • Ethical leadership • Followership • Warrior ethos • Develops self • Speaking and writing • Active listening	Leads • Leads others • Builds trust • Extends influence beyond chain of command • Leads by example • Communicate	Accomplishing mission • Responsibility, accountability, authority • Decisiveness/risk management • Continuous improvement • Problem solving • Technical credibility
People Team • Develops and inspires others • Takes care of people • Builds teams and coalitions • Negotiating	Develops • Creates a positive environment • Prepares self • Develops others • Stewards the profession	Leading People • Develop people • Team building • Combat/crisis leaders • Conflict management • Leveraging diversity • Professionalism
Organizational • Operational & strategic art • Unit, Air Force, Joint, & Coalition capabilities • Non-adversarial crisis response • Enterprise structure & relationships • Government orgs & processes • Global, regional, & cultural awareness • Strategic Communication • Resource Stewardship • Change management • Continuous improvement • Vision • Decision making • Adaptability	Achieves • Gets results	Leading change • Creativity & innovation • Vision • Strategic thinking • External awareness • Flexibility • Service motivation
		Working with People • Influencing & negotiating • Partnering • Political awareness • Oral communication • Written communication
		Resource Stewardship • Financial management • Leveraging technology • Human resource management

MILITARY NURSING TEAM EFFECTIVENESS

Characteristics that may be salient inputs to military team effectiveness are depicted in figure 8. Studies of nursing teamwork have identified hospital characteristics, unit characteristics, and staff characteristics that seem to influence nursing teamwork in civilian hospitals. However, these characteristics have not been tested in a military hospital.

The teamwork environment in a military hospital is shaped by additional contextual factors (e.g. the mission, turnover) that may influence nursing teamwork (DoD, 2014). Findings from the Military Health Systems Review Group indicate that teamwork is consistently lower in military hospitals when compared to civilian hospitals (DoD, 2014). They cite frequent turnover as a significant issue that impacts staffing in military hospitals. The turnover of nursing staff is highest among the military who change geographic locations every few years. The assertion that turnover impacts staffing is supported by data from the Hospital Survey on Patient Safety Culture (HSOPS), which indicates that 48% of respondents in military hospitals perceive staffing to be adequate compared to 57% of respondents in civilian hospitals.

Nursing teams in military hospitals also differ from nursing teams in civilian hospitals on other characteristics. Military nurses who comprise about 50% of the team are more likely to be male, have expanded roles, and have less experience than civilians (Patrician et al., 2010). For example NAs have the role as first responders in a combat setting. The military not only change geographical locations but also locations within the same hospital. Military nurses progress to specialty care units or administrative and leadership positions after a few years (Patrician et al., 2010). As a result, military nurses

have less years of experience working on a specific patient care unit than their civilian counterparts.

Nursing teams in military hospitals also have salient input variables that have not been studied. Team members are differentiated by additional characteristics such as by personnel category (military or civilian), service affiliation (Air Force, Army, Navy), and pay grade (officer ranks, enlisted ranks). These team members also work in a hierarchical organization that is grounded in formal leadership processes. Although studies support that leadership is an important for teamwork, the relationship between leadership and nursing teamwork has not been tested (Burke et al., 2006; Fleishman et al., 1992; Morgeson et al., 2009; Zaccaro et al., 2002).

Hospital characteristics, unit characteristics, and some staff characteristics (age, education, shift worked, work hours, and employment status) were not included in this study because these factors were not expected to vary in a single military hospital. The focus of this study was to identify a set of characteristics at the individual level that may be important for nursing teamwork in a military setting. These individual level characteristics and their proposed relationship to nursing teamwork are depicted within the dashed outline in Figure 8.

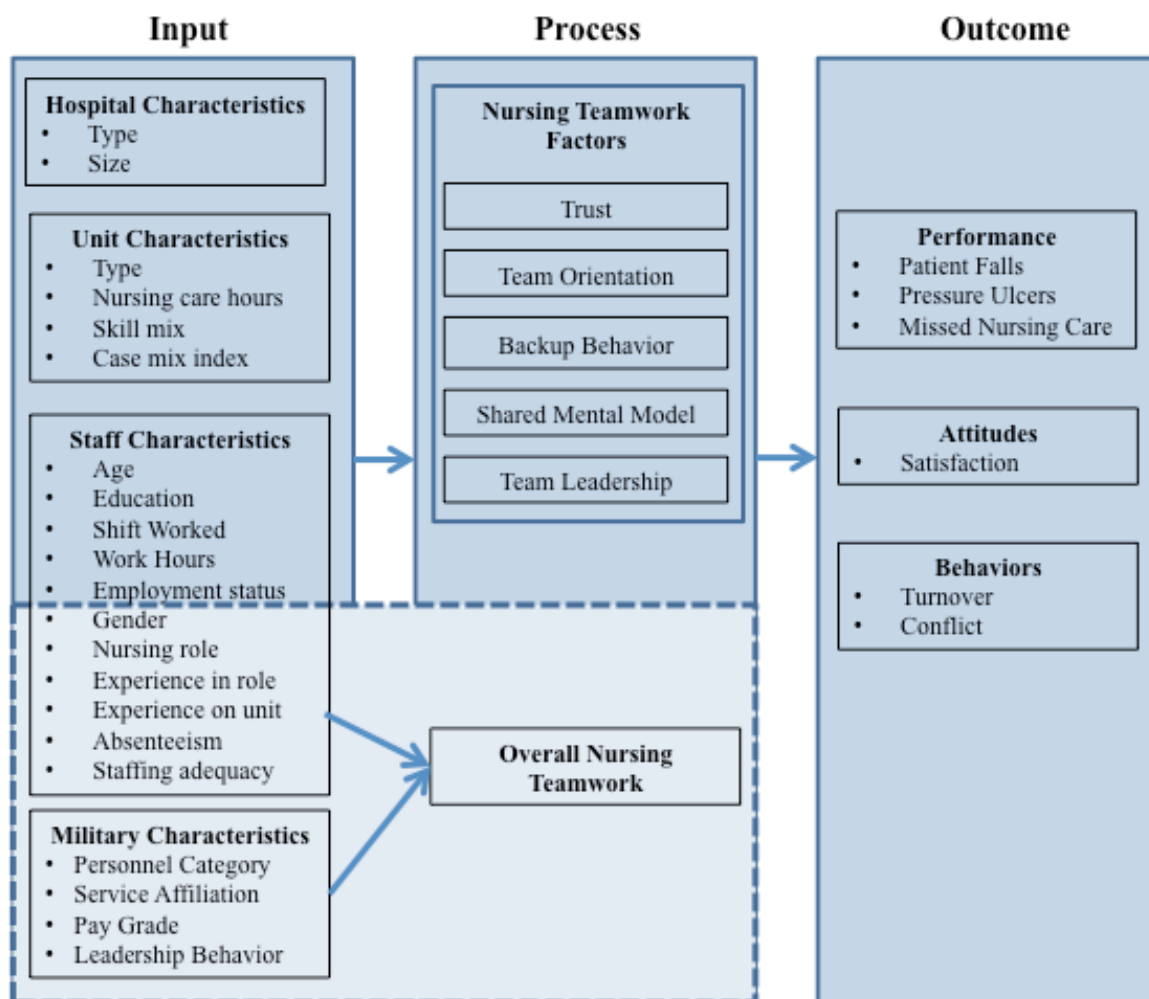


Figure 8. Proposed military nursing team effectiveness framework.

The framework is based on variables tested in a civilian hospital and additional characteristics of nursing staff in military settings. Staff Characteristics and Military Characteristics within the dashed outline are included in this study.

CHAPTER SUMMARY

In this chapter the literature that supports a conceptual framework for nursing team effectiveness was developed. Studies of nursing teams have begun to address an important gap in the literature on healthcare, the effectiveness of teams on patient care units. These studies have defined the concept of nursing teamwork and identified related factors and outcomes of nursing teamwork on patient care units, where patients receive

the majority of their hospital care. A small amount of literature supports that staff characteristics (gender, nursing role, experience absenteeism, staffing adequacy) are related to nursing teamwork in civilian hospitals. A gap in this literature is the relationship between staff characteristics and nursing teamwork in a military hospital. Additional contextual factors may impact nursing staff in military hospitals. Therefore, the literature that supports the importance of military characteristics (personnel category, service affiliation, pay grade, leadership behavior) is also presented. The relationship between military characteristics and nursing teamwork has not been explored. The conceptual model for the current study is illustrated in figure 1. The methods and procedures for testing this conceptual model are presented in the next chapter.

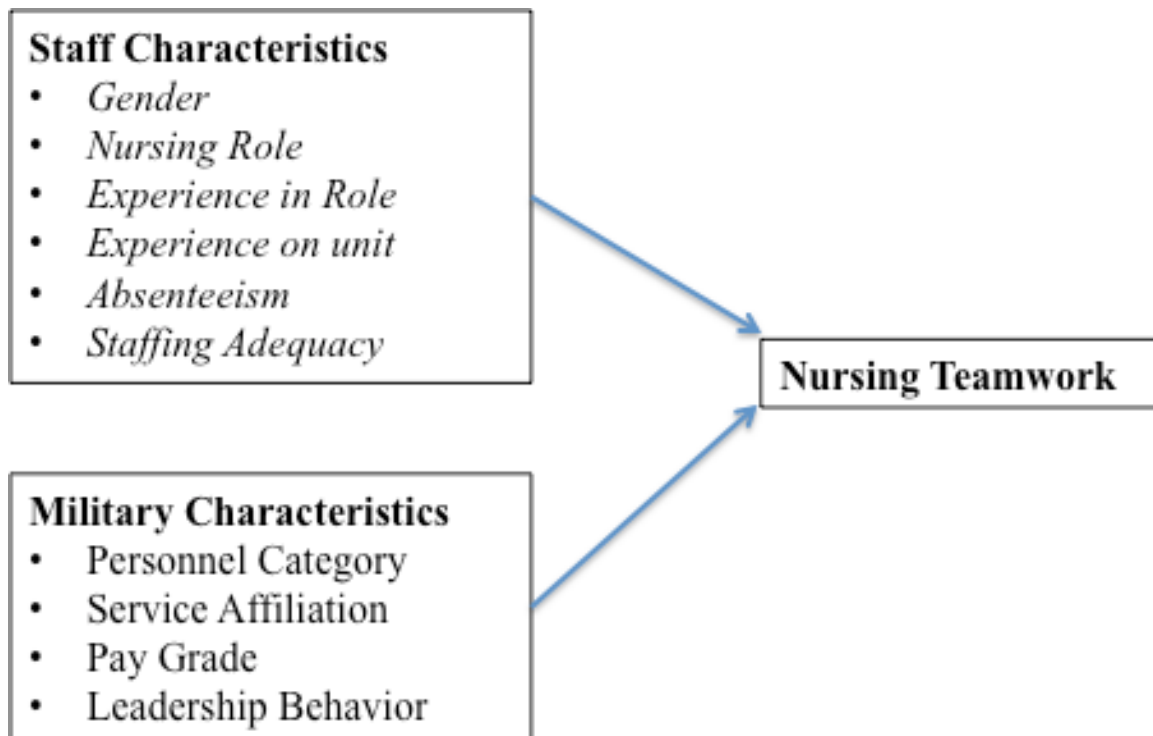


Figure 1. Study framework for correlates and factors of nursing teamwork in a military hospital.

Variables in italics have been tested in previous studies of nursing teamwork in a population of civilian nurses. Adapted from “Variations of Nursing Teamwork by Hospital, Patient Unit, and Staff Characteristics,” by B. Kalisch and K.H. Lee, 2013, *Applied Nursing Research*, 26, p.2. Copyright 2013 by Elsevier Inc.

CHAPTER 3: Methods

The literature presented in chapter 2 supports that nursing teamwork is influenced by characteristics of nurses on the team. A gap in the literature is the relationship between individual characteristics and nursing teamwork in a military hospital. This chapter describes the methods that were used in this study to determine the relationship between individual characteristics of nursing team members and nursing teamwork in a military hospital. It includes a description of the research design, sample and selection criteria, procedures for data collection, processes to ensure the protection of human subjects, instruments and their psychometric properties, and data analysis procedures.

RESEARCH DESIGN

A conceptually driven cross-sectional correlational study using survey methodology was used to assess staff and military characteristics and their relationship with nursing teamwork. Staff characteristics and military characteristics were then tested as correlates and factors associated with nursing teamwork in an acute care military hospital.

SAMPLE AND SELECTION CRITERIA

Setting and sample.

A convenience sample of nursing staff at Walter Reed National Military Medical Center (WRNMMC) was recruited to participate in this study. WRNMMC is a 261 bed academic medical center in the national capital area that serves the health care needs of approximately 205,000 beneficiaries annually. In addition, the hospital is a referral center for some of the most complex patients in the MHS because of the availability of

specialty care services. Patients with complex injuries sustained in overseas military operations and those with rare illness are often treated at WRNMMC.

WRNMMC has an average patient census of 183 patients. Patients admitted to the hospital are cared for on 15 patient care units. Of the units, four are intensive and intermediate care, and include a medical ICU, Surgical ICU, Neonatal ICU, and Pediatric ICU. Six of the units are medical-surgical, and five are specialty care units. The specialty care units include a hematology/oncology, obstetric, pediatric, psychiatric, and a TBI rehabilitation unit.

WRNMMC employs approximately 694 nursing staff to work on patient care units. Of these, approximately 39% are military officers, 35% are military enlisted and 26% are federal civilian employees. The military are affiliated with the Air Force, Army, or Navy. The military officers are registered nurses (RNs), while the enlisted and civilians work in various patient care roles. Of the enlisted, approximately 15% are licensed practical nurses (LPNs), and 85% are medics, corpsman, or technicians. Of the civilians, approximately 94% are registered nurses (RNs), and 6% are nursing assistants (NAs).

Based on this administrative data, the nursing staff at WRNMMC was expected to differ in demographics, education and training, and experience from the national nursing population. As a whole, the nursing staff in military hospitals differs from that of the national nursing population because of the large portion of officers and enlisted. While federal civilian nurses are similar in demographics to the national averages, the military diverge. Previous studies (Patrician, Shang, & Lake, 2010) indicate that military nurses

are younger (18-30 years old), and 34% male when compared to their civilian counterparts (25-54 years old, and 10% male).

The education and training of military nursing staff also differs from civilian counterparts. The minimum educational requirement is a bachelor's degree in nursing for military officers, while only 45% of the national RN population possesses this level of education (HRSA, 2013). Newly graduated military officers also complete a clinical nursing transition program to facilitate the transition from student to professional practice prior to working independently. Further didactic and clinical training is required for military officers that specialize in the nursing care of specific patient populations. To specialize in critical care, military officers must complete a course and clinical training prior to working independently. The military services differ in their didactic requirements to specialize in obstetrics and gynecology and psychiatric and mental health nursing. Army officers must complete a course and clinical training. In contrast, Air Force officers may specialize in these areas after gaining one year of experience on a medical surgical unit, and Navy officers may begin working on these units without prior nursing experience.

Enlisted are designated as an LPN, medic, corpsman, or technician after specialized training is completed (U.S.Army, 2007). The Army is the only service that has military LPNs in their staffing mix. The requirements for designation as an LPN are graduation from an accredited licensed practical or vocation nurse program, a valid LPN/LVN license, current Emergency Medical Technician-Basic certification or equivalent training through the Army Medical Department Center and School (AMEDD C&S) to meet 68W Military Occupational Specialty (Health Care Specialist)

requirements, and completion of 120 hours of critical care experience at an approved training site. Medics, corpsman, and technicians attend structured training in their role as first responders in a deployed setting and as an assistant in the hospital or clinic setting. Medics, corpsman, and technicians must demonstrate competency and obtain certifications prior to providing patient care. For example, medics and technicians complete EMT-Basic or equivalent training and corpsman complete clinical and medication certifications before arriving at their first duty station. Training prepares these nursing staff members for expanded roles and to use algorithms to treat patients under the direction of licensed medical and nursing staff.

The experience levels among nursing staff in military hospitals vary. Civilian nurses are a more experienced group of staff nurses than their military counterparts. Civilians generally have at least one year of nursing experience when they enter the federal system, and tend to stay in staff nurse positions (Patrician et al., 2010). Civilian RNs in staff nurse positions have about 14 years of experience. Conversely, military typically enter the system after completing minimum education and training requirements and move out of staff nurse positions over time.

Experience in the RN nursing role also varies among military officers. In general military progress in pay grade as years of experience increases. The pay grade of officers assigned to patient care units at WRNMMC range from O1-O4. Military officers in the grade of O1 generally have less than two years of experience as an RN, while officers in the grade of O4 have more than 9 years of experience as an RN. Approximately 32% of the military officers assigned to WRNMMC as an RN are in the paygrade of O1. Of these, 75% work on a medical-surgical unit. Officers with more than two years of

experience generally work on ICUs or specialty care units. Military officers who specialize in a specific patient population are typically required to gain a few years of experience on a medical surgical unit before completing additional didactic and clinical training. While these military officers have more experience in their role as an RN; they may have little experience in caring for their specialized patient population.

Estimating the experience of enlisted military is less precise. Enlisted staff members with civilian education enter the military at higher pay grades than those without college credit hours. For example, an LPN in the grade of E4 may have no experience or several years of experience as an LPN. Additionally, LPNs may have experience working as a Medic prior to attending the practical nurse program. The pay grade of military LPNs at WRNMMC range from E4 - E6. The pay grade of military medics, corpsman, and technicians ranges from E1 - E5. Approximately 73% of the enlisted are in the grade of E3 and below. Enlisted in this pay grade typically have less than four years of experience if they entered the military as an E1. Consequently, the collection of data at WRNMMC allowed for a sample with variation in individual characteristics. Variation is important for identifying factors that are related to an outcome (Munro, 2005).

Selection criteria.

The inclusion criteria were: (1) nursing personnel (RNs, LPNs, NAs, medics, corpsman, and technicians) who work on an inpatient ICU/Intermediate, medical-surgical, maternal child health, or psychiatric care unit; who are (2) employed full time (either active duty military or Defense Health Agency (DHA) civilian) in a direct patient care role; and (3) are willing to participate in the study. Exclusion criteria were nursing

personnel who: 1) work in an emergency department or perioperative unit 2) or in management or purely administrative role (e.g. unit clerk).

Power analysis and sample size estimation.

A power analysis was calculated to determine the required sample size using G*Power software, Version 3.1.9.1 (Faul, Erdfelder, Buchner, & Lang, 2009). Power, or the probability that a statistical test will detect a significant difference if one actually exists, was set at 80%, which is the desirable level in behavioral science research (Gliner, Morgan, & Leech, 2009). The significance level was set at $p = .05$. The sample size for a medium effect size for regression was chosen for 20 variables to associate staff characteristics and military characteristics to nursing teamwork.

Effect size is the degree to which the phenomenon is present in the population (Gliner et al., 2009). A moderate effect size ($r^2 = .3$) was chosen based on the work of Kalisch and colleagues (Kalisch & Lee, 2013) that indicate a moderate effect size for factors related to nursing teamwork in civilian hospitals is typical. Based on an a priori multiple regression omnibus test, the required sample size for a study with power of 80%, $\alpha = .05$ and a moderate effect size is 271 surveys.

PROTECTION OF HUMAN SUBJECTS

The Institutional Review Board from Walter Reed National Military Medical Center reviewed and approved this study. The Institutional Review Board from Uniformed Services University of the Health Sciences concurred with the review. Because of the potential for subtle coercion or intimidation of junior military enlisted personnel who are used to complying with instructions and directions from authority figures, the investigator wore civilian clothing while interacting with the participants.

Although wearing civilian clothes may be perceived as deceptive, it is general practice for recruiting participants in a military hospital to avoid undue influence of junior staff to participate.

Privacy and confidentiality of participants.

Questionnaires were anonymous and no personally identifiable information was collected. Questionnaires were distributed to all nursing personnel who met criteria for inclusion in the study. A locked collection box was placed on each unit to protect the responses provided by individual participants. Additional protections were instituted with procedures for data collection, coding, and reporting. Data such as age and pay grade were collected as a range to protect the privacy of participants. The coding of data ensured that nominal categories contained several participants. Data were analyzed and reported in aggregate and are not identifiable by patient care unit.

Confidentiality of the research data.

Completed questionnaires were placed in a locked file cabinet, located in the PIs secured office. The questionnaires will be maintained as part of the study file for three years from the date the study is closed in accordance with 32 CFR 219.115(b), and then shredded.

DATA COLLECTION PROCEDURES

To garner support for the study, the investigator met with nursing leadership at all levels. During a face-to-face meeting, the investigator provided the Chief Nursing Officer with an overview of the study, answered questions, and requested support. The support requested included access to nursing personnel, permission to place a survey box

on each patient care unit, and permission to distribute the survey during duty hours. Written permission to recruit nursing personnel and a signed letter of support were obtained from the Chief Nursing Officer following the meeting.

The investigator began face-to-face meetings with inpatient nursing leadership approximately two weeks prior to recruiting nursing staff. Senior leaders in the nursing administrative offices received a brief overview of the study and a letter of support signed by the Chief Nursing Officer. Next, the investigator met individually with the nurse managers of the patient care units. The meetings took place in the nurse manager offices and lasted from 15 minutes to an hour depending on questions. The nurse managers were provided general information about the study, the contact information of the investigator, and an overview of the process for recruiting. The investigator discussed the location and maintenance of the surveys and survey box, collection of the data, and removal of the survey box. The investigator stressed that participation in the study was voluntary and that results of the study would be shared as a summary of the dissertation findings.

The investigator recruited study participants from 15 patient care units at Walter Reed National Military Medical Center in September 2014. The initial contact of nursing staff took place in the evening immediately following IRB approval. Nurse managers were not present during the initial contact of nursing staff.

During the initial contact, the investigator approached the charge nurse of each unit and requested to speak to the nursing staff about the study. The investigator provided an overview of the study. The investigator handed surveys to nursing staff and referred them to the cover letter of the survey booklet. The investigator described the purpose, eligibility criteria, and information about how the results of the study would be

used and shared with the participants. The investigator provided contact information for the investigators and the Director of Human Research Protections. Questions about the study were answered.

The investigator disclosed the voluntary nature of the study and described the precautions taken to ensure the responses were anonymous and private. These precautions included the use of anonymous surveys and a locked survey box. The investigator showed the nursing staff the locked survey box, and instructed them to place completed surveys in the box. The locked survey box was placed on each patient care unit in a location designated by the nursing staff as being accessible and attention grabbing. A study flyer was attached to each survey box to make them easy to identify and to advertise the study.

Steps were taken to maximize participation and to minimize disruption to patient care. The investigator solicited input from the nursing staff about the best days and times to recruit participants on each patient care unit. In addition, the investigator requested that nursing staff share information about the study with the oncoming shift and staff who were not present for the overview. Blank survey booklets were placed next to each survey box. Prior to leaving the unit, the investigator recorded the number of survey booklets distributed to each patient care unit.

The survey booklet was a 5.5 x 4.25 inch self-administered questionnaire. The 10-page survey booklet contained a cover letter followed by a 3-part questionnaire. The cover letter described the purpose of the study, instructions for returning the survey, and standard information found in an informed consent document. The 3-part questionnaire contained 86 items designed to collect background information, data on nursing

teamwork, and data on leadership behaviors. On the last page of the survey, participants were thanked and reminded to place completed surveys in the locked survey box.

The investigator visited nursing units frequently to recruit for the study, answer questions, and ensure surveys were available and that the survey collection box was accessible. The schedule for visiting each unit was based on information provided by the nursing staff, and observation by the investigator regarding the best times to recruit. The schedules of nursing staff at WRNMMC follow a consistent pattern. Nursing staff work a mix of 12 hour and 8 hour shifts. Days off are grouped together. During the study period, the same nursing team members generally worked together. This pattern enabled the investigator to determine which days and times to visit each patient care unit to make initial and subsequent contacts of nursing staff. The investigator provided oral and written information about the study and answered questions for each shift until all shifts were contacted at least twice.

The nurse managers were on duty during the recruitment of day shift, but not directly involved. A few nurse managers verbally supported participation in research in general and informed nursing staff that a study was being conducted, most did not. This occurred when nursing staff requested an overview of the study during change of shift huddle, which was attended by nurse managers. Less frequently, it occurred when nurse managers were making rounds during recruitment and were asked about the study by nursing staff. None of the nurse managers knew which nursing staff completed the survey and which did not.

The investigator collected data about the nursing unit including the pay grade and service affiliation of the nurse manager, and the number of personnel assigned to the

patient care unit by nursing role. Prior to leaving the patient care unit each visit, the investigator recorded the number of surveys distributed, and the number of surveys collected from each locked survey box.

Recruitment culminated when the investigator determined that the accessible population was exhausted. The investigator determined the population was exhausted when no new contacts were made, and nursing staff reported that they had already participated or did not want to participate in the study. Following the recruitment period, the survey boxes were left on the units for an additional 2 weeks to collect surveys of late responders. Researchers at WRNMMC collected the survey boxes. The collected surveys were placed in sealed envelopes by researchers from WRNMMC who were on the study protocol. The sealed envelopes were labeled with the name of the patient care unit and sent to the investigator by certified mail.

MEASURES

Each participant completed an 87-item self-administered pen and paper survey that consisted of three separate data collection instruments (Table 7). The estimated time to complete the questionnaire was less than 30 minutes.

Table 7. Data Collection Instruments

Instrument	Concept	Measures Collected	Items	Scoring Criteria
Nursing Teamwork Survey (NTS)	Nursing Teamwork	Trust Team Orientation Back-up Behavior Shared Mental Models Leadership	33	Higher scores indicate a higher level of the nursing teamwork dimension
	Staff Characteristics	Regular Unit Education Degree	21	NA NA NA

		Gender		NA
		Age		NA
		Nursing Role		NA
		Week Hours		NA
		Work Hours		NA
		Experience on Unit		Higher scores
		Experience in Nursing		indicate more
		Role		experience
		Shift		NA
		Overtime		NA
		Absenteeism		Higher scores
				indicate more
		Intent to Leave		absenteeism
				NA
		Staffing Adequacy		Higher scores
				indicate a
		# of patients		better
		# admissions		perception of
		# discharges		staffing
		Satisfaction in		NA
		position		NA
		Satisfaction in role		NA
		Satisfaction with		Higher scores
		teamwork		indicate higher
				satisfaction
Military	Military	Personnel Category	3	NA
Personnel	Characteristics	Service Affiliation		
Factors		Pay Grade		
Leader	Perceived	Consideration	10	Higher scores
Behavior	Leadership	Integration	5	indicate more
Description	Behavior	Initiation of Structure	10	observation of
Questionnaire (form XII)		Predictive Accuracy	5	the type of
				leader
				behavior
			87	

Nursing teamwork survey.

The nursing teamwork survey (NTS) is a 33-item questionnaire with a Likert scale (1 = *rarely* to 5 = *always*) designed to measure the perception of nursing teamwork within inpatient settings. The NTS consists of five subscales: trust, team orientation,

backup behavior, shared mental models, and team leadership. The subscales combined, measure nursing teamwork on a patient care unit. Higher scores indicate more teamwork. Negatively worded items were reverse coded.

Trust.

Trust was measured with seven items that reflect the frequency in which the participant perceives that nursing staff engages in trusting behaviors on their unit. An example item is “team members value, seek, and give each other constructive feedback.”

Team orientation.

Team orientation was measured with nine items that reflect the frequency in which the participant perceives that nursing staff engages in behaviors that reflect team goals are more important than individual goals. An example item is “team members are more focused on their own work than working together to achieve the total work of the team.”

Backup behavior.

Backup behavior was measured with six items that reflect the frequency in which the participant perceives that nursing staff anticipates other team member’s needs through accurate knowledge about their responsibilities. An example item is “within our team, members are able to keep an eye out for each other without falling behind in our own individual work.”

Shared mental models.

Shared mental model was measured with seven items that reflect the frequency in which the participant perceives that nursing staff understand what nursing tasks needs to

be completed and how to best complete a task with the nursing staff available. An example item is “all team members understand what their responsibilities are throughout the shift”.

Team leadership.

Team leadership was measured with four items that reflect the frequency in which the participant perceives that charge nurses and team leaders were able to manage and lead the nursing team. An example item is “the nurses who serve as charge nurses or team leaders balance workload within the team.”

The NTS also contains a section to capture information about the patient care unit and nursing staff. Participants were asked to fill in the name of the patient care unit and the numbers of patients cared for, admitted, and discharged during the last shift worked. Categorical items measure staff characteristics including demographics, nursing role, schedule and work hours, experience, absenteeism, and perception of staffing. Satisfaction was measured with three items to capture satisfaction in the current position, with being a nurse, or nurse assistant, or a unit clerk/secretary, and with the level of teamwork on the current unit. The question stem was “How satisfied are you...?” Answer choices are on a 5 point scale where (1 = very dissatisfied to 5 = very satisfied). Intent to leave the current position is measured with one item “Do you plan to leave your current position?”. Answer choices were 1 = in the next 6 months 2 = in the next year and 0 = no plans within the year.

The development and psychometric properties of the instrument was reported in the literature (Kalisch, Lee, & Salas, 2010). Methods to establish content, concurrent, and construct validity are summarized in Table 8. The mean test-retest reliability was

.92, the coefficients on each scale ranged from .77 to .87. The overall internal consistency of the survey was 0.94; coefficients on each scale ranged from $\alpha = .74$ to $\alpha = .85$. In this study, the coefficient for the overall nursing teamwork score was similar (Cronbach's $\alpha = .94$).

Table 8. Validity of the NTS

Content Validity	Concurrent Validity	Construct Validity
Theory (Salas, Sims & Burke, 2005)	Correlation between satisfaction with teamwork and unit NTS score ($r = .63$, $p < .001$)	Exploratory Factor Analysis and Confirmatory Factor Analysis
Qualitative Data (Kalisch Weaver, & Salas, 2009)		Contrast Validity: NTS differentiated nursing teamwork of inpatient nursing staff ($r_{WG(J)} = .90$ or higher) from nursing teamwork of outpatient survival flight nursing staff ($r_{WG(J)} = .25$)
Expert Panel (content validity index 91.2%)		Convergent Validity: Correlation between the Teamwork Climate Scale of the Safety Awareness Questionnaire (SAQ) and total score on the NTS ($r = .76$, $p = .01$)

Note. The testing of the instrument and psychometric properties are reported in "The Development and Testing of the Nursing Teamwork Survey," by B.J. Kalisch, H.L. Lee, and E. Salas, 2010, *Nursing Research*, 59, pp. 42-50.

The NTS has been used in subsequent studies on medical-surgical, intermediate, intensive care, rehabilitation, pediatric, maternity, psychiatric, emergency department, and perioperative patient care units of civilian hospitals (e.g. Kalisch & Lee, 2009; Kalisch & Lee, 2013). The NTS has not been used in military hospitals.

Military personnel factors.

The investigator composed three items (personnel category, service affiliation, and pay grade) to measure the personnel factors that differentiate nursing staff in military hospitals. Previous studies indicate that nursing staff that are military differ in demographics (e.g. age, gender, education) from those who are civilian (Patrician, Shang, & Lake, 2010). Additionally, military hospitals have a formal hierarchical structure. Military officers and enlisted are differentiated by paygrade, which represents rank and status. Hierarchy and status may influence what behaviors are perceived as appropriate or inappropriate. Finally, each of the military services has a unique culture that may influence perceptions of behavior and expectations.

Leader behavior description questionnaire (Form XII).

The Leader Behavior Description Questionnaire (LBDQ) is a 100-item measure used to describe the behavior of a leader from the perspective of followers. Items are measured on a five point Likert scale with endpoints 1 = *never* and 5 = *always*. The psychometric properties of the instrument have been reported in the literature (Schriesheim & Kerr, 1974; Stogdill, 1963). The reliability of the LBDQ subscales was determined by a modified Kuder-Richardson formula (Stogdill, 1963). The Kuder-Richardson formula is a measure of internal consistency. In the modified formula, each item was correlated with the remainder of the items in its subscale rather than with the subscale score that included the item, yielding a conservative estimate of reliability. The LBDQ has been used in military and nursing populations.

The LBDQ consists of twelve scales. Four of the scales were selected for this study to tap into key leadership behaviors influenced by military service doctrine and

training. The “consideration” and “integration” scales were selected, to tap into competencies that establish direction, align people, motivate and inspire (Northouse, 2013). The “initiation of structure” and “predictive accuracy” scales were selected, to tap into competencies intended to produce order and consistency.

Consideration.

The “consideration” scale of the LBDQ consists of 10-items that measure the frequency that leaders engage in behaviors that motivate and inspire teams. An example item is “puts suggestions made by the group into operation.” Internal consistency of the scale ranged from .76 to .82 (Stogdill, 1963). In this study the coefficient for consideration was similar (Cronbach’s $\alpha = .88$).

Three items in the consideration scale are reverse coded. These items describe leader behaviors that are exclusionary. An example item is “acts without consulting the group.”

Integration.

The “integration” scale of the LBDQ consists of 5 items that measure the frequency that leaders engage in behaviors that align people. An example item is “keeps the group working together as a team.” Internal consistency of the scale ranged from .73 to .79 (Stogdill, 1963). In this study the coefficient for integration was higher (Cronbach’s $\alpha = .92$).

Initiation of structure.

The “initiation of structure” dimension of the LBDQ consist of 10-items that measure the frequency that leaders engage in behaviors intended to organize and provide

structure to work units. An example item is “lets group members know what is expected of them.” Internal consistency of the scale ranged from .79 to .83 (Stogdill, 1963). In this study the coefficient for structure was similar (Cronbach’s $\alpha = .89$).

Predictive accuracy.

The “predictive accuracy” sub-dimension of the LBDQ consists of five items that measure the frequency that leaders engage in planning behaviors. An example item is “anticipates problems and plans for them.” Internal consistency of the scale ranged from .62 to .91 (Stogdill, 1963). In this study the coefficient for predictive accuracy was similar (Cronbach’s $\alpha = .83$).

Patient care unit measures.

In addition to the self-administered survey, the investigator collected data about the nursing unit including the pay grade and service affiliation of the nurse manager, and the number of personnel assigned to the patient care unit by nursing role. The investigator recorded the number of surveys distributed and the number of surveys collected from each locked survey box.

Dependent variable.

Overall nursing teamwork.

The overall nursing teamwork score was calculated as an average of the 33 items on the NTS. Higher scores on overall nursing teamwork indicate a better perception of teamwork on the patient care unit.

Correlate and Factor variables.

Staff characteristics.

Six staff characteristics (gender, nursing role, experience on unit, experience in nursing role, absenteeism, and perceived adequacy of staffing) were tested as factors of nursing teamwork. These variables were measured with background items included on the NTS. Gender (male/female) and nursing role (RN staff nurse, LPN staff nurse, nursing assistant/tech, nurse manager/assistant nurse manager, and unit clerk/secretary) was measured with two categorical items. Experience was measured with two items to capture a nursing staff member's experience in their nursing role and on the current patient care unit. Answer choices were on a 5 point scale where 1 = *up to 6 months*, 2 = *greater than 6 months to 2 years*, 3 = *greater than 2 years to 5 years*, 4 = *greater than 5 years to 10 years*, and 5 = *greater than 10 years*. Absenteeism was measured with one item "in the past 3 months, how many days or shifts did you miss work due to illness, injury, extra rest etc. (exclusive of approved days off)?" Answer choices were on a 5 point scale where 1 = *none*, 2 = *1 day or shift*, 3 = *2 - 3 days or shifts*, 4 = *4 - 6 days or shifts*, and 5 = *over 6 days or shifts*. The perception of adequate staffing was measured with one item on the NTS "How often do you feel the unit staffing is adequate?" Answer choices were on a 5 point scale where 1 = *100% of the time*, 2 = *75% of the time*, 3 = *50% of the time*, 4 = *25% of the time* and 5 = *0% of the time*.

Military characteristics.

Eight military characteristics (personnel category, pay grade, service affiliation, consideration, integration, initiation of structure, and predictive accuracy) were tested as correlates and factors of nursing teamwork. Three variables were captured as categorical items created by the investigator; personnel category (military, civilian), service affiliation (Air Force, Army, Navy), and pay grade (O1-O2, O3-O5, GS4-GS8, GS9-

GS12, E1-E3, E4-E5). The perceived behavior of nurse managers was captured with six variables (consideration, integration, initiation of structure, predictive accuracy, and leadership score) derived from the scales of the LBDQ. The leadership composite score was calculated as an average of the structure, consideration, integration, and predictive accuracy scales of the LBDQ. Higher leadership scores indicate more frequent consideration, integration, initiation of structure, and predictive accuracy behaviors of a nurse manager on the patient care unit.

Data Analysis

Completed questionnaires were reviewed for potential data discrepancies (e.g. stray marks, double answers, or answers that are marked between two choices). Questions with two answer choices marked or that contained marks between two choices were reviewed. The most conservative response of an item was used to avoid the appearance of inflating a rating. Data were coded and double entered into Microsoft Excel by the researcher. Discrepancies in data entry were resolved by comparing the data to the questionnaire. This process continued until accuracy checks reached 100%. The data was imported into a statistical software program.

Prior to analysis, staff characteristics (gender, nursing role, experience in role, experience on unit, absenteeism, perceived staffing adequacy), military characteristics (personnel category, pay grade, service affiliation, leadership score, structure, consideration, integration, and predictive accuracy) and nursing teamwork were examined using IBM SPSS 19.0 for out of range data, missing values, and fit between their distributions and the assumptions of multivariable analysis.

Missing values on study variables are reported in Table 9. Gender, nursing role, experience on unit, absenteeism, perceived staffing adequacy, and personnel category, had four or less missing values. Plausible replacement values could not be determined and all cases were retained for analysis. More than 5% of the values on service affiliation, pay grade, consideration, integration, predictive accuracy, and nursing teamwork were missing. The missing values were examined for patterns using case summaries.

Table 9. Missing Data

Variable	Frequency	Missing		Changes to Dataset
		n	%	
Gender	219	2	.9%	None
Nursing Role	220	1	.5%	None
Experience in Role	221	0	0%	None
Experience on Unit	217	4	1.8%	None
Absenteeism	220	1	.5%	None
Staffing Adequacy	220	1	.5%	None
Personnel Category	220	1	.5%	None
Service Affiliation	154	67	43.5%	None
Pay Grade	203	18	7.6%	16 values replaced
Structure	212	9	4.1%	None
Consideration	208	13	5.9%	None
Integration	210	11	5.0%	None
Predictive Accuracy	207	14	6.3%	None
Nursing Teamwork	188	33	14.9%	None

The 67 missing values on service affiliation were further examined. All cases were in the civilian personnel category. Civilian personnel were recently affiliated with the Defense Health Agency (DHA), rather than a parent military service (e.g. Air Force, Army or Navy), during the restructuring of the MHS in the summer of 2015. Therefore, a category to capture DHA affiliation was added and missing values were replaced with a value to reflect DHA service affiliation. The 18 missing values on pay grade also had a

consistent pattern. The case summary analysis indicated that a majority ($n = 16$) of the cases were in the civilian personnel category. Of these, 14 cases were also in an RN nursing role and had a degree in nursing. Therefore, the missing values of these 14 cases were replaced with a value that reflects the pay grade (GS9-GS12) consistent with civilian RNs. Two cases ($n=2$) were also in an NA nursing role and the missing values were replaced with a value that reflects the pay grade (GS4-GS8) consistent with civilian NAs. The remaining cases were in the military personnel category and the pay grade could not be determined. The missing value of these cases was not replaced resulting in 2 missing values on pay grade.

Items that comprised the structure, consideration, integration, predictive accuracy, and nursing teamwork scales were missing from 0 to 10 values. Cases with missing values on these scale items were identified and examined for patterns. The majority of cases with missing values were also female, in an RN role, and military personnel category (Table 10). Cases with missing values for nursing teamwork did not differ from cases with nursing teamwork scores on structure ($t = .006, p \text{ ns}$), consideration ($t = .16, p \text{ ns}$), integration ($t = .62, p \text{ ns}$), or predictive accuracy ($t = .09, p \text{ ns}$). The missing values were not replaced and the variables were retained. The missing values on nursing teamwork limit the sample to 188 cases for analysis.

Table 10. Percent of Missing Data for Leadership behaviors and Nursing Teamwork by Individual Characteristics

Characteristic	Structure		Consideration		Integration		Predictive Accuracy		Nursing Teamwork	
	n	%	n	%	n	%	n	%	n	%
Gender										
Female	9	100%	11	85%	11	100%	14	100%	25	78%
Male	0	0%	2	15%	0	0%	0	0%	7	22%

Nursing Role										
RN	8	89%	11	85%	10	91%	13	93%	24	73%
LPN	0	0%	0	0%	0	0%	0	0%	0	0%
NA	1	11%	2	15%	1	9%	1	7%	9	27%
Experience in Role										
Up to 6 months	1	11%	2	15%	1	9%	2	14%	5	15%
Greater than 6 months to 2 years	4	44%	6	46%	4	37%	4	29%	10	30%
Greater than 2 years to 5 years	1	11%	3	24%	3	27%	3	21%	2	6%
Greater than 5 years to 10 years	0	0%	0	0%	2	18%	0	0%	7	21%
Greater than 10 years	3	34%	2	15%	1	9%	5	36%	9	27%
Experience on Unit										
Up to 6 months	1	13%	2	17%	1	10%	2	15%	7	21%
Greater than 6 months to 2 years	6	74%	9	75%	8	80%	8	62%	13	39%
Greater than 2 years to 5 years	0	0%	0	0%	0	0%	0	0%	5	15%
Greater than 5 years to 10 years	1	13%	1	8%	1	10%	3	23%	8	24%
Greater than 10 years	0	0	0	0%	0	0%	0	0%	0	0%
Absent shifts in past 3 months										
None	6	67%	9	69%	7	64%	9	64%	21	64%
1 shift	0	0%	1	8%	2	18%	1	7%	7	21%
2-3 shifts	3	33%	3	23%	2	18%	4	29%	1	3%
4-6 shifts	0	0%	0	0%	0	0%	0	0%	2	6%
Over 6 shifts	0	0%	0	0%	0	0%	0	0%	2	6%
Staffing Adequacy										
0% of time	0	0%	0	0%	0	0%	0	0%	0	0%
25% of time	1	11%	2	15%	1	9%	1	7%	5	16%
50% of time	1	11%	1	8%	2	18%	2	14%	6	19%
75% of time	5	56%	7	54%	4	36%	7	50%	13	41%
100% of time	2	22%	3	23%	4	36%	4	29%	8	25%
Service Affiliation										

Air Force	1	12%	0	0%	0	0%	1	7%	2	6%
Army	3	33%	4	31%	3	27%	4	29%	8	24%
Navy	3	33%	7	54%	5	46%	5	36%	11	33%
DHA Civilian	2	22%	2	15%	3	27%	4	29%	12	36%
Paygrade										
O1 - O2	6	67%	10	76%	8	73%	9	64%	11	33%
O3-O5/GS9-	2	22%	1	8%	2	18%	3	22%	14	43%
GS12										
E1-E3	0	0%	1	8%	0	0%	0	0%	5	15%
E4-E5/GS4-	1	11%	1	8%	1	9%	2	14%	3	9%
GS8										

Categorical variables with poor splits were recoded to eliminate univariate outliers. LPNs were combined with NAs for analysis to reduce the poor split (11 to 210) between the LPN nursing role and other nursing roles (RN, NA). In the military setting, LPNs and NAs are not differentiated by military pay grade, therefore the LPN group is similar to the NA group in status and hierarchy. Additionally, the mean nursing teamwork scores for LPN ($M = 3.84$) and NA ($M = 3.75$) were similar. The mean nursing teamwork score for RNs was 3.67. Collapsing these categories resulted in a dichotomous variable for nursing role (1 = RN, 0 = NA or LPN).

Service affiliation was recoded into three categories to eliminate the poor split (9 to 212) between Air Force to other service affiliations (DHA, Army, Navy). The mean nursing teamwork scores were similar for Army ($M = 3.78$) Air Force ($M = 3.94$) and Navy ($M = 3.76$). The leadership (i.e. director of nursing and 13 of the 15 nurse managers) at WRNMMC is Army. Therefore, Air Force was combined with Navy to form a category for Navy and Air Force where 1 = Navy or Air Force, 2 = Army, and 3 = DHA .

Prior to multivariable analysis, military characteristic variables were recoded. Pay grade was recoded into an ordinal variable to reflect hierarchy and status; where pay

grades E1-E3 = 1, E4-E5 and GS4-GS8 = 2, O1-O2 = 3, O3-O5 and GS9-GS12 = 4.

Service affiliation was contrast coded. The first contrast was coded to compare military and civilian affiliation where 1 = Army, Navy or Air Force, and -2 = DHA civilian. The second contrast was coded to compare Army and Navy or Air Force service affiliations (1 = Army, -1 = Navy or Air Force, and 0 = DHA).

Three cases with extremely low scores on nursing teamwork were found to be univariate outliers. The outliers were civilian RNs with greater than 10 years of experience, who perceived staffing to be adequate 75% of the time. The three outliers were deleted.

The distributions of study variables were examined using statistical methods and plots. The distributions of continuous variables indicated skewness and kurtosis for absenteeism and experience. Because the sample is near 200, the skewness and kurtosis calculations were not used as the sole criterion for transformation. Further examination using frequency histograms indicated that all continuous variables were normally distributed.

Bivariate scatterplots, expected normal probability plots, and detrended normal probability plots were used to further examine pairwise linearity, distributions, and homoscedasticity. These plots indicated that the assumptions of normal distribution and homoscedasticity were met. At the completion of data screening 185 cases were available for analysis.

Demographics for the sample and subpopulations (e.g. military, civilian, patient care units) were explored to describe characteristics of the study sample. Descriptive

statistics (frequencies, means, and standard deviations) were calculated for all study variables.

Aim 1. Identify staff characteristics and military characteristics associated with nursing teamwork.

Research question 1: *What is the relationship between staff characteristics (gender, nursing role, absenteeism, experience on unit, experience in role, and perceived staffing adequacy) and nursing teamwork?* Correlational analysis and t tests were used to determine the relationship between staff characteristics and nursing teamwork (Table 11).

Table 11. Analysis of Staff Characteristics and Nursing Teamwork

Staff Characteristic	Test
Gender (nominal)	t-test
Nursing Role (nominal)	t-test
Experience in role (scale)	Pearson's r
Experience on unit (scale)	Pearson's r
Absenteeism (scale)	Pearson's r
Perceived Staff Adequacy (scale)	Pearson's r

Research question 2: *What is the relationship between military characteristics (personnel category, service affiliation, pay grade, perceived leadership behavior of the nurse manager) and nursing teamwork?* Correlational analysis, t tests, and ANOVAs were used to explore the relationship between military characteristics and nursing teamwork (Table 12).

Table 12. Analysis of Military Characteristics and Nursing Teamwork

Military Characteristic	Test
-------------------------	------

Personnel Category (nominal)	t-test
Service Affiliation (nominal)	ANOVA
Pay Grade (nominal)	ANOVA
Leadership Behavior	Pearson's r
Leadership Score (scale)	
Structure (scale)	Pearson's r
Consideration (scale)	Pearson's r
Integration (scale)	Pearson's r
Predictive Accuracy (scale)	Pearson's r

Aim 2. Test the nursing teamwork model

Question 1: *What staff characteristics and military characteristics contribute to overall nursing teamwork in a military hospital?*

Multiple regression analyses was conducted to describe the relationship among staff characteristics, military characteristics, and nursing teamwork, and to determine which variables explained nursing teamwork in a military hospital.

Prior to analyses, multivariate outliers and multicollinearity of study variables were examined. Multivariate outliers were tested using Mahalianobis distance at $p > .001$. Bivariate correlations were reviewed to assess multicollinearity of factor variables. Bivariate correlations $> .70$ were considered mutlicollinear (Tabacknick & FiddeI, 2013). Additionally, collinearity statistics were examined for factor variables. Variables with tolerance values less than .10, or a Variance Inflation Factor (VIF) greater than 10, were considered multicollinear. Additional criteria for multicollinearity are a condition index

greater than 30 and variance proportions greater than .50 for at least two different variables on a dimension (Belsely, Kuh, & Welsch, 1980). Based on this examination, it was determined that multicollinearity existed in the data.

Nine factors were highly correlated with other variables in the data set. Nursing role was correlated with pay grade ($r = .75$). Experience in role was correlated with experience on unit ($r = .71$) and personnel category ($r = -.77$). Additionally, the four leadership behavior variables (structure, consideration, integration, and predictive accuracy) were highly correlated ($r = >.75$). Further examination of eigenvalues and condition indexes indicated multicollinearity among the leadership behavior variables. The leadership behavior variables had the lowest eigenvalues and were closely examined. Three of the leadership behaviors (consideration, integration, predictive accuracy) also had condition indexes greater than 30. Additionally, the variance proportions for consideration and integration were greater than .50 on a single dimension, meeting criteria for multicollinearity.

Correlation among leadership behavior variables is a common finding in leadership studies (Judge & Piccolo, 2004; Judge, Piccolo, & Ilies, 2004; Schriesheim, House, & Kerr, 1976; Schriesheim & Kerr, 1974; Weissenberg & Kavanagh, 1972). However, correlations greater than .70 are problematic for multiple regression analysis (Tabachnick & Fidell, 2013). Options for dealing with multicollinearity include summing or averaging the collinear variables, computing principle components and replacing the collinear variables with the computed variable, and deleting the variable with the highest variance proportion (Tabachnick & Fidell, 2013). Models were computed using two of the options.

A leadership composite score was calculated by averaging the z scores of the leadership behavior variables (structure, consideration, integration, and predictive accuracy). The coefficient for the composite score $\alpha = .95$. Principle components analysis of the leadership questions was also conducted to further explore patterns in the leadership data collected. The goal of this analysis was to identify patterns in the data. A limitation of using this technique is that results are not generalizable; however, the reason for conducting the analysis was to describe and explore relationships with the data rather than to make predictions about the larger population.

A principal components analysis (PCA) was conducted on the 30 leadership items with oblique rotation (direct oblimin). An oblique rotation was chosen because it allows for correlation among factors. The Kaiser-Mayer-Olkin (KMO) measure verified the sampling adequacy for the analysis, $KMO = .943$, and all KMO values for individual items were $>.8$, which is well above the acceptable limit of $.5$. Bartlett's test of sphericity $\chi^2 (406) = 4123.72, p < .001$, indicated that correlations between items were sufficiently large for PCA. An initial analysis was run to obtain eigenvalues for each component in the data. Four components had eigenvalues over Kaiser's criterion of 1 and in combination explained 67% of the variance. The scree plot was slightly ambiguous and showed inflection that would justify retaining two or four components. Given the small sample size, the average communality of $.58$, and an examination of the components, a two-factor solution was forced on the data. The two-factor solution explained 58% of the variance, and is the number of components that were retained in the final analysis. Factors loading after rotation are reported in chapter 5. The items that cluster on the

same components suggest that component one represents leading, and component two represents being a member.

Separate regression models using the composite leadership score, and the factors derived from the data (leading and being a member) were computed. In addition, the decision was made to drop experience in role from the multiple regression analysis based on the multicollinearity diagnostics. The variables entered into each model are depicted in figure 9.

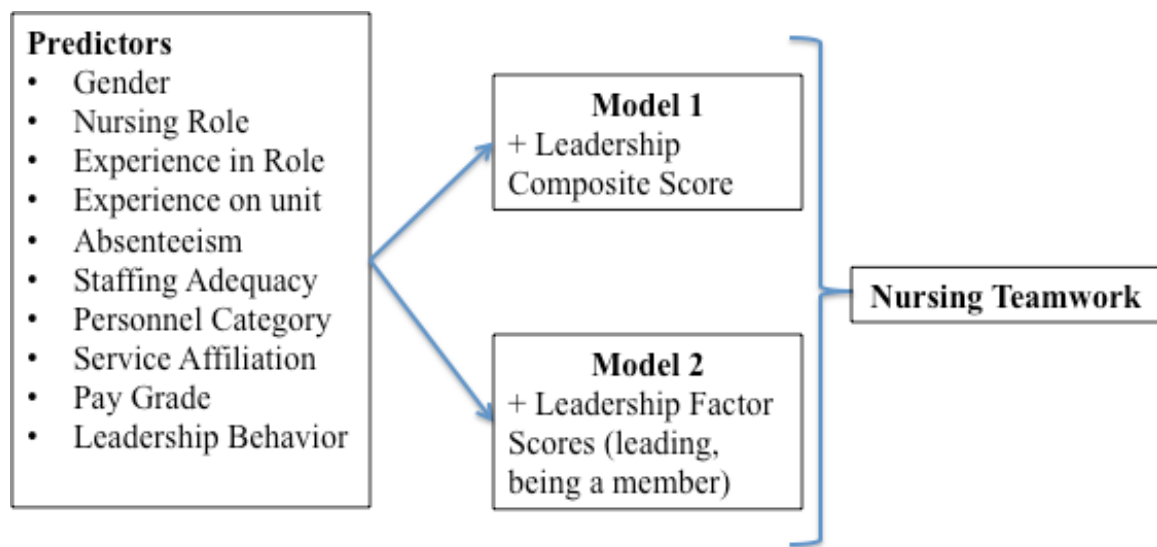


Figure 9: Multiple Regression Models.

Factor variables in the rectangle on the left are included in all models. A separate model is fit for the composite leadership score and the leadership factors scores (leading and being a member), depicted in the rectangles in the center. The dependent variable is in the rectangle on the right.

Standard multiple regression analyses and statistical multiple regression analyses using, forward entry, stepwise regression, and backward deletion variable selection techniques were conducted to describe the relationship among staff characteristics, military characteristics, and nursing teamwork. Standard multiple regression analysis was

used to examine the unique contribution of each factor variable. In this procedure, all variables enter the model at the same time and remain in the model.

Statistical multiple regression is an exploratory technique in which a model is selected based on the relationship between the factor variable and the criterion. The entry level for variables to enter all models was set at an alpha level of .05 (Draper & Smith, 1998). The exit level for variables to be removed from models was set an alpha level of .10. Three variable selection techniques (forward, stepwise, and backward) were used to select factors for inclusion in multivariable linear regression models: forward selection, backwards elimination, and stepwise regression. In forward selection, the bivariate correlations between all candidate independent variables and the dependent variable were calculated. The candidate independent variable with the largest F ratio and smallest p value was entered into model. Partial F ratios and p values were then calculated for the remaining candidate independent variables, and the candidate independent variable with the largest F ratio and smallest p value was entered into the model. This process continued until no candidate independent variable met the threshold ($p < 0.05$) for entry. In backwards selection, all candidate independent variables were simultaneously entered into the model. Partial F ratios and p values were calculated for each model independent variable as if it were the last variable entered, and the model variable with the smallest partial F ratio and largest p value was eliminated. Partial F values and p values were recomputed, and the process was repeated until all remaining model independent variables met the threshold ($p < 0.10$) for inclusion. In stepwise selection, candidate independent variables were entered one at a time into the model using the same procedure as forward selection. After each independent variable entered the model, all independent

variables in the model were examined for potential elimination using the procedure described in backwards selection. Entry and elimination of variables alternated until no further candidate independent variables met threshold for entry ($p < 0.05$), and no model independent variables met threshold for elimination ($p < .10$).

Several measures (beta weights, zero-order correlations, squared semi-partial correlation, and structure coefficients) were used to interpret multiple regression results (Nathans, Oswald, & Nimon, 2012). Beta weights were used to measure the contribution of each staff characteristic and military characteristic to the multiple regression equation, while holding other variables constant. However, when independent variables are collinear, a beta weight may reflect variance that is shared with another independent variables in the equation (Pedhazur, 1997). Therefore, additional measures were used to interpret the results. Zero order correlations measured the magnitude and direction of the bivariate relationships and were compared with the beta weights to identify variables that contributed to the multiple regression equation but did not contribute directly to nursing teamwork (Nathans et al., 2012). Squared semi-partial correlations were used to examine the unique contribution of each staff characteristic and military characteristic to the regression equation (Tabachnick & Fidell, 2013). Specifically, squared semi-partial correlations indicated how much R^2 would decrease if the variable was deleted from the model. Finally, structure coefficients were squared to examine the amount of variance in the in nursing teamwork that could be attributed to each staff characteristics and military characteristic when variance was shared among the variables (Nathans et al., 2012). Collectively these measures were used to examine the relationships among staff characteristics, military characteristics, and nursing teamwork.

CHAPTER SUMMARY

The research methodology was described in this chapter. A cross-sectional design using a survey methodology was used to examine the relationship among staff characteristics, military characteristics, and nursing teamwork in a convenience sample of nursing staff in a military hospital.

A description of the sample, inclusion and exclusion criteria for participation, and power analysis for sample size determination were discussed. Data collection procedures including the protection of research participants were outlined. An overview of the measures and psychometric properties of the survey instruments was provided. The chapter concluded with an overview of the data analysis plan.

CHAPTER 4: Results

The methods including the data analysis plan for this study were outlined in chapter 3. In this chapter, the results of the data analysis are reported. Data were analyzed using SPSS 19.0. Demographic characteristics of the sample are presented followed by the descriptive statistics of the study variables, and bivariate analysis. The results of multiple linear regression models that identify factors of nursing teamwork are described. The chapter culminates with the results of additional analysis that was conducted to test a model of nursing teamwork in a military setting.

SAMPLE

The investigator recruited study participants from 15 patient care units at Walter Reed National Military Medical Center in September 2014. Two hundred and twenty seven surveys were returned from approximately 703 eligible nursing personnel; resulting in a 32.3% return rate. Of the returned surveys, 6 surveys did not have data for 3 scales. An additional 33 surveys were missing data on at least one question on the nursing teamwork scale and therefore did not have a calculated score for nursing teamwork. Three surveys were identified as influential outliers and excluded from analysis. The final sample included 185 surveys from nursing staff of 15 patient care units. The patient care units included medical surgical (including pediatric and oncology), ICU (surgical, medical, and pediatric), mother infant child (neonatal ICU, L&D), psychiatric, and traumatic brain injury rehabilitation. These patient care units are nested within five sections (critical care, medical, surgical, maternal child, and psychiatric).

Each nursing section has a different supervisor. These supervisors may influence the nursing units through their expectations for teamwork and leadership behaviors.

Therefore, one-way between groups analysis of variances were conducted to determine whether the leadership behaviors (leadership score, leading, and being a member), and nursing teamwork differed by nursing section. There was a significant difference in the leadership score $F(4,179) = 3.74, p = .005$, being a member $F(4,168) = 4.76, p = .001$, leading $F(4,168) = 3.74, p = .006$, and nursing teamwork $F(4,180) = 3.34, p = .01$ among the nursing sections. However, nursing section was not retained as a control variable because the sample of nursing staff from the maternal child ($n = 16$) and psychiatric ($n = 18$) sections was small.

The characteristics of the final sample ($N = 185$) by section are summarized in Table 13. The sample contains responders from the five sections; however, fewer responders were from the maternal child and psychiatric sections. Overall, the majority of the responders were female (70%) under 35 years old (62%), worked in the RN role (70%) and have a bachelor of science in nursing (73%). Females in the sample worked in all sections. Conversely, some sample characteristics were more prevalent in the critical care and medical surgical sections. Males worked in critical care (13% of the sample) rather than the maternal child (0% of the sample) or psychiatric sections (3% of the sample). Similarly, 62% of the nursing staff under 35 years old worked on critical care and medical surgical units. While RNs and LPNs in the sample worked in all sections, the majority of NAs worked in the critical care (8% of the sample) and surgical sections (8% of the sample). Day shift was the most common shift worked. Forty-two percent of the sample worked day shift, followed by rotating shifts (29%), and night shift (24%). A majority of the responders who worked rotating shifts were in the critical care and medical surgical sections. Another characteristic that was more prevalent in the critical

care and medical surgical sections is experience. A majority of the responders with two years or less of experience in their nursing role worked on medical surgical units.

Conversely, responders with more than 10 years of experience worked in the critical care section.

A majority of the staff was military (64%). Of the military, 37% were Navy, 23% were Army, and only 4% were Air Force. The Air Force only worked in the critical care, while the Army and Navy worked in the critical care or medical surgical sections. Only six percent of the sample were military who worked in maternal child or psychiatric units. Most of the military were junior officers (O1-O2) and junior enlisted (E1-E3). Junior officers who worked in the medical surgical sections comprised 25% of the sample.

Table 13. Demographic Characteristics as a Percentage of Nursing Section
N = 185

	Critical Care	Medical	Surgical	Maternal Child	Psych
Characteristic	(n = 63)	(n = 39)	(n = 49)	(n = 16)	(n = 18)
Gender					
Male	38.1	33.3	25.0	0.0	33.3
Female	61.9	66.7	66.7	100.0	66.7
Age					
Under 25 years old	14.3	43.6	46.9	12.5	11.1
25-34 years old	41.3	35.9	22.4	37.5	22.2
35-44 years old	27.0	5.1	14.3	25.0	22.2
45-54 years old	7.9	7.7	10.2	12.5	16.7
55 years and older	9.5	7.7	6.1	12.5	27.8
Shift Worked					
Days	44.4	33.3	44.9	37.5	50.0
Evenings	1.6	5.1	4.1	0	22.2
Nights	28.6	17.9	16.3	37.6	27.8
Rotates	25.4	43.6	34.7	25.0	0
Nursing Role					
Staff nurse RN	74.6	71.8	58.3	93.8	55.6
Staff nurse LPN	3.2	5.1	10.4	6.3	5.6
Nursing Assistant	22.2	23.1	31.3	0	38.9

(Medic/Corpsman)					
Education Level					
High school graduate/GED	14.3	15.4	26.7	0	38.9
Associate degree graduate	12.7	15.4	11.1	18.8	0
Bachelor's degree graduate	65.1	64.1	60.0	62.5	61.1
Graduate degree	7.9	5.1	2.2	18.8	0
Highest Degree					
LPN diploma	4.0	6.9	21.2	6.3	9.1
RN diploma	4.0	0	3.0	6.3	.0
Associate's degree	4.0	0	3.0	12.5	.0
Bachelor's degree in nursing	72.0	86.2	72.7	56.3	72.7
Bachelor's degree outside of nursing	6.0	0	0	0	18.2
Master's degree or higher in nursing	6.0	6.9	0	6.3	0
Master's degree or higher outside of nursing	4.0	0	0	12.5	0
Experience in Role					
Up to 6 months	12.7	20.5	16.3	6.3	11.1
Greater than 6 months to 2 years	19.0	43.6	49.0	12.5	5.6
Greater than 2 years to 5 years	25.4	15.4	6.1	12.5	11.1
Greater than 5 years to 10 years	14.3	2.6	14.3	25.0	50.0
Greater than 10 years	38.6	17.9	14.3	43.8	22.2
Experience on Unit					
Up to 6 months	14.8	23.7	18.4	12.5	35.3
Greater than 6 months to 2 years	41.0	44.7	51.0	37.5	5.9
Greater than 2 years to 5 years	14.8	10.5	16.3	12.5	29.4
Greater than 5 years to 10 years	29.5	21.1	14.3	37.5	29.4
Service Affiliation					
Air Force	11.1	0	0	0	0
Army	23.8	25.6	26.5	18.8	11.1
Navy	28.6	56.4	44.9	18.8	16.7
DHA	36.5	17.9	28.6	62.5	72.2
Pay Grade					
E1-E3	11.3	15.4	16.7	0	22.2
E4-E5 or GS4-GS8	11.3	12.8	22.8	6.2	33.4
O1-O2	25.8	51.3	54.2	12.5	0
O3-O5 or GS9-GS12	51.6	20.5	6.3	81.3	44.4

The influence of the military on the demographics is reflected in several of the sample characteristics (Table 14). While the percentage of military females (39%) was similar to that of civilian females (31%), the majority of males were military. Military males comprised 25% of the entire sample. While ages of the entire sample ranged from under 25 years old to over 55 years old, the population as a whole was relatively young. More than half of the nursing staff was under 35 years old, and the majority of those less than 35 years old were military. The influence of the military experience is also reflected in the sample characteristics. Overall, the nursing staff is relatively inexperienced. Only about 39% of the nursing staff had more than 5 years of experience in their nursing role and working on their patient care unit. Most military nursing staff had two years or less of experience in their nursing role and on their patient care unit.

Table 14. Demographic Characteristics as a Percentage of Civilian and Military Personnel Category

Characteristic	Civilian (n = 67)	Military (n = 118)
Gender		
Male	13.6	39.0
Female	86.4	61.0
Age		
Under 25 years old	1.5	44.1
25-34 years old	17.9	41.5
35-44 years old	31.3	11.0
45-54 years old	20.9	3.4
55 years and older	28.4	0
Shift Worked		
Days	50.7	37.3
Evenings	10.4	1.7
Nights	31.3	19.5
Rotates	7.5	41.5
Nursing Role		
Staff nurse RN	72.7	67.8
Staff nurse LPN	9.1	4.2
Nursing Assistant (Medic/Corpsman)	18.2	28.0
Education Level		
High school graduate (or GED)	7.9	24.6

Associate degree graduate	20.6	7.6
Bachelor's degree graduate	61.9	63.6
Graduate degree	9.5	4.2
Highest Degree		
LPN diploma	11.1	8.2
RN diploma	3.7	2.4
Associate's degree	9.3	0
Bachelor's degree in nursing	57.4	83.5
Bachelor's degree outside of nursing	9.3	0
Master's degree or higher in nursing	3.7	4.7
Master's degree or higher outside of nursing	5.6	1.2
Experience in Role		
Up to 6 months	1.5	22.0
Greater than 6 months to 2 years	0	47.5
Greater than 2 years to 5 years	4.5	22.0
Greater than 5 years to 10 years	38.8	3.4
Greater than 10 years	55.2	5.1
Experience on Unit		
Up to 6 months	6.3	26.5
Greater than 6 months to 2 years	7.8	59.0
Greater than 2 years to 5 years	25.0	10.3
Greater than 5 years to 10 years	60.9	4.3
Greater than 10 years	0	0

The dependent variable, nursing teamwork, was calculated as an average of the 33 items on the NTS. The mean nursing teamwork score for this sample was 3.70 ($SD = 0.59$), which falls within the range of mean nursing teamwork scores (3.44 - 3.78) reported in a previous study of civilian hospitals (Kalisch & Lee, 2013). The range of scores reflected the differences in nursing teamwork by hospital size in their study. Smaller hospitals (<150 beds) reported higher mean nursing teamwork scores ($M = 3.78$, $SD = 0.65$) than medium ($M = 3.44$, $SD = 0.43$) and large ($M = 3.52$, $SD = 0.54$) hospitals. Based on hospital size, the mean nursing teamwork score in the current study (3.70) is higher than the mean nursing teamwork score (3.44) of medium sized (150-399 beds) civilian hospitals.

SPECIFIC AIM 1

The first specific aim was to identify staff characteristics and military characteristics associated with nursing teamwork. The results of two research questions developed to answer this specific aim are reported below.

What is the relationship between staff characteristics (gender, nursing role, absenteeism, experience on unit, experience in role, and perceived staffing adequacy) and nursing teamwork?

What is the relationship between military characteristics (personnel category, service affiliation, pay grade, perceived leadership behavior of the nurse manager) and nursing teamwork?

Staff characteristics and nursing teamwork.

The relationship between staff characteristics and nursing teamwork was explored using correlational analysis and t tests. Descriptive statistics are reported in Table 15. Correlations among experience, absenteeism, staffing adequacy, and nursing teamwork are reported in Table 16.

Table 15. Staff Characteristics: Descriptive Statistics (N=185)

Variable	n	%	<i>M</i>	<i>SD</i>
Gender				
Male	55	30		
Female	129	70		
Nursing Role				
RN	128	69		
LPN/NA	57	31		
Experience in Role			3.03	1.41
Experience on Unit			2.45	1.06
Average number of shifts missed in last 3 months			.72	.96
Staffing Adequacy			2.68	.95

Gender and nursing teamwork.

An independent-samples t-test was conducted to compare the nursing teamwork scores for male and female nursing staff. There were no significant difference in scores for males ($M = 3.82$, $SD = .60$) and females ($M = 3.65$, $SD = .58$); $t(182) = -1.71$, p ns, two tailed). The magnitude of the differences in the means (mean difference = .16, 95% CI: -.35 to .03) was small (Cohen's $d = .28$).

Nursing role and nursing teamwork.

Nursing role was collapsed into 2 groups (RN and LPN/NA) because the group size for LPN was small ($n=13$). An independent-samples t-test was conducted to compare the nursing teamwork scores for RN and nursing staff who were not RNs (LPN and NA). There were no significant difference in scores for RNs ($M = 3.67$, $SD = .57$) and LPN and NA ($M = 3.77$, $SD = .62$); $t(183) = 1.01$, p ns, two tailed). The magnitude of the differences in the means (mean difference = .10, 95% CI: -.28 to .09) was small (Cohen's $d = .17$).

Experience and nursing teamwork.

The relationship between experience and nursing teamwork was assessed with two variables, experience in the nursing role and experience on the patient care unit. The correlations of experience and nursing teamwork were not significant ($r_{\text{role}} = -.05$, ns., $r_{\text{unit}} = -.10$, ns.)

Absenteeism and nursing teamwork.

A Pearson product-moment correlation coefficient was computed to assess the relationship between the number of absent shifts reported in the past 3 months and

nursing teamwork. The results suggest that nursing staff who miss more shifts perceive teamwork to be lower $r(183) = -.18, p < .05$.

Staffing adequacy and nursing teamwork.

The correlation between perceived staffing adequacy and nursing teamwork was statistically significant, $r(183) = .25, p < .05$. The results suggest that when staffing is better, nursing teamwork is also better.

Table 16. Staff Characteristics and Nursing Teamwork: Correlations (N=185)

Variables	1	2	3	4	5
1. Nursing Teamwork	—				
2. Experience in Role	-.05	—			
3. Experience on Unit	-.10	.71***	—		
4. Absenteeism	-.18*	.43***	.30***	—	
5. Staffing Adequacy	.25***	.03	-.07	-.07	—

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Military characteristics and nursing teamwork.

The relationship between military characteristics and nursing teamwork was explored using correlational analysis, t tests, and ANOVAs. Descriptive statistics are reported in Table 17. The leadership behavior variables were calculated for each scale of the LBDQ (form XII) measured (structure, consideration, integration, and predictive accuracy) as described in the LBDQ XII manual (Stogdill, 1963). The mean scores for structure ($M = 3.64, SD = 0.59$) consideration ($M = 3.77, SD = 0.73$) integration ($M = 3.81, SD = 0.84$) and predictive accuracy ($M = 3.60, SD = 0.71$), were similar to the mean scores ($M_{\text{structure}} = 3.86, SD_{\text{structure}} = 0.57, M_{\text{consideration}} = 3.71, SD_{\text{consideration}} = 0.56, M_{\text{integration}} = 3.9, SD_{\text{integration}} = 0.52, M_{\text{predictive accuracy}} = 3.62, SD_{\text{predictive accuracy}} = 0.42$) reported for a sample of Army personnel (officers and enlisted) used for testing of the LBDQ (form XII) scales. Additionally, the mean scores for structure and consideration were similar to scores

($M_{structure} = 3.76$, $M_{consideration} = 3.83$) reported in more recent studies (Judge & Piccolo, 2004; Judge et al., 2004; Piccolo et al., 2012).

Correlations among pay grade, leadership behaviors (structure, consideration, integration, and predictive accuracy) and nursing teamwork are reported in Table 18.

Table 17. Military Characteristics: Descriptive Statistics (N=185)

Variable	n	%	<i>M</i>	<i>SD</i>
Personnel Category				
Military	118	64		
Civilian	67	36		
Service Affiliation				
Army	43	23		
Navy or Air Force	75	41		
DHA Civilian	67	36		
Pay Grade			2.92	1.70
Structure			3.64	0.59
Consideration			3.77	0.73
Integration			3.81	0.84
Predictive Accuracy			3.60	0.71

Personnel category and nursing teamwork.

An independent-samples t-test was conducted to compare the nursing teamwork scores for military and civilian nursing staff. Military ($M = 3.78$, $SD = .57$) differed from civilians ($M = 3.57$, $SD = .61$), $t(183) = 2.29$, $p < .05$. The magnitude of the differences in the means (mean difference = $-.20$, 95% CI: $-.38$ to $-.03$) was small (Cohen's $d = .36$).

Service affiliation and nursing teamwork.

A one-way between groups analysis of variance was conducted to explore the impact of service affiliation on nursing teamwork, as measured by the NTS. Participants were divided into three groups according to service affiliation (Group 1: Army, Group 2 Navy and Air Force, Group 3 DHA). There was no difference at the $p < .05$ level in nursing teamwork for the three groups: $F(2,182) = 2.70$, $p = ns$.

Pay grade and nursing teamwork.

A Pearson product-moment correlation coefficient was computed to assess the relationship between pay grade and nursing teamwork. The results were not significant $r(183) = -.07, p \text{ ns}$, two tailed.

Leadership behavior and nursing teamwork.

Correlations were computed to assess the relationship between four leadership behaviors (structure, consideration, integration, and predictive accuracy) and nursing teamwork. The relationships were statically significant, $p < .05$.

Table 18. Leadership Behavior and Nursing Teamwork: Correlations and Descriptive Statistics (N=185)

Variables	1	2	3	4	5
1. Nursing Teamwork	—				
2. Structure	.60***	—			
3. Consideration	.61***	.81***	—		
4. Integration	.64***	.83***	.89***	—	
5. Predictive Accuracy	.55***	.80***	.76***	.79***	—

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

SPECIFIC AIM 2

The second specific aim was to test the nursing teamwork model. The conceptual model (figure 1) presented at the end of chapter 2 was tested. As described in chapter 3, variables were recoded as indicators prior to multiple regression analysis. Gender was coded as an indicator for female. Nursing role was coded as an indicator for RN. Service affiliation was recoded as an indicator for Army.

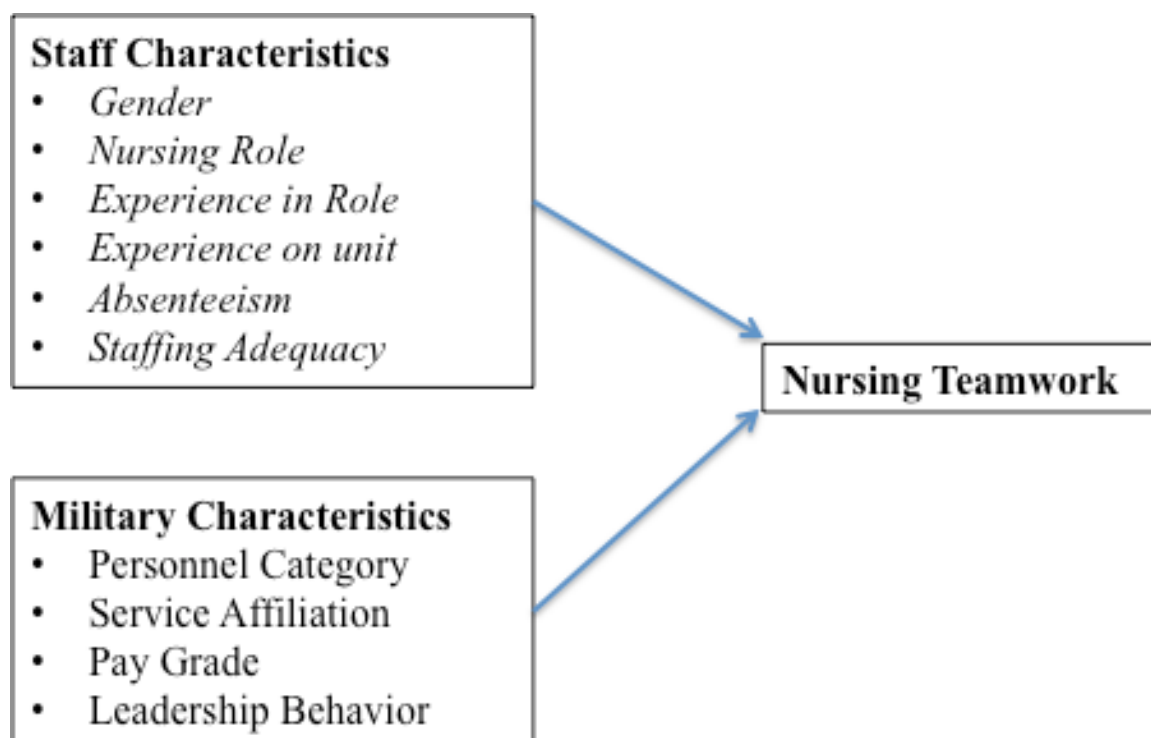


Figure 1. Study framework for correlates and factors of nursing teamwork in a military hospital.

Variables in italics have been tested in previous studies of nursing teamwork in a population of civilian nurses. Adapted from “Variations of Nursing Teamwork by Hospital, Patient Unit, and Staff Characteristics,” by B. Kalisch and K.H. Lee, 2013, *Applied Nursing Research*, 26, p.2. Copyright 2013 by Elsevier Inc.

Multicollinearity was noted among several of the factor variables (experience on unit, experience in role, personnel category, structure, consideration, integration, and predictive accuracy). Therefore, experience in role was deleted from analysis because it was correlated with experience on unit and personnel category.

Composite and factor scores were calculated for leadership behavior. The leadership score was calculated from weighted z scores of the leadership variables (structure, consideration, integration, and predictive accuracy) to form a composite score that provided a more stable measure of the underlying leadership behaviors. Individual items of the LBDQ were used to form factor scores using principle components analysis

(PCA). The procedure for the PCA is described in more detail in chapter 4. The two-factor solution explained 58% of the variance. Table 19 shows the factor loadings after rotations. The items that cluster on the same components suggest that component one represents leading, and component two represents being a member.

Table 19. Summary of Principle Component Analysis Results for the Leadership Behavior Questions

Item	Rotated Component Loadings			
	Pattern Matrix		Structure Matrix	
	Leading	Being a member	Leading	Being a member
Sees to it that the work of the group is coordinated	.84	-.15	.88	.38
Gives advance notice of changes	.84		.83	.16
Makes sure that his/her part in the group is understood by the group members	.84		.84	.23
Things usually turn out as he/she predicts	.84	-.19	.79	
Is accurate in predicting the trend of events	.81	-.25	.75	
Settles conflicts when they occur in the group	.81		.81	.24
Seems able to predict what is coming next	.80		.82	.30
Helps group members settle their differences	.78	.14	.82	.35
Looks out for personal welfare of group members	.77	.25	.84	.46
Schedules the work to be done	.77		.75	.13
Maintains definite standards of performance	.77		.77	.19
Puts suggestions made by the group into operation	.77	.20	.82	.40
Is willing to make changes	.76	.14	.79	.34
Makes accurate decisions	.72	.24	.79	.43
Lets group members know what is expected of them	.72	.12	.75	.31
Keeps the group working together as a team	.72	.35	.81	.54
Tries out his/her ideas in the group	.71		.72	.24
Decides what shall be done and how it shall be done	.70	-.29	.63	
Makes his/her attitudes clear to the group	.69	-.17	.64	
Is friendly and approachable	.68	.31	.77	.49
Encourages the use of uniform procedures	.65	.20	.70	.40

Asks that group members follow standard rules and regulations	.64		.63	.13
Does little things to make it pleasant to be a member of the group	.61	.17	.66	.33
Treats all group members as his/her equals	.60	.37	.70	.53
Anticipates problems and plans for them	.58	-.29	.50	-.14
Permits the group to set its own pace	.47	.14	.51	.26
Keeps to himself/herself		.68	.20	.70
Refuses to explain his/her actions	.21	.60	.37	.66
Acts without consulting the group	.32	.59	.48	.68
Eigenvalues	14.95	3.89		
% of Variance	52.46	6.01		

Note: Factor loadings over .40 are bold.

Multiple regression analysis.

Multiple regression analyses was conducted to describe the relationship among staff characteristics, military characteristics, and nursing teamwork, and to determine which variables contributed to nursing teamwork in a military hospital. Staff characteristics were gender, nursing role, experience on the unit, absenteeism, and staffing adequacy. Military characteristics were personnel category, service affiliation, pay grade, and leadership behavior. Leadership behavior was measured with a composite score (leadership score) computed from weighted z scores of the leadership variables (structure, consideration, integration, and predictive accuracy), and with the factor scores (leading and being a member) calculated from principle component analysis. The correlations of the variables are in Table 20. The significant correlations were gender, absenteeism, staffing adequacy, personnel category, leadership score, being a member, and leading. Separate regression analyses were conducted for the leadership score and for the leadership factors (leading and being a member) calculated from principle component analysis. These two models were built using standard and statistical

regression (Tabachnick & Fidell, 2013). Variables for statistical regression were selected using stepwise, forward selection and backward deletion processes. This process yielded a separate model for the leadership score and the leadership factors.

Table 20. Staff Characteristics, Military Characteristics, and Nursing Teamwork: Correlations and Descriptive Statistics (N=185)

Variables	1	2	3	4	5	6	7	8	9
1. Nursing Teamwork	–								
2. Gender	-.13*	–							
3. RN	-.07	.37***	–						
4. Experience on Unit	-.10	.32***	.14*	–					
5. Absenteeism	-.18**	.21**	-.07	.30***	–				
6. Staffing Adequacy	.25***	-.10	.02	-.07	-.07	–			
7. Personnel Category	.17**	-.27***	-.04	-.67***	-.43***	-.06	–		
8. Service Affiliation	-.02	-.10	.09	.15*	.15*	-.09	-.17**	–	
9. Pay Grade	-.07	.34***	.75**	.45***	.12	-.01	-.34***	.24***	–
10. Leadership Score	.65***	.03	.09	.05	-.17**	.23**	.03	-.05	.07
11. Being a Member	.31***	.08	.13*	.23***	.09	.14*	-.02	.07	.23***
12. Leading	.62***	.01	.06	.01	-.18*	.21**	.05	-.05	.05

Note: * $p < .05$. ** $p < .01$. *** $p < .001$

Table 20
Continued

Variables	10	11	12
10. Leadership Score	–		
11. Being a Member	.39***	–	
12. Leading	.99***	.27***	–

Note: * $p < .05$. ** $p < .01$. *** $p < .001$

Model 1: Leadership composite score.

Leadership composite score and nursing teamwork standard regression procedure. Multiple regression using the standard regression procedure was conducted. Nine factors (gender, nursing role, experience on unit, absenteeism, staffing adequacy, personnel category, service affiliation, pay grade, and leadership score) were entered into the model. The model was statistically significant, $F(9, 169) = 17.57, p < .001$, and accounted for approximately 48% of the variance in nursing teamwork ($R^2 = .48$, Adjusted $R^2 = .46$). The regression equation from this analysis was: nursing teamwork = $3.60 - .06 \text{ gender} - .25 \text{ nursing role} - .02 \text{ experience on unit} - .01 \text{ absenteeism} + .07 \text{ staffing adequacy} + .06 \text{ personnel category} + .04 \text{ service affiliation} + .06 \text{ pay grade} + .40 \text{ leadership}$.

Two factors were significant: nursing role ($\beta = -.19; t = -2.03, p < .05$) and leadership ($\beta = .64; t = 10.88, p < .05$) and contributed 44% ($R^2 = .44$) of the variance in nursing teamwork. The size and direction of the relationships suggest that higher nursing teamwork scores are reported by nursing staff that are LPNs or NAs and those who reported higher leadership composite scores. Among those variables, the leadership composite score is a more important factor for nursing teamwork.

A comparison across statistics (Table 21) shows that the leadership score had the strongest direct relationship to nursing teamwork across multiple indices. Leadership obtained the largest beta weight ($\beta = .64$; $t = 10.88$, $p < .05$), demonstrating that it made the largest contribution to the regression equation, while holding all other factor variables constant. The zero-order correlation of leadership with nursing teamwork ($r = .65$) showed that leadership had the largest direct effect. The difference in beta weight ($\beta = .64$) and the zero order correlation ($r = .65$) indicates that leadership score shared some variance with other independent variables; however the shared variance is small. The squared semi partial correlation (.41) indicates that if leadership were deleted, the model ($R^2 = .48$) would only account for 7% of the variance in nursing teamwork.

Table 21. Leadership Composite: Full Regression Model Results

Model	b	SE-b	Beta	t	r	Structure Coefficient
Constant	3.60	0.19		19.51		
Gender	-0.06	0.08	-.05	-.73	-0.13	-0.19
Nursing Role	-0.25	0.12	-.19*	-2.03	-0.07	-0.10
Experience on unit	-0.02	0.05	-.04	-.47	-0.10	-0.14
Absenteeism	-0.01	0.05	-.01	-.20	-0.18	-0.26
Staffing Adequacy	0.07	0.04	.11	1.90	0.25	0.36
Personnel Category	0.06	0.03	.15	1.81	0.17	0.24
Service Affiliation	0.04	0.04	.05	.88	-0.02	-0.03
Pay Grade	0.06	0.06	.11	1.05	-0.07	-0.10
Leadership Score	0.40	0.04	.64***	1.88	0.65	0.94

Note: The dependent variable was nursing teamwork. $R^2 = .48$, Adjusted $R^2 = .46$.

* $p < .05$, ** $p < .01$ *** $p < .001$

The beta weight for nursing role ($\beta = -.19$; $t = -2.03$, $p < .05$) suggested that this variable played a more minor but still statistically significant role in the regression effect when holding all other variables constant. The zero-order correlation of nursing role with nursing teamwork ($r = .07$) showed that the RN nursing role has a small negative direct

effect on nursing teamwork. However, the squared structure coefficient (.01) showed that nursing role contributed negligible variance to nursing teamwork. Moreover, the squared semi partial correlation (.02) indicates that if nursing role were deleted, the model ($R^2 = .48$) would account for 46% of the variance in nursing teamwork. These statistics demonstrated that the unique contribution of nursing role was small.

Leadership composite score and nursing teamwork stepwise, forward, and backward selection procedure. Multiple regression using stepwise, forward, and backward selection procedures was conducted. These procedures yielded identical regression models. The regression model contained four of the nine factors and was reached in four steps with no variables removed using the stepwise and forward selection procedures. The regression model using backward deletion procedures was reached in six steps. Absenteeism, experience on unit, gender, service affiliation, and pay grade were removed from the model.

The model was statistically significant, $F(4, 174) = 39.19, p < .001$, and accounted for approximately 47% of the variance in nursing teamwork ($R^2 = .47$, Adjusted $R^2 = .46$). Nursing teamwork was primarily explained by higher leadership scores, and to a lesser extent by personnel category, nursing role, and staffing adequacy. The raw and standardized regression coefficients of the factors together with their correlations with nursing teamwork, and their structure coefficients are shown in Table 22. Leadership score received the strongest weight in the model followed by personnel category, nursing role and staffing adequacy. Inspection of the structure coefficients suggests that leadership score was a strong indicator of nursing teamwork. Staffing

adequacy and personnel category made a moderate contribution, and nursing role made a small contribution to nursing teamwork.

Table 22. Leadership Composite: Reduced Regression Model Results.

Model	b	SE-b	Beta	t	r	Structure Coefficient
Constant	3.62	0.12		31.59		
Leadership Score	0.40	0.04	.63***	11.14	0.65	0.94
Personnel Category	0.06	0.02	.15**	2.69	0.17	0.25
Nursing Role	-0.17	0.07	-.13*	-2.35	-0.07	-0.10
Staffing Adequacy	0.07	0.04	.11*	.11	0.25	0.36

Note: The dependent variable was nursing teamwork. $R^2 = .47$, Adjusted $R^2 = .46$

* $p < .05$, ** $p < .01$, *** $p < .001$.

Model 1: Leadership composite score and nursing teamwork summary.

Exploratory models were built using four different procedures to examine the relationships between staff characteristics, military characteristics and nursing teamwork. The staff characteristics were gender, nursing role, experience on the unit, absenteeism, and staffing adequacy. Military characteristics were personnel category, service affiliation, pay grade, and a leadership composite score derived from averaged z scores of the structure, consideration, integration, and predictive accuracy measures of the LBDQ.

The models are summarized in Table 23. All models were significant at $p < .001$, and explained approximately 46% of the variance in nursing teamwork. The models built using statistical regression procedures had higher F values than the model built using standard regression. The models using stepwise, forward, and backward variable selection procedures had the highest F statistic $(4, 174) = 39.19, p < .001$ and contained two additional variables (staffing adequacy and personnel category) that were significant.

Overall, these finding supported that leadership behaviors were the most significant direct contributor of variance in nursing teamwork, as reflected across

different measures of direct, total, and partial effects. Results also supported that staffing adequacy, personnel category, and nursing role contributed directly and indirectly to the overall model.

Table 23. Leadership Composite: Comparison of Full and Reduced Regression Models.

Variable	Standard β	Stepwise and Forward β	Backward β
Constant			
Gender	-.05		
Nursing Role	-.19*	-.13*	-.13*
Experience on unit	-.04		
Absenteeism	-.01		
Staffing Adequacy	.11	.11*	.11*
Personnel Category	.15	.15**	.15**
Service Affiliation	.05		
Pay Grade	.11		
Leadership Score	.64***	.63***	.63***
R^2	.48	.47	.47
Adjusted R^2	.46	.46	.46
F	17.57	39.19	39.19

* $p < .05$, ** $p < .01$, *** $p < .001$

Model 2: Leadership factor scores (leading and being a member).

Leadership factor scores and nursing teamwork standard regression procedure. Multiple regression using the standard regression procedure was conducted. Ten factors (gender, nursing role, experience on unit, absenteeism, staffing adequacy, personnel category, service affiliation, pay grade, leading and being a member) were entered into the model. The model was statistically significant, $F(10, 159) = 14.04$, $p < .001$, and accounted for approximately 47% of the variance in nursing teamwork ($R^2 = .47$, Adjusted $R^2 = .44$). The regression equation from this analysis was: nursing teamwork = $3.72 - .06 \text{ gender} - .18 \text{ RN} - .02 \text{ experience on unit} - .04 \text{ absenteeism} + .07 \text{ staffing}$

adequacy + .04 personnel category + .03 service affiliation + .02 pay grade + .32 leading + .22 being a member.

Two factors were significant: leading ($\beta = .55$; $t = 8.80$, $p < .05$) and being a member ($\beta = .18$; $t = 2.79$, $p < .05$). The size and direction of the relationships suggest that higher nursing teamwork scores are reported by nursing staff that also reported higher leadership factor scores. Among the leadership factors (leading and being a member), the leading factor score was more important for explaining variance in nursing teamwork.

A comparison across statistics (Table 24) shows that leading had the strongest direct relationship with nursing teamwork across multiple indices. Leading obtained the largest beta weight ($\beta = .55$, $p < .001$), demonstrating that it made the largest contribution to the regression model, while holding all other factor variables constant. The zero-order correlation of leading with nursing teamwork ($r = .62$), showed that leading had the largest direct effect. The difference in beta weight ($\beta = .55$) and the zero order correlation ($r = .62$) indicates that leadership score shared some variance with other independent variables; however the shared variance is small. The squared semi partial correlation (.33) demonstrated that if leading were deleted, the model ($R^2 = .47$) would only account for 14% of the variance in nursing teamwork.

Table 24. Leadership Factor Scores: Full Regression Model Results

Model	b	SE-b	Beta	t	r	Structure Coefficient
Constant	3.72	0.20		18.20		
Gender	-0.06	0.09	-.05	-.72	-0.13	-0.19
Nursing Role	-0.18	0.13	-.14	-1.41	-0.07	-0.10
Experience on unit	-0.02	0.05	-.04	-.499	-0.10	-0.15
Absenteeism	-0.04	0.05	-.05	-.741	-0.18	-0.26
Staffing Adequacy	0.07	0.04	.11	1.72	0.25	0.36

Personnel Category	0.04	0.04	.10	1.15	0.17	0.25
Service Affiliation	0.03	0.05	.04	.72	-0.02	-0.03
Pay Grade	0.02	0.06	.04	.34	-0.07	-0.10
Leading	0.32	0.04	.55***	8.80	0.62	0.91
Being a Member	0.11	0.04	.18**	2.79	0.32	0.47

Note: The dependent variable was nursing teamwork. $R^2 = .47$, Adjusted $R^2 = .44$.

* $p < .05$, ** $p < .01$, *** $p < .001$

The beta weight for being a member ($\beta = .18, p < .01$) suggested that this component of leadership played a minor but still statistically significant role in the regression effect when holding all other variables constant. The zero-order correlation of the being a member factor score with nursing teamwork ($r = .32$) showed that this factor score had a moderate direct effect. The square structure coefficient (.22) also showed that the being a member component of leadership contributed moderate variance to y . The squared semi partial correlation (.05) indicates that if the being a member factor were deleted the model ($R^2 = .47$) would be reduced by 5%. These statistics demonstrated that the additional variance explained by the being a member factor is small.

Leadership factor scores and nursing teamwork stepwise and forward selection procedure. Multiple regression using stepwise and forward selection procedures was conducted. These procedures yielded identical regression models. The regression model contained four of the ten factors and was reached in four steps with no variables removed. The model was statistically significant, $F(4, 165) = 33.37, p < .001$, and accounted for approximately 45% of the variance in nursing teamwork ($R^2 = .45$, Adjusted $R^2 = .43$). Variance in nursing teamwork was primarily explained by higher levels of the leading component of leadership behaviors, and to a lesser extent by the being a member component of leadership behavior, experience on unit, and nursing role. The raw and standardized regression coefficients of the factors together with their correlations with

nursing teamwork, and their structure coefficients are shown in Table 25. The leading component of leadership behaviors received the strongest weight in the model followed by the being a member component of leadership behaviors, experience on the unit, and nursing role. Inspection of the structure coefficients suggests that the leading component of leadership behaviors was a strong indicator of nursing teamwork, followed by the being a member component. Experience on unit and nursing role made moderate contributions to nursing teamwork.

Table 25. Leadership Factor Scores: Stepwise and Forward Regression Results

Model	b	SE-b	Beta	t	r	Structure Coefficient
Constant	3.99	0.10		41.00		
Leading	0.34	0.04	.58***	9.57	0.62	0.93
Being a Member	0.12	0.04	.21**	3.36	0.32	0.48
Experience on Unit	-0.08	0.03	-.14*	-2.25	-0.10	-0.15
Nursing Role	-0.15	0.08	-.12*	-2.01	-0.07	-0.10

Note: The dependent variable was nursing teamwork. $R^2 = .45$, Adjusted $R^2 = .43$

* $p < .05$, ** $p < .01$, *** $p < .001$.

Leadership factor scores and nursing teamwork backward deletion procedure.

The regression model using backward deletion procedures contained five of the ten factors and was reached in six steps. Pay grade, experience on unit, service affiliation, and gender were removed from the model. The model was statistically significant, $F(5, 164) = 28.13$, $p < .001$, and accounted for approximately 45% of the variance in nursing teamwork ($R^2 = .45$, Adjusted $R^2 = .44$). Nursing teamwork was primarily explained by higher levels of the leading component of leadership behaviors, and to a lesser extent by the being a member component of leadership behavior, personnel category, staffing adequacy, and nursing role. The raw and standardized regression coefficients of the factors together with their correlations with nursing

teamwork, and their structure coefficients are shown in Table 26. The leading component of leadership behaviors received the strongest weight in the model followed by the being a member component. Inspection of the structure coefficients suggests that the leading component of leadership behavior was a strong indicator of nursing teamwork. The being a member component, staffing, and personnel category were moderate indicators of nursing teamwork. Nursing role contributed little to the variance in nursing teamwork.

Table 26. Leadership Factor Scores: Backward Regression Results

Model	b	SE-b	Beta	t	r	Structure Coefficient
Constant	3.62	0.12		30.23		
Nursing Role	-0.16	0.07	-.13*	-2.21	-0.07	-0.10
Staffing	0.08	0.04	.12*	1.94	0.25	0.37
Personnel Category	0.06	0.02	.15**	2.52	0.17	0.25
Leading	0.33	0.04	.55***	9.14	0.62	0.91
Being a Member	0.10	0.04	.17**	2.85	0.32	0.47

Note: The dependent variable was nursing teamwork. $R^2 = .45$, Adjusted $R^2 = .44$

*** $p < .001$, ** $p < .01$ * $p < .05$

Model 2: Leadership factor scores and nursing teamwork summary.

Exploratory models were built using four different procedures to examine the relationships between staff characteristics, military characteristics and nursing teamwork. The staff characteristics were gender, RN nursing role, experience on the unit, absenteeism, and staffing adequacy. Military characteristics were personnel category, service affiliation, pay grade, and components (leading, and being a member) derived from leadership behavior items.

The models are summarized in Table 27. All models were significant at $p < .001$, and explained approximately 45% of the variance in nursing teamwork. The models built using statistical regression procedures had higher F values than the model built using

standard regression. The models using stepwise and forward variable selection procedures had the highest statistic $F(4, 165) = 33.37, p < .001$, and only four variables. However, the results of the backward deletion procedure indicate that staffing adequacy and personnel category were excluded from the stepwise and forward models based on the sequence of variable entry into the model.

Overall, these findings supported that both components of the leadership behavior contributed directly to nursing teamwork, as reflected across different measures of direct, total, and partial effects. Results also supported that nursing role, experience on unit, staffing adequacy, and personnel category, contributed directly and indirectly to the overall model.

Table 27. Leadership Factor Scores: Comparison of Full and Reduced Models

Variable	Standard β	Stepwise and Forward β	Backward β
Constant			
Gender	-.05		
Nursing Role	-.14	-.12*	-.13*
Experience on unit	-.04	-.14*	
Absenteeism	-.05		
Staffing Adequacy	.11		.12*
Personnel Category	.10		.15*
Service Affiliation	.04		
Pay Grade	.04		
Leading	.55***	.58***	.55***
Being a Member	.18**	.21**	.17**
R^2	.47	.45	.46
<i>Adjusted R²</i>	.44	.43	.45
<i>F</i>	14.04	33.37	28.13

* $p < .05$, ** $p < .01$, *** $p < .001$

Model Selection.

The two regression models were reviewed. The adjusted R^2 for the two models were similar across regression procedures and regression models (Table 28). Based on these results, no model clearly stands out as the best regression model for nursing teamwork. The regression equations from this analysis were:

Table 28. Summary of Nursing Teamwork Models by Leadership Variable

Model	Standard	Stepwise and Forward	Backward
	<i>Adjusted R²</i> (# Significant Variables)	<i>Adjusted R²</i> (#Significant Variables)	<i>Adjusted R²</i> (#Significant Variables)
1: Leadership Composite Score	.46 (2)	.46 (4)	.46 (4)
2: Leadership Factor Scores	.44 (2)	.43 (4)	.45 (5)

Note: Gender, RN, Experience on Unit, Absenteeism, Staffing Adequacy, Personnel Category, Service Affiliation, and Pay Grade were factor variables in all models.

Model 1: nursing teamwork = 3.60 - .06 gender - .25 RN - .02 experience on unit - .01 absenteeism + .07 staffing adequacy + .06 personnel category + .04 service affiliation + .06 pay grade + .40 leadership.

Model 2: nursing teamwork = 3.72 - .06 gender - .18 RN - .02 experience on unit - .04 absenteeism + .07 staffing adequacy + .04 personnel category + .03 service affiliation + .02 pay grade + .32 leading + .22 being a member.

Several variables, including leadership (leadership composite score, and leadership factor scores), nursing role, experience on unit, staffing adequacy, and personnel category, contributed to nursing teamwork. These variables were chosen as factors of nursing teamwork to further test the relationships using hierarchical linear regression.

Additional Analyses.

Hierarchical linear regression analysis was conducted to determine if the addition of staff characteristics (nursing role, experience on unit, staffing adequacy) and then personnel category explained variance in nursing teamwork beyond that explained by leadership. Separate regression analyses were conducted for the leadership composite score, and the leadership factor (leading and being a member) scores.

Leadership Composite Model.

The results of regression analysis that included the leadership composite score are presented in Table 29. The model was significant ($p < .05$) at the end of each step. After step three, with all IVs in the equation, $R^2 = .47$, $F(5, 175) = 31.56$, $p < .001$. The adjusted R^2 value of .46 indicates that almost half of the variance in nursing teamwork is explained by nursing role, experience on unit, staffing adequacy, personnel category, and the leadership composite score.

Characteristics (nursing role, experience on unit, and staffing adequacy) that have been tested in previous studies (Kalisch & Lee, 2013) were entered in step one explaining 7% of the variance in nursing teamwork $R^2 = .07$, $F_{\text{staff char}}(3, 177) = 4.60$, $p < .01$. After entry of personnel category at step two the total variance explained by the model was 10%, $R^2 = .10$, $F_{\text{perscat}}(4, 176) = 5.05$, $p = .001$. Personnel category explained an additional 3% of the variance in nursing teamwork. After step three, with the leadership composite score added to the model, the total variance explained by the model was 47%. The leadership composite score explained an additional 37% of the variance in nursing teamwork. Notably, staffing adequacy ($\beta = .27$; $t = 3.70$, $p = .001$) and personnel category ($\beta = .24$; $t = 2.45$, $p = .02$) were significant factor variables of nursing teamwork

in steps one and two. These factor variables were no longer significant in step 3 when the leadership composite score was added to the model. In addition nursing role ($\beta = -.03$; $t = -2.30$, $p < .05$) was a significant factor of nursing teamwork in step three when the leadership composite score was added.

Table 29. Individual Characteristics, Leadership Composite Score, and Nursing Teamwork

	B	SE B	β	t
Step 1				
Constant	3.44	0.18		19.40
Nursing Role	-0.09	0.09	-.07	-0.95
Experience on Unit	-0.04	0.04	-.07	-1.01
Staffing Adequacy	0.16	0.05	.24**	3.35
Step 2				
Constant	3.19	0.20		15.87
Nursing Role	-0.11	0.09	-.08	-1.15
Experience on Unit	0.05	0.06	.09	0.92
Staffing Adequacy	0.17	0.05	.27***	3.70
Personnel category	0.10	0.04	.24*	2.45
Step 3				
Constant	3.64	0.16		22.80
Nursing Role	-0.16	0.07	-.13*	-2.30
Experience on Unit	-0.01	0.04	-.02	-0.21
Staffing Adequacy	0.07	0.04	.11	1.92
Personnel category	0.06	0.03	.14	1.83
Leadership score	0.40	0.04	.63***	11.11

Note: $R^2 = .07$ for step 1, $\Delta R^2 = .03$ for step 2, $\Delta R^2 = .37$ for step 3 ($p < .001$). * $p < .05$, ** $p < .01$, *** $p < .001$.

The leadership score was used as the dependent variable to further explore the relationship between individual characteristics and leadership. Regression analysis was conducted to determine the relationship between individual characteristics (nursing role, experience on unit, staffing adequacy, and personnel category) and leadership. The results are presented in Table 30.

Individual characteristics (nursing role, experience on unit, staffing adequacy, and personnel category) explained 8% (adjusted 6%) of the variance in leadership, $R^2 = .08$, F

(4, 176) = 3.70, $p < .01$. Staffing adequacy ($\beta = .25$; $t = 3.40$, $p = .001$) was the only significant factor of the leadership composite score.

Table 30. Individual characteristics and Leadership

	B	SE B	β	t
Constant	-1.12	0.20		-3.46
Nursing Role	0.14	0.09	.07	0.96
Experience on Unit	0.15	0.06	.17	1.68
Staffing Adequacy	0.26	0.05	.25**	3.40
Personnel category	0.10	0.04	.16	1.61

Note: The dependent variable was leadership composite score. $R^2 = .08$, Adjusted $R^2 = .06$ *** $p < .001$, ** $p < .01$ * $p < .05$

Finally, the relationship between leadership score and nursing teamwork was determined using regression analysis. The results are presented in Table 31. The leadership composite score explained 42% (adjusted 42%) of the variance in nursing teamwork, $R^2 = .42$, $F(1, 179) = 131.71$, $p < .001$.

Table 31. Leadership Composite Score, Individual Characteristics and Nursing Teamwork

	B	SE B	β	t
Constant	3.70	0.03		111.85
Leadership Score	0.41	0.04	.65***	11.57

Note: The dependent variable was nursing teamwork. $R^2 = .42$, Adjusted $R^2 = .42$ *** $p < .001$, ** $p < .01$ * $p < .05$

Leadership Factors Model.

The results of hierarchical linear regression including the leadership factor scores (leading and being a member) are presented in Table 32. The model was significant ($p < .05$) at the end of each step. After step four, with all IVs in the equation, $R^2 = .46$, $F(6, 163) = 23.37$, $p < .001$. The adjusted R^2 value of .44 indicates that almost half of the

variance in nursing teamwork is explained by nursing role, experience on unit, staffing adequacy, personnel category, and the leadership factor scores.

Characteristics (nursing role, experience on unit, and staffing adequacy) that have been tested in previous studies (Kalisch & Lee, 2013) were entered in step one explaining 7% of the variance in nursing teamwork $R^2 = .07$, $F_{\text{staff char}}(3, 166) = 4.31$, $p < .01$. After entry of personnel category at step two the total variance explained by the model was 10%, $R^2 = .10$, $F_{\text{perscat}}(4, 165) = 4.73$, $p = .001$. Personnel category explained an additional 3% of the variance in nursing teamwork. After step three, with the leading factor score added to the model, the total variance explained by the model was 44%. The leading factor score explained an additional 33% of the variance in nursing teamwork. After step four, with the being a member factor score added to the model, the total variance explained by the model was 46%. The being a member factor score explained an additional 3% of the variance in nursing teamwork. Notably, staffing adequacy ($\beta = .24$; $t = 3.24$, $p = .001$) and personnel category ($\beta = .24$; $t = 2.37$, $p = .02$) were significant factors of nursing teamwork in steps one and two. These factor variables were no longer significant in step 4 when the being a member factor score was added to the model. In addition nursing role ($\beta = -.12$; $t = -2.13$, $p < .05$) became a significant factor variable for nursing teamwork in step four when the being a member factor score was added.

Table 32. Individual Characteristics, Leadership Factor Scores, and Nursing Teamwork

	B	SE B	β	t
Step 1				
Constant	3.44	0.18		18.78
Nursing Role	-0.09	0.10	-0.07	-0.92
Experience on Unit	-0.04	0.04	-0.07	-0.97
Staffing Adequacy	0.16	0.05	0.24**	3.24

Step 2				
Constant	3.19	0.21		15.36
Nursing Role	-0.11	0.10	-0.08	-1.12
Experience on Unit	0.05	0.06	0.09	0.89
Staffing Adequacy	0.17	0.05	0.27***	3.58
Personnel category	0.10	0.04	0.24*	2.37
Step 3				
Constant	3.54	0.17		20.92
Nursing Role	-0.14	0.08	-0.13	-1.89
Experience on Unit	-0.02	0.05	-0.03	0.35
Staffing Adequacy	0.09	0.04	0.13*	2.17
Personnel category	0.07	0.03	0.16*	2.10
Leading	0.35	0.04	0.59***	9.83
Step 4				
Constant	3.68	0.17		21.28
Nursing Role	-0.16	0.07	-0.12*	-2.13
Experience on Unit	-0.02	0.05	-0.04	-0.50
Staffing Adequacy	0.07	0.04	0.11	1.81
Personnel category	0.05	0.03	0.12	1.47
Leading	0.33	0.04	0.55***	9.12
Being a member	0.11	0.04	0.18**	2.86

Note: $R^2 = .07$ for step 1, $\Delta R^2 = .03$ for step 2, $\Delta R^2 = .33$ for step 3, $\Delta R^2 = .03$ for step 4 ($p < .01$). * $p < .05$, ** $p < .01$, *** $p < .001$.

The leadership factor scores were used as the dependent variables to further explore the relationship between individual characteristics and leadership. Regression analysis was conducted to determine the relationship between individual characteristics (nursing role, experience on unit, staffing adequacy, and personnel category) and the leadership factor scores (leading and being a member). The results are presented in Tables 33 and 34.

Individual characteristics (nursing role, experience on unit, staffing adequacy, and personnel category) explained 6% (adjusted 4%) of the variance in the leading factor score, $R^2 = .06$, $F(4, 165) = 2.58$, $p < .05$. Staffing adequacy ($\beta = .23$; $t = 2.97$, $p = .003$) was the only significant factor related to the leading factor score.

Table 33. Individual characteristics and Leading

	B	SE B	β	t
Constant	-0.98	0.36		-2.71
Nursing Role	0.11	0.17	.05	0.64
Experience on Unit	0.10	0.10	.12	1.01
Staffing Adequacy	0.25	0.09	.23**	2.97
Personnel category	0.09	0.07	.13	1.28

Note: The dependent variable was leading factor score. $R^2 = .06$, Adjusted $R^2 = .04$

*** $p < .001$, ** $p < .01$ * $p < .05$

Individual characteristics (nursing role, experience on unit, staffing adequacy, and personnel category) explained 12% (adjusted 10%) of the variance in the being a member factor score, $R^2 = .12$, $F(4, 165) = 5.77$, $p < .01$. Staffing adequacy ($\beta = .18$; $t = 2.46$, $p = .02$), experience on unit ($\beta = .41$; $t = 4.07$, $p = .001$), and personnel category ($\beta = .27$; $t = 2.70$, $p = .008$) were significantly related to the being a member factor score.

Table 34. Individual characteristics and Being a member

	B	SE B	β	t
Constant	-1.58	0.35		-4.52
Nursing Role	0.16	0.16	.08	1.02
Experience on Unit	0.39	0.10	.41***	4.07
Staffing Adequacy	0.20	0.08	.18*	2.46
Personnel category	0.19	0.07	.27*	2.70

Note: The dependent variable was being a member factor score. $R^2 = .12$, Adjusted $R^2 = .10$ *** $p < .001$, ** $p < .01$ * $p < .05$

Finally, the relationships between the leadership factor scores and nursing teamwork were determined using regression analysis. The leading factor score explained 39% (adjusted 39%) of the variance in nursing teamwork, $R^2 = .39$, $F(1, 171) = 108.63$, $p < .001$. The being a member factor score explained 10% (adjusted 10%) of the variance in nursing teamwork, $R^2 = .10$, $F(1, 171) = 19.10$, $p < .001$

CHAPTER SUMMARY

This study explored correlates and factors of nursing teamwork in a military hospital setting. Descriptive statistics were computed for staff characteristics and military characteristics. Correlational analysis, *t* tests, and ANOVAs were used to explore the relationship between staff characteristics and nursing teamwork and military characteristics and nursing teamwork. The findings of bivariate analysis were not significant for nursing role, experience, service affiliation, and pay grade. Nursing teamwork did not differ by gender when ANOVA was used to test the relationship ($t = -1.71, p \text{ ns}$); however, the findings of correlation analysis were significant ($r = -.13, p < .05$). The findings were significant for absenteeism in the past 3 months ($p < .05$), staffing adequacy ($p < .001$) personnel category ($p = .02$), pay grade ($p < .05$), and leadership behaviors ($p < .001$). The leadership behaviors measured in the bivariate analysis included structure, consideration, integration, predictive accuracy.

Multiple regression analysis was used to explain variance in nursing teamwork from the combined set of variables. Several variables (experience in role, experience in unit, structure, consideration, integration, and predictive accuracy) were found to be collinear; therefore, experience in role and was excluded from multiple regression analysis, and factor scores were computed for the leadership behaviors. Separate regression analyses were conducted for the computed leadership behavior variables: leadership composite score and leadership factors scores (leading and being a member).

After the data was prepared regression analysis was used to explain variance in nursing teamwork from staff characteristics and military characteristics. Staff characteristics were gender, nursing role, experience on the unit, absenteeism, and staffing adequacy. Military characteristics were personnel category, service affiliation,

pay grade, and leadership behavior (leadership composite score and leadership factor scores).

All models were significant at $p < .001$, and explained 45% to 48% of the variance in nursing teamwork. Based on examination of the adjusted R^2 , number of variables in the model, F statistic, and betas no model clearly stood out as the best regression model for nursing teamwork. Several variables were significantly related to nursing teamwork; nursing role, experience on unit, staffing adequacy, personnel category, and leadership (leadership composite score, leadership factor scores).

These relationships were tested with further analysis. Hierarchical linear regression was used to determine the relationship between individual characteristics (nursing role, experience on unit, staffing adequacy, and personnel category) and nursing teamwork. Staffing adequacy ($\beta = .27$; $t = 3.70$, $p = .001$) and personnel category ($\beta = .24$; $t = 2.45$, $p = .02$) were significant factors for nursing teamwork when entered in steps one and two. These factors were no longer significant when the leadership composite score or the being a member factor score were added to the regression models. Additionally, nursing role ($\beta = -.03$; $t = -2.30$, $p < .05$) became a significant factor of nursing teamwork when the leadership composite score or the being a member factor score were added to the regression models. Multiple regression analysis was then used to determine the relationship between individual characteristics and leadership. The results of multiple regression analysis indicate that staffing adequacy ($\beta = .25$; $t = 3.40$, $p = .001$) is the only significant factor of the leadership composite score, and leading factor score. Staffing adequacy ($\beta = .18$; $t = 2.46$, $p = .02$), experience on unit ($\beta = .41$; $t = 4.07$, $p =$

.001), and personnel category ($\beta = .27$; $t = 2.70$, $p = .008$), were significant factors of the being a member factor score.

This pattern of results suggests that leadership accounts for over a third of the variation in nursing teamwork in this sample. The contribution of individual characteristics is less clear because of the shared variation in factor variables. Staffing adequacy and personnel category contribute modestly to the model when entered in isolation. However, the addition of leadership reduces the contribution of staffing adequacy and personnel category to the model. The being a member factor score appears to explain differences in the perception of nursing teamwork, through its relationships with experience, staffing adequacy, and personnel category. In addition leadership, specifically the being a member factor score appears to enhance the contribution of nursing role in the model of nursing teamwork.

CHAPTER 5: Discussion

The study is summarized and discussed in this chapter. First, the study is summarized including the purpose, methods, and findings. The summary is followed by a discussion of the findings, limitations, and implications for research, practice, and policy.

SUMMARY OF THE STUDY

The purpose of this conceptually driven cross-sectional study was to explore correlates and factors of nursing teamwork on patient care units in a military hospital. Study results were anticipated to inform research and practice related to nursing teamwork in military healthcare settings.

The conceptual framework for this study is based on a framework for nursing teamwork developed for acute care hospitals in the civilian setting by Kalisch and colleagues (Kalisch & Lee, 2009; Kalisch, Lee, & Salas, 2010; Kalisch & Lee, 2013; Kalisch et al., 2009) which identified contextual factors (hospital type, size, unit type, staffing, gender, age, education, nursing role, experience, work hours, absenteeism, staffing adequacy) influencing nursing teamwork on patient care units. While this work is relevant to the military, there may be differences between military and civilian hospitals and teams that are important to consider. Further, nurses in military hospitals can be differentiated from one another by characteristics such as personnel category (military or civilian), service affiliation (Air Force, Army, Navy), and pay grade (officer ranks, enlisted ranks). Military nurses are more likely to be male, have expanded roles, and have less experience than civilians (Patrician et al., 2010). These differences in gender, roles, and experience in nursing personnel are unique to the military setting.

Full time nursing personnel (RNs, LPNs, NAs, medics, corpsman, and technicians) who work on an inpatient ICU/Intermediate, medical-surgical, maternal child health, or psychiatric care unit were recruited for participation in this study. Nursing personnel who worked in an emergency department or perioperative unit, or who were in a management (e.g. nurse manager) or a purely administrative role (e.g. unit clerk) were excluded due to differences in the structure and composition of the teams and the tasks performed.

Data were collected using an 87-item self-administered paper-based survey that combined three separate measures, the nursing teamwork survey (NTS; 33 items) which measures nursing teamwork and staff characteristics, four scales from the Leader Behavior Description Questionnaire (LBDQ form XII; 30 items), and three items to capture additional characteristics of nursing staff in military settings. The four scales from the LBDQ were consideration, integration, initiation of structure, and predictive accuracy. The estimated time to complete the questionnaire was less than 30 minutes. Approximately 703 nursing staff of 15 patient care units were eligible to participate. A total of 227 surveys were returned resulting in a 32.3% return rate, and after exclusion of 39 incomplete surveys, the final sample size for data analysis was 185 surveys.

The dependent variable, nursing teamwork, was calculated as an average of the 33 items on the NTS. The mean nursing teamwork score was 3.70, which falls within the range of mean nursing teamwork scores (3.44 - 3.78) reported in a previous study of civilian hospitals (Kalisch & Lee, 2013), but was higher than the mean nursing teamwork scores reported for hospitals of similar size (3.70 vs. 3.44).

Key Findings

The statistical findings of this study are generally consistent with that of prior research (e.g. Kalisch & Lee 2013) but show some important distinctions. Absenteeism and perceived staffing adequacy were significantly related with nursing teamwork; however, gender, nursing role, and experience were not. Among the military characteristics, personnel category, and leadership behaviors were significantly related to nursing teamwork but service affiliation and pay grade were not related.

Multiple regression was used to further explore the relative contribution of the different characteristics to nursing teamwork. Analyses found that there was significant multicollinearity among the four leadership scales; therefore, two analysis models were adopted. The first was to average the z-scores of the four scales into a single overall leadership behavior score. The second model used a principal components analysis and derived two primary factors, labeled “leading” and “being a member”, which were subsequently used in the multiple regression analysis.

The results of the multiple regression analyses indicated that the combination of the nursing characteristics and military characteristics, including leadership, explained 45% to 48% of the variance in nursing teamwork. Both models were similar, and indicated that nursing role, experience on the unit, staffing adequacy, personnel category, and leadership behavior were important influences on nursing teamwork. However, follow-up analyses indicated that the leadership factors had different relationships with nursing teamwork and other characteristics. The “leading” factor explained 33% of the variance in nursing teamwork beyond that explained by the other characteristics (nursing role, experience on the unit, staffing adequacy, personnel category) and the “being a member” factor explained an additional 3% of the variance in nursing teamwork. The

“being a member” factor made a smaller but important contribution to nursing teamwork. When added to the model, “being a member” reduced the variation in nursing teamwork attributed to staffing adequacy and personnel category, allowing nursing role to contribute to the model.

DISCUSSION OF STUDY FINDINGS

Contrary to the findings of the Military Health System (MHS) review, teamwork in the study hospital was similar to that of civilian hospitals (DoD, 2014; Kalisch & Lee, 2013). The differences in findings may be attributable to the measures used and the study participants. The MHS review reported results of the Hospital Survey on Patient Safety Culture (HSOPS), including the teamwork within units dimension, which consisted of four items indicative of team orientation and back up behaviors (DoD, 2014). In contrast, teamwork in this study was measured using the NTS, which captures five dimensions (trust, shared mental models, team orientation, team leadership, and backup behavior) of teamwork within nursing units (Kalisch, Lee, & Salas, 2010; Kalisch et al., 2009). However, only the overall nursing teamwork score was examined in this study. It is plausible that nursing personnel in military hospitals display fewer team orientation and back up behaviors but more of the other nursing teamwork behaviors than nursing staff in civilian hospitals because of staffing deficiencies. Staffing is positively related to team orientation and backup behavior (Kalisch & Lee, 2009; Kalisch & Lee, 2011, 2013). Results of the HSOPS also reported lower perceptions of staffing adequacy in military hospitals compared to civilian hospitals (DoD, 2014). The nursing staff in military hospitals receive TeamSTEPPS® training, which may also explain differences in responses of personnel in military and civilian hospitals (DoD, 2014). The expectation

for teamwork behaviors may be affected by the knowledge of teamwork behaviors and skills acquired from team training. In addition to the measure used, the participants included in this study also differed from the participants included in the HSOPS comparative review. The HSOPS comparative review included all hospital staff (e.g. clinical and administrative), while this study only included nursing staff in direct patient care roles on an inpatient unit (DoD, 2014). Evidence supports that hospital staff appraise teamwork differently based on their roles (Kalisch & Lee, 2012, 2013; Makary et al., 2006; Thomas, Sexton, & Helmreich, 2003; A. C. Weaver, Callaghan, Cooper, Brandman, & O'Leary, 2015).

The study findings support and extend the nursing teamwork literature. Studies of nursing teamwork have found that characteristics of the nursing staff including gender, nursing role, full time equivalency, shift worked, years of experience on the unit, absenteeism, and perceived staffing adequacy were related to perceptions of nursing teamwork in civilian hospitals (Kalisch & Lee, 2009; Kalisch & Lee, 2013). Full time equivalency and shift worked were not examined in this study because nursing personnel are hired full time and to work any shift in military hospitals. The relationships between the staff characteristics examined and nursing teamwork were similar in a military hospital. The study findings also extend the nursing teamwork literature by examining military characteristics including leadership. These findings are compared and contrasted with those in the literature in the discussion that follows.

Staff characteristics and nursing teamwork.

The sample was of nursing staff from a military hospital and was 65% military, which made the sample unique. Previous studies have found that the military nursing

workforce differs in gender, age, education, and experience from the civilian nursing workforce (Patrician et al., 2010). Likewise, the sample in this study had a larger portion of males (30% vs. 10%), was younger (62% vs. 38% were under 35 years old), and held a BSN (73% vs. 44%) than a previous study of nursing teamwork conducted in civilian hospitals (Kalisch & Lee, 2013). However, the relationships between staff characteristics and nursing teamwork was generally consistent with findings in the nursing teamwork literature (Kalisch, Friese, Choi, & Rochman, 2011; Kalisch & Lee, 2009; Kalisch & Lee, 2011, 2013)

Gender.

The relationship between gender and nursing teamwork is inconclusive in the literature (Kalisch & Lee, 2009; Kalisch & Lee, 2013). Nursing teamwork was found to differ by gender in one study (Kalisch & Lee, 2009) but not in a study that accounted for the nesting of nursing staff within units and hospitals (Kalisch & Lee, 2013). Similarly, the findings in this study were inconclusive but suggest that gender may remain an important characteristic to consider in military settings.

In contrast to studies conducted in civilian hospitals (Kalisch & Lee, 2009), males in this study perceived teamwork to be better than females, although the relationship was weak and only significant with bivariate correlation. The findings were not significant when t tests were used or in multivariate models of nursing teamwork where gender was also correlated to other factors (nursing role, experience, absenteeism, personnel category, and pay grade) that may have accounted for variance shared with gender. Females tended to be civilian RNs, have more years of experience on the patient care unit, and miss more shifts while males tended to be enlisted military. The current study

did not account for the nesting of nursing staff within patient care units and the finding may be attributed to type 1 error; however, other explanations such as the masculinity of the military and the gender diversity of the nursing team may also explain the positive appraisal of nursing teamwork by males in a military setting.

Nursing is a feminine profession (Simpson, 2004). In military hospitals, nursing personnel are embedded in a masculine organization (Barrett, 1996; Eagley, Wood, & Johannesen-Schmidt, 2004). The military provide care on the battlefield and in deployed locations. As such, the nursing profession in the military can be dangerous, require independent decision-making, and is heroic. The enlisted nursing staff in particular is trained to provide nursing care on the battlefield with limited supervision. For this reason, males may evaluate nursing teamwork more positively in a military setting than in a civilian setting where nursing is a feminine profession. Future studies are required to further explore gender perceptions of nursing personnel in the military. For example studies grounded in social role theory may shed light on why males in the military have positive perceptions of nursing teamwork.

Gender diversity has been shown to influence the perception of teamwork behaviors and team performance (Bear & Woolley, 2011; Wegge et al., 2008). When women are in workgroups collaboration among team members is improved (Bear & Woolley, 2011). However, evidence also supports that as the proportion of women on a team increases perceptions of teamwork are more negative as the team interacts over time (West, Heilman, Gullett, Moss-Racusin, & Magee, 2012). The nursing staff in this sample was more gender diverse (70% vs. 90% female) than reported in studies of civilian hospitals (Kalisch & Lee, 2013). The larger proportion of males on nursing

teams in this study may have improved perceptions of teamwork, especially among males. Further research that measures males as a proportion of the nursing team is required to determine the relationship among gender diversity and nursing teamwork.

Interestingly, the relationship between gender and nursing teamwork seems to differ based on the hospital setting (military or civilian). However, gender was related to several other variables in the model (nursing role, experience, absenteeism, personnel category, and pay grade) and the relationship is unclear. In addition to exploring other explanations (e.g. masculinity of the military, gender diversity of teams) of gender differences, future studies should also include variables that capture the interaction of gender and other characteristics.

Nursing role.

Previous studies have found that teamwork varies by nursing role (Kalisch & Lee, 2013). Nursing personnel in leadership and administrative roles (e.g. nurse managers and unit clerks) perceive nursing teamwork to be better than nursing personnel (RNs, LPNs, and NAs) in direct patient care roles (Kalisch & Lee, 2009; Kalisch & Lee, 2012, 2013). The findings of this study further support that perceptions of nursing teamwork are similar among nursing staff in direct patient care roles (RNs, LPNs, and NAs) in a military setting.

Experience.

The findings of previous studies suggest that perceptions of teamwork become stable as the nursing team interacts over time (Kalisch & Lee, 2009; Kalisch & Lee, 2013). Nursing staff with less than 6 months of experience in their nursing role and on their patient care unit perceive teamwork to be better than nursing staff with more

experience (Kalisch & Lee, 2009). In this study the relationship between experience and nursing teamwork was insignificant. Neither experience in the nursing role nor on the patient care unit was correlated to nursing teamwork. However, the majority of the nursing staff with less than 6 months experience was military, and military reported higher nursing teamwork scores than civilians in this sample. Experience was measured on an ordinal scale with five levels that was used prior studies (Kalisch & Lee, 2013) . Given the correlation between personnel category (military or civilian) and experience, future studies in the military setting should consider measuring experience as a continuous variable to capture the shorter periods of time military work on a particular unit. Additionally, future studies should also capture the interaction of experience and personnel category.

Absenteeism.

Evidence supports that absenteeism is related to nursing teamwork (Kalisch & Lee, 2009; Kalisch & Lee, 2013). In a study of nursing teamwork nurses who reported missing 2-6 shifts in the last three months also perceived nursing teamwork to be worse than nurses who missed less than 2 shifts or more than 6 shifts in the last three months (Kalisch & Lee, 2013). The findings of this study are consistent with the literature in that absenteeism was negatively correlated with nursing teamwork. However, absenteeism was also correlated with civilian personnel suggesting that factors other than illness and rest may be important in the military hospitals. Unlike their civilian counterparts, military nursing staff cannot call in sick, but rather are required to seek medical attention for illness or injury. In addition military nursing staff may be absent from the unit for

other reasons such as for military specific training or duties. Exploring reasons for voluntary and involuntary absenteeism may be important in the military hospital setting.

Staffing adequacy.

Prior studies provide evidence that adequate staffing is important for supporting nursing teamwork on patient care units (Kalisch & Lee, 2009; Kalisch & Lee, 2013; Kalisch, Russell, et al., 2013). Staffing is positively related to nursing teamwork when measured with administrative data and measured as a perception of the nursing staff (Kalisch & Lee, 2009; Kalisch & Lee, 2013; Kalisch, Russell, et al., 2013). Common staffing indices such as hours per patient day and skill mix were moderately associated with nursing teamwork in a study using unit level data (Kalisch & Lee, 2011). While staffing indices are widely utilized, evidence supports that the perception of adequate staffing is also an important measure and positively related to nursing teamwork (Kalisch et al., 2011; Kalisch & Lee, 2009; Kalisch & Lee, 2013). Likewise, this study found that perceived staffing adequacy was positively correlated with nursing teamwork. However, the relationship between perceived staffing adequacy and nursing teamwork was weak.

Perceived staffing adequacy was the measure chosen in this study to capture teamwork conditions from the nursing staff point of view (Kalisch et al., 2011). Staffing adequacy is associated with inadequate staffing of NAs, while other staffing indices (hours per patient day) are thought to capture the resources required for patient care. The sample in this study had a larger percent of NAs (25% vs 18%) than a study of civilian hospitals which may explain the strength of the relationship (Kalisch & Lee, 2013). Additionally, the percent of nursing staff in this sample that perceived staffing to be adequate 100% of the time (17% vs. 16%) was similar to findings in the literature but a

smaller percent of this sample perceived staffing to be adequate 75% of the time (48% vs. 54%) than in a study conducted in a civilian hospital (Kalisch & Lee, 2009).

This finding is consistent with that of the recent MHS review where staffing was identified as a problem in military hospitals based on data from the Hospital Survey on Patient Safety Culture (HSOPS) that indicated lower perceptions of staffing adequacy (48% vs. 57%) in military hospitals compared to civilian hospitals (DoD, 2014). The explanation advanced in the MHS review for these perceptions of staffing in military hospitals was the impact of frequent military rotations and deployments on the patient care units (DoD, 2014). A likely consequence of the military turnover is a nursing staff with less experience. The findings of this study support that the majority of military nursing personnel had two years or less of experience on their patient care unit. However, this study did not support a correlation between staffing adequacy and experience on the patient care unit.

Studies of nursing teamwork have found a relationship between skill mix and nursing teamwork which is another plausible explanation for perceptions of inadequate staffing (Kalisch & Lee, 2011). RNs and NAs may have difficulty coordinating patient care (Kalisch, 2011). Evidence supports that the number of NAs on a nursing team is negatively correlated with nursing teamwork (Kalisch, Russell, et al., 2013). Teams with more NAs may have difficulty forming shared mental models, focusing on the work of the team, assisting one another, and developing trust. These teams may also require more leadership from the charge nurses and team leader. While the total number of staff, RNs, or LPNs on a nursing team was not related to nursing teamwork the mix of RN, LPN, and NA staff seem to be important. Nursing teams in units with more RNs in the skill mix

have a team orientation rather than a focus on individual work, and were also led by charge nurses who engaged in team leadership behaviors (Kalisch & Lee, 2011). These staffing indices are unit level measures and therefore, were not included in the current study.

The link between staffing and nursing teamwork is supported in the literature and by the findings of this study. While this sample had a larger percent of NAs than reported in the literature, perceptions of staffing adequacy were worse suggesting that factors other than the number of NAs are important. In the military setting, unit level measures such as skill mix may better capture components of staffing and their associations with nursing teamwork. Previous studies of nursing teamwork indicate that unit level measures of staffing (e.g. skill mix, number of RNs, LPNs, and NAs, hours per patient day) are moderately related to nursing teamwork. Additionally, the turnover of patients on units may affect staffing and should be considered (Park, Blegen, Spetz, Chapman, & De Groot, 2012). Designing future studies to incorporate unit level staffing measures is important for a better understanding the relationship between staffing and nursing teamwork in the military setting.

Military Characteristics and Nursing Teamwork.

The nursing personnel in military hospitals can be described as military or civilian, by service affiliation (Air Force, Army, or Navy), and by pay grade (officer ranks and enlisted ranks) in addition to the staff characteristics described in the nursing teamwork literature (DHA, 2012; Kalisch & Lee, 2013). In this study 65% of the sample was military. The military were 37% Navy, 23% Army, 4% Air Force, and 69% were officers. Seventy-eight percent of the officers were in entry-level pay grades (O1-O2).

In addition to individual characteristics, leadership is salient in a military setting.

Theoretical and empirical evidence suggest that individual characteristics and leadership influence teamwork (Campion et al., 1993; Hackman, 1987; Morgeson et al., 2010).

Personnel category.

Military and civilian nursing personnel working in the same hospital perceived nursing teamwork differently even when staff characteristics (nursing role, experience on the unit, staffing adequacy) were held constant. Prior studies have found that military and civilian nursing personnel differed on characteristics such as gender, age, education, and experience (Patrician et al., 2010). The findings of this study suggest that military and civilian nursing personnel have differences beyond those characteristics that influence nursing teamwork.

Team norms for behavior develop over time and are important for effective teamwork (Morgeson et al., 2009). Military may perceive teamwork to be better because they train as a team from accession into service to retirement. Team tasks are regularly practiced in training exercises to maintain readiness for deployment on short notice. Thus, military develop cultural norms of how to work together as a team and coordinate across teams. Military training and cultural norms may enable military team members to quickly identify shared goals, clarify roles, lead a team, and use feedback to improve teamwork. It is plausible that through regular training, military develop shared mental models, trust, and team leadership skills, and are able to provide assistance to other team members when needed; however this hypothesis has not been tested in nursing teams.

Another explanation is that military nursing personnel develop collectivistic norms over time while civilians maintain the individualistic norms of the United States

(Gelfand, Erez, & Aycan, 2007). Building skills and meeting the mission often requires military to have little choice as to geographical location, work assignment, or work hours. The federal civilians, similarly to their non-government colleagues, do not have this shared experience. They are not required to train as a team in the same manner and they have choice in location, work hours, and tenure. In this way, work norms of federal civilians maintain the vertical individualistic culture of the U.S. where high freedom is valued (Triandis & Gelfand, 1998). Thus military and civilians on the same patient care unit may approach patient care tasks differently and have different perceptions of teamwork. Military may engage in shared teamwork norms especially with other military personnel, and civilians may work more independently.

To fully understand the difference in perceptions of nursing teamwork between military and civilians further research is needed. A study designed to measure individual cultural norms (e.g. horizontal, vertical, individualism, and collectivism) would determine if there are differences. Additionally, an ethnographic study may also increase our understanding of cultural differences between military and civilian nursing personnel.

Service Affiliation.

Nursing teams in military hospitals are increasingly comprised of members of different military services (Air Force, Army, or Navy), and each service has cultural norms that guide group interaction (L. Wong et al., 2003). Even within a military service subcultures of highly technical groups may develop different norms for interaction than groups that rely on people to perform tasks (L. Wong et al., 2003). While the Air Force and Navy are similar in their reliance on technology (hospital ships, air craft), rather than

basic equipment (temporary tent hospitals) used by the Army during deployments, perceptions of nursing teamwork did not vary by service affiliation in this study.

The finding may be explained by job similarity and by the short length of time nursing personnel working on patient care units have served in the military. Differences in deployment roles (e.g. care on the battle field, transfer of wounded from battle field to stateside) are not evident in the hospital setting where the work of nursing is the same regardless of military service. Additionally, a majority of the military nursing personnel were in entry-level pay grades and may not have developed the cultural norms of their parent service. Culture develops as people interact over time (Schein, 2010). The results may be significant in deployed environments or in samples of nursing personnel who have served longer in the military. Future studies should consider the amount of time in service and explore the relationship with different samples such as in multiple hospitals and in the deployed setting.

Pay grade.

Behaviors in military settings are guided by a hierarchical rank structure and the military hospital is no exception (Patrician et al., 2010; L. Wong et al., 2003). Studies suggest that hierarchy and status may influence the perception of teamwork in that higher status members perceive teamwork to be better than lower status team members (A. C. Weaver et al., 2015; Weinberg et al., 2011). Furthermore lower status members are more likely to perceive teamwork as delegation of tasks from higher status members rather than as a team effort (Weinberg et al., 2011). The findings of this study did not support a relationship between pay grade, an indicator of military rank, and nursing teamwork. Interestingly, military enlisted in the lowest ranks perceived teamwork to be high.

However this finding must be taken with caution because civilians were coded as having rank commensurate with mid-grade enlisted and officers. Additionally, the sample of officers in midgrade ranks and military enlisted in general was small.

Team members with higher status have more positive perceptions of teamwork (Barrett, 1996; A. C. Weaver et al., 2015; Weinberg et al., 2011). The expanded role of military NAs may explain why the lowest ranking team members have high perceptions of nursing teamwork. The enlisted nursing staff is in the role of first responder on the battlefield. This role in particular is perceived to be important in the military and increases the status of enlisted nursing assistive personnel. Enlisted are not only NAs; they are medics, corpsmen, or technicians and commonly referred to as “docs” by military in combat roles. Thus, status may influence perceptions of nursing teamwork; however this hypothesis has not been tested.

The findings of this study suggest that status may influence group interactions on patient care units. Status and power are the primary sources of informal hierarchy (Magee & Galinsky, 2008). Future studies should explore the influence of formal and informal hierarchies on nursing teamwork. Do nursing personnel behave in ways that increase their informal hierarchy?

Leadership behaviors and nursing teamwork.

Theory suggests that leadership helps teams overcome environmental challenges and to regulate teamwork behaviors in support of team goals (Morgeson et al., 2009; Morgeson et al., 2010). The theoretical link between leadership and teamwork is further supported by empirical evidence (Aarons & Sommerfeld, 2012; Burke et al., 2006; Cummings et al., 2010; Havig, Skogstad, Kjekshus, et al., 2011; Ruggieri & Abbate,

2013). Studies of the nursing work environment also support that the leadership behaviors of the nurse manager are important on patient care units (Cummings et al., 2010; Patrician et al., 2010; C. Wong & Cummings, 2007). However, this is the first study to examine the relationship between leadership behaviors of the nurse manager and nursing teamwork. This study found that leadership behaviors (structure, consideration, integration, predictive accuracy) and the scores computed to address multicollinearity (leadership composite score, and “leading” and “being a member” factor scores) were strongly correlated with nursing teamwork.

The leadership behaviors examined were selected to capture leadership competencies described in military policy (Air Force Doctrine Document 1-1, Army Doctrine Publication 6-22, and the Navy Leadership Competency Model). Military leaders are expected to skillfully use a variety of leadership behaviors to accomplish the military mission. Findings from this study indicate that individual leaders of patient care units in military hospitals also display a variety of leadership behaviors emphasized in the military. The leadership behavior most frequently observed was integration followed by consideration, structure, and predictive accuracy; however, none stood out as a dominant leadership behavior. It is unclear if these leadership behaviors were learned from formal leadership training, and further investigation to determine the effectiveness of leadership training is warranted.

Leadership behaviors (structure, consideration, integration, predictive accuracy) are commonly classified as task focused or person focused (House & Aditya, 1997; Northouse, 2012). Structure and predictive accuracy are task focused leadership behaviors while consideration and integration are person focused leadership behaviors.

However, studies that have examined the factor structure of structuring and consideration leadership behaviors find that items measuring structure and consideration may load on the same factor (Judge et al., 2004; Piccolo et al., 2012). Similarly in this study, the leadership factors (“leading” and “being a member”) contained items from all scales and seemed to align with the concepts of task focused and person focused leadership behaviors. The focus of this discussion is on the leadership factor scores; the leadership composite score was unidimensional and did not provide additional insight of the dimensions of leadership.

Task focused leadership behaviors produce order and consistency through activities such as planning, organizing, staffing, and controlling (House & Aditya, 1997; Northouse, 2012). Items that loaded on the “leading” factor score were consistent with task focused leadership behaviors. Leadership behaviors that indicated the nurse manager was leading the team included coordinating work, keeping the group informed of changes, clarifying roles and responsibilities, managing conflict, predicting changes in workload, attending to the personal welfare of group members, incorporating suggestions made by the group, and keeping the group working together as a team.

The “leading” factor was strongly and positively correlated with nursing teamwork. Theoretical evidence supports that the behaviors captured in the “leading factor” may help teams develop trust, team orientation, shared mental models, and appropriately engage in backup behavior (Morgeson et al., 2009; Zaccaro et al., 2002). Likewise, an examination of the “leading” behaviors and the nursing teamwork behaviors captured by the measures used in this study suggest that “leading” behaviors may influence nursing teamwork through five dimensions (trust, team orientation, backup

behavior, shared mental model, team leadership). The proposed relationships are discussed below and should be tested in future studies.

Trust in the context of teamwork is the belief that team members will satisfactorily perform their own role and have concern for the rights and interests of other members on the team (Salas et al., 2005). A function of leadership is to compose teams that ensures the mix of individuals facilitates trusting cooperative relationships (Morgeson et al., 2009). Nurse managers may help their team build trusting relationship when they share information, clarify expectations, and are concerned with the personal welfare of group members. Behaviors that indicate trust within the nursing team are clarifying the intended messages, communicating expectations, providing constructive feedback, sharing ideas and information, engaging in changes to make improvements, and allocating responsibilities in a way that is perceived to be fair (Kalisch, Lee, & Salas, 2010). Therefore, a positive relationship is expected between leading behaviors and nursing team trust.

Team orientation is concerned with developing a focus on team goals rather than individual goals (Salas et al., 2005). Leaders help teams develop a team orientation by clarifying and communicating the team goals and expectations for interaction (Morgeson et al., 2009). Nurse managers that clarify responsibilities, manage conflict, and incorporate suggestions made by the group may help teams develop a team orientation by managing conflict and motivating the team toward goal accomplishment. Nursing teams that have a team orientation manage conflict, participate, provide constructive feedback, and work towards the team goal rather than focusing on their one work (Kalisch, Lee, &

Salas, 2010). A positive relationship is expected between leading behaviors and team orientation.

Backup behavior is the ability to anticipate the needs of other team members and to provide assistance when there is an imbalance in workload (Salas et al., 2005). Nurse managers who are able to predict changes in workload and coordinate work may help nursing teams develop appropriate backup behaviors. Nursing teams that engage in backup behavior notice when team members fall behind and pitch in to get the work done without being asked (Kalisch, Lee, & Salas, 2010). Additionally the charge nurses and team leaders assist the other nursing team members when there is an imbalance in workload. A positive relationship is expected between leading behaviors and backup behaviors.

Shared mental models represent the understanding of the team's purpose and the roles and behaviors required by team members to coordinate work (Zaccaro et al., 2002). Leaders build shared mental models by communicating the team goals, performance expectations, and the roles and responsibilities of each member in team (Morgeson et al., 2009; Zaccaro et al., 2002). Likewise, nurse managers that engage in "leading" behaviors (ensure the work of the group is coordinated, keeps the group informed of changes, clarifies roles and responsibilities) are likely to develop shared mental models in nursing teams. Nursing teams with shared mental models understand their own and other team members roles and responsibilities, communicate necessary information to the next shift, and have an awareness of the strengths and weaknesses of other team members (Kalisch, Lee, & Salas, 2010). Therefore, a positive relationship is expected between leading behaviors and shared mental models.

Team leadership is the ability to direct and coordinate the work of the team (Salas et al., 2005). Leaders that ensure the work of the group is coordinated may influence nursing teamwork by setting the example and adjusting team leadership behaviors of the charge nurse or team leader. Key team leadership behaviors of the charge nurse are monitoring the progress of the team, balancing workload, planning for changes in the workload, and providing clear and relevant directions (Kalisch, Lee, & Salas, 2010). Therefore, a positive relationship is expected between leading behaviors and team leadership.

Person focused leadership behaviors cultivate an environment that supports teamwork through actions that build team cohesion, motivates, and inspires team members (Cummings et al., 2010; House & Aditya, 1997; Northouse, 2012). Items that loaded on the “being a member” factor score were consistent with person focused leadership behaviors. The “being a member” behaviors indicated the nurse manager was part of the group and included interacting, explaining actions, and consulting the group.

Theoretical evidence supports that these leader behaviors help teams develop trust, team orientation, and shared mental models (Morgeson et al., 2009; Zaccaro et al., 2002). Leaders build trust and cohesion, motivate, and inspire teams through frequent interaction and by involving the group in decisions. The “being a member” factor was moderately correlated with nursing teamwork. The proposed relationship is positive between “being a member” leadership behaviors and nursing team trust, team orientation, and shared mental models and should be tested in future studies.

Nursing Teamwork Model

The study framework was based on the work of Kalisch and colleagues (Kalisch & Lee, 2009; Kalisch, Lee, & Salas, 2010; Kalisch & Lee, 2013; Kalisch et al., 2009) who identified staff characteristics (gender, nursing role, experience on the unit, absenteeism, and perceived staffing adequacy), which may influence nursing teamwork. Military characteristics (personnel category, service affiliation, pay grade, and leadership behavior) were added to explore the potential influence of these additional characteristics on nursing teamwork in the military hospital. In this study, the combination of staff characteristics and military characteristics explained 45% to 48% of the variance in nursing teamwork. Results of the multiple regression analysis indicated that nursing role, experience on the unit, perceived staffing adequacy, personnel category, and leadership behavior may influence nursing teamwork. The findings of this study further support the nursing teamwork literature and offer additional insights in a military setting.

The findings of this study are similar to those in the literature, in that nursing role and perceived staffing adequacy made significant contributions to nursing teamwork in regression models (Kalisch & Lee, 2013). In contrast to studies of nursing teamwork, absenteeism did not significantly contribute to regression models in this study (Kalisch & Lee, 2013). Although significantly correlated with nursing teamwork, absenteeism and gender did not contribute to the model. A possible explanation is that absenteeism and gender were correlated with each other and with other factors in the model (experience on the unit, personnel category, nursing role, and the “leading” factor score) that received explanatory credit. When factors are correlated, explanatory credit may be assigned to other factors (Tabachnick & Fidell, 2013). Also, as previously discussed, the measure of voluntary absenteeism used may only capture missed shifts of civilian personnel and

requires further study. Staff characteristics alone explained seven percent of the variance in nursing teamwork.

The results of this study also extend the nursing teamwork literature by examining military characteristics. Of the military characteristics that contributed to the nursing teamwork model, personnel category explained an additional three percent of the variance in nursing teamwork beyond that explained by staff characteristics (nursing role, experience on the unit, staffing adequacy) and the perceived leadership behavior of the nurse manager explained an additional 36% of the variance in nursing teamwork. Studies of nursing teamwork in the military setting should include personnel category and consider how it interacts with other characteristics (gender, experience, absenteeism).

Of the characteristics explored, the perceived leadership behavior of the nurse manager explained most of the variance in nursing teamwork. The “leading” factor explained 33% of the variance in nursing teamwork beyond that explained by the other characteristics (nursing role, experience on the unit, staffing adequacy, personnel category). This finding suggests that nursing teams in the military setting require frequent task focused leadership behaviors that clarify roles and coordinate the team. Task focused leadership behaviors produce order and consistency, reduce role ambiguity, and manage conflict (House & Aditya, 1997; Northouse, 2012).

The “being a member” factor explained an additional 3% of the variance in nursing teamwork. Although a smaller, the contribution to nursing teamwork was important. When added to the model, “being a member” reduced the variation in nursing teamwork attributed to staffing adequacy and personnel category, allowing nursing role to contribute to the model. A possible explanation is leaders that interact and

communicate more with the team help nursing teams develop more accurate mental models. Previous studies have found that leader communication helps teams develop mental models that are more accurate and similar among members (Burke, 1999; Marks, Zaccaro, & Mathieu, 2000). These same studies also found that teams better adapt to changing conditions when leaders provide explanations for how they expect the team to react to changes. Therefore; “being a member” behaviors may help develop shared mental models among military and civilian personnel and help nursing teams adapt to changes in workload. However, to fully understand the relationships among leadership behaviors, other characteristics and nursing teamwork further research is required.

The nursing teamwork model for military hospitals was revised based on the results of this study. The revised model of nursing teamwork is illustrated in figure 10, and requires further testing. Individual characteristics (gender, nursing role, staffing adequacy, personnel category) are inputs of nursing teamwork in this setting. Leadership behavior appears to mediate the relationship between individual characteristics and nursing teamwork. When leadership behavior was added as to the model, the relationship between individual characteristics and nursing teamwork changed. Staffing adequacy and personnel category no longer contributed to the model but nursing role became significant. In the military setting it is important to include individual characteristics of nursing personnel and leadership in studies of nursing teamwork.

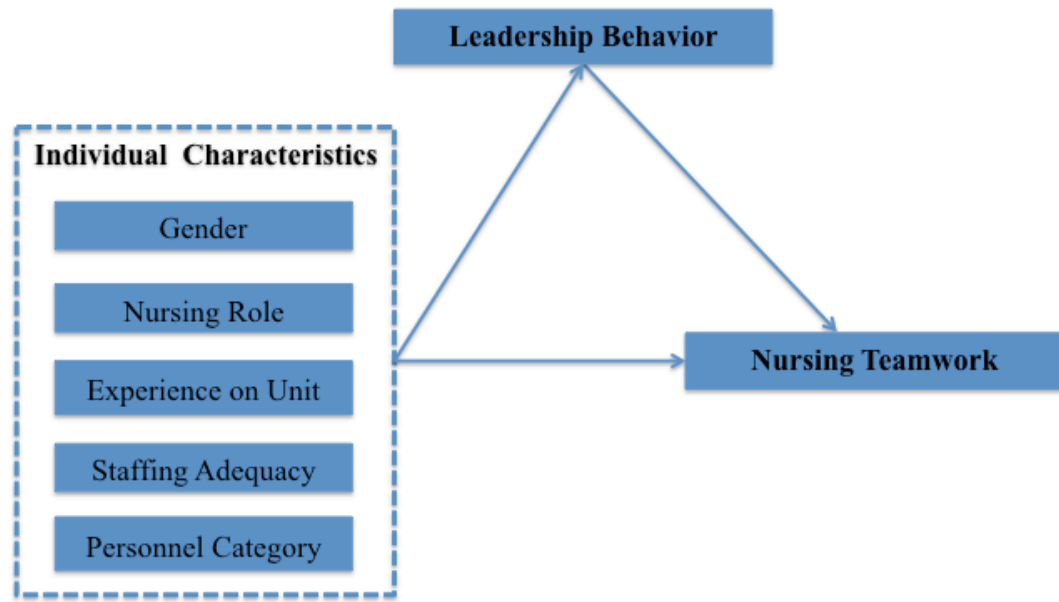


Figure 10: Revised nursing teamwork model for military hospitals.

CONCEPTUAL FRAMEWORK

Based on the findings of this study, the leadership behaviors of nurse manager may be an important input into theoretical models of nursing teamwork. Leadership explained most of the variance in nursing teamwork in this study. Furthermore, task focused leadership behaviors and person focused leadership behaviors appear to have different relationships with nursing teamwork and other characteristics. Nursing teamwork was strongly related to task focused leadership behaviors and moderately related to person focused leadership behaviors. These behaviors are conceptually different and may influence different dimensions of nursing teamwork (DeRue, Barnes, & Morgeson, 2010; House & Aditya, 1997; Morgeson et al., 2009; Northouse, 2012; Zaccaro & Klimoski, 2002). While the strength of the relationship was smaller for person focused leadership behaviors they appeared to reduce the variance that was shared with perceived staffing adequacy, an important measure of staffing (Kalisch et al., 2011).

LIMITATIONS

Although the findings of this study make a contribution to the nursing teamwork literature, several limitations must be acknowledged. Limitations with the sample, design, and measures limit conclusions that can be drawn.

This study used a convenience sample of nursing staff from a single military hospital. Due to potential selection bias, the findings from this study might not be representative of other military hospitals within the MHS and generalizations to other military hospitals should be made with caution (Gliner et al., 2009). However, the sample contained a mix of civilian and military nursing staff from the Air Force, Army, and Navy in one hospital, but some units had few participants, and the number Air Force and LPNs in the sample was small. Additionally, the leadership behaviors represented the views of individual nursing staff, but were limited to 15 nurse managers. A sample with more hospitals and patient care units is required to fully test a model of nursing teamwork. Three cases were outliers and deleted from the study. The cases were civilian RNs with over 10 years of experience. Therefore, the results may not generalize to civilian RNs who have worked on a patient care unit for more than 10 years (Tabachnick & Fidell, 2013). The small number of patient care units in the sample also limited the study design.

Nursing units were nested within sections within the study hospital. This nesting of units may influence the teamwork environment or perceptions of nursing personnel. Type 1 error was introduced by the inability to account for the nesting effect and the exploratory nature of the study in which several statistical tests were run on the data (Gliner et al., 2009). Additionally, the use of a cross sectional design limit conclusions

that can be drawn about teams and the factors that influence them. The dynamic nature of teamwork limits the application of cross-sectional studies to link staff characteristics and leadership behaviors to team processes (Marks et al., 2001). However, a cross-sectional design was appropriate to explore the relationships among staff characteristics, military characteristics, and nursing teamwork (Polit & Beck, 2008).

The data obtained from self-report measures were limited to what participants were willing and able to report. Participants were asked about the frequency of specific behaviors of their nurse manager nursing team members. Although the measures used were valid, this method cannot capture specific behaviors or the situational factors that may influence behavior (Judge et al., 2004; Kalisch, Lee, & Salas, 2010; Stogdill, 1963). The referent of the nursing teamwork survey was the nursing team as a whole. However, participants may have answered the survey based on experience with a few personnel or a category of staff (e.g. military versus civilian).

The leadership behaviors selected for this study were generic. The leadership scales did not contain a mix of positive and negative leadership behaviors or provide a score for a single nurse manager. The understanding of how a combination of leadership behaviors are related to nursing teamwork was not gleaned from this study. Leadership behaviors influence different outcomes of team performance, however patient and organizational outcomes were not collected (Burke et al., 2006). Therefore, conclusions cannot be drawn about the relationship among leadership behaviors, staff characteristics and teamwork and important healthcare outcomes. Experience and nursing role may be an important input in models that examine clinical outcomes such as falls, pressure ulcers, and missed nursing care. Conversely, leadership may be an important input into

models that examine organizational outcomes such as satisfaction, turnover and conflict. In addition, the absence of specific measures of teamwork factors (e.g. trust, shared mental models, back up behavior, team orientation, team leadership) limited the conclusions that can be drawn about relationships among individual characteristics, leadership behavior and specific team processes.

IMPLICATIONS AND RECOMMENDATIONS

Research.

This study examined the relationship between individual characteristics and nursing teamwork in a military setting; however, a number of questions remain to be addressed. While many questions were generated in the previous discussion, emphasis is placed on the following areas for further research 1) examining the relationships between leadership behaviors and nursing teamwork factors 2) clarifying the relationship among individual characteristics and leadership and then expanding studies to include outcomes 3) measuring culture, hierarchy and status 4) and using multi-level models and including unit level and hospital level variables.

Given the strong relationship between leadership and nursing teamwork further study of leadership behaviors is warranted. Theoretical evidence supports that leadership influences several dimensions of teamwork (Morgeson et al., 2009; Zaccaro et al., 2002). The findings of this study support a strong relationship between leadership behaviors and nursing teamwork. However, the factors that comprise nursing teamwork were not examined. Further research is needed to examine the relationships between leadership behaviors and the nursing teamwork factors (trust, team orientation, backup behavior, shared mental model, team leadership). Frameworks for the behavioral leadership

approach support to two general categories of leadership behaviors (task focused and person focused) and should be used to ground future research (House & Aditya, 1997; Northouse, 2012). Leadership behaviors that are task focused help teams coordinate (House & Aditya, 1997; Northouse, 2012). The order and consistency produced by these behaviors may help teams develop trust, team orientation, shared mental models, and appropriately engage in backup behavior (Morgeson et al., 2009; Zaccaro et al., 2002). Leadership behaviors that are person focused builds team cohesion, motivates, and inspires team members (Cummings et al., 2010; House & Aditya, 1997; Northouse, 2012). Person focused behaviors may help teams develop trust, team orientation, and shared mental models (Morgeson et al., 2009; Zaccaro et al., 2002). These proposed relationships should be tested.

Another lens to study leadership is through the theoretical framework put forth by Morgenson and colleagues (2009). An examination of leadership processes is particularly interesting in the context of military hospitals and teamwork, where building leadership capacity is important. Future studies should identify formal and informal leadership processes that effectively regulate teamwork behaviors and result in safe patient care. Specifically, these studies should examine processes that are effective for nurse managers and those that are effective for team leaders and under which conditions.

Several variables in this study were correlated limiting the understanding of how individual characteristics and leadership are related and how the combination of factors influences nursing teamwork and future studies are required to clarify the relationships. For example individual characteristics (e.g. nursing role, experience, absenteeism, personnel category, and pay grade) were correlated and shared variance may have limited

their contribution to regression models (Tabachnick & Fidell, 2013). Therefore, future studies should capture the interaction of these variables. Including interaction terms will not resolve the issues with measurement. Exploring reasons for voluntary and involuntary absenteeism may be important in the military hospital setting. The antecedents of voluntary and involuntary absenteeism are different (Martocchio, 1989). Additionally, the diversity of the nursing team may be more important than the individual characteristics, and future studies should consider using measures such as the proportion of males or military etc. on a team to better capture the diversity of the team (Bear & Woolley, 2011; Wegge et al., 2008). Given the correlation between personnel category (military or civilian) and experience, future studies in the military setting should consider measuring experience as a continuous variable to capture the shorter periods of time military work on a particular unit (Tabachnick & Fidell, 2013).

Leadership is an important input variable that needs further research in the context of patient care teams. Nursing teams in the military setting may require nurse managers to frequently use task focused leadership behaviors that clarify roles and coordinate the team. Task focused leadership behaviors may be especially important when workload is higher because they help teams readjust (Morgeson et al., 2009; Zaccaro et al., 2002). On the other hand, in this study person focused leadership behaviors reduced the variation in nursing teamwork attributed to perceptions of understaffing and personnel category, allowing nursing role to contribute to the model. Person focused leadership behaviors may help teams develop shared mental models and better adapt, but requires further study (Burke, 1999; Marks et al., 2000). In this study person focused leadership reduced variation shared by other characteristics; however, the sample size and design limited

conclusions that could be drawn about mediation or moderation. To address limitations of this study including sample size and design further research using a larger sample and experimental design is required.

Future studies should also include outcomes of nursing teamwork. The model of nursing teamwork proposes that nursing teamwork influences outcomes such as patient falls, pressure ulcer, missed nursing care, satisfaction, turnover and conflict (Kalisch & Lee, 2009; Kalisch, Lee, & Rochman, 2010; Kalisch & Lee, 2010, 2011, 2013; Kalisch & Xie, 2014). It is possible that different leadership behaviors are also related to different outcomes of nursing teamwork. Both task focused leadership behaviors and person focused leadership behaviors are related to team effectiveness; however they may influence different outcomes (Burke et al., 2006). Task focused leadership behaviors may improve productivity and performance while person focused leadership behaviors may improve satisfaction (Brunetto et al., 2013; Cummings et al., 2010; Havig, Skogstad, Veenstra, et al., 2011). To clarify the relationships, individual characteristics and leadership should be examined in a team effectiveness framework to better understand the influence of these variables on nursing teamwork and on outcomes.

Cultural differences (among military services, military and civilian) and hierarchy are palpable in the military setting; however, service affiliation and rank were not related to nursing teamwork, but personnel category was related to nursing teamwork. Measures of cultural values (power distance, collectivism, uncertainty avoidance, preference for teamwork) may provide insight into potential differences (Gelfand et al., 2007; Triandis & Gelfand, 1998). Additionally, understanding the role of status may also provide insight (Barrett, 1996; A. C. Weaver et al., 2015; Weinberg et al., 2011). Additionally,

an ethnographic study may also increase our understanding of cultural differences between military and civilian nursing personnel, service members, and the influence of hierarchy.

Future studies should use multi-level models and include unit level and hospital level variables to fully understand the influence of the environment on the team. Nursing staff are nested on patient care units which are nested in hospitals. The current study did not account for the nesting of nursing staff; therefore findings may be attributed to type 1 error. The model in this study explained about 45% of the variance in nursing teamwork; however, the unexplained variance suggests that additional factors influence nursing teamwork. Teamwork may differ by hospital type and size, and unit type and size in the MHS as it does in civilian healthcare systems (Kalisch & Lee, 2013; Kalisch, Russell, et al., 2013). A larger study with more hospitals and patient care units is required to study hospital and unit level variables.

Designing future studies to incorporate unit level staffing measures is important for a better understanding the relationship between staffing and nursing teamwork in the military setting. Adequate staffing is important for supporting nursing teamwork on patient care units (Kalisch & Lee, 2009; Kalisch & Lee, 2013; Kalisch, Russell, et al., 2013). Common staffing indices such as hours per patient day and skill mix were moderately should be used in future studies. Additionally, the turnover of patients on units may affect staffing and should be considered (Park et al., 2012).

Practice.

The results of this study have practice implications for nurse managers. A variety of leadership behaviors are important for nursing teamwork. Moreover, nurse managers

may be able to improve nursing teamwork by using different leadership behaviors to address specific problems within their nursing team. Nurse managers that observe problems with team coordination or conflict may want to apply task focused leadership behaviors (Morgeson et al., 2009; Zaccaro et al., 2002). The results of this study indicate that nursing teams in the military setting may require nurse managers to frequently coordinate the team, clarify roles and responsibilities, predict changes in workload, communicate changes, and manage conflict. These behaviors seem to make the most impact on nursing teamwork.

On the other hand, nurse managers that observe problems with team cohesion and motivation may want to apply person focused leadership behaviors (Cummings et al., 2010; House & Aditya, 1997; Morgeson et al., 2009; Zaccaro et al., 2002). The results of this study indicate that nurse managers who interact with the group, explain actions, and consult the group may improve the nursing team's ability to adapt to temporary changes in staffing and develop effective norms for teamwork behavior.

Leaders must ensure that nursing teams incorporate teamwork skills into the conduct of patient care to develop shared norms, especially in the military hospital setting where staff rotates frequently (Salas et al., 1992; Salas et al., 2005). Military may develop team norms through readiness training in which teamwork skills are intensely practiced and refined. As a result military develop cultural norms of how to work together as a team and coordinate across teams. Furthermore, these norms may transfer to other military settings. Conversely, the only opportunity civilian nursing personnel may have to develop teamwork skills is through team training. Person focused leadership behaviors seem to help military and civilian nursing personnel develop a shared

understanding for nursing teamwork behaviors. Teamwork skills must also be incorporated into local policies and procedures.

Policy.

Policy should align current education programs with the evidence. Leaders at different levels in the organization require different leadership skills (DeChurch et al., 2010; Hiller, DeChurch, Murase, & Doty, 2011). Leadership behaviors that support teamwork should be incorporated into existing TeamSTEPPS® training and service specific leadership courses. The leadership skills should progress from those a team leader requires (task focused) to those a charge nurse, nurse manager (task focused and person focused), and senior leader (transformational) require. For example, the basic courses for officers and enlisted should focus on building team leadership capacity through shared work to enhance cooperation and develop collective identities, which are required for effective teams (Day, Gronn, & Salas, 2004). Ongoing team training that explores differences in perceptions within the context of the team is also important for developing shared norms. Team dimensional training is an evidence based approach that can be easily implemented in military education or on a patient care unit (Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008). Opportunities to practice leadership skills at the lowest level and earliest opportunity are necessary.

Similarly, teamwork skills must be incorporated into hospital education and training and into patient care tasks to build team leadership capacity. Despite standardized TeamSTEPPS® training across the MHS, perceptions of teamwork vary within the same hospital (DoD, 2014). Currently, TeamSTEPPS® provides an overview of team processes and training on multidisciplinary tasks and may not transfer to the

patient care unit where a large portion of patient care tasks is completed by the nursing team. However, training that focuses on teamwork skills and problems common on patient care units are promising (Kalisch, Aebersold, McLaughlin, Tschannen, & Lane, 2014; Kalisch et al., 2007; Kalisch, Xie, & Ronis, 2013). However, team training in itself is not sufficient for building and maintaining effective team behaviors.

The nurse manager should receive formal leadership training prior to assignment as the leader of a patient care unit. Leadership is important for supporting teamwork (Burke et al., 2006; Cummings et al., 2010; Havig, Skogstad, Veenstra, et al., 2011; Morgeson et al., 2009; Ruggieri & Abbate, 2013). This study found that the leadership behavior of the nurse manager is important on patient care units and that task focused and person focused leadership behaviors have different relationships with nursing teamwork. Therefore leadership courses should incorporate the development of both task focused and person focused leadership skills. Nurse managers must be able to evaluate the deficiencies of their nursing teams and implement interventions to improve nursing teamwork. For example, changes in workflow often impact nursing teamwork (Kalisch et al., 2011; Kalisch & Lee, 2009; Kalisch & Lee, 2011). Training on tasks or scenarios that incorporate surges in patient workflow may develop the leadership skills required to help nursing staff adapt to changes in workload. Tasks or scenarios that are problematic or important for a patient care unit are appropriate scenarios for training leadership skills and should be incorporated into formal leadership training.

CONCLUSION

This conceptually driven cross-sectional study explored correlates and factors of nursing teamwork on patient care units in a military hospital. The results of the multiple

regression analyses indicated that the combination of the nursing characteristics (gender, nursing role, experience, absenteeism, staffing adequacy) and military characteristics (personnel category, service affiliation, pay grade), including leadership, explained 45% to 48% of the variance in nursing teamwork. Most of the variance in nursing teamwork was explained by leadership alone which supports including leadership in conceptual frameworks of nursing teamwork. Future research should examine the relationships between leadership behaviors and the nursing teamwork factors (trust, team orientation, backup behavior, shared mental model, team leadership), and include healthcare outcomes. Nurse managers may be able to improve nursing teamwork by using task focused and person focused leadership behaviors to address specific problems within their nursing team; however, policy is needed to align current educational programs with the evidence to develop leadership skills of the nurse manager.

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