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Background: Maintaining patient safety is an important pillar of health care delivery. Promoting a safe culture in a healthcare setting influences patient safety outcomes directly as well as indirectly through improved nurse outcomes. Previous studies of safety culture at hospitals in the Middle East have been descriptive in nature but few studies have examined its relationship with patient and nurse outcomes.

Purpose: The purpose of this study was to examine the relationship between safety culture and nurse and patient outcomes in acute care Middle East hospitals using data from the National Database of Nursing Quality Indicators® (NDNQI®).

Methods. Utilizing a cross-sectional correlational design, this study included 91 inpatient adult, pediatric, and perinatal units from seven Middle East hospitals that participated in the National Database of Nursing Quality Indicators® (NDNQI®) in 2018. Under a data use agreement with Press Ganey Associates LLC, unit safety culture was determined using data from the Practice Environment Scale of the Nursing Work Index [PES-NWI]. Data about four patient outcomes (CAUTI, CLABSI, falls, and pressure injuries) and three nurse outcomes (job enjoyment, psychological safety, and intent to stay at 1 and 3 years) were also extracted from the database and analyzed at the unit level.

Results. Multiple regression models and mediation analyses showed that safety culture was significantly associated with nurses' job enjoyment, psychological safety, and intention to stay at 1 and 3 years. Poisson count regression models showed that safety culture was significantly associated with two patient outcomes - CLABSI and pressure

injuries. However, when examining the mediation effects of nurse outcomes on the relationships between safety culture and patient outcomes, no significant direct effect of safety culture on patient outcomes were found. Lastly, mediation analysis showed that (a) only the psychological safety-respect indicator significantly mediated the relationship between safety culture and CAUTI; and (b) only intent to stay at 1 year and psychological safety-respect indicator have significant direct effect on CAUTI.

Conclusions and Recommendations. Safety culture was significantly associated with all nurse outcomes and some patient outcomes, and only psychological safety-respect mediated the relationship between safety culture and a patient outcome. The findings of this study are limited by the small number of hospitals that contributed data to NDNQI® for the variables of interest. Future research should examine these relationships in a larger sample. Hospital and nurse leaders should invest in optimizing safety culture to promote patient safety outcomes and nurse outcomes.

THE IMPACT OF SAFETY CULTURE ON NURSE AND PATIENT OUTCOMES IN MIDDLE EAST ACUTE CARE HOSPITALS

by

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Approved by

_____
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To my mother, Alanwar Almotairy, and late father, Morisheed Almotairy, for instilling the spirit to love lifelong learning and always chasing dreams with strong passion. To my wife, Wadha Almotairy, for her continuing support and endless love throughout this journey. To my beautiful daughters, Asayel & Alhanouf, for always shining my life.

APPROVAL PAGE

This dissertation, written by Monir Morisheed R. Almotairy, has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

Safety is a priority and a purpose in any healthcare setting. Maintaining patient safety, which is defined by the Institute of Medicine (2004a) as "the prevention of harm to patients" (p. 5) and "avoiding injuries to patients from the care that is intended to help them" (2001, p. 5), is as important as curing diseases and promoting health. *To Err is Human*, the landmark report of the Institute of Medicine (2000), indicated that 44,000 to 98,000 hospitalized patients die every year because of medical errors, which are defined as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim" (p. 4). However, a recent study highlighted that every year the number of deaths in the United States due to preventable medical errors is actually between 210,000 and 440,000 (James, 2013). In 2013 medical errors were classified as the third leading cause of death in the United States (Makary & Daniel, 2016). The Agency for Healthcare Research and Quality (2014) illustrated that one in every seven hospitalized Medicare patients have experienced at least one adverse event, defined as "an event that results in unintended harm to the patient by an act of commission or omission rather than by the underlying disease or condition of the patient" (Institute of Medicine, 2004a, p. 327). The National Patient Safety Foundation (2015) reported that 10% of hospitalized patients developed a healthcare-acquired condition, defined as "conditions that a patient develops while in the hospital being treated for something else" (Agency for Healthcare

Research and Quality, 2017b, para. 1), such as pressure ulcers, infections, falls, or adverse drug events. Besides the loss of lives and injuries, patient safety issues extend the hospital length of stay, and therefore increase the financial burden on patients, hospitals, and healthcare systems (Institute of Medicine, 2004b). In fact, the Institute of Medicine (2000) highlighted that the "total [annual] national cost (lost income, lost household production, disability and health care costs) of preventable adverse events (medical errors resulting in injury) are estimated to cost between $17 billion and $29 billion, of which health care costs represent over one-half" (p.1-2) . Falls among older adults alone cost the United States $50 billion in 2015 (Centers for Disease Control and Prevention, n.d; Florence et al., 2018). In fact, prolonged lengths of stay in hospitals due to hospital-acquired conditions account for two-thirds of Medicare costs (Department of Health and Human Services, 2010).

Patient Safety Initiatives

Initiatives and programs aimed at preventing harm to patients have been introduced and implemented in many areas around the world. For example, the National Quality Forum (NQF) nursing-sensitive measurement standards in the United States were introduced to guide patient safety research after the IOM report in 2000. The National Quality Forum (2004) report identified 15 voluntary consensus standards for nursing sensitive care that classify safety priorities and issues in healthcare settings. These standards included failure to rescue, pressure ulcer prevalence, falls, falls with injury, restraint prevalence, and infections, such as catheter-associated urinary tract infection

(CAUTI), central line-associated bloodstream infection (CLABSI), and ventilator-associated pneumonia (VAP).

In the United States, many organizations took the lead in patient safety efforts since release of the IOM report in 2000 and passage of the Patient Safety and Quality Improvement Act in 2005 and the Patient Safety Rule in 2008. The Joint Commission released its first National Patient Safety Goals (NPSGs) in 2002 to guide the effort in identifying patient safety issues (Joint Commission, 2016). The NPSGs are the following: improve the accuracy of patient identification, improve the effectiveness of communication among caregivers, improve the safety of using medications, reduce the harm associated with clinical alarm system fatigue, reduce the risk of health care-associated infections, reduce the risk of patient harm resulting from falls, prevent health care-associated pressure ulcers, identify safety risks inherent in the organization's population, and prevent surgical errors.

Similarly, the Canadian *Safer Healthcare Now!* Program was launched in 2005 by the Canadian Patient Safety Institute to provide "evidence-based interventions to reduce preventable harm and improve patient safety and care in hospitals and healthcare facilities throughout Canada" (Canadian Patient Safety Institute, n.d, p. 2). Specifically, this program includes evidence-based interventions for the prevention of death among patients hospitalized for acute myocardial infarction, infection prevention and control (including surgical site infections, CLABSI, and VAP), falls and fall-related injuries, medication reconciliation to prevent adverse drug events, delirium prevention, preventing venous thromboembolism (VTE), and safe surgery checklist. Furthermore, the (Canadian

Patient Safety Institute) initiated the Six Domains of Safety Competencies to enhance patient safety across the health professions. These domains are: (a) contribute to a culture of patient safety, (b) work in teams for patient safety, (c) communicate effectively for patient safety, (d) manage safety risks, (e) optimize human and environmental factors, and (f) recognize and respond to disclosed adverse events (Canadian Patient Safety Institute, 2008, 2012, 2017).

Safety Culture as an Initiative

Safety culture has been one of the top initiatives used around the world to improve patient and staff outcomes (Joint Commission, 2017; Sammer & James, 2011; Timmel et al., 2010; Weaver et al., 2013).

Definition of Safety Culture

Safety culture has more than 46 definitions in the health literature (Waterson, 2014). The definitions of safety culture used in healthcare were originally developed in other fields, starting at the International Nuclear Safety Advisory Group (INSAG) after the Chernobyl crisis in 1987 (Cooper, 2002). Some of the definitions used for safety culture in the 1980s through early 1990s were: "The way we do things around here" (Deal & Kennedy, 1982, p. 4), and "[a] collection of beliefs, norms, attitudes, roles and practices of a given group or organization" (Turner et al., 1989, p. 4).

The International Nuclear Safety Advisory Group (INSAG) described safety culture as "that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance" (International Nuclear Safety Advisory Group,

1991, p. 1), however, the process was not clear in terms of how a safety issue is raised and dealt with. The 1993 definition of the Health and Safety Executive's (HSE) Advisory Committee on the Safety of Nuclear Installations has become the definition used across fields to define safety culture; this is also the definition that the Agency for Healthcare Research and Quality (AHRQ) used widely in the healthcare literature. AHRQ defines safety culture as "the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" (Nieva & Sorra, 2003, p. 1). To employ this term practically, High Reliability Organization (HRO) theory defined safety culture based on trusting, reporting, and improving (Chassin, 2013; Chassin & Loeb, 2013; Roberts, 1993). To illustrate, safety culture in a given organization is based on trust that (a) staff can report an error/potential error to leaders without retribution, and (b) trust that leaders will appraise the report by working on solving/improving it and proactively intervene to prevent it (Chassin, 2013; Chassin & Loeb, 2013; Roberts, 1993). Furthermore, safety culture is "supported when both upper level management and frontline workers place high value on safety" (Kaczur, 2017, p. 32).

Safety culture has been used interchangeably with the term safety climate (David et al., 2014; Garrouste-Orgeas et al., 2015; Sexton et al., 2006; Zohar & Polachek, 2014). Some health researchers, however, have concluded that safety culture is a higher level concept that includes the concept of safety climate (Singh et al., 2008; The Health Foundation Inspiring Improvement, 2011). In this study, Schein's view of organizational

culture and climate is used to elaborate on the difference between safety culture and climate. Schein (2010) explained that organizational culture is:

> A pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 18)

Schein (2010) proposed that a culture is formed if its members survive in/adapt with their environment. This also indicates that the time factor is a crucial element to build a culture. Schein proposed that there are three layers of organizational culture. First, the basic underlying assumptions layer is the unconscious layer and includes taken for granted beliefs, perceptions, thoughts, and feelings that are identical across members. Second, the espoused beliefs and values layer has strategies, goals, and philosophies of a group, which within an organization are the basis for all successful actions taken by members. The third layer is the artifacts, described as the visible organizational structure and processes (Schein, 2010). Part of the third layer is climate. Schein's conceptualization of the relationship between culture and climate can be applied to safety culture and climate. The artifacts are measurable compared to the other layers of the organization's culture. Hence, safety climate is part of safety culture (Schein, 2010; Zohar, 2000), and it can be used to measure and assess the actual underlying safety culture (Uryan, 2010; Zohar & Luria, 2005).

Patient and Nurse Outcomes in Relation to Safety Culture

In a few studies, safety culture, or its dimensions/domains, is discussed in relation to patient outcomes, such as fall rates and medical errors, and nurse outcomes, such as nurse satisfaction. For instance, a Comprehensive Unit-based Safety Program (CUSP), an 8-step program designed to enhance teamwork in identifying and mitigating safety risks, was used in a quasi-experimental study to determine whether it could improve safety culture (Ganaden & Mitchell, 2018). The authors concluded that the overall safety culture score by respondents increased from 70% pre-intervention to 76% post-intervention. In another study TeamSTEPPS training, an evidence-based approach to enhance teamwork and improve safety culture (Agency for Healthcare Research and Quality, 2017a), was used to enhance communication openness among healthcare staff, with the goal to improve the nonpunitive response to reported events in hospitals (Pasciolla & Alba, 2015). Comparing post-intervention to pre-intervention results indicated a 6% increase in staffs' perceptions that the reported events/concerns were heard, and a 14% increase in staff perceptions that reported events/concerns were addressed by leadership (Pasciolla & Alba, 2015). Safety culture was also used to describe the impact of having a pre-surgical checklist in operating rooms to enhance the communication and handoff between healthcare staff, identify potential safety issues, reduce surgical complications, and consequently improve the patient safety outcomes (Treadwell et al., 2014).

Safety culture has been studied in relation to nurse outcomes. For instance, safety culture was inversely correlated with nurse compassion fatigue and dissatisfaction (Anglade, 2015, 2017). Additionally, facets of safety culture, also called dimensions or

domains, have been studied in relation to some nurse outcomes. For example, managers' leadership style, as a dimension for safety culture, was found to have significant influence on nurses' job satisfaction (Williams, 2014).

Considering the overall picture, nurse outcomes can impact patient outcomes. The Institute of Medicine (2004b) recommended that the healthcare workforce is one of the safety defenses, and therefore organizations should conduct a continuous evaluation of their nurse staffing practices. In fact, the landmark report, *Free From Harm: Accelerating Patient Safety Improvement Fifteen Years After To Err is Human*, from the National Patient Safety Foundation (2015) emphasized the support for the health care workforce: "workforce safety, morale, and wellness are absolutely necessary to providing safe care. Nurses, physicians, medical assistants, pharmacists, technicians, and others need support to fulfill their highest potential as healers" (p. 10). Similar to patient outcomes, this recommendation is supported by studies that examined the relationship between work environment and workforce burnout (Linzer et al., 2014; National Patient Safety Foundation, 2015; Ulrich et al., 2014).

A report from the National Patient Safety Foundation's Lucian Leape Institute (LLI) (2013), *Through the Eyes of the Workforce: Creating Joy, Meaning, and Safer Health Care*, posits that "workplace safety is also inextricably linked to patient safety. Unless caregivers are given the protection, respect, and support they need, they are more likely to make errors, fail to follow safe practices, and not work well in teams" (p. 1-2). Besides the physical and psychological harm, this report shed light on another dimension for workforce safety. The report stated that "the costs of burnout, litigation, lost work

hours, employee turnover, and the inability to attract newcomers to caring professions are wasteful and add to the burden of illness" (Lucian Leape Institute, 2013, p. 10).

Patient Safety in the Middle East Region

In the past decade there has been growth in the attention given to safety and safety culture in the Middle East region, where this study was conducted. For example, the emphasis on patient safety in Saudi Arabia has increased since the release of healthcare strategic objectives in the Saudi National Transformation Program 2020. The Saudi Patient Safety Center (2017) reported that the average number of adverse drug events (ADEs), defined as "an injury resulting from medical intervention related to a drug" (Institute of Medicine, 2000, p. 33), is about 6% of the total patient admissions (Saudi Patient Safety Center, 2017). This number is based on a study that included only four local hospitals in Riyadh, the capital city of Saudi Arabia, yet it supports the significance of patient safety in Saudi Arabia. The fact that the Saudi Patient Safety Center was launched in 2017 as an initiative to meet the patient safety strategic objectives of the Saudi National Transformation Program 2020 indicates that Saudi Arabia is prioritizing patient safety as one of the quality indicators for its healthcare system (Saudi Vision 2030, 2017).

The Saudi National Transformation Program 2020 was released in 2015 as an initiative toward meeting Saudi Arabia's vision 2030. Saudi Arabia's Vision 2030 aims to:

> Grant the Kingdom a leading position in all fields, [and to] …. identify the general directions, policies, goals, and objectives of the Kingdom. [It]

> encompasses – in a number of domains – strategic objectives, targets, outcome-oriented indicators, and commitments that are to be achieved by the public, private, and nonprofit sectors. (Saudi Vision 2030, 2017, p. 6)

In fact, one of the objectives that the Transformation program is aiming at is "translating Strategic Objectives into Initiatives for the Participating Entities" (Saudi Vision 2030, 2017, p. 11); the participating entities include the Ministry of Health. In the Saudi Ministry of Health's 15 strategic objectives, patient safety is clearly emphasized as a healthcare priority. For example, one of the strategic aims for Saudi Arabia in the healthcare field is to "improve quality and safety principles as well as skills of service providers" (Saudi Vision 2030, 2017, p. 30). In the Saudi Ministry of Health's 15 strategic objectives, safety culture is one of the key performance indicators (outcome-oriented). The Ministry of Health is aiming to increase the percentage of hospitals that meet the United States median for safety culture perception scores from 10% to 50% by 2020 (Saudi Vision 2030, 2017).

Similar initiatives have been pursued in other Middle East countries. In fact, the Patient Safety Friendly Hospital Initiative (PSFHI), launched in 2006 by World Health Organization (WHO) Regional Office for the Eastern Mediterranean, to shed-light on patient safety, including the promotion of safety culture and identification of lapses in patient safety (World Health Organization, 2016; World Health Organization - Regional Office for the Eastern Mediterranean, 2011). In the PSFHI, the WHO highlighted 140 standards under the following domains: leadership and management, patient and public involvement, safe evidence-based clinical practices, safe environment for patients and

staff, and lifelong learning (World Health Organization, 2016). In 2009-2010, the first phase of PSFHI was carried out in Egypt, Jordan, Morocco, Pakistan, Sudan, Tunisia, and Yemen. The initiative was expanded later to Libya, Iran, Iraq, and Palestine in 2010-2011 (World Health Organization, 2016); Afghanistan, Syria, and private hospitals in Qatar in 2014-2015 (World Health Organization, 2016); and Oman in 2016 (Al-Mandhari et al., 2018). However, the WHO stated that "only a few countries have scaled up their efforts, like Iran, Palestine, Qatar (private sector) and Oman. There is an equivocal commitment by many countries, but initial enthusiasm has not yet materialized into action" (World Health Organization, 2016, p. 11).

On the other hand, many hospitals in the Middle East countries have joined the National Database of Nursing Quality Indicators® (NDNQI®) program. According to Press Ganey Associates LLC (2018), the purpose of the NDNQI® program is to "measure nursing quality, improve nurse engagement, strengthen the nursing work environment, assess staffing levels and improve reimbursement under current pay for performance policies" (para. 2). In short, efforts to support patient safety have been reported in different Middle East countries.

Statement of the Problem

Studies on safety culture conducted in several Middle East countries have been descriptive in nature. The majority of studies examined nurses' and other healthcare professionals' perceptions of safety culture using validated tools, such as the Hospital Survey on Patient Safety Culture and the Safety Attitude Questionnaire (Aboshaiqah & Baker, 2013; Aboul-Fotouh et al., 2012; Alayed et al., 2014; Almutairi et al., 2013;

Ammouri et al., 2015; El-Jardali et al., 2014; Hamdan & Saleem, 2013). These studies established a baseline assessment for safety culture in hospitals across the region. However, there is limited evidence about the relationship between safety culture and patient and nurse outcomes in hospitals in the Middle East region. Addressing this gap in knowledge can enrich the literature with evidence on linkages between safety culture, nurse outcomes, and patient outcomes and establish a foundation for future studies to optimize safety culture and ultimately nurse and patient outcomes.

Theoretical Framework

The Integrative Model of Organizational Climate of Staff Working Conditions and Safety (IMOC) is a nursing conceptual model that was developed based on Donabedian's Structure-Process-Outcome model (Bonner et al., 2009). It was developed first by Stone et al. (2005), and it was tested and expanded in 2009 by Bonner et al. Although Bonner et al. (2009) have tested the model on a sample of certified nurse assistants, this model as well as Stone et al. (2005) can be applied in other settings. This model embraces safety culture and how it influences patient and nurse outcomes. The model, as presented in Figure 1, has three levels: structure, process, and outcomes. The structure level consists of leadership (the organization leaders' philosophy on safety, how they are valuing it, and their connection with frontline workers) and organization structure (just and learning culture, policies and procedures, and safety systems).

The process level is called unit level safety climate domains, and it consists of communication, teamwork across units, overall perceptions, teamwork within units, feedback, organizational learning, management expectations, handoffs, staffing, and

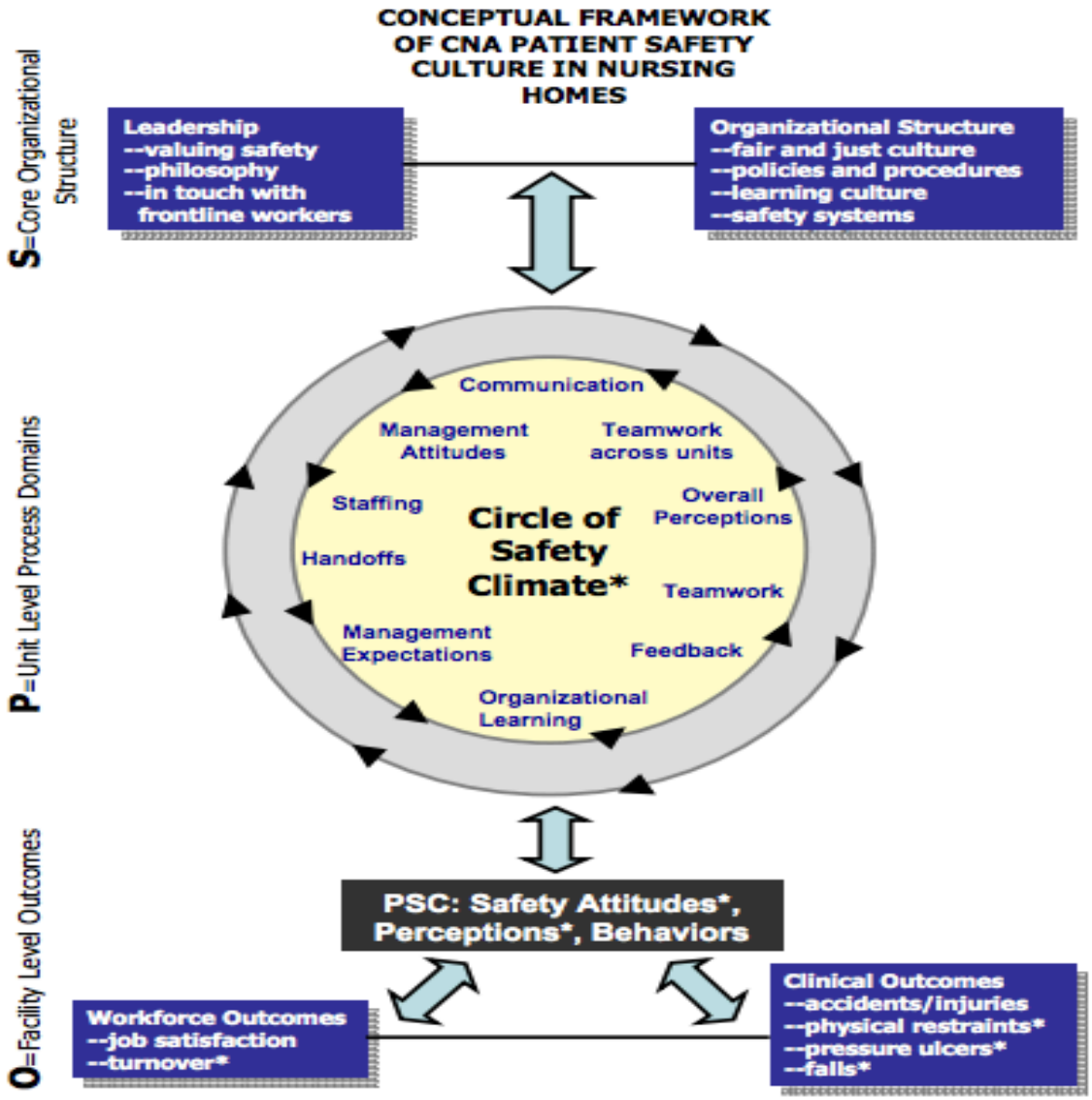
management attitudes. These domains are in a circular pattern, which indicates that they are nonlinear (Bonner et al., 2009). The outcomes level consists of proximal and distal outcomes. The proximal outcome is safety culture perceptions and attitudes. The distal outcomes are patient-related safety outcomes, such as medication errors and fall incidents, and nurse outcomes, such as satisfaction, engagement, and intention to leave.

It is important to highlight that changes in any level can influence other model levels (Bonner et al., 2009). For example, a leadership style can impact several components of safety climate which can influence safety culture perception and attitude and, ultimately, impact patient and nurse outcomes. Additionally, an outcome may also influence safety culture perceptions and attitudes, which can impact the leadership style or organizational policies and procedures. While the concepts of safety culture and safety climate have been used interchangeably in many nursing studies, the IMOC clearly presents these two concepts differently. Safety climate is seen in this model as the physical component that predicts the underlying culture of safety in an organization. This view is consistent with Schein's (2010) view, presented earlier in this chapter, on culture and climate. This third layer of Schein's view on safety culture, as discussed earlier, is presented in the IMOC as the leadership style and organizational structure. It also includes the circle of safety climate in the IMOC because this circle represents how staff utilize the organizational resources and other structures in their daily functioning and interactions with patients, frontline staff, and other team members, including managers. Therefore, the IMOC clearly lays out details that occur at the structure level. The IMOC also presents detailed outcomes. perceptions, attitudes, and behaviors pertaining to safety

culture are the target in the proximal outcomes and, most importantly, patient-related safety outcomes and staff outcomes are the distal outcomes.

Figure 1

Integrative Model of Organizational Climate of Staff Working Conditions and Safety. Reprinted with Permission



Study Aims

The purpose of this research is to examine the relationship between safety culture and nurse and patient outcomes in a sample of Middle East hospitals using data from the National Database of Nursing Quality Indicators® (NDNQI®). The study has three main aims:

1. To examine the associations between safety culture and nurses' job enjoyment, psychological safety, and intention to stay at 1 and 3 years in acute care hospitals in Middle Eastern countries;
2. To examine the associations between safety culture and catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), patient falls, and pressure injuries in acute care hospitals in Middle Eastern countries;
3. To examine the potential mediation effects of nurses' job enjoyment, psychological safety, and intention to stay at 1 and 3 years on the relationships among safety culture and CAUTI, CLABSI, patient falls, and pressure injuries in acute care hospitals in Middle Eastern countries.

CHAPTER II

LITERATURE REVIEW

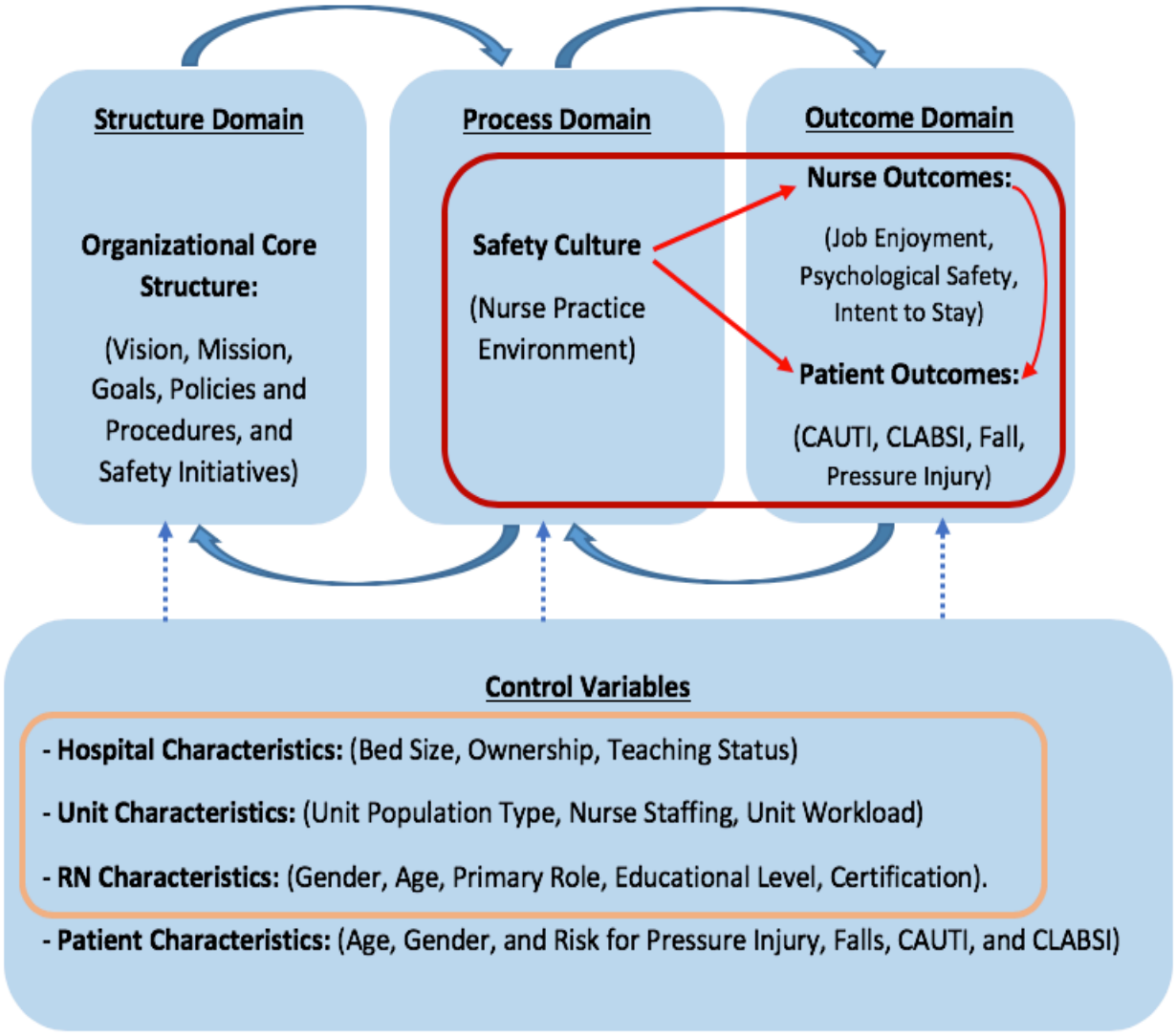
In this chapter I will appraise literature on safety culture in healthcare. Specifically, I will review the state of science regarding measuring safety culture perceptions and how safety culture has been studied in relation to nurse and patient outcomes. The review is drawn from international literature and ends with a focus on the Middle East region, which was the setting for this study.

The review is guided by an analytical model that lays out the study concepts of interest. As presented in Figure 2, safety culture is a process to achieve outcomes relevant to patients and nurses. The safety culture is influenced by the organizational structure – such as vision, mission, goals, policies and procedures, and safety initiatives. The relationships among structure, process, and outcome domains are influenced by the characteristics of hospital, unit, RN, and patient. Furthermore, the relationship between structure, process, and outcome domains is seen as a reciprocal relationship. To illustrate, although the organizational core structure can impact the safety culture and, ultimately, nurse and patient outcomes, outcomes can also impact the safety culture and reach the organizational core structures, such as organizational goals and priorities relevant to these outcomes. This study was interested in exploring the impact of safety culture on nurse and patient outcomes, while controlling for hospital, unit, and RN workgroup

characteristics. Furthermore, this study examined the mediation effects that nurse outcomes could have on the relationship between safety culture and patient outcomes.

Figure 2

The Study Analytical Model



The review is organized by first presenting descriptive results about hospital safety culture and its dimensions, followed by studies that have explored the relationship between safety culture and nurse outcomes, and ending with studies that have explored the relationship between safety culture and patient outcomes.

Safety Culture in Acute Care Hospitals

A large stream of research has examined staff perceptions of safety culture within their units or compared to different units within a given healthcare institution. Results of these studies presented an overall score/percentage for safety culture, which is then used to classify these units as having a high or low safety culture. In general, measuring the perception of safety culture across different healthcare professional groups showed score variability across these groups. Overall, in an integrated review by Willmott and Mould (2018), the scores of safety culture varies across different healthcare professional groups, clinicians had lower perception scores compared with non-clinicians, and unit safety culture was perceived higher compared to the overall hospital safety culture.

Hospital Survey on Patient Safety Culture

The Hospital Survey on Patient Safety Culture (HSOPSC) is a commonly used instrument to measure safety culture. Although the NDNQI® does not include data from this instrument, review of the use of the HSOPSC is included to show how safety culture has been studied and evaluated. The development of HSOPSC was sponsored by the Agency for Healthcare Research and Quality (AHRQ) and Medical Errors Workgroup of the Quality Interagency Coordination Task Force (QuIC) (Agency for Healthcare

Research and Quality, 2016). The purpose of HSOPSC is to measure the perception of hospital staff on safety culture in their institution.

The tool consists of 12 safety culture dimensions (42 items), where two of these dimensions are outcomes. The outcome dimensions are overall perception of safety and frequency of event reporting (reliability coefficients are 0.74 and 0.84, respectively). The other 10 dimensions, which are called process dimensions, are (with reliability coefficients in parentheses): supervisor/manager expectations and actions promoting patient safety (0.75), organizational learning-continuous improvement (0.76), teamwork within units (0.83), communication openness (0.72), feedback and communication about error (0.78), nonpunitive response to error (0.79), staffing (0.63), hospital management support for patient safety (0.83), teamwork across hospital units (0.80), and hospital handoffs and transitions (0.80). The correlations among the 12 dimensions ranged from 0.23 to 0.60. HSOPSC uses a 5-point Likert response scale of agreement ("Strongly disagree" to "Strongly agree") or frequency ("Never" to "Always"). The HSOPSC has two other outcomes: patient safety grade and number of events reported. The patient safety grade is a single-item measure that is graded from A through E (A = Excellent, B = Very Good, C = Acceptable, D = Poor, and E = Failing). The number of events reported is a single-item measure that has numeric response categories (Sorra & Nieva, 2004).

For each of the 12 HSOPSC dimensions scoring is accomplished by summing up the frequency of responses to each item. According to Sorra and Nieva (2004), the two highest response categories (Strongly agree/Agree and Most of the time/Always) are combined when calculating the frequency of responses for scoring purposes. Similarly,

the two lowest response categories (Strongly disagree/Disagree and Never/Rarely) are also combined when calculating the frequency of responses. For each dimension, composite frequency of the total percentage of positive responses – Strongly agree/Agree or Always/Most of the time (or disagree in negatively worded items) – is used to report the scoring. For a dimension to be classified as a strength area for a hospital, 75% of respondents have to answer "Strongly agree/Agree" or "Always/Most of the time" (Sorra & Nieva, 2004).

HSOPSC Ratings by Healthcare Professionals

The HSOPSC is often administered to all hospital employees to determine their perceptions of safety culture in their own setting. In Sri Lanka, Amarapathy et al. (2013) showed positive scores for safety culture dimensions. The overall perception of patient safety was 81.3%, and only two dimensions scored above 75% – organizational learning-continuous improvement (82.5%) and teamwork within units (84.8%). In Iran, Moussavi et al. (2013) indicated that the overall score of safety culture was 35%, with a lowest score (12%) for non-punitive response to error dimension and highest score (48%) for the teamwork within units dimension. The most recent report by AHRQ on 382,834 healthcare professionals from 630 U.S. hospitals revealed an overall score of safety culture of 65%, and dimensions ranging from 47% in nonpunitive response to error to 82% in teamwork within units (Famolaro et al., 2018). This report compared results from a 2016 report to a 2018 report and indicated that 13% of hospitals increased by a minimum of 5% on at least seven dimensions. Specifically, 35% of hospitals in 2018

increased by at least 5% on nonpunitive response to error, however, 21% of hospitals decreased by at least 5% on staffing (Famolaro et al., 2018).

The previously reported studies did not present a comparison between scores, either within or across healthcare professionals, based on hospital, unit, or staff characteristics as the culture of safety is evolving and reflected over a long period of time. One hospital characteristic, private versus public ownership, may have an influence on safety culture perception. For example, Arrieta et al. (2018) compared the perception of safety culture among health professionals from private and public sectors, and they found that private sector hospitals scored highest in all 12 dimensions of the HSOPSC. Furthermore, length of experience at hospital and unit influenced the number of positive scores of safety culture; overall grade of patient safety was rated higher among health professionals who have longer length of experience in their professions (Tomazoni et al., 2014). Staff on surgical units had higher overall perceptions of safety (48.1%) compared to staff on other units (40.4%), where differences may have varied based on dimensions across units (Shu et al., 2015). The AHRQ report on U.S. hospitals highlighted that smaller hospitals (6-24 beds) reported a higher overall score on safety culture, 71%, compared to 61% in larger hospitals (500+ beds) (Famolaro et al., 2018). In the AHRQ report, the overall score of safety culture varied by staff position; administration/management staff had a higher overall safety culture score (77%) than nurses (63%) (Famolaro et al., 2018).

In addition to assessing different dimensions of safety culture, the HSOPSC is used to assess how health professionals grade patient safety in their hospitals. In the

United States, the AHRQ found that 78% of health professionals graded patient safety in their work areas/units as excellent/very good (Famolaro et al., 2018). In Peru, Arrieta et al. (2018) reported that only 18% of health professionals graded patient safety as excellent or very good. When comparing private hospitals to public hospitals, 37% of health professionals from private hospitals graded patient safety as excellent or very good, compared to 13% to 15% from public hospitals. In China, those who graded patient safety as excellent/good in surgical and non-surgical units was 82.6% and 75.3%, respectively (Shu et al., 2015).

HSOPSC Ratings by Nurses

The perception of safety culture by nurses in hospital settings has been examined separate from the perceptions of all health professionals. In a study by Tavares et al. (2018), 221 nurses from a teaching hospital rated the overall safety culture score at 63%, and dimensions scored between 47% for nonpunitive response to errors and 75% for teamwork within units. In China, Xue et al. (2014) assessed safety culture perception, as part of their study, in seven large high-technology hospitals with 1000–2500 beds and reported that the overall safety culture perception was 57.4%. They identified organizational learning-continuous improvement (89.7%) and teamwork within units (86.5%) as the highest scored dimensions, with the staffing dimension as the lowest (23.6%). Like some previous studies, these studies did not compare safety culture scores based on demographic variables, such as years of experience and other RN, hospital, or unit characteristics.

In Norway, Ballangrud et al. (2012) surveyed 302 nurses and found variations in scores between unit and hospital levels. The overall perception of safety culture was 69%, with other dimensions ranging from 18% for frequency of event reporting and 80.6% for teamwork within hospital units. At hospital level, scores on all 12 dimensions ranged from 26% to 57%, whereas at unit level it ranged from 42% to 81%. Such findings emphasize the importance of assessing safety culture across different hospital levels. In Turkey, the overall perception of safety culture scored 51%, with results ranging from nonpunitive response to error scoring lowest (24%) to teamwork within units scoring highest (78.5%) (Güneş et al., 2016). These investigators also found variations in safety culture dimension scores based on demographic characteristics. For example, when comparing nurses who have less than 10 years of work experience to those who have more than 10 years of work experience; the overall perception of safety culture scored 44.5% and 59%, frequency of event reporting scored 20.1% and 36.4%, teamwork across hospital units scored 38.4% and 60.5%, and teamwork within units scored 64.8% and 89.9%, respectively.

Patient safety grade was also reported in many studies that assessed perception of safety culture among nurses. In Turkey patient safety was graded as very good or excellent by 50.2% of nurses (Güneş et al., 2016). In New York nurses graded patient safety as excellent (19.74%) or very good (50%), whereas the overall perception of safety culture was 49.7% (Armellino et al., 2010).

Safety Attitude Questionnaire

A second instrument that has been used frequently to measure safety in acute care hospitals is the Safety Attitude Questionnaire (SAQ). According to Sexton et al. (2006), SAQ was derived from the Intensive Care Unit Management Attitudes Questionnaire, which was also adopted from a commercial aviation's tool called the Flight Management Attitudes Questionnaire. SAQ has six domains: teamwork climate, safety climate, perception of management, job satisfaction, working conditions, and stress recognition, with all items in each domain rated using a Likert scale (Disagree strongly, Disagree slightly, Neutral, Agree slightly, and Agree strongly). For scoring purposes, the mean of the set of items for each domain is calculated. Although the mean score will be out of 5, the final reported results are in percentage (Center for Healthcare Quality and Safety, n.d). A scale score of 60% or higher is needed for a domain to be classified as satisfactory, and the goal zone is 80% or higher (Sexton et al., 2011). Researchers typically report the positive percent score for each domain as well as the overall score for safety culture.

SAQ Ratings by Healthcare Professionals

Like the HSOPSC, the SAQ has been used to measure the perceptions of safety culture by healthcare professionals in acute care hospitals. A study conducted by Carvalho et al. (2015) used a SAQ version translated and validated in Portuguese, to survey seven professional groups in one hospital. The overall safety culture score was 53.5%. Domains with satisfactory scores were stress recognition and job satisfaction with scores of 74.5% and 70.7%, respectively. In contrast, domain scores for teamwork

climate (59.1%), safety climate (48.9%), unit's perception of management (44.5%), working conditions (41.9%), and hospital's perception of management (34.9%) indicated need for improvements. In a study of four regional hospitals in Albania by Gabrani et al. (2015), only teamwork climate domain had a satisfactory score (60.3%). In contrast, domain scores for the perception of management (59.3%), job satisfaction (58.4%), safety climate (57.2%), working conditions (49.5%), and stress recognition (37.4%) indicated needs for improvements. Relihan et al. (2009) found that an Irish hospital, when compared to international benchmarks, has significantly higher scores for stress recognition (74.7% in Ireland vs. 67.8% in international benchmark), teamwork climate (73.7% vs. 68.5%), safety climate (71% vs. 65.9%), and job satisfaction (67.9% vs. 63.6%). Furthermore, the authors found score variations in all domains across health professionals; for all domains except stress recognition, nurse managers had the highest scores. Comparing staff nurses to physicians, the perception of management score for nurses was 48.4% and 51% for physicians; the working conditions score was 58.4% for nurses and 54.2% for physicians; the job satisfaction score was 66.1% for nurses and 58.3% for physicians; the safety climate score for nurses was 72.5% and 68.5% for physicians; the stress recognition score was 74.2% for nurses and 75% for physicians; and the teamwork climate score for nurses was 74.4% and 73.6% for physicians.

In Taiwan, Li (2013) surveyed 407 nurses and 76 physicians at a university hospital and reported that mean scores for four SAQ domains (safety climate, job satisfaction, perception of management, and working conditions). All four domains had satisfactory scores ranging from 62.5% to 67.2%, and there were no significant

differences between nurses and physicians. In Australia, Chaboyer et al. (2013) surveyed 672 healthcare professionals (76.3% were nurses) from different intensive care units (ICUs) across the country to evaluate the perception of safety culture. The authors reported the mean scores of SAQ domains and identified that four domains (job satisfaction, teamwork climate, safety climate, and stress recognition) had satisfactory scores ranging from 68.5% to 69.8%. Compared to physicians, nurses had significantly lower mean scores in job satisfaction (67.6% vs. 77.1%), teamwork climate (68.8% vs. 79.9%), safety climate (67.8% vs. 75.2%), and working conditions (57.6% vs. 67.9%). In these studies, the authors did not examine the perception of safety culture across different staff characteristics such as years of experience, or hospital characteristics.

Some investigators have compared the perceptions of safety culture based on hospital characteristics. In a Croatian study, Bulajic et al. (2017) identified that differences in safety culture perception across healthcare professionals can be related to hospital characteristics. The perception of safety culture was better in small hospitals compared to large hospitals. The overall total score of safety culture was 72% for hospitals that have less than 500 beds, 67.3% for hospitals with 500-1000 beds, 67.5% for hospitals with 1001-1500 beds, and 66.7% for hospitals with greater than 1500 beds. Bulajic et al. (2017) proposed that smaller hospitals have better communication with management, which in turn improves safety culture. Although this study did not investigate the impact of these findings on patient safety outcomes, it is worthwhile to draw connections between hospital, unit, and staff characteristics, safety culture, and nurse and patient outcomes.

SAQ Ratings by Nurses

Similar to other health professionals, SAQ was used to assess the perception of safety culture among nurses. In Ireland, SAQ scores by staff nurses ranged from 74.4% for teamwork climate to 48.4% for perceptions of hospital management (Relihan et al., 2009). In Australia, 53.3% of nurses rated job satisfaction positively, followed by teamwork climate 50.5% (Soh et al., 2018). However, the perception of hospital management was rated lower (9.3%) when compared to perception of unit management (33.3%) (Soh et al., 2018). In Iran Saberi et al. (2017) surveyed 325 nurses from a teaching hospital and reported that no SAQ domains reached a satisfactory level (60%). Although the authors did not report the score for the stress recognition domain, the scores for the rest of the domains were 59.2% for the perception of management, 55.6% for teamwork, 53.8% for job satisfaction, 49.5% for safety climate, and 43% for working conditions. In Brazil Kolankiewicz et al. (2017) surveyed 648 nurses from several hospitals and reported that all SAQ domains had satisfactory scores (ranging between 63.4% and 87.9%), except the stress recognition domain (58.1%). In a private hospital in Brazil, Golle et al. (2018) surveyed 215 nurses and reported satisfactory scores for SAQ domains. The domain scores were 91% for working conditions, 88% for job satisfaction, 76% for teamwork climate, 73% for safety climate, 67% for unit management perception, 66% for hospital management perception, and 60% for stress recognition. In 65 surgical care units at seven Swedish teaching hospitals, Olsson et al. (2016) surveyed 727 nurses, and the overall score for safety culture was satisfactory (71.3%). The domain scores were 82.7% for job satisfaction, 80.6% for teamwork climate, 76.9% for stress recognition,

65.7% for safety climate, 60.9% for working conditions, and 58.3% for perception of management.

Safety culture among nurses is influenced by nurse characteristics. In China Zhang et al. (2018) assessed the first line nurse managers' perception of safety culture using SAQ. The SAQ domains that had satisfactory mean scores were teamwork climate (79.4), job satisfaction (77.3%), safety climate (77.2%), and perception of management (66.2%). Most importantly, nurse managers who were 45 years and older had a significant difference in safety climate domain, those with higher positions showed significant differences in teamwork climate and stress recognition domains, and those who had a bachelor's degree or higher showed a significant difference in the stress recognition domain. In Cyprus, Raftopoulos and Pavlakis (2013) surveyed 132 ICU nurses, and they reported the following mean scores for SAQ domains: 82.4% for job satisfaction, 74.2% for teamwork climate, 73.2% for safety climate, 67% for working conditions, 54.7% for perception of management, and 30.7% for stress recognition. Moreover, the authors reported that the teamwork climate domain was strongly correlated ($p = .02$) with age and higher years of experience. Additionally, the authors reported that nurses who have more years of experience had higher mean scores in the perception of management domain.

Other Safety Culture Tools

Safety culture also has been studied among health professionals using the Safety Climate Survey (SCS), which has a cutoff of 75% for a domain to be considered a strength area (Pronovost et al., 2003). Gehring et al. (2015) assessed the perception of

safety culture using SCS in Swiss hospitals. The overall safety culture score was 70%, and item scores ranged from 54.5% to 84.5%. In Canada Kho et al. (2009) measured the perception of safety culture in an intensive care unit using SCS; the overall safety culture score was 75%, and item scores ranged from 25% to 87.5%. Comparison against international benchmarks was not highlighted in either study and neither did the authors examine safety culture perception in relation to hospital/unit characteristics, such as bed size, accreditation status, or staffing level.

Intervention Studies to Improve Safety Culture

The Comprehensive Unit-Based Safety Program (CUSP) and TeamSTEPPS are two common interventions that have been shown to have an impact on safety culture (Agency for Healthcare Research and Quality, 2017c). Two studies examined the impact of CUSP on safety culture. Hsu and Marsteller (2015) used SAQ to evaluate the impact of implementing CUSP in ICUs over a 2-year period. Out of five SAQ domains, four domains showed significant changes over the 2-year period: teamwork climate score increased from 45.2% to 52.5%; safety climate score increased from 41.7% to 52.5%; job satisfaction score increased from 52.8% to 60.2%; and working conditions score increased from 29.7% to 37.4% (Hsu & Marsteller, 2015). Lin et al. (2018) examined safety culture at baseline and post-CUSP intervention using HSOPSC, reporting significant improvements in the following 10 dimensions: overall perception of patient safety (from 49% to 53%); teamwork across units (from 49% to 54%); management-support patient safety (from 53% to 60%); nonpunitive response to error (from 36% to 40%); communication openness (from 50% to 55%); frequency of events reported (from

51% to 60%); feedback/communication about error (from 52% to 59%); organizational learning-continuous improvement (from 59% to 70%); supervisor/manager expectations and actions promoting safety (from 58% to 64%); and teamwork within units (from 68% to 75%).

Four studies examined the effect of a TeamSTEPPS intervention on safety culture. A quasi-experimental study assessed safety culture before and after implementing TeamSTEPPS over 3-year period by gathering data from 32,150 health professionals in 14 hospitals, two long term care facilities and outpatient areas of the North Shore LIJ Health System (Thomas & Galla, 2013). Although the HSOPSC scores from this study were not provided, the authors reported that TeamSTEPPS significantly improved the scores of all HSOPSC dimensions, with three dimensions, organizational learning, supervisor/manager expectations, and teamwork within units, having scores >75%. In a cluster randomized clinical trial, three hospitals (one served as a control, one received TeamSTEPPS training only, and one received TeamSTEPPS and in-situ simulation trainings) did not show significant change in the SAQ scores, although all three hospitals had high safety culture scores at baseline (Riley et al., 2011). A quasi-experimental study compared the effect of introducing TeamSTEPPS (at baseline and 1-month post intervention) on two HSOPSC dimensions (teamwork within units and communication openness) found improvements in both. Specifically, teamwork within units and communication openness increased from 74% and 58% at baseline, respectively, to 91% and 79% at 1-month follow up (Gaston et al., 2016). Additionally, a safety culture training program (SCTP) that consists of 76 theoretical and clinical training

hours was used to improve safety culture in Chinese hospitals (Xie et al., 2017). The authors used HSOPSC and SAQ pre-SCTP and six months post-SCTP to evaluate its effectiveness. They concluded that the scores for all HSOPSC dimensions improved in post-SCTP, and the overall score for safety culture increased from 62.39% to 75.99%. Moreover, only four SAQ domains (working conditions, job satisfaction, teamwork climate, and stress recognition) significantly improved. Findings from these intervention studies were equivocal, and only few studies showed an increase in safety culture perception scores.

Qualitative Studies of Safety Culture

Perception of safety culture has been explored using qualitative approaches. One such approach has been the analysis of responses to open-ended questions within the HSOPSC. Boussat et al. (2018) analyzed 247 comments collected from 3,978 HSOPSC questionnaires. The results suggested that understaffing, lack of resources, and lack of hospital management support led to many failures reported in the quantitative results.

Currie and Richens (2009) used phenomenology to explore the experiences and perception of safety culture by midwifery staff. Error reporting and under-reporting of errors, client expectations of the service, feedback and learning lessons, decision-making and staffing levels, communication, prioritization of safety, and staff safety emerged as themes relevant to safety culture. Group and individual interviews with physicians, conducted by Danielsson et al. (2018) highlighted the importance of physicians' shared values and norms to inform expectations for patient safety behaviors. They found that infallibility, described as never committing errors; responsibility for patient safety as part

of the role; autonomy in acting independently; and teamwork with other physicians and health professionals were the values and norms that drove physicians' behaviors in their work environment. However, findings from this study only addressed behaviors in a given environment, which can provide insight into how safety culture drives behaviors.

In summary, studies that examined safety culture in acute care hospitals were mostly descriptive in nature and typically used one of two instruments, HSOPSC and SAQ. Some investigators used interventional approaches to improve safety culture, and most of these interventional studies used the Comprehensive Unit-Based Safety Program (CUSP) or TeamSTEPPS interventions to improve the culture of safety. Surveys on safety culture have shown that there is a wide range in how healthcare professionals, including nurses, perceive the overall safety culture and its specific dimensions in their own practice settings. Unlike SAQ, some HSOPSC dimensions have shown consistency across different settings and countries, such as teamwork within units as one of the highest-scored dimensions and nonpunitive response to errors as one of the lowest-scored dimensions. Yet, overall safety culture and dimension scores reported in most studies show that the satisfactory score is not being met very often. Furthermore, only a few studies examined the influence of selected hospital, unit, and staff characteristics on overall safety culture or safety dimension scores. These findings suggest the need for more investigation of safety culture in acute care hospitals to understand its complexity and to enrich literature on such relationships between safety culture and hospital, unit, and staff characteristics.

Safety Culture in Relation to Nurse and Patient Outcomes

Safety culture has been studied in relation to nurse, patient, and organizational outcomes. However, the focus of this appraisal of the literature addresses the relationships between safety culture and the nurse outcomes and patient outcomes that will be examined in the proposed study.

Safety Culture and Nurse Outcomes

Job Enjoyment

Recently, joy at work has emerged as a contributor factor to patient safety (Gandhi et al., 2018; Lucian Leape Institute, 2013). With the Quadruple Aim move, joy at work is proposed as the fourth aim for high value of healthcare (Sikka et al., 2015). The National Academies of Sciences, Engineering, and Medicine (2019) in its recent publication, *Taking Action Against Clinician Burnout: A Systems Approach to Professional Well-Being*, introduced joy at work as part of addressing clinical burnout. Empirically, job enjoyment has been studied in relation to burnout among medical professionals (Tei et al., 2015); task performance among nurses (Tong, 2018); nurses' learning-focused environment, teamwork, constructive management, and time with patients (Pavlish & Hunt, 2012); job demands and turnover intention among nurses (Cortese et al., 2014); and nurses' job satisfaction (Gatti et al., 2017). However, no study has examined the relationship between safety culture and job enjoyment in the nursing context. Thus, research studies are needed to address this relationship and add an understanding of this relationship.

Nursing Workforce Safety

Some have argued that physical and psychological safety of the nursing workforce are crucial elements in optimizing patient safety as well as health professionals' joy and meaning in work. In fact, according to the Lucian Leape Institute (2013), workforce safety is a precondition for joy and meaning in work, and that "the absence of cultural norms [safety culture norms] that create the preconditions of psychological and physical safety obscures meaning of work and drains motivation" (Lucian Leape Institute, 2013, p. ES1).

Physical safety has been linked to the culture of safety. In a cross-sectional study of 723 nurses and 28,876 patient discharges, common nurse injuries such as needle-sticks, body fluid splashes, slips, trips, and falls, were found to have significant negative associations with the safety climate and teamwork domains of the SAQ and significant positive associations with nurse turnover (Taylor et al., 2012). Consistent with these findings, Smith et al. (2009), in a large cross-sectional study of nurses who worked in a Japanese teaching hospital, found that safety climate had significant negative associations with needle-sticks and sharps injuries among nurses in Japan. Furthermore, in a cross-sectional study of 280 California nurses, higher perceptions of safety culture were significantly associated with lower job strain, lower ergonomic risk perception, and lower work-related injury and symptom experiences (Lee & Lee, 2017).

Psychological harms, such as disrespect, emotional abuse, and bullying, have an effect on nurse safety. Specifically, psychological safety can also influence the culture of

safety. According to Edmondson (2012), psychological safety is based on trust and respect in teams:

> Psychological safety makes it possible to give tough feedback and have difficult conversations without the need to tiptoe around the truth. In psychologically safe environments, people believe that if they make a mistake others will not penalize or think less of them for it. They also believe that others will not resent or humiliate them when they ask for help or information. (p.119)

The importance of psychological safety to safety culture is mirrored in both the HSOPSC and SAQ subscales, which include team climate and non-punitive response to error. Additionally, research identified that a safety culture that promotes psychological safety can lead to better staff outcomes. A cross-sectional study that included 326 U.S. nurses showed that a safety culture that promotes psychological safety is inversely related to negative job affect and workplace hazards (Nixon et al., 2015). Schwappach and Gehring (2015) surveyed 1,013 nurses and physicians on the prevalence and predictors of not speaking up, among nurses and physicians despite concerns for safety; 37% of the sample indicated they did not speak up at least once when they could have prevented an incident by sharing information with other team members. The authors reported an inverse relationship between psychological safety and the frequency of withholding voice.

Trust, respect, and support, as other aspects of psychological safety, have been proposed recently as contributing elements to improve safety culture the (Lucian Leape Institute, 2017). Empirically, although there are few studies, the positive relationship between safety culture and trust (Auer et al., 2014; Han, 2018) and mutual respect

(Manojlovich et al., 2014) were supported. Overall, only a limited number of studies have examined the relationship between safety culture and psychological safety in the nursing context, so examining this relationship further can provide insights into how safety culture influences psychological safety.

Job Plans

Turnover and intention to leave the nursing profession, current workplace, or current position have been linked with safety culture. Specifically, the working conditions domain of the SAQ includes staffing levels in a given unit, which is relevant to turnover rates. In a cross-sectional study that used the SAQ to examine the perception of safety culture among 259 Brazilian nurses, Tondo and de Brito Guirardello (2017) found significant inverse correlations between SAQ domains and intention to leave the profession. In a cross-sectional study that included 326 U.S. nurses, a safety culture that promoted psychological safety was negatively related to intention to leave (Nixon et al., 2015). A cross-sectional study among 723 nurses that examined the association of unit-level safety climate and unit turnover with nurse injuries showed that unit turnover was associated positively with nurse injury (Taylor et al., 2012).

Research on interventions to improve safety culture examined the effect on nurses' job plans. Among 37 nursing units in nine California hospitals, Brown and Wolosin (2013) found significant negative relationships between nursing turnover and safety culture. Timmel et al. (2010) evaluated the effectiveness of introducing CUSP and found that the nurse annual turnover rate fell to 0% compared to 27% before implementing CUSP. Similarly, over a 5-year period, Meurling et al. (2013) used SAQ to

compare safety culture domain scores between intervention ICUs, where simulation-based team training was introduced, and control ICUs. They found that nurse turnover decreased by 2.2% per year in the intervention ICUs in contrast to a 1.7% increase per year in the control ICUs. Thus, improving safety culture can reduce nurse turnover, which can help maintain adequate staffing levels. However, only a limited number of studies used interventional approaches to improve nurse job plans.

Safety Culture and Patient Outcomes

Safety culture is believed to influence patient safety outcomes (Institute of Medicine, 2000, 2004b; Kirwan et al., 2013). While some of the studies are descriptive, many of them have evaluated the effect of inventions designed to improve the safety culture within specific patient care units. A cross-sectional study in Swiss acute care hospitals (Ausserhofer et al., 2013) found that safety culture was not a significant predictor for patient outcomes (nurse-reported medication errors, pressure ulcers, patient falls, urinary tract infections, bloodstream infections, pneumonia, and patient satisfaction). Similarly, Merrill (2011) conducted a correlational study with 466 nurses from 41 different units rating safety culture on the Safety Climate Survey (SCS). Safety culture scores were correlated with patient outcome data drawn from unit databases. Although the nurses reported moderate to high safety culture scores, they were not associated with positive patient outcomes. In contrast, Taylor et al. (2012), in a cross-sectional study using the SAQ, found negative associations between pressure injuries and safety climate and teamwork domain scores. The researchers concluded that turnover was positively associated with patient's pulmonary embolism/deep vein thrombosis

(PE/DVT) and negatively with patient's falls and pressure injuries (Taylor et al., 2012). Given the mixed results on the relationships between nurse turnover and patient outcomes, more research studies are needed to further explain the relationships between safety culture, nurse job plans (turnover/intention to leave), and patient outcomes.

CUSP is an intervention aimed at improving safety culture, the effectiveness of CUSP on patient outcomes has been examined in several studies. One multi-site, phased, and cluster-randomized controlled trial examined the causal effects of CUSP in reducing central line-associated bloodstream infection (CLABSI) rates in the ICU. CLABSI rates were reduced by 81% in the intervention group and 69% in the control group over the study period (19 months) (Marsteller et al., 2012). In the same vein, Hong et al. (2013) evaluated the effectiveness of CUSP on CLABSI rates in 17 ICUs over 33 months. The mean CLABSI rate fell from 1.8 infections per 1,000 catheter days to 1.1 post-intervention. Lin et al. (2013) evaluated the effectiveness of CUSP in reducing CLABSI rates in 20 adult ICUs and 18 non-adult ICUs in 16 hospitals. Over 36 months the CLABSI rate in all ICUs decreased from 1.57 to 0.29 infections per 1,000 catheter days; adult ICUs showed reduction in CLABSI rates from 1.49 to 0.25; non-adult ICUs showed reduction in CLABSI rates from 2.54 to 0.33. Miller et al. (2016) implemented CUSP over 5 years in two ICUs in a community-based academic health care system to reduce CLABSI rates. The rate decreased from 3.9 to 0.5 infections per 1,000 catheter days. In a quasi-experimental study that examined the effectiveness of CUSP on CLABSI in surgical ICUs over 3-year period, Thom et al. (2014) reported that the CLABSI rate decreased from 5.0 to 1.5 infections per 1,000 catheter days. Approximately 11.4

CLABSIs were prevented in 1 year, which led to a cost saving of $205,200 in that year. In a single center, quasi-experimental study in a regional burn ICU in Maryland, Sood et al. (2017) reported that CUSP reduced CLABSI rates from 15.5 per 1,000 catheter days to zero and sustained it for 3 years. Using data from 649 CUSP-participating hospitals from the United States, CLABSI rate decreased from 1.95 infections per 1,000 catheter days to 1.04 over 3 years (Richter & McAlearney, 2018). These authors highlighted that hospitals with higher HSPOSC safety culture scores at baseline showed lower CLABSI rates after the intervention.

CUSP also has been utilized in studies that aim to reduce catheter-associated urinary tract infections (CAUTI). Over 18 months, data collected from 926 units (roughly 40% of these units were ICUs) from 603 hospitals in the United States indicated that CAUTI rates (defined as number of infections per 1,000 catheter days) decreased from 2.40 to 2.05 (Saint et al., 2016). Catheter use in non-ICUs decreased from 20.1% to 18.8% and CAUTI rates decreased from 2.28 to 1.54; whereas in ICUs there was no reduction in the catheter use or CAUTI rates (Saint et al., 2016). Miller et al. (2016) evaluated CUSP over 5 years in two ICUs in a community-based, academic health care system in reducing CAUTI rates; the rate decreased from 2.4 to 1.2. Underwood (2015) also evaluated the effectiveness of CUSP on reducing CAUTI rates and found that CUSP reduced catheter use from 89% to 75% and CAUTI rates by 19%.

TeamSTEPPS is a program that many acute care hospitals have introduced in an effort to improve safety culture, and patient outcomes. Riley et al. (2011) conducted a cluster randomized clinical trial to examine the effect of TeamSTEPPS on the perinatal

morbidity rate in three hospitals (one served as a control hospital, one received TeamSTEPPS training only, and one received TeamSTEPPS and in-situ simulation training). When comparing the control hospital to the hospital that used TeamSTEPPS alone, there was no statistical differences. However, the in situ simulation with TeamSTEPPS improved the perinatal morbidity rate by 37% (Riley et al., 2011). A quasi-experimental study that examined the effect of TeamSTEPPS on patient fall rates and hospital acquired pressure injury (HAPI) rates found that fall and HAPI rates decreased by 69% and 100%, respectively, three months after the introduction of TeamSTEPPS (Kim, 2014).

Safety Culture and Nursing Practice Environment

The Institute of Medicine (2004b) identified safety culture as an approach to transform the nursing practice environment. Lake (2002) defined the nursing practice environment as "organizational characteristics of a work setting that facilitate or constrain professional nursing practice" (Lake, 2002, p. 178), which in turn influences patient outcomes. In fact, the Institute of Medicine (2004b) stated that safety culture is an effective approach in transforming the nursing practice environment because it "recognize[s] that the majority of errors are created by systemic organizational defects in work processes, not by blameworthy individuals; support[s] staff; and foster[s] continuous learning by the organization as a whole and its employees" (p.14). The American Association for Critical-Care Nurses (AACN) asserted that a healthy practice environment is "essential to ensure patient safety, enhance staff recruitment and retention, and maintain an organization's financial viability" (American Association of

Critical-Care Nurses, 2016, p. 1). A professional nursing practice environment "empowers nurses by providing them with increased opportunities for autonomy, accountability, and control over the environment in which they deliver care" (Zelauskas & Howes, 1992, p. 18), which in turn increases nurses participation at decision making levels to promote optimal patient care (Friese et al., 2008).

Examination of the literature shows similarities in the constructs of safety culture and nursing practice environment. Indeed, investigators that aim to assess the perceptions of nurses about their work environment and organizational policies relevant to patient safety have used safety culture measurement tools, such as Hospital Survey on Patient Safety Culture (HSOPSC) and Safety Attitude Questionnaire (SAQ), to validate tools to measure nursing practice environments. Connor (2018) surveyed 1,030 nurses and physicians to evaluate and establish convergent validity for the AACN Healthy Work Environment Assessment Tool (HWEAT) using the HSOPSC. The findings showed moderate correlation between the HWEAT and HSOPSC (correlation coefficients of 0.30 to 0.52), and HWEAT revealed a Cronbach's alpha of 0.77. In a similar vein, the study conducted by Olds and Lake (2010) to determine predictors of hospital safety culture and the relationships between safety culture and safety grade used the practice environment as a benchmark. They found that the nursing practice environment was a predictor for safety culture. Findings from both studies indicate that the safety culture and practice environment mirror/predict each other. Furthermore, upon comparison of nursing practice environment and safety culture surveys, several subscales of the Practice Environment Scale of the Nursing Work Index (PES-NWI) and HWEAT – such as collegial

relationship, staffing, teamwork and collaboration, communication, and leadership support subscales – overlap with safety culture domains/dimensions in HSOPSC and SAQ. This is important for this study because data collected for the NDNQI® database measures several aspects of the nurse work environment.

Nursing practice environment has been studied in relation to patient and nurse outcomes. A stream of studies has focused on assessing the overall nursing practice environment and evaluating it in relation to nurse and patient outcomes. The assessment of the nursing practice environment is believed to mirror patient and nurse outcomes.

The composites of nursing practice environment are consistent across literature. For instance, the AACN posited that a healthy practice environment consists of skilled communication, true collaboration, effective decision making, appropriate staffing, meaningful recognition, and authentic leadership (American Association of Critical-Care Nurses, 2016). These standards highlighted (a) proficiency in communication and clinical skills, (b) pursuing and fostering true collaboration among nurses and with other health professionals, especially physicians and administrators, (c) that nurses play essential roles in policy making relevant to directing and evaluating clinical care and leading organizational operations, (d) appropriate staffing that matches patient needs and nurse competencies, (e) recognition of nurses and their essential contributing in patient care, and (f) embracing a healthy work environment by nurse leaders. Similarly, the Institute of Medicine (2004b) identified eight core elements, called patient safeguards, for the nurse work environment. These elements are (a) governing boards that focus on safety, (b) leadership and evidence-based management structures and processes, (c) effective

nursing leadership, (d) adequate staffing, (e) organizational support for ongoing learning and decision support, (f) mechanisms that promote interdisciplinary collaboration, (g) work design that promotes safety, and (h) safety culture, which is an organizational culture that continuously strengthens patient safety.

Measuring the Nursing Practice Environment

The Practice Environment Scale of the Nursing Work Index (PES-NWI) has been used widely to describe the nursing practice environment and to help decision makers identify areas that are related to various nurse and patient outcomes of interest. The NDNQI® database includes data from the PES-NWI. The PES-NWI consists of the following subscales: (a) nurse manager ability, leadership, and support of nurses; (b) nurse participation in hospital affairs; (c) nursing foundations for quality of care; (d) staffing and resource adequacy; and (e) collegial nurse-physician relations (Lake (2002). These subscales were the results of confirmatory analysis of the Nursing Work Index (NWI) data from 11,636 Pennsylvania nurses. The PES-NWI is a 31-item instrument that uses a 4-point Likert scale ranging from 1 = strongly disagree to 4 = strongly agree. According to Lake and Friese (2006), "the subscale score is the average of the subscale item responses. A single composite score is calculated as the mean of the subscale scores" (p. 4). Subscales that score higher than 2.5 designate general agreement, and subscales that score below 2.5 designate general disagreement (Lake, 2002; Lake & Friese, 2006). Based on the PES-NWI scores, Lake and Friese (2006) classify nursing practice environments as favorable, mixed, and poor. A favorable nursing practice environment classification is received when four or more subscales score above 2.5; a

mixed nursing practice environment classification is received when two to three subscales score above 2.5; and a poor nursing practice environment classification is received when one or no subscales score above 2.5 (Lake & Friese, 2006).

Research on Nursing Practice Environment and Outcomes

Most studies that have examined the nursing practice environment and nurse outcomes were descriptive in nature, employing a cross-sectional approach. An increasing number of studies have identified the impact of the nursing practice environment on nurse outcomes, such as job satisfaction (Coetzee et al., 2013; Gabriel et al., 2013); burnout and emotional exhaustion (Choi & Boyle, 2014; Coetzee et al., 2013; Gabriel et al., 2013); nurse empowerment (Choi & Boyle, 2014); intention to leave (Choi & Boyle, 2014; Coetzee et al., 2013; Gabriel et al., 2013); and nurse job experience and quality of care (Aiken et al., 2008). A study by Sloane et al. (2018) utilized a database from 53,855 nurses from 4 US states (Pennsylvania, New Jersey, Florida, and California) collected between 2006 to 2016 to examine the impact of nursing resources on patient safety and quality of care. The nursing resources in this study were the nurse work environment, nurse staffing, and nurse education level. Findings showed that an improvement in nursing practice environment by one standard deviation would decrease the odds of unfavorable quality of care and patient safety by 0.82 – 0.97 (Sloane et al., 2018). In a 700-bed general hospital and a 600-bed university hospital in Belgium, Van Bogaert et al. (2014) examined the influence of nursing practice environment, nurse work characteristics, and nurse burnout on nurse satisfaction, intent to leave, and nurse-assessed quality of care using the PES-NWI tool. The nursing practice environment was

positively associated with nurse job satisfaction and nurse-assessed quality of care and negatively associated with intent to leave. These findings are congruent with other studies in the literature. Blake (2012) found that leadership as an element of the nursing practice environment had an inverse relationship with nurse intention to leave. Similarly, Leineweber et al. (2016) studied 23,076 nurses who worked in 384 hospitals in 10 European countries (Belgium, England, Finland, Germany, Ireland, Netherlands, Norway, Poland, Spain, and Switzerland) and found that intention to leave current workplace was influenced by the nursing practice environment, with some variation at country and unit levels. However, intention to leave the profession showed less variation at country (4.6%) and unit (3.9%) levels. Additional analysis revealed that intention to leave the current workplace was significantly related to nursing practice environment and satisfaction with schedule flexibility. The authors concluded that individual level factors (such as gender, years of experience as registered nurse, full vs. part-time work) explained the intention to leave the nursing profession, and that organizational factors (unit characteristics and hospital characteristics) explained the intention to leave current workplace.

Some studies have utilized qualitative approaches to examine factors influencing nurse outcomes; nursing practice environment has emerged as an influencer for these outcomes. McKenzie and Addis (2018) used purposive sampling to explore 12 nurses' experiences and satisfaction in renal inpatient wards. The results indicated that the work environment influenced their experiences and job satisfaction. Galuska et al. (2018) interviewed nurses from around the United States to explore their experiences with joy

and meaning in their practice environment. Leadership, teamwork, and learning opportunities were elements of nursing practice environment that influenced the joy and meaning in their work. Similarly, nursing practice environment in an ambulatory oncology setting was explored using two focus groups (Kamimura et al., 2012). This study revealed that workload, communication among team members, support from leadership and other staff, and physical resources were elements of the practice environment that impacted the quality of care and nurses' job satisfaction.

Patient outcomes also have been studied in relation to nursing practice environment. A cross-sectional study that used the PES-NWI to determine the relationships among nursing practice environment, nurse staffing levels, nurses' error interception practices, and rates of non-intercepted medication errors showed significant relationships (Flynn et al., 2012). The nursing practice environment positively influenced nurses' error interception practices, which in turn had an inverse influence on the rate of medication errors. Similarly, Van Bogaert et al. (2014) examined the influence of nursing practice environment on patient adverse events in Belgium. The nurse management subscale of the PES-NWI was a predictor of patient falls, patient and family complaints, patient and family verbal abuse, nosocomial infection rates, and medication errors. In the United States, Blake (2012) found that the collaboration subscale of the nursing practice environment had a significant negative relationship with CLABSI, risk adjusted mortality rate, and risk adjusted length of stay.

Rationing of nursing care, defined as "the withholding or failure to carry out necessary nursing tasks due to inadequate time, staffing level, and/or skill mix" (Schubert

et al., 2008, p. 228), was shown to be the best predictor of patient satisfaction, nurse reported medication errors, bloodstream infections, and pneumonia (Ausserhofer et al., 2013). The authors asserted that an "observed suppression effect might indicate a mediating role for rationing of nursing care between factors of the work environment and patient outcomes" (p. 241). The relevance of nurse staffing was also seen in a correlational study by (Merrill, 2011), who surveyed 466 nurses from 41 different units and found that nurse staffing was significantly related to patient fall rates and healthcare acquired pressure injuries. Relevant to staffing, the staff mix of registered nurses showed a significant relationship with the number of reported adverse events among 1,397 nurses from 108 general medical and surgical units at 30 Irish hospitals (Kirwan et al., 2013).

In summary, the nursing practice environment has been studied in relation to nurse and patient outcomes. Findings of the studies support the IOM recommendation to transform the work environment for nurses to keep patients safe. However, these studies have not examined the mediating role that nurse outcomes may have on patient outcomes. Thus, addressing this gap in future studies can provide deeper understanding on how the nursing practice environment and nurse outcomes influence patient outcomes.

Safety Culture in the Middle East Countries

Middle Eastern countries included in this review are countries that are in the WHO Eastern Mediterranean region: Afghanistan, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, and Yemen (World Health Organization, n.d). Similar to the research that has been conducted

globally on safety culture, research studies conducted in Middle East Countries used the same approaches to address safety culture in acute care hospitals. The majority of studies employed descriptive cross-sectional designs to assess the perception of safety culture. Moreover, the HSOPSC and SAQ were the most commonly used tools for measuring safety culture.

HSOPSC

The HSOPSC has been used to assess baseline perception of safety culture. In a study that assessed the perception of safety culture among 289 Tunisian physicians and paramedical staff (Cheikh et al., 2016), results indicated an overall percentage of positive responses ranging from 32.7% for the hospital management support for patient safety dimension to 68.8% for frequency of events reported dimension. When comparing physicians to paramedical staff, physicians had good perceptions (above 75%) for two of the safety culture dimensions, supervisor expectations and actions promoting safety (82.3%) and frequency of events reported (84%), whereas for paramedical staff all dimensions were below 75%. In another study that assessed safety culture in a university hospital in Egypt, the overall perception of safety across health professionals was 39.3%, and the scores of dimensions ranged from 23.2% for frequency of events reporting dimension to 57.4% for teamwork within units dimension (Aboul-Fotouh et al., 2012). Roughly 30% of these health professionals graded patient safety as excellent/very good. Ali et al. (2018) assessed the perception on safety culture in Kuwaiti public hospitals, and they reported that the overall perception of patient safety was 60.5%, with dimensions ranging from 27.7% in non-punitive response to error dimension to 89.7% in teamwork

within units dimension. In Palestine, Hamdan and Saleem (2013) used the Arabic version of HSOPSC and found that the overall perception of safety culture was 43%, with scores for dimensions ranging between 17% for nonpunitive response to error dimension and 71% for teamwork within units dimension. Although the overall score for safety culture perception was not satisfactory, 63.5% of health professionals graded patient safety as excellent or very good. In Lebanon, El-Jardali et al. (2010) found that the overall perception of safety was 72.5%, and dimensions ranged from 24.3% in non-punitive response to error to 82.3% in teamwork within units dimension. Nearly 73% of health professionals graded patient safety as excellent/very good.

In the same vein, Aboshaiqah and Baker (2013) surveyed 498 nurses in a tertiary hospital in Riyadh-Saudi Arabia, and reported that the overall safety culture score was 52%, with dimensions ranging from 22% (hospital handoffs and transitions) to 90% (hospital management support for patient safety). They reported significant variations in the safety culture perception based on nurse characteristics, such as gender, age, years of experience, Arabic versus non-Arabic speaking, and length of shift worked. In another tertiary hospital in Riyadh, Alonazi et al. (2016) reported that the overall perception of safety culture was 57.9% with scores ranging between 43.5% and 73% for the safety culture dimensions. Alquwez et al. (2018) surveyed 351 nurses from three public general hospitals in Saudi Arabia and reported 48.8% total score of safety culture, with domains ranging from 16.6% (nonpunitive response to error) to 85.8% (teamwork within units). However, 67% of nurses graded patient safety as excellent/very good (Alquwez et al., 2018). Alswat et al. (2017) surveyed 2501 healthcare professionals (78% were registered

nurses) and reported an overall safety culture score of 59.5% with dimensions ranging from 24.8% (nonpunitive response to error) to 86.3% (organizational learning-continuous improvement). Roughly 67% of respondents graded patient safety as excellent/very good (Alswat et al., 2017). In an adult oncology unit, Alharbi et al. (2018) surveyed 127 health professional (67% were nurses) and reported an overall safety culture score of 49% with dimensions ranging from 6.1% (teamwork across units) to 69.3% (teamwork within units). A cross-sectional study by Alahmadi (2010) to evaluate the perception of safety culture among 223 health professionals in 13 general hospitals in Riyadh concluded that the overall positive score of safety culture was 59%, with dimensions ranging from 22% (nonpunitive response to error) to 87% (organizational learning–continuous improvement). Furthermore, 60% of respondents graded patient safety as excellent or very good (Alahmadi, 2010). In a similar study El-Jardali et al. (2014) assessed the perception of safety culture among 2,572 health professionals (nurses represented roughly 50% of the sample) in a large tertiary hospital in Riyadh. The study revealed an overall score of safety culture of 65.3%, with dimensions ranging from 26.8% (nonpunitive response to error) to 79.6% (organizational learning–continuous improvement). A cross-sectional study that evaluated safety culture post accreditation (between 2006-2009) at a large teaching hospital in Jeddah reported that the overall safety culture score was 45%, with dimensions ranging from 15% (staffing) to 74% (organizational learning–continuous improvement) (Al-Awa et al., 2012).

SAQ

The SAQ has been utilized to assess the overall perception of safety culture in hospitals in Middle Eastern countries. In Palestine, the highest score was for job satisfaction (63.2%) and lowest was for working conditions (16.2%) (Elsous et al., 2017). This study also compared the scores of the SAQ domains for different demographic characteristics. Gender was the only demographic characteristic that showed a significant difference ($p = 0.042$) in teamwork climate. There were differences in job satisfaction depending on years of experience; perception of hospital management based on gender, position, age, and years of experience; working conditions based on gender; and overall SAQ score based on gender and position.

In Saudi Arabia, Alayed et al. (2014) reported an overall safety culture score of 62.5% among 216 ICU nurses who completed SAQ. Al-Malki et al. (2018) surveyed 144 health professionals (roughly 70% were nurses) and concluded that the overall positive safety culture score was 61.2% (overall positive safety culture score for nurses was 59.6%). In the open-ended questions, staffing level, communication and teamwork skills, training and education, resources and guidelines, and administration support were recommended by staff to improve patient safety (Al-Malki et al., 2018). In a tertiary teaching hospital in Riyadh, Aljadhey et al. (2016) surveyed 418 nurses and reported an overall positive safety culture score of 46.7%, where the job satisfaction domain received the highest score (92.6%) and stress recognition received the lowest score (17.7%).

Safety Climate Survey (SCS)

Only one study utilized the SCS to assess safety culture in Saudi Arabia. Almutairi et al. (2013) assessed the culture of safety among 415 nurses at a large medical city in Riyadh, and they concluded that only 54% rated the safety climate in their workplace as positive (as described earlier, positive safety climate >75%). However, the safety climate mean score in this study was 72.75%.

Safety Culture and Outcomes

Few researchers have examined outcomes in relation to safety culture in the Middle East. In a descriptive-correlational survey of 381 Jordanian nurses that examined the relationship between safety climate and nurse outcomes AbuAlRub et al. (2012) found a moderate positive correlation between safety culture and intention to stay at work. Alayed et al. (2014) reported ICU nurse job satisfaction of 70%, whereas the overall safety culture score was 62.5% in a Saudi hospital. Similarly, Al-Malki et al. (2018) reported a nurse job satisfaction score of 68.1%, whereas the overall nurses' safety culture score was 59.6% in a Saudi hospital. As discussed above, Aljadhey et al. (2016) showed that 92.6% of nurses stated that they were satisfied in their jobs, whereas the overall safety culture score was 46.7%. However, no further correlations or associations were identified between safety culture and nurse job satisfaction in Middle Eastern hospitals.

Intervention Studies

Studies on safety culture also included a few interventional studies. In the United Arab Emirates (UAE), Reddy et al. (2014) evaluated CUSP over a 6-year period to

address CLABSI rates. They found that the overall CLABSI rate fell from 2.99 at baseline to 1.47 infections per 1,000 catheter days. In Saudi Arabia, a quasi-experimental study that delivered a safety educational program for 50 ICU nurses assessed the effectiveness of this program using SAQ (Basuni & Bayoumi, 2015). Safety climate showed significant positive correlation with job satisfaction and negative correlation with stress recognition (Basuni & Bayoumi, 2015). A research article by Khan et al. (2017) indicated that 17 ICUs in eight Saudi public and private hospitals joined the Comprehensive Unit-based Safety Program for mechanically ventilated patients (CUSP 4 MVP) project. Findings of this project showed that ICU mortality rate for mechanically ventilated patients was reduced significantly from 32.8% in October 2015 to 19.1% in October 2016 (Khan et al., 2019).

Qualitative Studies

Safety culture was also studied in Middle Eastern countries using qualitative approaches. Aljadhey et al. (2014) used an exploratory qualitative inquiry approach to identify contributing factors and challenges to medication safety issues in a Saudi hospital. The authors concluded that a blaming safety culture appeared to be a challenging factor to improve medication safety. Similarly, in Lebanon El-Jardali et al. (2012) thematically analyzed the responses to open-ended questions in HSOPSC; findings highlighted prioritizing patient safety as one of the strategic priorities for hospitals, training about patient safety, increasing public awareness of patient safety by establishing a national patient safety culture, and increasing staff awareness of updates relevant to patient safety in the Lebanese accreditation program.

Nursing Practice Environment

Several studies addressed the nursing practice environment in Middle Eastern countries. Almuhsen et al. (2017) surveyed 465 nurses, using PES-NWI, to explore their perceptions of their practice environment in a large medical city (tertiary hospital) in Riyadh-Saudi Arabia. This study established the face validity and reliability (Cronbach's alpha = 96.1) for PES-NWI in Saudi Arabia. Almuhsen et al. (2017) found that only two subscales, staffing and resources adequacy (2.73) and nurse participation in hospital affairs (2.55), had a mean score above 2.5, which indicated that the nursing work environment was a mixed environment. Furthermore, there were significant differences between age groups for nursing participation in hospital affairs, nursing foundation for quality of care, and nurse manager ability; between education groups for nursing foundation for quality of care; between certification groups for nursing participation in hospital affairs and nursing foundation for quality of care; between position status for all PES-NWI subscales; between unit type for collegial nurse-physician relations; and between years of experience for nursing participation in hospital affairs, nursing foundation for quality of care, nurse manager ability, and collegial nurse-physician relations. Similarly, Aboshaiqah (2015) assessed nurses' perceptions of their work environment in a large tertiary hospital in Saudi Arabia using the Healthy Work Environment Assessment Questionnaire (HWEAT), where a mean score of 1.00 – 2.99 indicates an environment that needs improvement; a mean score of 3.00 – 3.99 indicates a good environment; and 4.00 – 5.00 indicates an excellent environment (Aboshaiqah, 2015; American Association of Critical-Care Nurses, 2018). Aboshaiqah (2015) reported

that the HWEAT subscales (Effective decision making, authentic leadership, appropriate staffing, true collaboration, skilled communication, and meaningful recognition) received good ratings (means range from 3.53 to 3.76).

In the same vein, Fallatah et al. (2017) explored nurses' perception of their practice environment (PES-NWI) and nurses' job satisfaction in five governmental hospitals in Makkah, Saudi Arabia. They reported that the nursing practice environment was favorable – the lowest mean score was 2.61 in staffing and resources adequacy subscale, and the highest mean score was 3.06 in the collegial nurse-physician relations subscale. Although this study did not examine the association between nursing practice environment and job satisfaction, the mean score for job satisfaction was 3.47 indicating that nurses were moderately satisfied (Fallatah et al., 2017). In a relevant study, Ambani (2017) explored the nursing practice environment and nurse outcomes (job dissatisfaction, burnout, and intention to leave) in two types of hospitals (teaching and public). The author reported that in the public hospital only one PES-NWI subscale (collegial nurse-physician relations) had a favorable score (mean score above 2.5) which indicate poor nursing practice environment, whereas in the teaching hospital all PES-NWI subscales had mean scores above 2.5 (the lowest mean score was 2.89 in the nurse participation in hospital affairs subscale and the highest mean score was 3.15 in the nursing foundations for quality of care subscale) indicating a favorable nursing practice environment. In the teaching hospital, 26% of nurses were burned out, 15.8% were dissatisfied, and 19.2% had an intention to leave, whereas in the public hospital 80.8% of nurses were burned out, 64.7% were dissatisfied, and 33.2% had the intention to leave

within a year. In UAE, Al-Maaitah et al. (2018) used PES-NWI to evaluate nursing practice environment and found that only the staffing and resource adequacy subscale score was unfavorable.

Several studies have examined the relationship between nursing practice environment and nurse outcomes, mostly from Saudi Arabia. Alharbi (2018) examined the relationship between nursing practice environment, nurse outcomes (job satisfaction, burnout, and intention to leave), nurse perceived quality of care and patient safety in a large tertiary hospital in Riyadh, Saudi Arabia, found that the staffing and resources adequacy predicted job satisfaction and burnout. Furthermore, Alharbi (2018) found that (a) the nurse manager ability and leadership predicted job satisfaction, and (b) staffing, resources adequacy and nursing foundation for quality of care predicted nurses' perceptions of quality of care and patient safety. Ambani (2017) identified significant effects of nursing practice environment and hospital type on nurse burnout and job dissatisfaction, which led to increased intent to leave. Alghamdi (2017) surveyed nurses from different hospital types and geographical regions in Saudi Arabia to explore the nursing practice environment, and highlighted that the mean score for all PES-NWI subscales in the entire sample were above 2.5, indicating a favorable practice environment (the lowest mean score was 2.71 in nurse participation in hospital affairs, and the highest mean score was 3.02 in nursing foundation for quality care). In Jordan, Al-Hamdan et al. (2017) found a positive significant relationship between nursing practice environment and job satisfaction as well as intent to stay.

Only one study was found that examined the relationship between nursing practice environment and patient outcomes. This study was conducted by Alghamdi (2017) in Saudi Arabia and identified significant negative correlations between nursing practice environment and patient fall and mortality rates. Patient satisfaction and pressure ulcers did not show significant correlations with nursing practice environment.

Summary

Many investigators have studied safety culture in acute care hospitals in the Middle East and found that scores for safety culture vary across different acute care hospitals. Studies of safety culture in relation to patient outcomes from the region were not found. The only nurse outcomes that were examined in relation to safety culture were job satisfaction and intent to stay. Similarly, only one study examined nursing practice environment in relation to patient outcomes, yet it has been studied in relation to some nurse outcomes, such as job satisfaction, intention to leave, burnout, and perception on quality of care. Thus, further research is needed to study safety culture in relation to nurse outcomes as well as patient outcomes.

Chapter Summary

Safety culture has been studied internationally. Studies were either in a form of reporting scores of safety culture that indicates satisfactory or unsatisfactory status, or in relation to nurse and patient outcomes. In these studies, safety climate is viewed as an element of safety culture, and it was used to evaluate the hidden safety culture beliefs, values, and norms.

Overall, most of these studies used descriptive approaches to evaluate safety culture. However, some studies used quasi-experimental approaches to improve safety culture and in turn patient outcomes. Only a few studies utilized quasi-experimental designs to improve nurses' and health professionals' outcomes. In Middle Eastern countries studies were mostly descriptive in nature using cross-sectional approaches. Few studies used qualitative approaches to explore safety culture or interventions to improve it. Most importantly, no studies were found that examined the relationship between safety culture and patient outcomes in hospitals in Middle Eastern countries. In many of the studies discussed in this chapter, safety culture varied based on hospital characteristics (such as hospital type and size), unit characteristics (such as staffing levels), and nurse characteristics (such as position, educational level, and years of experience).

Despite the limited literature from the Middle East region on the relationship between safety culture and nurse and patient outcomes, the nursing practice environment is an approach that can be used to inform and mirror safety culture, and in turn explain its relationship with nurse and patient outcomes. The PES-NWI was the most commonly used tool to examine the practice environment for nurses. Therefore, the opportunity to use data from Middle East acute care hospitals that participate in the NDNQI® database will help address current gaps in understanding the relationship between safety culture and nurse and patient outcomes.

CHAPTER III

METHODS

In chapter 3 I describe the study aims, design, data source, setting and sample, and data management. Furthermore, this chapter describes the study independent (safety culture) and dependent variables (nurse and patient outcomes). Finally, a description of the statistical analysis procedures for each specific aim is laid out at the end of the chapter.

Study Aims

The study has three aims:

1. To examine the associations between safety culture and nurses' job enjoyment, psychological safety, and intention to stay at 1- and 3-years in acute care hospitals in Middle Eastern countries;

2. To examine the associations between safety culture and catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), patient falls, and pressure injuries in acute care hospitals in Middle Eastern Countries;

3. To examine the potential mediation effects of nurses' job enjoyment, psychological safety, and intention to stay at 1- and 3-years on the relationships among safety culture and CAUTI, CLABSI, patient falls, and pressure injuries in acute care hospitals in Middle Eastern countries.

Study Design

This study used a cross sectional, correlational design to analyze data from an existing database. The data were for the period between January 1, 2018 and December 31, 2018. Given that the hospital unit is the focus of evaluation in safety culture research (Pronovost & Sexton, 2005), the data used in this study was aggregated at the hospital unit level.

Data Source

The data used in this study is from the National Database of Nursing Quality Indicators® (NDNQI®) dataset for acute care hospitals in the Middle East. The NDNQI® was established in 1998 by the American Nurses Association and was initially housed at the University of Kansas (Montalvo, 2007). The purpose of the NDNQI® was to "collect and build on data obtained from earlier studies and further develop nursing's body of knowledge related to factors which influence the quality of nursing care" (Montalvo, 2007, p. 2). In 2014, Press Ganey Associates LLC acquired the NDNQI® . According to Press Ganey Associates LLC (2018), more than 2,000 hospitals in the United States participate in the NDNQI® database, capturing the voice of more than 200,000 nurses every year. They report data to assess nursing care quality and nurse staffing and to improve the nursing practice environment as well as nurse engagement. A growing number of hospitals outside the U.S. have begun participating in the NDNQI®. In 2018 this included 31 hospitals from the Middle East region (P. Miller, personal communication, December 14, 2018).

Hospitals that participate in the NDNQI® follow a standard protocol for data collection. NDNQI® has standardized the definitions and data collection methods for all variables and nurse-sensitive quality indicators in the database, including characteristics of hospitals, patient care units, nursing staff, and patients, as well as structure, process, and outcome clinical indicators and two RN survey options. Participating hospitals determine which of their units will participate in data collection and which indicators, including RN survey options, they will report to NDNQI®. Each participating hospital assigns an NDNQI® site coordinator to facilitate communication with Press Ganey Associates LLC. The NDNQI® site coordinator and NDNQI® staff work together to classify hospital units following the NDNQI® protocol. According to Montalvo (2007), NDNQI® provides web-based training for NDNQI® site coordinators on the 19 tracked NDNQI® clinical indicators to ensure that data submitted by hospitals are aligned with the NDNQI® protocol. The NDNQI® database has clinical indicator data for each month. RN survey data are collected on an annual basis. All data are submitted to the database through a secured website, after which it goes through layers of checking and cleaning by NDNQI® staff to identify errors and outliers.

Setting and Sample

The portion of the database used in this study is from acute care hospitals in Middle East countries that participate in the NDNQI®. Middle Eastern countries are countries that are in the WHO Eastern Mediterranean region: Afghanistan, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab

Emirates, and Yemen (World Health Organization, n.d). All hospitals that participate in NDNQI® use the criteria established by NDNQI® to identify the RNs who are eligible to participate in the RN surveys. They are RNs who are employed by participating hospitals – as full-time, part-time, or per-diem –, spend at least 50% of their working time in direct patient care, and have been working on their units for a minimum of 3 months. For this study, the following types of in-patient units within the Middle East acute care hospitals were included: (a) adult, pediatric, and perinatal units, (b) have had five or more responses to the RN survey of interest (Practice Environment Scale of the Nursing Work Index [PES-NWI], job enjoyment, psychological safety, and job plans), and (c) reported clinical data (patient outcomes) on catheter-associated urinary tract infection (CAUTI), central line-associated bloodstream infection (CLABSI), falls, and pressure injuries,.

Power Analysis

The study independent variable, safety culture (PES-NWI), guided the power analysis. The analysis for all aims was estimated at the unit-level using multilevel modeling. The unit PES-NWI mean score was associated with each of the dependent variables in Aims 1 and 2. There are 398 participating units from 31 hospitals in the Middle East (P. Miller, personal communication, December 14, 2018), but no specific details were provided on how many units/hospitals submitted data on PES-NWI. Thus, the following power analysis was conducted presuming that all units submitted data on PES-NWI. Table 1 describes the detectable differences in PES-NWI mean by unit interclass correlation (ICC).

Table 1

Detectable Mean Difference in PES-NWI Subscales in Middle East Hospitals

Scenario	Type 1 Error	Power	Average no. Units Per Hospital	ICC	Detectable Difference
1	0.05	80%	56	0	0.200
2	0.05	80%	56	0.10	0.510
3	0.05	80%	56	0.333	0.879
4	0.05	80%	56	0.50	1.068

The medium size mean differences between PES and the outcomes of interest can be detected when the unit ICC is small (e.g., 0 & 0.10) and the average number of units per hospitals is at least 56. However, the sample size for this study was based on the analysis that had the greatest requirements across aims. Thus, the sample size for this study is the sample size needed for the mediation analysis in Aim 3. The ability to detect medium effect sizes for mediation analysis with at least 80% power was an overall number of 90 units based on the recommendations of Fritz and MacKinnon (2007) for Sobel-First Order testing (1982).

Data Management

Data on eligible participating units were prepared and de-identified by NDNQI® staff. A Data Use Agreement was established between Press Ganey Associates LLC and

the University of North Carolina at Greensboro (UNCG). Data and data documentation (e.g. codebook) were delivered to the principal investigator through an NDNQI® secured file transfer website. The study investigator and co-investigators who had access to the NDNQI® data files signed a confidentiality disclosure agreement.

At UNCG data and data dictionaries were stored in a secured and password-protected website, following the UNCG data security and IRB protocols and requirements. It was managed and analyzed through UNCG approved computer devices. Handling the data, including the recoding, was completed in collaboration with a statistician and followed the NDNQI® data codebook.

Study Measures

Dependent Variables – Patient Outcomes

CAUTI

CAUTI is defined as:

> A UTI [urinary tract infection] where an indwelling urinary catheter was in place for more than two consecutive days in an inpatient location on the date of event, with day of device placement being Day 1, and an indwelling urinary catheter was in place on the date of event or the day before. If an indwelling urinary catheter was in place for more than two consecutive days in an inpatient location and then removed, the date of event for the UTI must be the day of device discontinuation or the next day for the UTI to be catheter-associated. (NDNQI, 2019b, p. 3)

The NDNQI® provides raw monthly CAUTI data at the patient and unit levels. Also, the NDNQI® collects data on the urinary catheter days (device days), which reflect the number of days the catheter was in place. For the purpose of this study, the unit monthly CAUTI count and catheter days were used.

CLABSI

CLABSI is defined as "a laboratory confirmed bloodstream infection [LCBI] where an eligible BSI [bloodstream infection] organism is identified, and an eligible central line is present on the LCBI DOE [date of event] or the day before" (NDNQI, 2019c, p. 5). The NDNQI® provides raw monthly CLABSI data at the patient and unit levels. Also, the NDNQI® collects data on the central line days (device days), which reflect the number of days the central line was in place. For the purpose of this study, the unit monthly CLABSI count and central line days were used.

Falls

A patient fall is defined as "a sudden, unintentional descent, with or without injury to the patient, that results in the patient coming to rest on the floor, on or against some other surface (e.g., a counter), on another person, or on an object (e.g., a trash can)" (NDNQI, 2016b, p. 2). Fall incidents are reported in four categories: no injury (no signs or symptoms of injury as determined by post-fall evaluation), minor injury (resulted in application of ice or dressing, cleaning of a wound, limb elevation, topical medication, pain, bruise or abrasion), moderate injury (resulted in suturing, application of steri-strips or skin glue, splinting, or muscle/joint strain), and major injury (resulted in surgery, casting, traction, required consultation for neurological or internal injury, fracture, patients who have coagulopathy who receive blood products as a result of a fall, or death as a result of injuries sustained from the fall) (NDNQI, 2016b). The NDNQI® provides raw monthly falls data at the patient level as well as unit level. This study was interested in the monthly falls count for each unit. In the analyses for falls, the unit patient days

(including perinatal days for eligible units) divided by 1000 (to get falls per 1000 patient days) was modeled as a control variable.

Pressure Injuries

A pressure injury is characterized as:

> Localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. (NDNQI, 2018, p. 4)

Pressure injuries are categorized as either community or hospital acquired (NDNQI, 2018). A subset of the hospital acquired pressure injuries is unit-acquired pressure injuries (developed after patient admitted to the unit) (NDNQI, 2018). The NDNQI® classifies pressure injuries into five stages: stage 1, non-blanchable erythema of intact skin; stage 2, partial-thickness skin loss with exposed dermis; stage 3, full-thickness skin loss; stage 4, full-thickness skin and tissue loss; and stage 5 or unstageable, obscured full-thickness skin and tissue loss, deep tissue pressure injury (persistent nonblanchable deep red, maroon or purple discoloration), mucosal membrane pressure injury (found on mucous membranes with a history of a medical device in use at the location of the injury), non-visible pressure injury (known pressure injury located under a non-removal dressing or device that cannot be visualized at the time of the skin inspection and the stage is not documented in the patient's record), and medical device related pressure injury (result from the use of devices designed and applied for diagnostic or therapeutic purposes) (NDNQI, 2018). The tool used by NDNQI® for pressure injury

identification, staging, and origin has shown overall kappa coefficients for pressure injury identification and origin of 0.83 and 0.79, respectively, indicating near perfect agreement (Bergquist-Beringer et al., 2011). Furthermore, this tool showed a kappa coefficient for pressure injury staging of 0.60-0.61 for direct observation of the wounds and 0.69 for web-based pictures, indicating moderate to substantial agreement (Bergquist-Beringer et al., 2011). The NDNQI® provided raw quarterly data on pressure injuries at the patient level as well as unit level. However, this study is interested in the monthly count of unit acquired pressure injuries. In the analyses, the number of patients assessed for pressure injuries on the day of pressure injury survey, divided by 100, was modeled as a control variable.

Dependent Variables – Nurse Outcomes

Job Enjoyment

Job enjoyment is defined as "the degree to which people like their work" (NDNQI, 2016a, p. 18). The NDNQI® job enjoyment scale is part of the RN Survey; it was adapted from Brayfield and Rothe (1951) and Taunton et al. (2004); it has seven items with the following response options: strongly agree, agree, tend to agree, tend to disagree, disagree, and strongly disagree. The scoring is reported using unit mean score. The NDNQI® reported the coefficient alpha for job enjoyment scale annually for the period between 2008 and 2013, and it showed alphas between 0.921 and 0.928 (NDNQI, 2016a). Data on job enjoyment are reported annually at the unit level.

Nurse Psychological Safety

Psychological safety was defined as "a shared belief that the team is safe for interpersonal risk taking" (Edmondson, 1999, p. 354). Aspects of psychological safety that are of interest in this study are trust, respect, support, and teamwork. Two measures from the NDNQI® RN Survey are used to measure psychological safety. The Through the Eyes of the Workforce (EWF) survey has three items. It was adapted with permission of the National Patient Safety Foundation (NDNQI, 2016a), and it is used for trust, respect, and support. These three items are:

- I am recognized and thanked for what I do in my job. (Trust)
- In my job, I am treated with dignity and respect by everyone. (Respect)
- I have what I need in my job, so I can make a contribution that gives meaning to my life. (Support)

The response options are coded as 1=never, 2=rarely, 3=some days, 4=most days, and 5=every day. The unit score is the mean of all responding unit RN scores (NDNQI, 2016a), so the higher the score the higher the perceptions of psychological safety. The EWF survey has acceptable reliability (P. Miller, personal communication, February 23, 2020).

The Nurse to Nurse Interaction subscale, and it is used to measure the teamwork aspect of psychological safety. It is a 3-item subscale (Likert scale-6 points of agreement) from the NDNQI® job satisfaction-revised scale. The NDNQI® reported the coefficient alpha for the Nurse to Nurse Interaction scale annually for the period between 2008 and

2013 and showed alphas between 0.86 and 0.87 (NDNQI, 2016a). The three items of this scale are:

- RNs I work with count on each other to pitch in and help when things get busy.
- There is a good deal of teamwork among RNs I work with.
- RNs I work with support each other.

The response options are coded as 1=strongly disagree, 2=disagree, 3=tend to disagree, 4=tend to agree, 5=agree, and 6=strongly agree. The unit score is the mean of all responding unit RN scores, so the higher the score the more positive the perceptions of psychological safety reported by RNs (NDNQI, 2016a). The total mean for the Nurse to Nurse interaction scale and each item of the EWF will be used in the analysis. Data on psychological safety indicators are reported as part of the RN survey that is conducted once a year.

Intent to Stay

Intent to stay at the same unit is part of the job plans items in the NDNQI® RN Surveys. The intent to stay items were developed by the NDNQI® (P. Miller, personal communication, February 23, 2020). RN job plans describe a nurse's plans to continue working at his/her current workplace for the upcoming 1 and 3 years. The interest of this study was the nurse intention to continuing working at the same unit for the next 1 and 3 years. Both the 1- and 3-years job plans are reported in the dataset as the unit percentage of RNs who want to stay at the same unit at the two time intervals.

Independent Variable – Safety Culture

Practice Environment Scale of the Nursing Work Index (PES-NWI)

The PES-NWI was developed by Lake (2002) and endorsed by the National Quality Forum in 2004 (NDNQI, 2019a). In this study it was used as the measure of safety culture. It is a 31-item scale that has five subscales: nurse participation in hospital affairs; nursing foundations for quality of care; nurse manager ability, leadership, and support of nurses; staffing and resource adequacy; and collegial nurse-physician relations. The NDNQI® reported the coefficient alpha for the PES-NWI subscales annually for the period between 2008 and 2013, and it showed alphas between 0.89 and 0.90 for nursing participation in the hospital affairs subscale; 0.86 and 0.88 for nursing foundations for the quality of care subscale; 0.89 to 0.90 for nurse manager ability, leadership, and support of nurses; 0.87 to 0.88 for staffing and resource adequacy; and 0.86 to 0.87 for collegial nurse-physician relations (NDNQI, 2016a). For scoring purposes, all items under each subscale have the following response options: 1= strongly disagree, 2= disagree, 3= agree, and 4= strongly agree. The survey is completed by RNs in the unit and then the scores are aggregated to unit level. For each subscale the unit level mean is calculated, which is used to calculate the unit level overall composite score for the RN workgroup (the higher the score the more positive the rating) (NDNQI, 2016a). As part of the RN survey, RNs complete the PES-NWI once a year.

Control Variables

Hospital Characteristics

The characteristics controlled for at hospital level are bed size, ownership, and teaching status. Hospital bed size is categorized in the dataset as <100 beds, 100-199, 200-299, 300-399, 400-499, and ≥500. For this study, due to the relatively small number of hospitals, ownership was recoded into two categories: government/not for profit and private/for profit. The teaching status of the hospital was coded as academic medical center, teaching hospital, or non-teaching hospital.

Unit Characteristics

The unit characteristics that were controlled for were unit population type, nurse staffing, and unit workload. The following unit population types were selected for this study: pediatrics inpatient, adult inpatient, and perinatal inpatient. Variables for nurse staffing used in this study were registered nurse hours per patient days (RNHPPD), RN skill mix, and nurse-patient staffing ratios. The RNHPPD is the number of hours worked by RNs assigned to the unit for the year 2018 divided by the sum of patient days (including maternal and neonatal days for eligible units) for that unit during the same period. The average RN skill mix is calculated as the proportion of nursing hours worked by RNs among all nursing personnel (RNs, licensed practical nurses, and unlicensed assistive personnel) in a unit during the year 2018. Staffing ratio is the unit mean of number of patients assigned to each RN in the last shift. Since nurse hours and patient days were reported monthly, for this study the RNHPPD and RN skill mix were calculated and inserted into the dataset for each month for the analyses relevant to patient

outcomes. In contrast, these two variables were calculated for the year to use in the analyses relevant to nurse outcomes. Unit workload was measured using the nurse reported number of worked hours in the previous 7 days. Worked hours by RNs were aggregated to unit-level, and then reported in the dataset as the unit mean number of hours worked in the previous 7 days.

RN Workgroup Characteristics

Data collected on characteristics of nurses are RN gender, age, primary role as staff or charge nurse, educational level, and credentials. The RN gender is reported as the unit percentage of RNs who are female/male. RN age is reported in the dataset in three variables: the percentage of unit RNs who are below 30 years old, between 30 and 40 years old, and older than 40 years old. In terms of the primary role (i.e. the option that best describes at least 50% of the RN's job), nurses reported their primary role as staff nurse, charge nurse, advanced practice nurse, coordinator of clinical program, nurse manager, case manager, nursing staff education/development, research role, other clinical roles, other non-clinical role, and/or other role. For this study only staff and charge nurse role data were used when reporting the primary roles of interest (i.e. 50% of time) for the RN workgroup, and these are reported as unit percentage of RNs who report those two primary roles. The education level of the RN, defined as the highest level of nursing education, was measured as the percentage of RNs with a bachelor's degree or higher on the unit. Credentials refers to RNs who had competence or certification awarded by a national specialty nursing association (e.g., CCRN, CEN, CNOR), also coded as the percentage of nurses on the unit with such credentials.

Data Analysis

The analyses for Aim 1 and Aim 2 were conducted using SPSS v.26. Mediation analysis, Aim 3, was conducted using Mplus (Muthén & Muthen, 2017). The specific analyses for each aim are described below.

Aim 1

To examine the associations between safety culture and nurses' job enjoyment, psychological safety, and intention to stay at 1 and 3 years in acute care hospitals in Middle Eastern countries.

Unit level descriptive statistics for hospital, unit, and RN workgroup characteristics was conducted. Initially, longitudinal unit-level hierarchical linear modeling (HLM) was the intended statistical approach for analyzing these relationships, given the nested nature of units within hospitals. However, preliminary analyses indicated that only seven hospitals reported data on PES-NWI, which limited the possibility to run HLM analysis (Jackson, 2003; Rabe-Hesketh & Skrondal, 2006). Thus, alternative statistical approaches were pursued to accomplish this aim. Given the small sample size of units and that psychological safety and job plans have several measurement indicators, a multivariate multiple regression (MMR) model was used for each of these two nurse outcomes. This approach was used because it can identify the linear relationships between one set of predictors and several dependent variables in the same model. It can also identify the interactions between the dependent variables and include these interactions into the model. Because job enjoyment has only one measurement indicator, a multiple linear regression was used to analyze its relationship

with safety culture. The multiple linear regression is a special case of the MMR with only one dependent variable, and it can examine the linear relationships between a set of predictors and a dependent variable as in the MMR. Furthermore, having only seven hospitals limited the possibility to include hospital characteristics in one model. In collinearity diagnostics, VIF values increase to > 5 when two or more hospital characteristics were included in one model, which indicates multicollinearity (Kutner et al., 2005). Thus, each hospital characteristic was separately modeled to overcome multicollinearity.

Aim 2

To examine the associations between safety culture and catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), patient falls, and pressure injuries in acute care hospitals in Middle Eastern countries.

Unit level descriptive statistical analysis for hospital, unit, and RN workgroup characteristics was conducted. Unit-level hierarchical linear modeling (HLM) was planned to analyze the relationships between safety culture and nurse outcomes, given the nested nature of units within hospitals. However, similar to Aim 1, seven hospitals participated in the RN Survey with the PES-NWI, which limited the possibility of using the HLM approach. Several alternative analyses were used to accomplish this aim. Longitudinal count and logistic regressions, approaches that take into consideration the monthly incidence counts and account for monthly count changes, were attempted, but the analyses did not converge because of (a) the small sample size of units, and (b) the

majority of units had zero CAUTI (63.5%), CLABSI (67.1%), falls (34.4%), and/or pressure injuries (80.5%). For the same two reasons, logistic and count regressions for aggregated annual unit counts for the patient outcomes were not successful in accomplishing this Aim. Thus, a reduced model of count regression, performed without the hospital characteristics and unit population variables, was conducted for each of the patient outcomes. These analyses successfully converged, and tests for overdispersion indicated use of Poisson regression. For the reduced models, an ancillary parameters test indicated that Poisson count regression was suitable to perform the analyses. Additionally, given that the majority of units had zero incidences, zero-inflated Poisson count regression was pursued, but it did not successfully converge. Thus, the standard Poisson count regression was pursued to examine the relationships between safety culture and patient outcomes of interest.

Aim 3

To examine the potential mediation effects of nurses' job enjoyment, psychological safety, and intention to stay at 1 and 3 years on the relationships among safety culture and CAUTI, CLABSI, patient falls, and pressure injuries in acute care hospitals in Middle Eastern countries.

The analysis used to meet this Aim was mediation analysis. Specifically, the study utilized Sobel first-order test (Sobel, 1982) with bias-corrected bootstrap of mediation. According to Fritz and MacKinnon (2007), the Sobel first-order test is:

> The most common product of-coefficients test and assesses the presence of mediation by dividing the indirect effect by the first-order delta-method standard

> error of the indirect effect…. This value is then compared against a standard normal distribution to test for significance. If significance is found, mediation is considered to be present. (p. 4)

Furthermore, the bias-corrected bootstrap test of mediation is:

> The same as the percentile bootstrap test of mediation, except that it corrects for skew in the population. The problem with the percentile bootstrap is that it is possible that the confidence interval will not be centered on the true parameter value. The bias-corrected bootstrap contains a correction for the bias created by the central tendency of the estimate. (Fritz & MacKinnon, 2007, p. 5)

Initially, each patient outcome had a separate mediation model to examine the mediation effects of nurse outcomes (job enjoyment, psychological safety, and job plans) on the relationship between safety culture and the patient outcome, while controlling for hospital, unit, and RN workgroup characteristics. Because of the reasons stated in Aim 2, the reduced models, without the hospital characteristics and unit population variables, were instead used to examine mediation effects of job enjoyment, psychological safety, and job plans on the relationship between safety culture and each patient outcome while controlling for RN and unit characteristics. However, the reduced models did not reveal trustworthy models because of high standard errors, as Mplus displayed. Thus, a basic model for each dependent variable (DV) was pursued with the independent variable and mediators, while only controlling for incidence control, which are patient/catheter days. The basic model for each DV successfully converged. Given that job plans for 1 and 3 years have a range of 0-100 while the other nurse outcomes have much smaller ranges, job plans had higher standard errors, which can influence model accuracy. Thus, these

two variables were divided by 100 to get a more well-conditioned range that covaries with the mediation variables by their range. Normality testing, for all variables in the models except the DV, showed that the patient/catheter days variables had skewed distributions. Transformation using Squared Root (SQRT) improved the distribution, but it did not improve sensitivity analyses. Furthermore, the PES-NWI showed an extreme outlier, but SQRT did not improve the sensitive analyses. Thus, the original version of the patient/catheter days variables and PES-NWI were used in the mediation analyses. A diagram for each patient outcome will be presented in Chapter 5.

CHAPTER IV

MANUSCRIPT 1: THE RELATIONSHIP BETWEEN SAFETY CULTURE AND NURSE OUTCOMES IN ACUTE CARE HOSPITALS IN THE MIDDLE EAST REGION

Abstract

Aim. To examine the associations between safety culture and nurses' job enjoyment, psychological safety, and intention to stay at 1 and 3 years.

Design. A cross-sectional correlational design using existing data from the National Database of Nursing Quality Indicators® (NDNQI®).

Methods. Safety culture data were collected using the Practice Environment Scale of the Nursing Work Index [PES-NWI], and data about three nursing outcomes (job enjoyment, psychological safety, and intent to stay at 1 and 3 years) were analyzed for inpatient adult, pediatric, and perinatal units. A total of 91 units from seven hospitals were included in this study. Multiple regression (MR) approaches – standard MR for job enjoyment, and multivariate MR for psychological safety and intent to stay – were utilized. The analysis controlled for hospital, unit, and RN workgroup characteristics. Preliminary statistical analysis indicated that a model for each hospital characteristic is needed to overcome multicollinearity.

Results. Most of the included units were from midsize hospitals (n = 52), governmental/not for profit (n = 72), and teaching hospitals (n = 66). Units were mainly medical-surgical units (n = 52). Private/for profit hospitals had higher scores across all

study variables, compared to governmental/not for profit hospitals. Smaller hospitals also had higher scores on safety culture and all nurse outcomes except intent to stay at 3 years. Multiple regression models showed that unit safety culture was significantly associated with RN unit workgroup job enjoyment, psychological safety, and intention to stay at 1 and 3 years.

Conclusion. Across the study models, safety culture had a significant impact on nurses' job enjoyment, psychological safety, and intent to stay at 1 and 3 years.

Impact. Understanding the impact of safety culture on nursing outcomes in Middle East hospitals is important to identify approaches to maintain patient safety. Hospital/nurse leaders and RN unit managers should invest in optimizing safety culture to promote nurse outcomes.

Keywords: Safety culture, nurse outcomes, job enjoyment, psychological safety, intent to stay.

Introduction

Nurses are important stakeholders in maintaining patient safety in healthcare settings. The Institute of Medicine (IOM) report in 2004 emphasized that creating a supportive safety culture for nurses can transform the nursing work environment and improve nurse outcomes, which in turn is believed to optimize patient outcomes. In fact, the report highlighted that the healthcare workforce, including nurses, is one of the safety defenses, thus organizations should conduct continuous evaluation of their nursing practices as an indicator, among many, for supportive safety culture.

Several international patient safety organizations, such as the World Health Organization, Canadian Patient Safety Institute, and Saudi Patient Safety Center, also are in alignment with the IOM view on keeping patients safe. For instance, the importance of having a system approach that takes into consideration workforce needs, including nurses, has been highlighted in eight recommendations to address patient safety systematically (National Patient Safety Foundation, 2015). The National Patient Safety Foundation (2015) emphasized that safe care for patients is influenced by the safety and wellbeing of the workforce. I have used data from the National Database of Nursing Quality Indicators® (NDNQI®) to investigate the association between unit safety culture and unit nurse outcomes in acute care hospitals in the Middle East region, where little work of this nature has been conducted

Background

Joy and meaning at work have been introduced in health literature as important elements to create safe care (Lucian Leape Institute, 2013). In fact, joy and meaning at

work have been added as a fourth element to the Triple Aim, which consequently has become the Quadruple Aim, and is aimed at promoting effectiveness in healthcare organizations (Sikka et al., 2015). Furthermore, there are increasing calls to prevent and address staff burnout, because of its potential to negatively affect quality and safety of care (Chemali et al., 2019; National Academies of Sciences, Engineering, and Medicine, 2019; Salyers et al., 2017). However, no previous studies were found, including in the Middle East region, that examine the relationship between safety culture and nurse job enjoyment.

Building trust, respect, and support within the healthcare team is crucial to create a culture of safety (Lucian Leape Institute, 2017). A positive relationship between trust among health professions or teams and safety culture has been established in previous studies (Auer et al., 2014; Han, 2018). In fact, trust and respectful communication in healthcare emerged as essential elements to provide safe care (Rönnerhag et al., 2019; Vogus & Sutcliffe, 2007). According to Edmondson and Roloff (2009), trust, respect, and support can be part of psychological safety, a concept that has several aspects such as speaking up and teamwork, which have been studied in relation to safety culture. Teamwork/performance, as an indicator of psychological safety (Edmondson, 1999), has been strongly and positively correlated with safety culture (Rehder et al., 2020; Schwartz et al., 2019; Sexton et al., 2017). In Middle Eastern hospitals teamwork shows a positive relationship with safety culture (Alzahrani et al., 2018; Ammouri et al., 2015; El-Jardali et al., 2010; El-Jardali et al., 2014).

Nurses' intent to stay or leave their jobs has been examined in relation to safety culture. Safety culture has a negative relationship with nurses' intention to leave (Nixon et al., 2015; Tondo & de Brito Guirardello, 2017) and a positive relation with nurses' intention to stay (Liang et al., 2016). Similarly, in a study from the Middle East, safety culture was positively associated with nurses' intention to stay among Jordanian nurses (AbuAlRub et al., 2012). Findings from these studies are consistent.

No studies from Middle East acute care hospitals on trust, respect, and support among nurses in relation to safety culture were found. Furthermore, studies from Middle East hospitals that addressed teamwork did not include nursing samples from across the Middle East hospitals or control for hospital characteristics such as size, ownership, or teaching status; unit characteristics such as unit type or staffing ratio; or RN workgroup characteristics such as education, age, or certification. Thus, this study addressed this gap to add understanding about teamwork among nurses from across Middle East hospitals. In summary, in the Middle East region there is no evidence about the relationship between safety culture and job enjoyment, trust, respect, and support, and limited evidence about the relationship between safety culture and teamwork and nurse intention to stay. Using an existing database, this study explored whether relationships exist between safety culture and job enjoyment, psychological safety, and intention to stay among a sample of units from Middle East acute care hospitals.

The Integrative Model of Organizational Climate of Staff Working Conditions and Safety (IMOC) developed by Stone et al. (2005) and expanded by Bonner et al. (2009) was used as a theoretical framework. Although this integrative model was

developed to address working conditions and organizational climate of all healthcare staff, Bonner et al. (2009) employed it in the nursing context. This model is based on Donabedian's Structure-Process-Outcome model and proposes that a change in any of the model components can influence the other components. The structure level reflects the organization leaders' philosophy and goals about patient safety, policies and procedures, and safety systems. The process level consists of what the organization has put in place to achieve its patient safety goals, such as staffing, handoff systems, communication transparency, learning environment, and supporting teamwork within and across units. The outcomes level is comprised of proximal outcomes, which are staff perceptions and attitudes about patient safety in their units based on what they experience about safety climate, and distal outcomes, which are nurse and patient outcomes. The model levels that were examined in this study were the process level (safety culture) and distal outcomes (three nurse outcomes).

The Study

Study Aim

The aim of this study was to examine the associations between unit safety culture and RN unit workgroup job enjoyment, psychological safety, and intent to stay at 1 and 3 years.

Design and Participants

The study used a cross sectional correlational design, with data analysis conducted at the unit-level. Data for Middle East acute care hospitals were obtained from the NDNQI® (https://members.nursingquality.org). Deidentified data from the hospitals'

inpatient adult, pediatric, and perinatal units were obtained from Press Ganey Associates LLC through a data use agreement. IRB approval was received from the University of North Carolina Greensboro.

The hospital units included in the study must have participated the NDNQI® RN surveys of interest, Practice Environment Scale of the Nursing Work Index [PES-NWI], job enjoyment, psychological safety, and intent to stay at 1 and 3 years, between January 1st and December 31st of 2018. For registered nurses (RNs) to be eligible to participate in the NDNQI® RN surveys for their units, they needed to be full-time or part-time nurses who spent at least 50% of their working time in direct care in their units for at least 3 months. Although there were 31 Middle East hospitals participating in the NDNQI® in 2018 (P. Miller, personal communication, December 14, 2018), the sample for this study included 91 units from 7 hospitals. Units at the other hospitals were excluded because they did not submit data on the PES-NWI.

Data Collection Measures

Dependent Variables

Job Enjoyment. Job enjoyment is defined as "the degree to which people like their work" (NDNQI, 2016a, p. 16), and it was measured in the NDNQI® dataset using a 7-item scale, each with a Likert-type response rating scale with 6 categories of agreement (NDNQI, 2019a). The job enjoyment scale has shown Cronbach's alphas between 0.921 and 0.928 (NDNQI, 2016a). In this study the job enjoyment scale had a Cronbach's alpha of 0.845. The unit-level mean score was reported in the NDNQI® database.

Psychological Safety. Psychological safety was defined as "a shared belief that the team is safe for interpersonal risk taking" (Edmondson, 1999, p. 354). The NDNQI® has no specific survey for psychological safety. The annual RN survey does, however, include the Through the Eyes of the Workforce (EWF) survey and *Nurse to Nurse Interaction* subscale, which for this study served as the measure of psychological safety. The EWF is a 3-item survey (Likert-type response rating scale with 5 categories of agreement) that the NDNQI® adapted with permission of the National Patient Safety Foundation (NDNQI, 2019a). The items are indicators of respect, support, and trust among nurses, respectively:

- In my job, I am treated with dignity and respect by everyone.
- I have what I need in my job, so I can make a contribution that gives meaning to my life.
- I am recognized and thanked for what I do in my job.

A unit level mean score for each of the three items was reported in the NDNQI® dataset. The Cronbach's alpha of the EWF in this study was 0.89. The Nurse to Nurse Interaction scale is a 3-item scale (Likert scale-6 points of agreement) from the NDNQI® job satisfaction-revised scale, and it is used in this study to serve as an indicator of teamwork among nurses. It has demonstrated Cronbach's alphas between 0.86 and 0.87 in studies conducted between 2008 and 2013 (NDNQI, 2016a). In this study, the 3-item Nurse to Nurse Interaction scale had a Cronbach's alpha of 0.94. The three items of this scale are:

- RNs I work with count on each other to pitch in and help when things get busy.

- There is a good deal of teamwork among RNs I work with.
- RNs I work with support each other.

The overall mean score for each scale is reported in the NDNQI® for each unit.

Intent to Stay (at 1 and 3 years). Intent to stay was measured by two items that were developed by the NDNQI® (P. Miller, personal communication, February 23, 2020). In these two items, RNs are asked whether they intend to stay in their current units for the next 1 and 3 years. The responses to both items were aggregated at the unit level using the percentage of each unit's RNs who intended to stay.

Independent Variable

Safety Culture. This study uses the Practice Environment Scale of the Nursing Work Index (PES-NWI) as a proxy to measure safety culture. It is a 31-item instrument (Likert scale 4 points of agreement) that has the following five subscales: nurse participation in hospital affairs; nursing foundations for quality of care; nurse manager ability, leadership, and support of nurses; staffing and resource adequacy; and collegial nurse-physician relations (NDNQI, 2019a). Although the nursing practice environment is not safety specific, the IOM (2004b) emphasized the impact of safety culture and practice environment on each other to optimize quality and safety of care. The PES-NWI subscales measure aspects that are included in two widely used patient safety culture surveys, Hospital Survey on Patient Safety Culture (HSOPSC) and Safety Attitude Questionnaire (SAQ), to measure aspects of safety culture. For instance, PES-NWI measures collegial nurse-physician relations, while SAQ examines the collegial relationships of a nurse with physicians, pharmacists, and other nurses. Furthermore,

staffing adequacy was measured using similar language across PES-NWI, HSOPSC, and SAQ to determine the staff perception about level of staffing to adequately carry on daily tasks. Additionally, leader/manager/supervisor role was measured across these three surveys using items that determine how supportive the leader/manager/supervisor was for providing high quality care.

The PES-NWI is scored and reported in the NDNQI® database as a unit-level mean score for each subscale as well as an overall composite mean score of PES-NWI, which is what this study used. A value of 2.5 is the cutoff point in PES-NWI, where a composite mean score > 2.5 indicates agreement and < 2.5 indicates disagreement (Lake & Friese, 2006). Although comparison is usually done based on the number of subscales that have values > 2.5, classifying units as favorable, mixed, or unfavorable, this study used the composite mean score of PES-NWI in the analyses. The NDNQI® reported Cronbach's alphas for the subscales between 0.86 and 0.90 (NDNQI, 2016a). In this study, Cronbach's alpha for the PES-NWI subscales ranged from 0.91 to 0.95.

Control Variables

Hospital Characteristics. The three hospital characteristics that were controlled for in the analysis were hospital size, ownership, and teaching status. Hospitals were either <100, 100-199, 200-299, 300-399, 400-499, or ≥500 beds. Hospitals were classified as either governmental/not for profit or private/for profit and as academic medical center, teaching hospital, or non-teaching hospital.

Unit Characteristics. This study controlled for the unit population type, nurse staffing, and unit workload. The unit population types were pediatric inpatient, adult

inpatient, and perinatal inpatient. Nurse staffing was measured using three variables: registered nurse hours per patient days (RNHPPD), RN skill mix, and nurse-patient staffing ratios. The annual RNHPPD was calculated as the number of hours worked by RNs in a given unit divided by the sum of patient days (including maternal and baby days for eligible units) in 2018. The RN skill mix is the proportion of RN worked hours to worked hours of all nursing staff in 2018. Nurse-patient staffing ratio was measured using the unit mean number of patients assigned for each RN in the last shift. Lastly, unit workload was measured using the unit mean number of hours worked in the last 7 days.

RN Workgroup Characteristics. The study controlled for RN age, gender, primary role, education, and credential status. For each unit, the RN age was reported as the percentage of RNs, within that unit, who were below 30 years old, between 30 and 40 years old, and over 40 years old. Unit percentage of RNs who were female/male, had a primary role as staff nurse/charge nurse, had earned a BSN degree or higher, and were certified by a nursing association were controlled in the study models.

Data Analysis

Descriptive statistics were used to describe hospital and unit population types. Regression analysis was used to determine the relationship between safety culture and nurse outcomes at the unit level. Because of the small sample size of units, each nurse outcome was modeled separately. Because of multicollinearity when included together, each hospital characteristic was modeled separately. RNs' psychological safety and intent to stay at 1 and 3 years have several measurement indicators, thus a multivariate multiple regression (MMR) approach was used for analysis. The MMR allows more than one

independent variable and more than one dependent variable/indicator in the model at the same time. Multiple linear regression was used to analyze job enjoyment.

Results

Descriptive Findings

There was wide variability among the seven hospitals on characteristics (Table 2). The most common size (n = 3) was 300-399 beds, meaning that 52 of the study units (57.1%) were in hospitals of this size. There were no 200-299 and 400-499 bed hospitals in the study sample. Most of the hospitals (n = 5) were government/not for profit, meaning that 72 of the study units (79.1%) were in government/not for profit hospitals. Most of the hospitals (n = 4) were teaching hospitals, meaning that 66 of the study units (72.5%) were in teaching hospitals. There were no academic medical centers in the study sample. Private/for profit hospitals were non-teaching hospitals and were of small (< 100 beds) and medium (300-399 beds) size.

Unit population types are shown in Table 3. Pediatric units numbered 22 (24.2% of the total units in the study) with the majority being medical-surgical. Adult units numbered 61 (67% of the total) with the majority being medical-surgical. Perinatal units numbered 8 (8.8% of the total).

Descriptive findings for unit scores on safety culture, job enjoyment, psychological safety, and intent to stay at 1 and 3 years are reported in Table 4. Each measure is presented by the hospital characteristics. Hospitals with less than 100 beds had higher means in job enjoyment, all psychological safety indicators (EWF-Respect, EWF-Support, EWF-Trust, and teamwork), intent to stay at 1 year, and safety culture.

Private/for profit hospitals had higher means in job enjoyment, all psychological safety indicators and intent to stay at 1 and 3 years, and safety culture. Teaching hospitals had higher unit means in intent to stay at 1 year and safety culture, while the non-teaching hospitals had higher means in job enjoyment, three indicators of psychological safety (EWF-Support, EWF-Trust, and teamwork), and intent to stay at 3 years.

Regression Findings

Job Enjoyment

The relationships between safety culture and job enjoyment are presented in Table 5. In the hospital bed size model, for every additional 1 point increase in safety culture mean score, the predicted mean score in job enjoyment increases by 1.330 points (95% confidence interval [CI] = [1.05, 1.61]), adjusting for unit characteristics (unit population types, RN hours per patient days, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days) and RN workgroup characteristics (education status, age, gender, nurse primary role, and credential status). In the hospital ownership model, for every additional 1 point increase in safety culture mean score, the predicted mean score in job enjoyment increases by 1.267 points (95% confidence interval [CI] = [1.01, 1.53]), adjusting for the unit and RN workgroup characteristics. In the hospital teaching status model, for every additional 1 point increase in safety culture mean score, the predicted mean score in job enjoyment increases by 1.313 points (95% confidence interval [CI] = [1.06, 1.57]), adjusting for the unit and RN workgroup characteristics. All relationships with job enjoyment were significant with p-values < .001.

Psychological Safety

The results of analysis of the relationship between safety culture and RN psychological safety are presented in Table 6. In the hospital bed size model, MMR analysis (Wilks' $\Lambda = .459$, $p < .001$) indicated that for every additional 1 point increase in safety culture mean score, the predicted mean score in the EWF-Trust increases by 1.039 points (95% confidence interval [CI] = [.73, 1.35]), EWF-Respect increases by 0.903 points (95% confidence interval [CI] = [.62, 1.19]), EWF-Support increases by 1.327 points (95% confidence interval [CI] = [1.02, 1.64]), and teamwork increases by 0.795 (95% confidence interval [CI] = [.48, 1.11]), adjusting for unit characteristics (unit population type, RN hours per patient days, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days) and RN workgroup characteristics (education status, age, gender, nurse primary role, and credential status). In a model with hospital ownership, MMR analysis (Wilks' $\Lambda = .509$, $p < .001$) indicated that for every additional 1 point increase in safety culture mean score, the predicted mean score in EWF-Trust increases by 1.015 points (95% confidence interval [CI] = [.69, 1.33]), EWF-Respect increases by 0.868 points (95% confidence interval [CI] = [.58, 1.16]), EWF-Support increases by 1.248 points (95% confidence interval [CI] = [.94, 1.56]), and teamwork increases by 0.705 (95% confidence interval [CI] = [.40, 1.01]), adjusting for unit and RN workgroup characteristics. In a model with hospital teaching status, MMR analysis (Wilks' $\Lambda = .477$, $p < .001$) indicated that for every additional 1 point increase in safety culture mean score, the predicted mean score increases in EWF-Trust increases by 1.053 points (95% confidence interval [CI] = [.74, 1.37]), EWF-Respect by 0.894 points (95% confidence

interval [CI] = [.61, 1.18]), EWF-Support increases by 1.269 points (95% confidence interval [CI] = [.97, 1.57]), and teamwork increases by 0.752 (95% confidence interval [CI] = [.45, 1.06]), adjusting for unit and RN workgroup characteristics. The effects of safety culture on psychological safety indicators in the above models were significant with *p*-values < .001.

Intent to Stay (at 1 and 3 years)

The relationships between unit safety culture and RN intent to stay at 1 and 3 years are presented in Table 6. In the hospital bed size model, MMR analysis (Wilks' Λ = .809, $p < .001$) revealed that for every additional 1 point increase in safety culture mean score, the predicted mean score in intent to stay at 1 year increases by 28.8% (95% confidence interval [CI] = [12.70, 44.82]), and at 3 years increases by 24.7% (95% confidence interval [CI] = [5.34, 44.13]), adjusting for unit characteristics (unit population type, RN hours per patient days, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days) and RN workgroup characteristics (education status, age, gender, nurse primary role, and credential status). In the hospital ownership model, MMR analysis (Wilks' Λ = .787, $p < .001$) revealed that for every additional 1 point increase in safety culture mean score, the predicted mean score increases in intent to stay at 1 year by 30.9% (95% confidence interval [CI] = [15.07, 46.71]), and at 3 years increases by 25.0% (95% confidence interval [CI] = [6.03, 43.96]), adjusting for the unit and RN workgroup characteristics. In the hospital teaching status model, MMR analysis (Wilks' Λ = .779, $p < .001$) revealed that for every additional 1 point increase in safety culture mean score, the predicted mean score in intent to stay at 1 year increases by 31.7 % (95% confidence

interval [CI] = [16.08, 47.30]), and at 3 years increases by 24.5% (95% confidence interval [CI] = [5.83, 43.25]), adjusting for unit and RN workgroup characteristics. The effect of safety culture on intent to stay indicators in the above models were significant with *p*-values between <.001 and .013.

Discussion

In this study the impact of safety culture on nurse job enjoyment, psychological safety, and intent to stay at 1 and 3 years in acute care hospital units in the Middle East was investigated, and it is the first study examining NDNQI® data from this region.

Descriptive findings for the nurse outcomes in these Middle East hospitals are comparable to findings from hospitals in other countries. In this study, the safety culture (PES-NWI) mean score was 2.98, varying between 2.79 to 3.11, depending on hospital characteristics. These scores show that the level of safety culture is comparable to scores reported from other parts of the world. In the USA, for instance, Lake et al. (2015) reported that the PES-NWI mean score (N = 98) was 3.05 – ranging between 2.95 to 3.16, and Aiken et al. (2011) reported that 29.8% of 665 study hospitals from 4 states had PES-NWI mean scores below 2.65, 50.7% had PES-NWI mean scores between 2.65 and 2.95, and 19.6% had PES-NWI mean scores > 2.95. Across 89 units from 21 hospitals in China, the PES-NWI mean score was 3.10 (Liu et al., 2012).

Job enjoyment mean score in the Middle East acute care hospitals was higher when compared to hospitals from the United States. In this study, job enjoyment had a mean score of 4.06, and it ranged between 3.86 to 4.44 depending on hospital characteristics. In the United States, Ballard et al. (2016) reported a mean score of job

enjoyment of 3.26, and it ranged between 3.31 to 3.28 depending on unit population type, for a sample of 3,203 inpatient units. Similarly, Choi and Boyle (2013) reported a mean score on job enjoyment of 3.72, and it ranged between 3.68 and 3.76 based on unit specialty, across 2,763 units from 576 hospitals. Furthermore, Choi and Miller (2018) reported a mean score of job enjoyment of 3.94 among RNs (n = 82,925) who felt that they had appropriate patient assignments, where RNs (n = 23,514) who felt that their patient assignment was inappropriate had a mean score for job enjoyment of 2.98.

Although respect and teamwork have been studied in previous research, it is hard to make comparisons because different measures were used in those studies compared to this study. Fewer studies are available to compare Middle East scores to other countries on intent to stay. In this study, I found that 68.0% and 75.0% of the RNs intended to stay at their units at 1 and 3 years, respectively. In the United States, Choi and Miller (2018) reported that 79.2% of RNs who felt they had an appropriate patient assignment and 54.4% of those RNs who their patient assignment was inappropriate intended to stay in their units. No studies that used the same measure for intention to stay at 3 years as this study or the other psychological safety indicators (trust and support) were found for comparison.

The findings of the study showed that higher safety culture scores are significantly associated with higher job enjoyment, psychological safety, and intent to stay at 1and 3 years. The study findings indicate that the impact of safety culture on nurse outcomes is significant, while controlling for hospital, unit, and RN workgroup characteristics. As shown in Table 4, findings indicate that smaller, private/for profit, and

non-teaching hospitals had higher scores on the outcome variables. It is helpful to indicate, as mentioned earlier, that the private/for profit hospitals in this study were non-teaching hospitals and were small (< 100 beds) and medium (300-399 beds) sized. Thus, it might be the hospital ownership characteristic that is driving safety culture and nurse outcomes, where private/for profit hospitals have higher mean scores. This finding is consistent with a previous study by Arrieta et al. (2018) who found that private hospitals had higher safety culture scores compared to public hospitals. This conclusion can be examined in future studies that have a larger hospital sample and more even distribution across size and ownership.

No previous research examining the impact of safety culture on nurse job enjoyment was found. However, previous research has identified the relationship between nursing practice environment and job enjoyment (Ballard et al., 2016; Gajewski et al., 2010; Wade et al., 2008), but these studies were not specific to the Middle East. Thus, job enjoyment findings from this study adds understanding about the impact safety culture has on nurse job enjoyment among nurses in the Middle East. Furthermore, this finding indicates the need for further examination of this relationship in the specific healthcare context of Middle East countries.

This study also showed significant positive relationships between safety culture and indicators of nurses' psychological safety (respect, support, and trust). These findings support previous research that has examined the relationship between safety culture and mutual respect (Manojlovich et al., 2014) and teamwork (Alzahrani et al., 2018; Ammouri et al., 2015; El-Jardali et al., 2010; El-Jardali et al., 2014; Rehder et al., 2020;

Schwartz et al., 2019; Sexton et al., 2017). Despite that previous empirical studies have not examined the relationship between safety culture and meaning in work among nurses, meaning in work is important for creating a supportive work environment that fosters a culture of patient safety (Warshawsky et al., 2013). Some studies have found other aspects of psychological safety, such as a "speaking-up" related climate (Huddleston & Gray, 2016; Schwappach & Niederhauser, 2019) and emotional wellbeing (McLinton et al., 2018) to influence nurse performance and consequently quality of care. Alingh et al. (2019) found no significant relationship between safety culture and psychological safety. Thus, more studies are needed in this area to further examine the relationship between safety culture and nurses' psychological safety as well as other nurse outcomes to understand the underpinning mechanisms.

This study also showed significant relationships between safety culture and intent to stay at 1 and 3 years. Previous research has shown that safety culture is a significant predictor of intent to stay (AbuAlRub et al., 2012; Liang et al., 2016), but did not determine how long the nurses intended to stay. Our analysis, in this study, was able to examine two specific time points in the future in relationship to safety culture. With these findings, future studies can qualitatively examine the process of how safety culture influences nurses' intent to stay at 1 and 3 years.

Overall, the study findings are in alignment with the Integrative Model of Organizational Climate of Staff Working Conditions and Safety, which proposes the impact of safety culture on nurse outcomes. Specifically, this model proposes that a change in safety culture, a process level variable, can directly influence nurse outcomes,

and vice versa. Thus, higher safety culture scores enhance nurse outcomes. Given the positive significant relationships in this study between safety culture and job enjoyment, psychological safety, and intent to stay at 1 and 3 years, this study supports the Integrative Model of Organizational Climate of Staff Working Conditions and Safety model.

Limitations

The small sample of hospitals and units was a limitation of this study. Having such a limitation did not allow inclusion of all hospital characteristics and nurse outcomes in one regression model. Furthermore, having a small number of hospitals (all eligible units were from seven hospitals) precluded performing more advanced statistical approaches such as multilevel modeling to better investigate for hospital, unit, and RN workgroup characteristics. That approach requires at least ten hospitals for each level two variable (hospital characteristic) to examine such relationships (Jackson, 2003; Rabe-Hesketh & Skrondal, 2006). Furthermore, the small sample size of units precluded controlling for interactions between nurse outcomes, which can add more insight about the moderation relationships. For instance, previously psychological safety was thought to be a precondition for restoring job enjoyment (Lucian Leape Institute, 2013; Sikka et al., 2015). Moreover, the study sample comes from hospitals in different Middle Eastern countries, which might have differences in health care and nurse education systems and how much these countries rely on local versus expatriate nurses. However, this study did not control for the hospitals based on what country they are in due to the small sample size. Nevertheless, one of the strengths of the study is that it is the first to examine the

relationships among safety culture and nurse outcomes across different units in acute care hospitals in the Middle East using NDNQI® data.

Recommendations and Implications

Several recommendations for research on the specific nurse outcomes have been addressed above. Additional recommendations for research and practice emanated from this study. Further exploration of the impact of safety culture on nurse outcomes is needed using a larger number of units and hospitals to better understand these relationships while controlling for the nested nature of units within hospitals. This would allow for advanced statistical approaches and controlling for the complexity of health care systems as well as relationships (e.g. interaction) among study variables. With a larger sample, examination of differences based on unit type could also be explored. Finally, this study used data from one year, and as more Middle East hospitals participate in the NDNQI, studies examining data over a longer period to time could be conducted.

Implications of the findings for practice suggest that hospital and nurse leaders/unit managers should strive to improve the culture of safety to optimize the quality of care by addressing nurses' needs and enhancing nurse outcomes. Examples of culture change strategies that could be introduced at the hospital and unit level could include interventions such as Comprehensive Unit-based Safety Program (CUSP) and TeamSTEPPS, to improve aspects relevant to safety culture. These programs improve collegial relationships and communication openness among nurses and with other healthcare staff. They include managers and supervisors and give attention to the staffing and resources needed to provide the adequate care and establish a healthy work

environment for nurses. Building a community of nurses where they can enjoy their work, feel safe, and willing to spend more time in their work area can foster healthcare efforts to provide better quality of care.

Conclusion

Safety culture showed positive and significant relationships with nurse outcomes. Findings of this study can be cautiously generalized for the study sample included hospitals of different sizes, ownership type, and teaching status. The selection of a wide range of unit population types, inpatient adult, pediatric, and perinatal, adds to the generalizability.

Acknowledgment

The National Database of Nursing Quality Indicators® (NDNQI®) data were supplied by Press Ganey Associates LLC. Press Ganey Associates LLC. specifically disclaims responsibility for any analyses, interpretations or conclusions.

Tables

Table 2

Hospital Characteristics

Categories	Number of Hospitals by Hospital Characteristic	Number of Units by Hospital Characteristic
N	7	91
Hospital bed size		
< 100 beds	1	6
100 – 199	2	12
200 – 299	0	0
300 – 399	3	52
400 – 499	0	0
≥ 500	1	21
Hospital ownership		
Government/Not for profit	5	72
Private/ For profit	2	19
Teaching status		
Academic medical center	0	0
Teaching	4	66
Non-teaching	3	25

Table 3

Number of Units Per Unit Population Type

Patient population	Number of units
Pediatric Inpatient (*n* = 22)	
Critical Care	5
Step Down	1
Medical-Surgical	15
Rehabilitation	1
Adult Inpatient (*n* = 61)	
Critical Care	13
Step Down	6
Medical/Surgical	37
Rehabilitation	1
Bone Marrow Transplant	1
Moderate acuity	2
Blended Acuity	1
Perinatal Inpatient (*n* = 8)	
Antepartum/Postpartum	4
Mother/Baby	1
OB and Medical/Surgical	3

Note. Total number of units is *n* = 91

Table 4

Unit Mean and SD for Safety Culture and Nurse Outcomes Based on Hospital Characteristics

Hospital Characteristic		Job Enjoyment	Psychological Safety				Intent to Stay		
		JE *M (SD)* *Range (1-6)*	EWF-R *M (SD)* *Range (1-5)*	EWF-S *M (SD)* *Range (1-5)*	EWF- T *M (SD)* *Range (1-5)*	TW *M (SD)* *Range (1-6)*	1 Year *M (SD)* *Range (0-100)*	3 Years *M (SD)* *Range (0-100)*	SC *M (SD)* *Range (1-4)*
Hospital Bed Size	*< 100*	4.44 (.34)	4.61 (.17)	4.36 (.27)	4.35 (.36)	5.36 (.28)	85.85 (15.05)	73.19 (17.36)	3.11 (.33)
	100 - 199	3.86 (.43)	4.12 (.30)	3.98 (.41)	3.62 (.39)	4.98 (.32)	54.59 (22.53)	62.97 (25.99)	2.79 (.14)
	300 – 399	4.10 (.40)	4.21 (.37)	4.00 (.44)	3.76 (.38)	4.92 (.35)	67.00 (17.28)	76.19 (16.21)	3.05 (.26)
	≥ 500	3.96 (.34)	4.11 (.32)	4.05 (.31)	3.69 (.31)	4.85 (.28)	72.92 (15.15)	79.55 (15.71)	2.90 (.15)
Hospital Ownership	*Government /Not for profit*	4.00 (.40)	4.19 (.35)	4.01 (.42)	3.73 (.37)	4.89 (.33)	67.38 (18.27)	74.11 (18.68)	2.97 (.25)
	Private/For profit	4.23 (.37)	4.24 (.38)	4.09 (.35)	3.90 (.45)	5.12 (.33)	70.22 (20.21)	78.51 (15.76)	3.01 (.25)
Teaching Status	*Teaching*	4.03 (.39)	4.20 (.36)	4.01 (.41)	3.73 (.37)	4.89 (.34)	68.66 (17.19)	74.18 (17.73)	2.99 (.25)
	Non-Teaching	4.14 (.45)	4.20 (.37)	4.07 (.38)	3.85 (.44)	5.07 (.34)	66.17 (22.21)	77.27 (19.29)	2.95 (.26)

Overall	*Total*	4.06 (.41)	4.20 (.36)	4.03 (.41)	3.77 (.39)	4.94 (.35)	67.97 (18.61)	75.03 (18.11)	2.98 (.25)

Note. $n = 91$. EWF-R: Eye of Workforce-Respect, EWF-S: Eye of Workforce-Support, EWF-T: Eye of Workforce-Trust, TW: Teamwork, 1-Year: % of RNs with Intent to stay at the same unit in 1 year, 3-Years: % of RNs with Intent to stay at the same unit in 3 years, JE: Job Enjoyment, SC: Safety Culture. For all measures, the higher the score the better the outcome.

Table 5

Relationship Between Safety Culture and Job Enjoyment, Controlling for Hospital, Unit, and RN Workgroup Characteristics

			95% Confidence Interval for B		
Control Variables	IV	B	Lower	Upper	*p*-value
Hospital Bed Size + Unit & RN Workgroup Characteristics	SC	1.330	1.050	1.610	< .001
Hospital Ownership + Unit & RN Workgroup Characteristics	SC	1.267	1.009	1.526	< .001
Hospital Teaching Status + Unit & RN Workgroup Characteristics	SC	1.313	1.056	1.571	< .001

Note. $n = 91$. Unit characteristics included in each model were unit population type, RN hours per patient days, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days. RN workgroup characteristics included in each model were education status, age, gender, nurse primary role, and certification status from nursing association.

Table 6

Relationship Between Safety Culture and Psychological Safety and Intent to Stay, Controlling for Hospital, Unit, and RN Workgroup Characteristics

Control Variables	IV	Nurse Outcomes	Wilks' Lambda (p-value)	B	95% Confidence Interval for B		*p*-value
					Lower	Upper	
Hospital Bed Size + Unit & RN Workgroup Characteristics		Psychological Safety					
	SC	EWF-Respect	.459 (<.001)	.903	.616	1.190	< .001
	SC	EWF-Support		1.327	1.015	1.639	< .001
	SC	EWF-Trust		1.039	.731	1.348	< .001
	SC	Teamwork		.795	.482	1.108	< .001
		Intent to Stay					
	SC	Stay in Same Unit-1yr	.809 (<.001)	28.762	12.703	44.822	.001
	SC	Stay in Same Unit -3yr		24.739	5.342	44.137	.013
Hospital Ownership + Unit & RN Workgroup Characteristics		Psychological Safety					
	SC	EWF-Respect	.506 (<.001)	.868	.578	1.159	< .001
	SC	EWF-Support		1.248	.937	1.559	< .001
	SC	EWF-Trust		1.015	.693	1.337	< .001
	SC	Teamwork		.705	.398	1.013	< .001
		Intent to Stay					
	SC	Stay in Same Unit-1yr	.787 (<.001)	30.888	15.066	46.709	< .001
	SC	Stay in Same Unit -3yr		24.996	6.033	43.960	.010
		Psychological Safety					

Hospital Teaching Status + Unit & RN Workgroup Characteristics	SC	EWF-Respect	.477 (<.001)	.894	.607	1.180	< .001
	SC	EWF-Support		1.269	.968	1.570	< .001
	SC	EWF-Trust		1.053	.741	1.365	< .001
	SC	Teamwork		.752	.445	1.058	< .001
		Intent to Stay					
	SC	Stay in Same Unit-1yr	.779 (<.001)	31.690	16.075	47.305	< .001
	SC	Stay in Same Unit -3yr		24.539	5.831	43.247	.011

Note. $n = 91$. Unit characteristics included in each model were unit population type, RN hours per patient days, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days. RN workgroup characteristics included in each model were education status, age, gender, nurse primary role, and certification status from nursing association.

CHAPTER V

MANUSCRIPT 2: THE IMPACT OF SAFETY CULTURE ON PATIENT OUTCOMES IN ACUTE CARE HOSPITALS IN THE MIDDLE EAST REGION: MEDIATION EFFECT OF NURSE OUTCOMES

Abstract

Aim. To examine the associations between safety culture and four patient outcomes (catheter-associated urinary tract infections [CAUTI], central line-associated bloodstream infections [CLABSI], patient falls, and pressure injuries) and to examine mediation effects of three nurse outcomes (job enjoyment, psychological safety, and intention to stay at 1 and 3 years) on the relationships among safety culture and patient outcomes.

Design. A cross-sectional correlational design, using 2018 data from the National Database of Nursing Quality Indicators® (NDNQI®) on Middle East hospitals.

Methods. Safety culture data were collected using the Practice Environment Scale of the Nursing Work Index. A total of 90 adult, pediatric, and perinatal inpatient units from seven hospitals were included, where the sample for each patient outcome varied (n = 73 - 90) based on availability of outcome data. Statistical analyses consisted of Poisson regressions and Sobel-first order test for mediation.

Results. Safety culture was significantly associated with CLABSI and pressure injuries. However, when examining the mediation effects of nurse outcomes, no significant direct effect of safety culture on patient outcomes were found. Lastly,

mediation analysis showed that (a) the psychological safety-respect indicator significantly mediated the relationship between unit safety culture and CAUTI; and (b) intent to stay at 1 year and psychological safety-respect indicator had a significant direct effect on CAUTI.

Conclusions. Safety culture was significantly associated with two patient outcomes and mediation role was supported in one patient outcome. Future research should examine these relationships in a larger sample to have a deeper understanding of these relationships.

Impact. Safety culture remained an important and significant influencer on nurse outcomes. Findings establish a baseline for researchers in the Middle East to further explore safety culture in relation to patient safety in their context to unveil the potential impact of safety culture on patient and healthcare outcomes.

Keywords: Safety culture, patient outcomes, CAUTI, CLABSI, falls, pressure injuries, nurse outcomes, job enjoyment, psychological safety, intent to stay.

Introduction

Patient safety has received increasing amounts of attention worldwide, over the last decade. The World Health Organization reported that 10% of hospitalized patients are harmed as a result of medical errors (World Health Organization, 2019). In the United States, for example, the report by the Institute of Medicine (2000) highlighted the importance of patient safety in health care settings, mainly in acute care settings. In the report the number of people who died because of medical errors each year ranged between 44,000 and 98,000. In a recent report by Makary and Daniel (2016), the third leading cause of death in the United States was medical errors. Safety culture is defined by the Agency for Healthcare Research and Quality (AHRQ) as "the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" (Nieva & Sorra, 2003, p. 1). Promoting a safety culture in healthcare organizations has been one of the top initiatives of many patient safety organizations to improve patient safety outcomes. In fact, the Institute of Medicine (2004b) highlighted that safety culture can influence patient safety outcomes directly as well as indirectly through nurse outcomes.

There are a limited number of studies worldwide examining the relationship between safety culture and patient outcomes (DiCuccio, 2015), but none of these studies were in the Middle East region. Thus, this current study examined linkages between safety culture and patient outcomes in acute care hospitals in the Middle East region. Given that several hospitals in the Middle East are accredited by international

organizations, such as the Joint Commission International, this study focused on the Joint Commission's National Patient Safety Goals for hospitals (Joint Commission, 2020a) and nursing care (Joint Commission, 2020b). Specifically, this study focused on the relationship between safety culture and the following patient outcomes: catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), falls, and pressure injuries. Furthermore, this study examined the mediation effect of nurse outcomes on the relationship between safety culture and patient outcomes.

Background

A growing body of literature has examined the relationship between safety culture and patient outcomes. Several studies have shown a positive relationship between high safety culture and good patient outcomes. Taylor and colleagues (2012) found that higher safety climate and teamwork scores on the Safety Attitude Questionnaire (SAQ) were negatively associated with pressure injury rates. Higher communication openness scores were significantly correlated with lower pressure injuries and falls rates (Han et al., 2020). Not all studies, however, have shown a significant relationship between safety culture and CAUTI, CLABSI, patient falls, and pressure injuries (Ausserhofer et al., 2013; Groves, 2014; Mark et al., 2008; Meddings et al., 2017; Merrill, 2011; O'Brien, 2009).

Programs designed to improve safety culture have been shown to positively affect patient safety. The TeamSTEPPS program, which aims to improve teamwork and other aspect of safety culture, reduced patient fall and pressure injury rates by 69% and 100%,

respectively when introduced in one hospital setting (Kim, 2014). The Comprehensive Unit-based Safety Program (CUSP) has also been used to optimize safety culture and decrease infection rates. For instance, CUSP reduced central line-associated bloodstream infection (CLABSI) rates in the ICU setting. Reported drops in infections per central line days were as follows: 1.8 to 1.1 (Hong et al., 2013), 1.75 to 0.29 (Lin et al., 2013), 3.9 to 0.5 (Miller et al., 2016), 5.0 to 1.5 (Thom et al., 2014), 15.5 to 0 (Sood et al., 2017), 1.96 to 1.15 (Berenholtz et al., 2014), 4.48 to 1.33 (Marsteller et al., 2012), 1.95 to 1.04 (Richter & McAlearney, 2018), and 2.99 to 1.47 (Reddy et al., 2014). The differences in magnitude of impact reflects the wide range in baseline CLABSI rates and the length of the studies, from 19 months to 5 years. CUSP also contributed to 50% reduction in catheter-associated urinary tract infection (CAUTI) rates in ICUs (Underwood, 2015) and in non-intensive care units by 32% (Saint et al., 2016).

Researchers have explored the relationship between nurse outcomes and patient outcomes. For instance, RN turnover was negatively associated with patient falls (Bae et al., 2010; Taylor et al., 2012) and pressure injuries (Taylor et al., 2012), but positively associated with rates of pulmonary embolism and deep vein thrombosis (Taylor et al., 2012). Nurse burnout, as the opposite of nurse enjoyment, was positively associated with patient adverse events (Liu et al., 2019; Liu et al., 2018), predicted patient falls and nosocomial infections (Van Bogaert et al., 2014), and significanlty decreased CAUTI and CLABSI (Hellyar et al., 2019). However, although it was theoretically proposed by the Institute of Medicine (2004b), the mediation effect of nurse outcomes on the relationship between safety culture and patient outcomes has not been examined empirically.

In Middle Eastern hospitals studies on safety culture have been descriptive in nature. The majority of studies examined nurses' and other healthcare professionals' perceptions of safety culture using validated tools, such as the Hospital Survey on Patient Safety Culture (HSOPSC) and the Safety Attitude Questionnaire (SAQ) (Aboshaiqah & Baker, 2013; Aboul-Fotouh et al., 2012; Alayed et al., 2014; Almutairi et al., 2013; Ammouri et al., 2015; El-Jardali et al., 2014; Hamdan & Saleem, 2013). AbuAlRub and Abu Alhijaa (2014) conducted an intervention study using an education program on safety culture to examine whether it could improve safety culture scores, patient fall rates, and pressure injury incidents. Findings showed that the education program did not improve the safety culture score, nor was there improvement in fall or pressure injury rates before and after the intervention. To the best of my knowledge, no other studies have examined the relationship between safety culture and patient outcomes in Middle East. Furthermore, no previous study has examined the mediation role of nurse outcomes on the relationship between safety culture and patient outcomes in the Middle East hospitals. Thus, examining the relationships between unit safety culture and unit patient outcomes and the mediation effect of unit nurse outcomes can add understanding of these relationships in Middle East acute care hospitals.

This study was guided by the Integrative Model of Organizational Climate of Staff Working Conditions and Safety (IMOC). This model was expanded by Bonner et al. (2009) to explain the relationships among structure (philosophy, goals, and policies and procedures on patient safety), process (initiatives and what is in place to optimize patient safety), and outcomes in in nursing context. The outcomes level consists of patient and

nurse outcomes. This model aligns with the Institute of Medicine (2004b) in regard to the direct relationship between safety culture and patient outcomes and indirectly through nurse outcomes. This study examines these aspects of the model: safety culture (process level) and patient outcomes (distal outcome), and the mediation effect of nurse outcomes (distal outcome).

The Study

Study Aims

Aim 1 of the study was to examine the relationship between unit safety culture and unit CAUTI, CLABSI, patient falls, and pressure injuries in acute care hospitals in the Middle East region. Aim 2 was to examine the potential mediation effects of nurses' job enjoyment, workplace psychological safety, and intent to stay at 1 and 3 years on the relationships among safety culture and the four patient outcomes.

Design and Participants

The study utilized a cross-sectional correlational approach to analyze data obtained from the National Database of Nursing Quality Indicators® (NDNQI ®) (https://members.nursingquality.org). Specifically, NDNQI® collects RN survey data as well as clinical data. Participating hospitals choose between two RN survey options: Practice Environment Scale-Nurse Work Index (PES-NWI) or Job Satisfaction. Moreover, hospitals choose one or more of the NDNQI® clinical indicators to report monthly (e.g. CAUTI, CLABSI, and falls) or quarterly data (e.g. pressure injuries). This study aggregated the monthly and quarterly data for each unit to annual data over a 1 year period for analysis.

The NDNQI® data that were used in this study were from Middle East acute care hospitals. The NDNQI® has data for 2018 on 31 Middle East hospitals (P. Miller, personal communication, December 14, 2018), but only seven hospitals were eligible for this study because they chose to collect nurse data using PES-NWI, used in this study as the measure of safety culture. The overall number of units in these seven hospitals was 91, but the specific number of units in the analysis for the different patient outcomes varied depending on how many units chose to report data on that specific outcome. Inclusion criteria for the units were (a) inpatient adult, pediatric, and perinatal units; (b) participated in the NDNQI® RN surveys of interest: Practice Environment Scale of the Nursing Work Index [PES-NWI], job enjoyment, psychological safety, and intent to stay at 1 and 3 years; and (c) reported clinical data on CAUTI, CLABSI, falls, or pressure injuries. All data used in this study were for the period between January 1st and December 31st of 2018. IRB approval was obtained from the University of North Carolina at Greensboro (UNCG). De-identified data were shared by Press Ganey Associates LLC through a data use agreement.

Data Collection Measures

Dependent Variables – Patient Outcomes

CAUTI. CAUTI is defined as:

> A UTI [urinary tract infection] where an indwelling urinary catheter was in place for more than two consecutive days in an inpatient location on the date of event, with day of device placement being Day 1, and an indwelling urinary catheter was in place on the date of event or the day before. If an indwelling urinary catheter was in place for more than two consecutive days in an inpatient location and then removed, the date of event for the UTI must be the day of device discontinuation or the next day for the UTI to be catheter-associated. (NDNQI, 2019b, p. 3)

Urinary catheter days (device days), which reflect the number of days the catheter was in place, divided by 1000 was modeled as a control variable, given that CAUTI is usually reported per 1000 urinary catheter days.

CLABSI. CLABSI is defined as "a laboratory confirmed bloodstream infection [LCBI] where an eligible BSI [bloodstream infection] organism is identified, and an eligible central line is present on the LCBI DOE [date of event] or the day before" (NDNQI, 2019c, p. 5). This study controlled for the number of days the central line was in place divided by 1000, given that CLABSI is usually reported per 1000 central-line days.

Falls. A patient fall is defined as "a sudden, unintentional descent, with or without injury to the patient, that results in the patient coming to rest on the floor, on or against some other surface (e.g., a counter), on another person, or on an object (e.g., a trash can)" (NDNQI, 2016b, p. 2). Since falls are usually reported in relation to 1000 patient days, this study used unit patient days (including perinatal days for eligible units) divided by 1000 as a control variable.

Pressure Injuries. A pressure injury is characterized as "localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device" (NDNQI, 2018, p. 4). Pressure injuries are staged from intact skin to open ulceration with pain, and only data on unit-acquired ulcers were included in this study. Kappa coefficients for pressure injury identification and origin were 0.83 and 0.79, respectively, indicating near perfect agreement (Bergquist-Beringer et al., 2011). Kappa coefficient for pressure injury staging by direct observation of the wounds was 0.60-0.61

and for web-based pictures was 0.69, indicating moderate to substantial agreement (Bergquist-Beringer et al., 2011). For this study the number of patients assessed for pressure injuries on the day of pressure injury survey, divided by 100, was modeled as a control variable, given that pressure injuries are usually reported per 100 patients assessed for pressure injuries.

Mediator Variables – Nurse Outcomes

Job Enjoyment. Job enjoyment is defined as "the degree to which people like their work" (NDNQI, 2016a, p. 18) and was measured using a 7-item scale (Likert scale, 6 points of agreement). In previous studies, the job enjoyment scale had Cronbach's alphas between 0.921 and 0.928 (NDNQI, 2016a). In this study, the job enjoyment scale had a Cronbach's alpha of 0.845. The unit-level mean score was reported in the NDNQI® database.

Psychological Safety. Psychological safety was defined as "a shared belief that the team is safe for interpersonal risk taking" (Edmondson, 1999, p. 354). Through the Eyes of the Workforce (EWF) survey and Nurse to Nurse Interaction subscale were used to measure aspects of psychological safety for each unit. The EWF survey has three items (Likert scale, 5 points of agreement) that measures trust (EWF-T), respect (EWF-R), and support (EWF-S) (NDNQI, 2016a). A unit level mean score for each of the 3 items was reported in the NDNQI® dataset. The Cronbach's alpha of the EWF in this study was 0.89. The Nurse to Nurse Interaction subscale is a 3-item subscale (Likert scale, 6 points of agreement) that has shown Cronbach's alphas between 0.86 and 0.87 (NDNQI,

2016a). In this study, the Nurse to Nurse Interaction subscale had a Cronbach's alpha of 0.94.

Intent to Stay. The intent to stay at the same unit at 1 and 3 years were part of the job plans in the NDNQI® RN Survey, which asks RNs two items about their plans in the next 1 and 3 years (NDNQI, 2019a). The data show the percentage of RNs who would stay in the same unit for the next 1 or 3 years.

Independent Variable

Safety Culture. This study used the Practice Environment Scale of the Nursing Work Index (PES-NWI) as the measure of safety culture. Safety culture and practice environment of nurses are seen as interrelated concepts in the literature (IOM, 2004b). A study conducted by Olds and Lake (2010) to determine predictors of hospital safety culture and the relationships between safety culture and safety grade used the practice environment as a benchmark. They found that the nurse practice environment was a predictor for safety culture. These findings indicate that safety culture and practice environment can mirror/predict each other.

The PES-NWI is 31 items (Likert scale, 4 points of agreement) with five subscales: nurse participation in hospital affairs; nursing foundations for quality of care; nurse manager ability, leadership, and support of nurses; staffing and resource adequacy; and collegial nurse-physician relations. The unit-level PES-NWI mean score is used in this study. The NDNQI® reported Cronbach's alphas for the subscales between 0.86 and 0.90 (NDNQI, 2019a). In this study, Cronbach's alpha for the PES-NWI subscales ranged from 0.91 to 0.95.

Control Variables

Unit Characteristics. This study controlled for two unit characteristics: nurse staffing and unit workload. Nurse staffing was measured using four variables: registered nurse hours per patient days (RNHPPD), RN skill mix, nurse-patient staffing ratios, and unit workload. The annual RNHPPD was calculated as the number of hours worked by RNs in a given unit divided by the sum of patient days (including maternal and baby days for eligible units) in 2018. The unit RN skill mix is the proportion of the RN hours to the total hours worked by all nursing staff in 2018. Nurse-patient staffing ratio was measured using the unit mean number of patients assigned for each RN in the last shift. The second characteristic, unit workload, was measured using the unit mean number of hours worked in the last 7 days.

RN Workgroup Characteristics. The study controlled for RN age, gender, primary role, educational status, and certification status. For each unit, the unit RN age was reported as the percentages of RNs below 30 years old, between 30 and 40 years old, and older than 40 years old. Unit percentages of each were reported for RN gender (female and male), primary role (staff nurse and charge nurse), educational status (BSN degree or higher), and certification status (percent with specialty certification from a nursing association).

Data Analysis

The analyses for Aim 1 were conducted using SPSS v.26 (IBM Corp., Armonk, NY). Unit level descriptive statistical analyses for unit and RN workgroup characteristics were conducted. Given that all patient outcomes of interest were reported as counts in the

NDNQI® dataset, count regression was used to examine relationships between safety culture and each of the four patient outcomes at the unit level. Tests for overdispersion indicated using Poisson regression. All analyses were adjusted for RN workgroup characteristics (age, gender, primary role, educational status, and certification status) and unit characteristics (RN hours per patient day, RN skill mix, staffing ratios, and workload).

Mediation analyses to address Aim 2 were conducted using Mplus (Muthén & Muthen, 2017) to determine the counterfactually-defined causal effects (Muthen et al., 2016). The analysis utilized the Sobel first-order test (Sobel, 1982) with 95% bias-corrected bootstrap for testing the mediated effects. Successfully converged models had only controlled for catheter days in CAUTI, central line days in CLABSI, patient days in falls, and patients assessed for pressure injuries. Percent of RNs with intent to stay at 1 year and 3 years were divided by 100 to improve convergence for mediation analysis. A two-sided p-value < 0.05 was considered statistically significant.

Results

Descriptive Findings

The incidence count and control variables for each outcome are reported in Table 7. This table also presents the descriptive findings for each unit and RN workgroup characteristic. The mean score of safety culture ranged between 2.98 and 3.01 because the number of units that could be used in the analysis varied from 73 to 90. Falls had the highest mean incidence count (3.59 falls) whereas mean incidence count for other outcomes ranged from 1.12 to 1.78. All four patient outcomes had a large standard

deviation (SD). Relatively, the incidence control of pressure injuries (assessed patients for pressure injuries) had the highest mean (12.15) whereas mean incidence control of other outcomes (catheter days for CAUTI, central-line days for CLABSI, and patient days for falls) ranged from 0.98 to 4.99. Unit-level descriptive statistics for the unit and RN workgroup characteristics that were controlled for in the analysis are reported in Table 7.

Aim 1: Relationship Between Safety Culture and Patient Outcomes

Results of the Poisson regression for all four patient outcomes, controlling for unit and RN workgroup characteristics, are presented in Table 8. In CAUTI, for every additional 1-point increase in safety culture score, the predicted mean number of CAUTI decreases by 5.7%. However, this relationship between CAUTI and safety culture was not statistically significant ($p = .919$). In CLABSI, for every additional 1-point increase in safety culture score, the predicted mean number of CLABSI increases by 718.1%. This relationship was significant ($p = .002$). In falls, with every additional 1-point increase in safety culture score, the predicted mean number of falls decreases by 38.9%. However, this relationship was not statistically significant ($p = .20$). In pressure injuries, for every additional 1-point increase in safety culture, the predicted mean number of pressure injuries decreases by 84.7% and was statistically significant ($p = .018$).

Aim 2: Mediating Effect of Nurse Outcomes

The study also tested whether nurse job enjoyment, psychological safety, and intent to stay mediated the relationship between safety culture and patient outcomes (CAUTI, CLABSI, falls, and pressure injuries) using Sobel's first-order testing and

bootstrapped confidence intervals. Tables 9-12 present standardized direct, indirect, and total effects of the mediation path analysis for CAUTI, CLABSI, falls, and pressure injuries, respectively. Furthermore, the path analysis of CAUTI, CLABSI, falls, and pressure injuries are presented in Figures 3-6, respectively.

In CAUTI, indirect effect of safety culture on CAUTI was not significant (z = .649, p = .727, 95% Bias-corrected bootstrap confidence interval = -3.152, 4.248). However, only the specific indirect effect for EWF-Respect was significant (β = 2.620, p = .013, 95% Bias-corrected bootstrap confidence interval = .837, 5.070). Significant direct effects for safety culture on nurse outcomes included positive associations with job enjoyment (β = 1.221, p < .001), intent to stay at 1 year (β = .205, p = .021), intent to stay at 3 years (β = .248, p < .001), EWF-Trust (β = .950, p < .001), EWF-Respect (β = .853, p < .001), EWF-Support (β = .906, p < .001), and nurse to nurse interaction (β = 590, p < .001). Intent to stay at 1 year had a negative significant direct effect on CAUTI (β = -4.784, p = .017). Furthermore, EWF-Respect had a positive significant direct effect on CAUTI (β = 3.073, p = .012). The direct effect of safety culture on CAUTI was not significant (β = .498, p = .851). The total effect of safety culture on CAUTI was not significant (β = 1.147, p = .439)

In CLABSI, indirect effect of safety culture on CLABSI was not significant (z = .880, p = .557, 95% Bias-corrected bootstrap confidence interval = -1.836, 4.157). No specific indirect effects for nurse outcome for CLABSI were significant. Significant direct effects of safety culture on nurse outcomes included positive associations with job enjoyment (β = 1.211, p < .001), intent to stay at 1 year (β = .206, p = .02), 3-year job

plan (β = .250, $p < .001$), EWF-Trust (β = .938, $p < .001$), EWF-Respect (β = .839, $p < .001$), EWF-Support (β = .908, $p < .001$), and nurse to nurse interaction (β = 583, $p = .001$). Nurse outcomes had no significant direct effect on CLABSI, adjusting for other model covariates. Furthermore, the direct effect of safety culture on CLABSI was not significant (β = 1.837, $p = .40$). However, the total effect of safety culture CLABSI on was significant (β = 2.717, $p = .029$).

In falls, indirect effects of safety culture on falls were not statistically significant (z = -.788, p = .40, 95% Bias-corrected bootstrap confidence interval = -2.783, 0.788). No specific indirect effects for nurse outcome for falls were significant. Significant direct effects of safety culture on nurse outcomes included positive associations with job enjoyment (β = 1.259, $p < .001$), intent to stay at 1 year (β = .201, $p = .018$), intent to stay at 3 years (β = .239, $p < .001$), EWF-Trust (β = .996, $p < .001$), EWF-Respect (β = .914, $p < .001$), EWF-Support (β = .974, $p < .001$), and nurse to nurse interaction (β = .587, $p < .001$). Nurse outcomes had no significant direct effect on falls. Furthermore, the direct effect of safety culture on falls was not significant (β = .998, $p = .30$). The total effect of safety culture on was not significant (β = .209, $p = .627$).

In pressure injuries, indirect effects of safety culture on pressure injuries were not statistically significant (z = 2.480, p = .76, 95% Bias-corrected bootstrap confidence interval = -10.033, 14.512). No specific indirect effects for nurse outcome were significant. Significant direct effects of safety culture on nurse outcomes included positive associations with job enjoyment (β = 1.265, $p < .001$), intent to stay at 1 year (β = .192, $p = .028$), intent to stay at 3 years (β = .212, $p = .001$), EWF-Trust (β = .989, $p <$

.001), EWF-Respect (β = .939, $p < .001$), EWF-Support (β = .980, $p < .001$), and nurse to nurse interaction (β = 602, $p < .001$). Nurse outcomes had no significant direct effect on pressure injury incidence. Moreover, the direct effect of safety culture on pressure injuries was not significant (β = -5.298, $p = .556$). The total effect of safety culture on was not significant (β = -2.818, $p = .432$).

Discussion

This study was conducted to examine (Aim 1) the relationships between safety culture and four patient outcomes (CAUTI, CLABSI, falls, and pressure injuries), and to examine (Aim 2) the mediation effects of nurse outcomes (job enjoyment, psychological safety, and intent to stay at 1 and 3 years) on these relationships. For Aim 1, unlike previous studies that used similar NDNQI® data and created incidence rates, this study utilized a count regression approach for the incidence counts while having incidence controls (device days for CAUTI and CLABSI, patient days for falls, and patients assessed for pressure injuries) as control variables in the models. To the best of my knowledge, this study is the first to examine the relationships of safety culture and patient outcomes and the mediated role of nurse outcomes on these relationships using NDNQI® data from Middle East acute care hospitals. Key findings from this study show that safety culture was significantly positively associated with CLABSI and negatively associated with pressure injuries. When examining the mediation effects of nurse outcomes, however, neither CLABSI nor pressure injuries had a significant relationship with safety culture. The nurse outcome EWF-Respect significantly mediated the effect of safety culture on CAUTI. Safety culture had a significant direct effect on all nurse outcomes

across the study mediation models. Finally, only CAUTI had a significant negative direct effect from nurses' intent to stay at 1 year, and positively from nurses' EWF-Respect. In other words, in Aim 1, three patient outcomes were influenced in the desired direction by safety culture. Only one statistically significant relationship showed an undesired outcome, that is, higher safety culture scores were associated with increased incidence of CLABSI.

In this study, safety culture has a significant positive relationship with CLABSI. Some prior studies have reached similar conclusions. Weaver et al. (2014) found that units that have nonpunitive cultures have higher CLABSI rates. While this is not, theoretically, what is expected as a result of boosting safety culture, it is important to highlight that previous research showed the positive association between safety culture and reporting/nonpunitive culture (Chiang et al., 2019; Kim et al., 2007; Paradiso & Sweeney, 2019; Robbins & McAlearney, 2016; Verbakel et al., 2015). In contrast, other studies have found that as safety culture increases CLABSI incidents decrease (Meddings et al., 2017; Richter & McAlearney, 2018; Vigorito et al., 2011). Thus, the relationship between safety culture and CLABSI needs to be unfolded qualitatively in future research, as enhancing safety culture may involve implementing policies to screen/test and report central-line infections, while considering reporting bias, in order to gain a deeper understanding of the effect of safety culture on this patient outcome. On the other hand, mediation analysis showed that the total effect of safety culture on CLABSI was significant. However, neither the direct nor indirect effects of safety culture on CLABSI were significant, which could indicate that there was no enough power to detect the

indirect effects of safety culture on CLABSI. Therefore, examining the mediation effects of safety culture on CLABSI using a larger sample size could reveal different conclusions.

This study also found that higher safety culture scores had a statistically significant association with fewer pressure injuries. The finding is supported by previous research that studied the influence of safety culture on pressure injuries (Han et al., 2020; Wang et al., 2014; Xie et al., 2017). However, other studies did not find statistically significant relationships between safety culture and pressure injuries (Ausserhofer et al., 2013; Bosch et al., 2011; Groves, 2014). With the limited body of research in this area in the Middle East, it is important that future studies expand on these findings and further explore the mechanism that safety culture has on reducing pressure injury incidences.

CAUTI and falls did not show statistically significant findings in this study. A previous systematic review by DiCuccio (2015) concluded that only a limited number of studies have shown statistically significant relationships between safety culture and patient outcomes. In this study neither direct nor indirect effects were found for the mediation role of nurse outcomes on the relationship between CLABSI or pressure injuries and safety culture. On the other hand, the two nurse outcomes that had a significant direct effect on a patient outcome were EWF-Respect – positively – and intent to stay at 1 year – negatively – in the mediation model for CAUTI. However, only EWF-Respect had a significant mediation role (indirect effect) on the relationship between safety culture and CAUTI. Given these findings and that no previous studies have explored the mediation roles of the nurse outcomes on the relationship between safety

culture and CAUTI, CLABSI, falls, and pressure injuries, this study opens the door to this area of research to understand the structure of influence that nurse outcomes could have on the relationship between safety culture and patient outcomes, as Integrative Model of Organizational Climate of Staff Working Conditions and Safety suggests, in acute care hospitals.

CAUTI, CLABSI, falls, and pressure injuries are among 15 measures that the National Quality Forum (NQF) identifies as nurse sensitive measures/outcomes. The NQF (2004) described nurse sensitive measures as "processes and outcomes that are affected, provided, and/or influenced by nursing personnel, *but for which nursing is not exclusively responsible*" (p. 2). The findings of this study, i.e. higher CLABSI rate associated with higher safety culture score, may illustrate the latter point. Because central lines are inserted by physicians and then cared for by nurses, CLABSI rates are driven by both physicians and nurses. In the context of the Middle East, this also applies to CAUTI where urinary catheters are inserted by health care personnel who are not registered nurses. Given this, safety culture and nurse sensitive outcomes that pertain to care that has high level of more involvement of other providers (e.g. central line care and urinary catheter insertion) may be examined qualitatively to help clarify why the rates are high even when safety culture as perceived by nurses is high.

Limitations

Given that the number of units eligible to be included in the analysis was small, the findings of this study cannot be generalized. A larger sample from Middle Eastern acute care hospitals is needed to draw generalizable conclusions. Additionally, a larger

sample would allow accounting for patient characteristics to risk-adjust for the type and acuity of patients. Moreover, the majority of units in this study were medical-surgical units, and some patient outcomes (e.g. CLABSI and CAUTI) do not occur as often on these units compared to high acuity units (e.g. ICUs). Furthermore, this study tried to control for hospital characteristics (e.g. bed size, teaching status, and ownership) and specific unit types (e.g. ICU, Step-Down, and Medical-Surgical), but it did not converge due to the small sample size of units and hospitals. Accounting for such characteristics takes into consideration the nesting nature of these units in their hospitals to yield a clear understanding of the health system complexity and acuity level of units. However, this study began to explore the complex relationships between safety culture, nurse outcomes and patient outcomes in this region and lays a foundation for future research.

Recommendations and Implications

Results of this study have important research, clinical, and policy implications. Safety culture had significant relationships with CLABSI and pressure injuries. While it is important to further explore the mixed findings on safety culture and CLABSI and expand on the finding related to safety culture and pressure injuries in the Middle East, it is also crucial to the body of research to investigate the relationship of safety culture with the other nurse outcomes that were not significant in these acute care hospitals in the Middle East. Future research should consider the statistical power needed to robustly examine these relationships. Having greater sample power can allow for studying these relationships in a single model, while controlling for relationships among patient outcomes.

This study has important clinical implications for nursing care. Hospital and nurse leaders have an important role in promoting the culture of safety to encourage reporting, address reported safety incidences, and to act upon them to optimize patient outcomes. Some of this study's findings showed that having a better nurse outcome (e.g. Intent to stay at 1 year) can lead to better patient outcomes (e.g. lower CAUTI rates). Thus, addressing nurse needs and implementing adequate policies to promote nurse retention can help enhance safety-related patient outcomes in acute care settings.

The findings of this study can inform national level policy within and across Middle East countries. Efforts to systematically collect and analyze hospital quality data on nurse sensitive outcomes (Graystone, 2018), within single or across multiple Middle East countries that are tailored to the context and complexity of these health systems can be useful to unpack the relationship between safety culture and patient outcomes within their contexts. Furthermore, having such national quality data may increase the number of participating hospitals that report data on quality indicators including safety culture and safety outcomes, which in turn establishes a baseline for safety culture, evaluate factors contributing to safety culture, and examine its impact on nurse and patient outcomes in the context of these countries.

Conclusion

This study examined the relationship between safety culture and four patient outcomes and the mediating roles that nurse outcomes could have on these relationships. Safety culture showed a significant relationship with CLABSI and pressure injuries, and EWF-Respect was a statistically significant mediator for the relationship between safety

culture and CAUTI. A significant direct effect between safety culture and each nurse outcomes was found. EWF-Respect and intent to stay at 1 year had a significant direct effect between nurse outcomes and a patient outcome in the CAUTI model. Nurse outcomes in other models did not have a direct effect on patient outcomes. Future research is needed to better understand these relationships.

Acknowledgment

The National Database of Nursing Quality Indicators® (NDNQI®) data were supplied by Press Ganey Associates LLC. Press Ganey Associates LLC, specifically disclaims responsibility for any analyses, interpretations or conclusions.

Tables

Table 7

Descriptive Results for Patient Outcomes

	CAUTI *n* = 74 Mean (SD) (Min – Max)	CLABSI *n* = 73 Mean (SD) (Min – Max)	Falls *n* = 90 Mean (SD) (Min – Max)	Pressure Injuries *n* = 82 Mean (SD) (Min – Max)
Annual Incidence Count	1.78 (4.49) (0 – 26)	1.12 (3.13) (0 – 21)	3.59 (4.75) (0 – 24)	1.54 (5.53) (0 – 38)
Incidence Control	.98[a] (1.31) (0 – 7.25)	1.12[a] (1.72) (0 – 9.76)	4.99[b] (3.58) (.03 – 16.62)	12.15[c] (16.87) (.08 – 88.65)
Safety Culture	3.00 (.26) (2.38 – 3.95)	3.01 (.26) (2.38 – 3.95)	2.98 (.24) (2.38 – 3.95)	2.99 (.25) (2.38 – 3.95)
Unit Characteristics				
RNHPPD	10.15 (5.47) (4.31 – 25.05)	10.23 (5.47) (4.31 – 25.05)	9.77 (5.30) (3.51 – 27.26)	10.27 (5.59) (3.96 – 27.26)
RN Skill Mix	86.15 (15.63) (44.65 – 100)	86.25 (15.72) (44.65 – 100)	87.98 (14.85) (44.65 – 100)	87.97 (15.22) (44.65 – 100)

Nurse-Patient Staffing Ratio: Mean number of patients assigned (last shift)	4.75 (1.84) (1 – 8.14)	4.70 (1.82) (1 – 8.14)	5.00 (1.90) (1 – 9.77)	4.77 (1.84) (1 – 9.77)
Unit workload	45.48 (8.14) (31 – 70.86)	45.61 (8.11) (31 – 70.86)	45.21 (7.49) (31 – 70.86)	44.71 (7.26) (31 – 70.86)
RN Workgroup Characteristics by Unit				
RN age: Percent under 30 years	43.97 (22.56) (0 – 100)	44.36 (22.40) (0 – 100)	41.28 (22.09) (0 – 100)	41.69 (22.78) (0 – 100)
RN age: Percent 30-40 years	37.14 (14.67) (0 – 66.67)	37.11 (14.65) (0 – 66.67)	36.97 (14.90) (0 – 66.67)	36.20 (14.60) (0 – 66.67)
RN Gender: Percent female	82.15 (18.40) (33.33 – 100)	82.15 (18.36) (33.33 – 100)	83.60 (17.67) (33.33 – 100)	82.39 (17.68) (33.33 – 100)
RN primary role: > 50% time as Percent staff or charge nurse	96.57 (7.56) (50 – 100)	96.94 (6.93) (50 – 100)	96.49 (6.98) (50 – 100)	96.50 (7.16) (50 – 100)
Educational Status: Percent BSN or Higher	80.54 (17.96) (0 – 100)	80.54 (18.15) (0 – 100)	80.08 (17.09) (0 – 100)	80.92 (17.02) (0 – 100)
Certification Status: Percent with specialty nursing certification	4.95 (7.91) (0 – 44.44)	4.97 (7.96) (0 – 44.44)	4.49 (7.59) (0 – 44.44)	4.47 (7.78) (0 – 44.44)

Note. Incidence control (Device Days[a]/Patient Days[b]/Number of assessed patients for pressure injuries[c]) reflects that dominator for each of the count DV. Catheter and central-line days were controlled for in CAUTI and CLABSI, respectively. Similarly, patient days and the number of assessed patients for pressure injuries were controlled for in falls and pressure injuries, respectively.

Table 8

Count Regression (Poisson) for the Relationship Between Safety Culture and Patient Outcomes, Controlling for Unit and RN Workgroup Characteristics

Dependent Variable	n of Units	Exp(B)	95% Confidence Interval for Exp(B)		*p*-value
			Lower	Upper	
CAUTI	74	.943	.308	2.887	.919
CLABSI	73	8.181	2.204	30.371	.002
Falls	90	.611	.288	1.297	.200
Pressure Injuries	82	.153	.032	.730	.018

Note. In each of the above models, the following unit characteristics controlled for were RNHPPD, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days. RN workgroup characteristics controlled for were age, gender, nurse primary role, educational status, and certification status.

Table 9

Standardized Direct, Indirect, and Total Effects from Path Analysis for CAUTI

Variables		Effects			95% Bias-Corrected Bootstrap CI	
DV	IV	Direct	Indirect	Total	Lower	Upper
JE	SC	1.221**	–	1.221**	–	–
ITS-1	SC	0.205*	–	0.205*	–	–
ITS-3	SC	0.248**	–	0.248**	–	–
EWF-T	SC	0.950**	–	0.950**	–	–
EWF-R	SC	0.853**	–	0.853**	–	–
EWF-S	SC	0.906**	–	0.906**	–	–
N-N	SC	0.590**	–	0.590**	–	–
CAUTI	SC	0.498	0.649	1.147	-3.152	4.248
	JE	0.217	0.265	–	-4.161	3.469
	ITS-1	- 4.784*	-0.982	–	-2.785	-0.096
	ITS-3	1.204	0.298	–	-0.645	1.721
	EWF-T	- 1.163	-1.105	–	-3.550	1.090
	EWF-R	3.073*	2.620*	–	0.837	5.070
	EWF-S	0.671	0.608	–	-0.997	2.982
	N-N	- 1.791	-1.056	–	-3.142	0.110

Note. n =74. SC: safety culture, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse to nurse interaction. The 95% Bias-Corrected Bootstrap CI is for indirect effects. *p < .05. **p < .001.

Table 10

Standardized Direct, Indirect, and Total Effects from Path Analysis for CLABSI

Variables		Effects			95% Bias-Corrected Bootstrap CI	
DV	IV	Direct	Indirect	Total	Lower	Upper
JE	SC	1.221**	–	1.221**	–	–
ITS-1	SC	0.206*	–	0.206*	–	–
ITS-3	SC	0.250**	–	0.250**	–	–
EWF-T	SC	0.938**	–	0.938**	–	–
EWF-R	SC	0.839**	–	0.839**	–	–
EWF-S	SC	0.908**	–	0.908**	–	–
N-N	SC	0.583*	–	0.583*	–	–
CLABSI	SC	1.837	0.880	2.717*	-1.836	4.157
	JE	0.847	1.026	–	-2.131	3.940
	ITS-1	-1.196	-0.247	–	-1.424	0.426
	ITS-3	0.522	0.130	–	-0.923	1.378
	EWF-T	0.975	0.915	–	-1.424	5.277
	EWF-R	0.554	0.465	–	-2.561	2.679
	EWF-S	-0.912	-0.829	–	-2.691	1.438
	N-N	-0.996	-0.580	–	-2.114	0.369

Note. n =73. SC: safety culture, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse to nurse interaction. The 95% Bias-Corrected Bootstrap CI is for indirect effects. *p < .05. **p < .001.

Table 11

Standardized Direct, Indirect, and Total Effects from Path Analysis for Falls

Variables		Effects			95% Bias-Corrected Bootstrap CI	
DV	IV	Direct	Indirect	Total	Lower	Upper
JE	SC	1.259**	–	1.259**	–	–
ITS-1	SC	0.201*	–	0.201*	–	–
ITS-3	SC	0.239**	–	0.239**	–	–
EWF-T	SC	0.996**	–	0.996**	–	–
EWF-R	SC	0.914**	–	0.914**	–	–
EWF-S	SC	0.974**	–	0.974**	–	–
N-N	SC	0.587**	–	0.587**	–	–
Falls	SC	0.998	-0.788	0.209	-2.783	0.788
	JE	-1.368	-1.721	–	-4.005	0.098
	ITS-1	-0.034	-0.007	–	-0.527	0.464
	ITS-3	-0.103	-0.025	–	-0.399	0.439
	EWF-T	0.586	0.583	–	-0.770	2.157
	EWF-R	0.013	0.012	–	-1.414	1.556
	EWF-S	-0.010	-0.010	–	-1.112	0.958
	N-N	0.645	0.379	–	-0.080	1.278

Note. $n = 90$. SC: safety culture, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse to nurse interaction. The 95% Bias-Corrected Bootstrap CI is for indirect effects. *$p < .05$. **$p < .001$.

Table 12

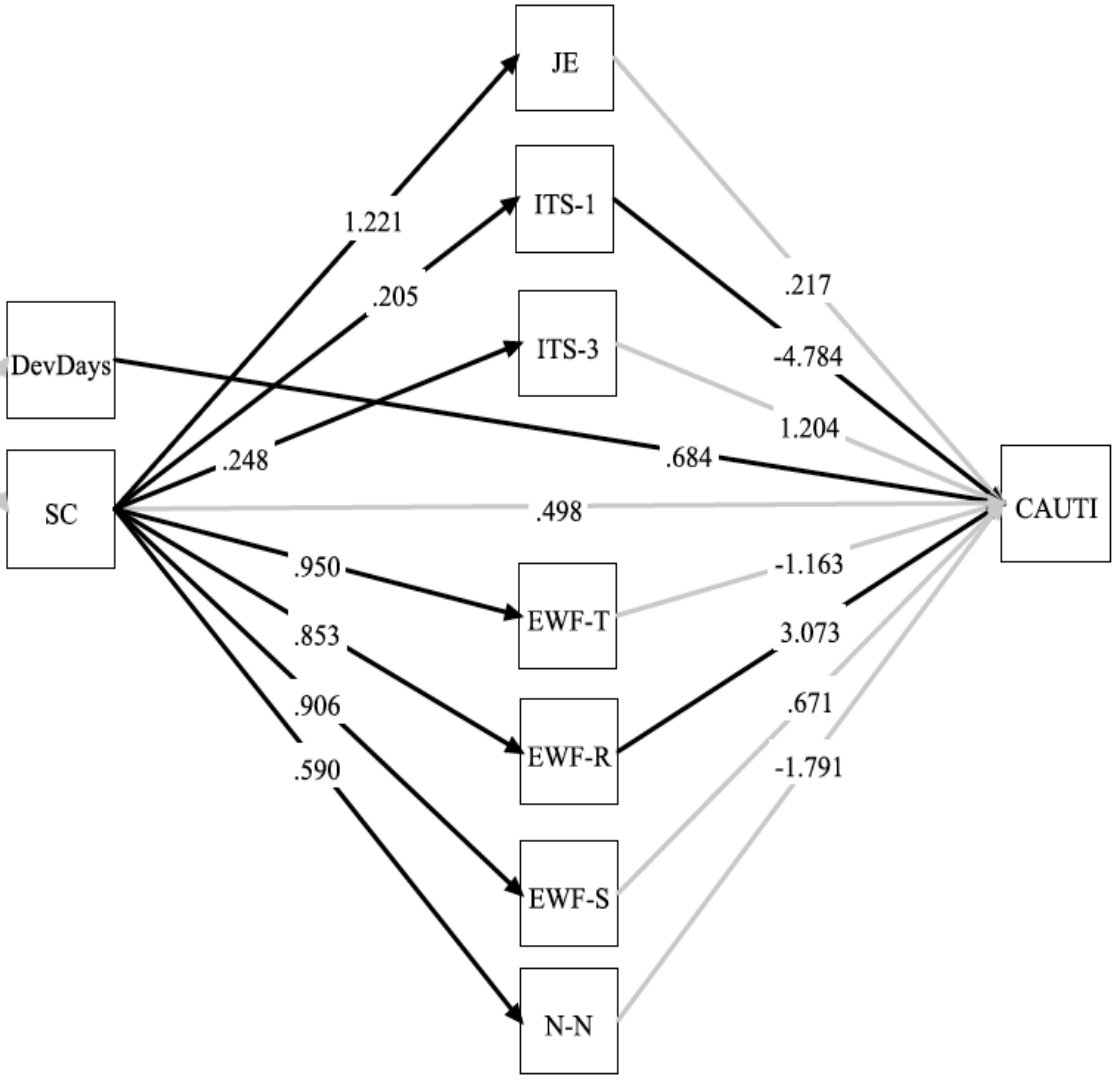
Standardized Direct, Indirect, and Total Effects from Path Analysis for Pressure Injuries

Variables		Effects			95% Bias-Corrected Bootstrap CI	
DV	IV	Direct	Indirect	Total	Lower	Upper
JE	SC	1.265**	–	1.265**	–	–
ITS-1	SC	0.192*	–	0.192*	–	–
ITS-3	SC	0.212*	–	0.212*	–	–
EWF-T	SC	0.989**	–	0.989**	–	–
EWF-R	SC	0.939**	–	0.939**	–	–
EWF-S	SC	0.980**	–	0.980**	–	–
N-N	SC	0.602**	–	0.602**	–	–
Pressure	SC	-5.298	2.480	-2.818	-10.033	14.512
Injuries	JE	2.390	3.023	–	-11.261	16.408
	ITS-1	-3.089	-0.593	–	-3.727	0.439
	ITS-3	3.347	0.710	–	-1.339	3.202
	EWF-T	-1.493	-1.477	–	-8.149	3.934
	EWF-R	0.611	0.574	–	-3.363	12.639
	EWF-S	-0.222	-0.217	–	-6.317	4.805
	N-N	0.767	0.461	–	-3.247	2.762

Note. n = 82. SC: safety culture, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse to nurse interaction. The 95% Bias-Corrected Bootstrap CI is for indirect effects. *p < .05. **p < .001.

Figure 3

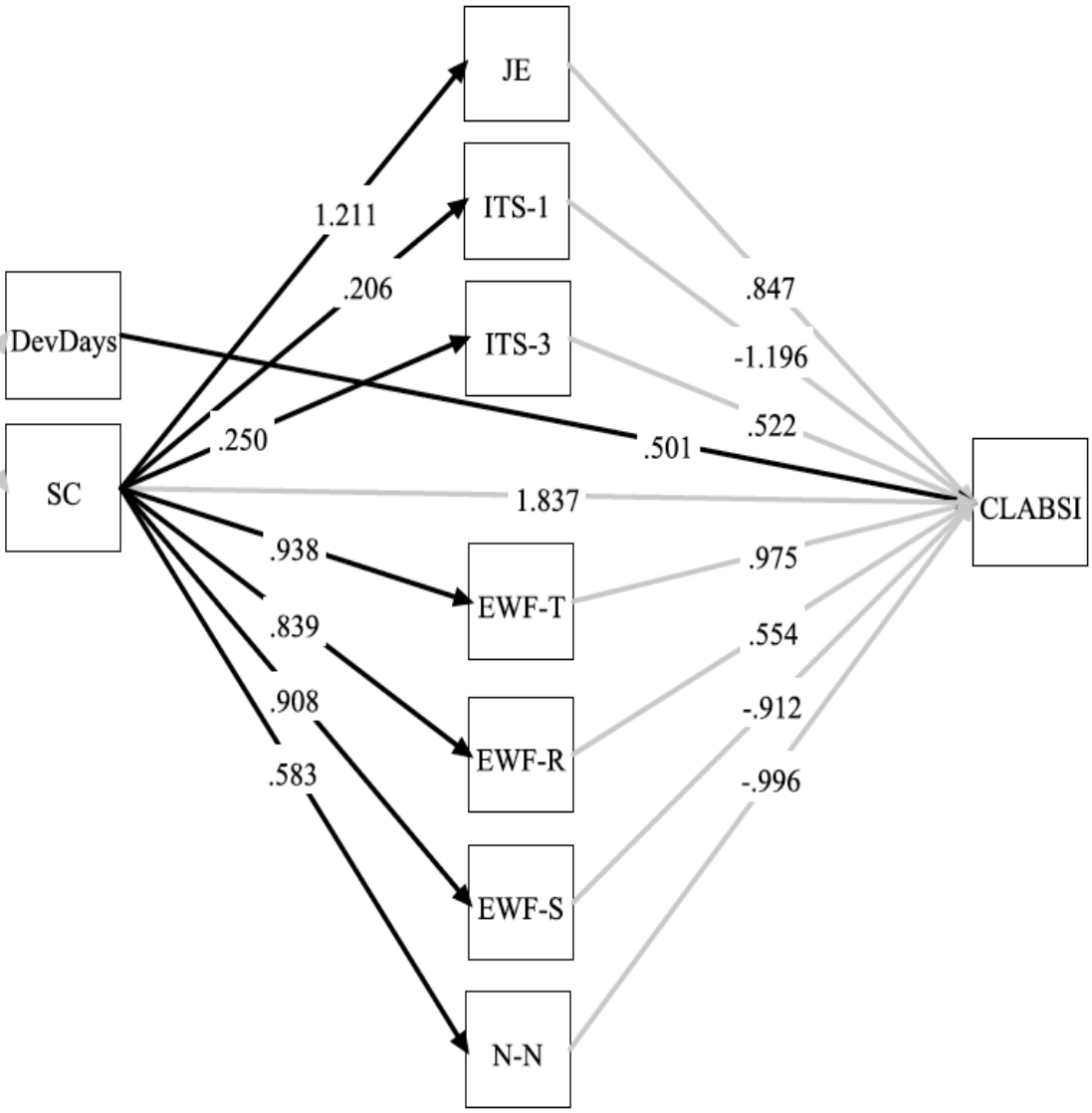
Path Diagram for Mediation Analysis of CAUTI (Standardized Solution)



Note. SC: safety culture, DevDays: catheter days, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse to nurse interaction. Paths with significant direct effects ($p < .05$) have black arrows while nonsignificant paths have gray arrows.

Figure 4

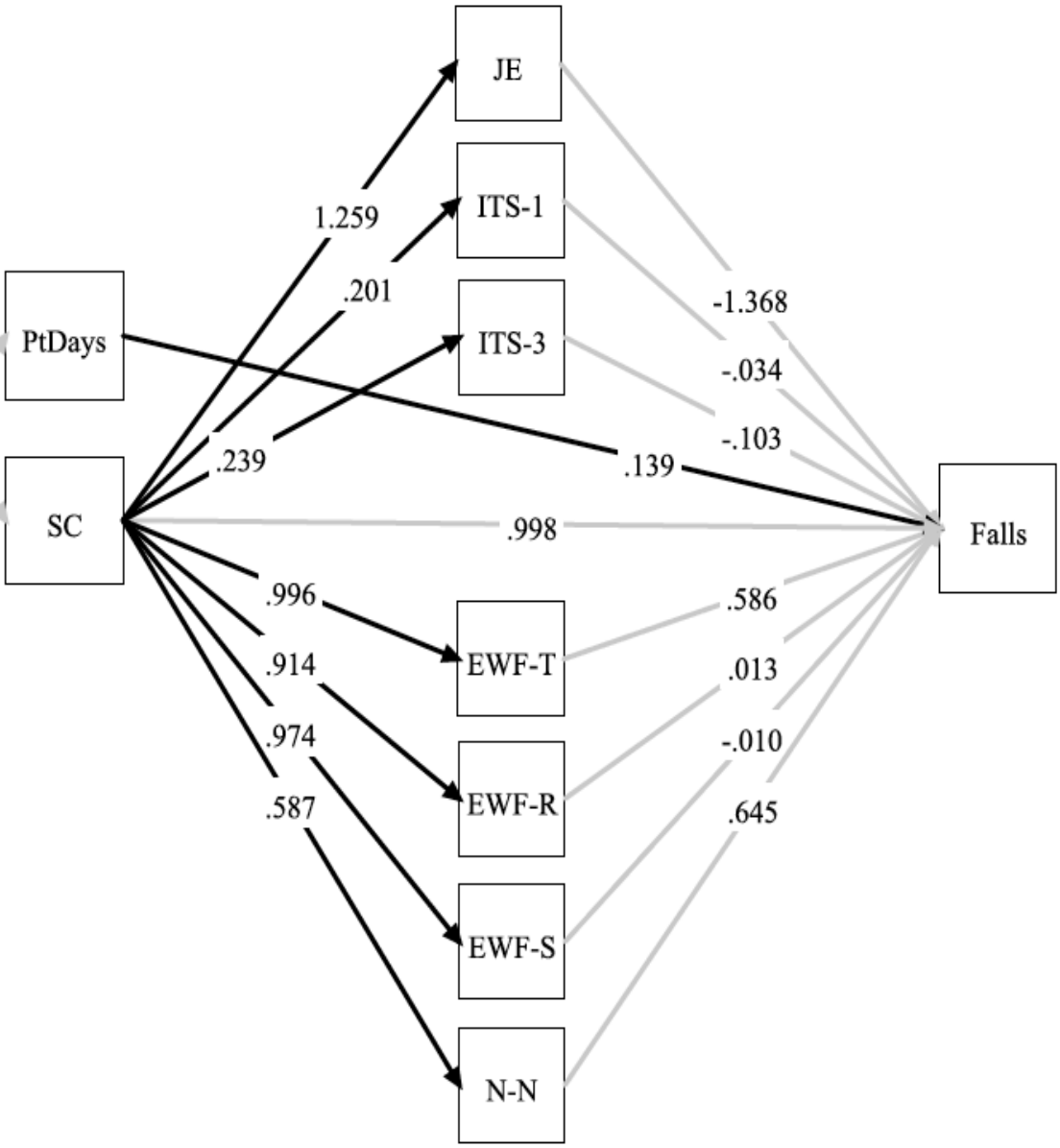
Path Diagram for Mediation Analysis of CLABSI (Standardized Solution)



Note. SC: safety culture, DevDays: central-line days, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse to -nurse interaction. Paths with significant direct effects ($p < .05$) have black arrows while nonsignificant paths have gray arrows.

Figure 5

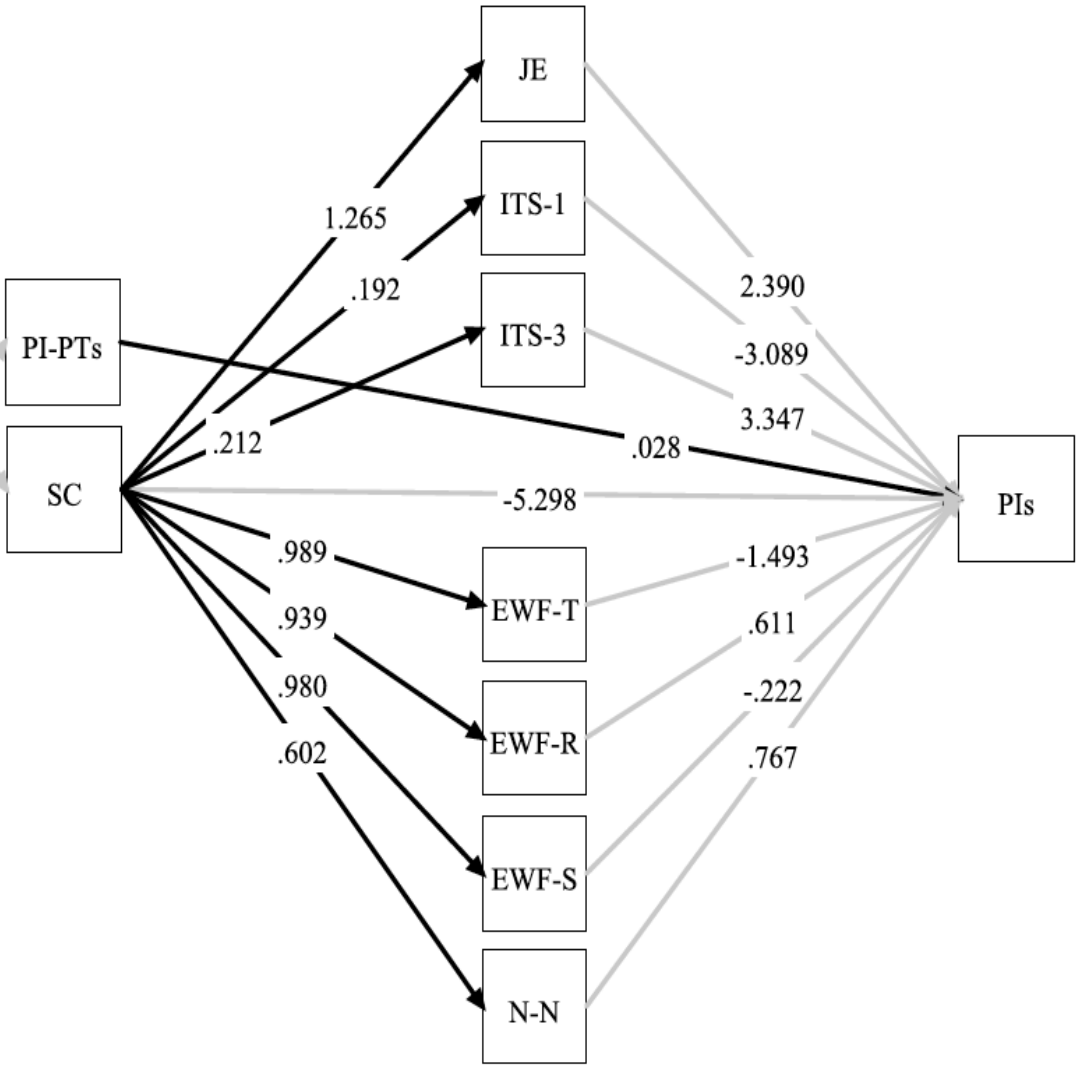
Path Diagram for Mediation Analysis of Falls (Standardized Solution)



Note. SC: safety culture, PtDays: patients days, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse to -nurse interaction. Paths with significant direct effects ($p < .05$) have black arrows while nonsignificant paths have gray arrows.

Figure 6

Path Diagram for Mediation Analysis of Pressure Injuries (Standardized Solution)



Note. SC: safety culture, PI-PTs: patients assessed for pressure injuries, JE: job enjoyment, ITS-1: intent to stay at 1 year, ITS-3: intent to stay at 3 years, EWF-T: trust; EWF-R: respect, EWF-S: support, N-N: nurse-nurse interaction. Paths with significant direct effects ($p < .05$) have black arrows while nonsignificant paths have gray arrows.

CHAPTER VI

CONCLUSION

This chapter provides summaries for the two manuscripts that comprise this dissertation. Specifically, the chapter summarizes the manuscripts' major findings, discussion, limitations, and implications for practice and future research. Finally, the chapter discusses linkages between the two manuscripts, similarities, and differences.

Manuscript 1

The specific aim for manuscript 1 was to examine the associations between safety culture and nurses' job enjoyment, workplace psychological safety, and intent to stay at 1 and 3 years. The study utilized a cross-sectional correlational design and data from Middle Eastern acute care hospitals from the NDNQI® database. Included data were from patient care units that met the following inclusion criteria: inpatient adult, pediatric, and perinatal units; participated in the NDNQI® RN surveys of interest (Practice Environment Scale of the Nursing Work Index [PES-NWI], job enjoyment, psychological safety, and intent to stay at 1 and 3 years); and participated in the NDNQI® database between January 1st and December 31st of 2018. Multiple regression approaches were utilized to accomplish this aim. The study modeled the relationships between safety culture and each of the nurse outcomes, controlling for hospital characteristics (size, ownership, and teaching status), unit characteristics (unit population types, RN hours per patient days, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days), and RN

workgroup characteristics (age, gender, nurse primary role, educational status, and certification status from nurse specialty association). In every nurse outcome, a separate model for each hospital characteristic was used to overcome multicollinearity. However, all of these models controlled for unit and RN workgroup characteristics. The database included 91 units from seven Middle Eastern acute care hospitals that met the study criteria.

Major Findings

Job Enjoyment

In the hospital bed size model, for every additional 1 point increase in safety culture mean score, the predicted mean score in job enjoyment increases significantly by 1.330 points, adjusting for unit and RN workgroup characteristics. In the hospital ownership model, for every additional 1 point increase in safety culture mean score, the predicted mean score in job enjoyment increases significantly by 1.267 points, adjusting for the unit and RN workgroup characteristics. In the hospital teaching status model, for every additional 1 point increase in safety culture mean score, the predicted mean score in job enjoyment increases significantly by 1.313 points, adjusting for the unit and RN workgroup characteristics.

Psychological Safety

In the hospital bed size model, for every additional 1 point increase in safety culture mean score, the predicted mean score in EWF-Trust increases significantly by 1.039 points, EWF-Respect by 0.903 points, EWF-Support by 1.327 points, and teamwork by 0.795, adjusting for unit and RN workgroup characteristics. In the hospital

ownership model, MMR analysis indicated that for every additional 1 point increase in safety culture mean score, the predicted mean score in EWF-Trust increases significantly by 1.015 points, EWF-Respect by 0.868 points, EWF-Support by 1.248 points, and teamwork by 0.705, adjusting for unit and RN workgroup characteristics. In the hospital teaching status model, MMR analysis indicated that for every additional 1 point increase in safety culture mean score, the predicted mean score increases in EWF-Trust increases significantly by 1.053 points, EWF-Respect by 0.894 points, EWF-Support by 1.269 points, and teamwork by 0.752, adjusting for unit and RN workgroup characteristics.

Intent to Stay

In the hospital bed size model, for every additional 1 point increase in safety culture mean score, the predicted mean score in intent to stay at 1 year increases significantly by 28.8%, and at 3 years increases by 24.7%, adjusting for unit and RN workgroup characteristics. In the hospital ownership model, for every additional 1 point increase in safety culture mean score, the predicted mean score in intent to stay at 1 year increases significantly by 30.9%, and at 3 years increases by 25.0%, adjusting for the unit and RN workgroup characteristics. In the hospital teaching status model, for every additional 1 point increase in safety culture mean score, the predicted mean score in intent to stay at 1 year increases significantly by 31.7%, and at 3 years increases by 24.5%, adjusting for the unit and RN workgroup characteristics.

Discussion

Safety culture mean score in this study were comparable to non-Middle Eastern countries. The safety culture mean score in this study was 2.98, where in the United

States it was 3.05 (Lake et al., 2015) and in China it was 3.10 (Liu et al., 2012). Job enjoyment mean score in this study was higher compared to the United States. Job enjoyment mean score in this study was 4.06, where in the United States was 3.26 (Ballard et al., 2016) and 3.72 (Choi & Boyle, 2013). Similar to safety culture, intent to stay findings were comparable to non-Middle Eastern countries. In this study, 67.97% and 75.03% of the RNs intended to stay in their units at 1 and 3 years, respectively. In the United States, the intent to stay at 1 year was 79.23% and 54.41% (Choi & Miller, 2018). Because of the different measures for respect and teamwork between this study and previous studies (Alzahrani et al., 2018; Ammouri et al., 2015; El-Jardali et al., 2010; El-Jardali et al., 2014; Manojlovich et al., 2014; Rehder et al., 2020; Schwartz et al., 2019; Sexton et al., 2017), no comparison can be made. Furthermore, comparisons cannot be done for intent to stay in 3 years and the other psychological safety indicators (trust and support) because of no prior studies in these areas.

Relationships between safety culture and job enjoyment, psychological safety, and intent to stay were significant in this study. This study is the first to address the relationship between safety culture and job enjoyment, psychological safety indicators of trust, respect, and support, and intent to stay at 3 years. Findings from this study support previous research on safety culture and mutual respect (Manojlovich et al., 2014), teamwork (Alzahrani et al., 2018; Ammouri et al., 2015; El-Jardali et al., 2010; El-Jardali et al., 2014; Rehder et al., 2020; Schwartz et al., 2019; Sexton et al., 2017), and intent to stay at the same unit at 1 year (AbuAlRub et al., 2012; Liang et al., 2016). Furthermore,

findings of this study support the Integrative Model of Organizational Climate of Staff Working Conditions and Safety.

Limitations

The small sample size of eligible units and hospitals was a limitation in this study. Because of the small sample size, the initial statistical approach, multilevel modeling, was not applicable, some of hospital characteristics were removed from the models to maintain hospital anonymity, several models were needed to overcome multicollinearity, and interactions between study variables were not added to the study models. However, given that it is the first study to address these relationships in the Middle East, this study establishes a foundation for future study using a larger sample of hospitals and units.

Recommendations and Implications

For future studies, the complexity of health systems needs to be accounted for when determining the appropriate sample sizes to conduct advanced statistical analyses. Sample size should take into consideration the number of units as well as hospitals. For practice, findings of this study highlighted safety culture as an influence on nurse outcomes, thus hospital and nurse leaders should invest in improving safety culture in their units/hospitals to optimize nurse outcomes.

Manuscript 2

The specific aims for this study were to examine the relationship between safety culture and CAUTI, CLABSI, patient falls, and pressure injuries in acute care hospitals in the Middle East region (aim 1) and the potential mediation effects of nurses' job enjoyment, workplace psychological safety, and intent to stay at 1 and 3 years on the

relationships among safety culture and the four patient outcomes in acute care hospitals in the Middle East region (aim 2). Similar to manuscript 1, the design of this study was a cross-sectional correlational approach, using existing datasets from the NDNQI® database. Inclusion criteria for the units were 1) inpatient adult, pediatric, and perinatal units; 2) participation in the NDNQI® RN surveys of interest, which were the Practice Environment Scale of the Nursing Work Index [PES-NWI], job enjoyment, psychological safety, and intent to stay at 1 and 3 years; 3) reported clinical data on CAUTI, CLABSI, falls, or pressure injuries; and 4) participated in the NDNQI® between January 1st and December 31st of 2018.

For aim 1, Poisson count regression was utilized. The study modeled the relationships between safety culture and each of the patient outcomes, controlling for unit characteristics (RN hours per patient days, RN skill mix, staffing ratio in the last shift, and workload in the last 7 days) and RN workgroup characteristics (age, gender, nurse primary role, educational status, and certification status from nurse specialty associations). Number of units that met the study criteria for each patient outcome varied because not all units participated in data collection for each clinical indicator. Thus, the sample size for patient outcomes ranged between 73 and 90. For aim 2, Sobel first-order test with bias-corrected bootstrap was used. The mediation models had basic models where the only control variable was the incidence control, which were 1000 catheter days in CAUTI, 1000 central-line days in CLABSI, 1000 patient days in falls, and 100 assessed patients for pressure injuries.

Major Findings

Aim 1: Relationship Between Safety Culture and Patient Outcomes

For every additional 1-point increase in safety culture score, the predicted mean number of CAUTI decreases by 5.7% (p = .919), CLABSI increases by 718.1% (p = 0.002), falls decrease by 38.9% (p = 0.20), and pressure injuries decreases by 84.7% (p = 0.018), controlling for unit and RN workgroup characteristics.

Aim 2: Mediation Effect of Nurse Outcomes

All direct effects of safety culture on nurse outcomes in all four patient outcomes were positive and significant. No direct effect between safety culture and a patient outcome was statistically significant. In regard to direct effect between nurse outcomes and patient outcomes, intent to stay at 1 year had a significant negative association (β = -4.784, p = .017) and EWF-Respect had significant positive association (β = 3.073, p = .012) with CAUTI. However, only in the CAUTI model did EWF-Respect have a significant indirect effect on the relationship between safety culture and the patient outcome.

Discussion

Safety culture was significantly positively associated with CLABSI and negatively associated with pressure injuries in count regressions in aim 1. Although the CLABSI findings were in the opposite direction of what would be expected theoretically, it is important to note that reporting culture (i.e. reporting of errors and complications) is a segment of safety culture. Prior studies have found that units with higher safety culture scores also have higher reporting of CLABSI incidences (Chiang et al., 2019; Kim et al.,

2007; Paradiso & Sweeney, 2019; Robbins & McAlearney, 2016; Verbakel et al., 2015; Weaver et al., 2014). However, there also is a body of literature that support the proposition that improving safety culture can decrease CLABSI incidents (Meddings et al., 2017; Richter & McAlearney, 2018; Vigorito et al., 2011). Findings on safety culture and pressure injuries are supported by some previous research (Han et al., 2020; Wang et al., 2014; Xie et al., 2017), while it important to state that also some previous research did not find a statistically significant relationship between safety culture and pressure injuries (Ausserhofer et al., 2013; Bosch et al., 2011; Groves, 2014). However, these relationships between safety culture and CLABSI and pressure injuries were not significant when nurse outcomes (job enjoyment, psychological safety, and intent to stay) were included in mediation analyses (aim 2).

Limitations

Similar to manuscript 1, the small sample size of units was a limitation in this study. Furthermore, this study did not control for patient characteristics to adjust for risk that arise from patient condition/comorbidities. Moreover, the hospital characteristics (such as bed size, teaching status, and ownership) and specific unit types (i.e. ICU, Step-Down, and Medical-Surgical) can yield findings relevant to the complexity of these units and the acuity level of patients cared for in these units.

Recommendations and Implications

Future research could replicate this study using a larger sample to examine the study relationships, including mediation, in a single model. By doing so, interactions between study variables might reveal robust findings/conclusions for these relationships.

Furthermore, future research can consider the mixed findings for CLABSI and pressure injuries to add deeper understanding of the relationship between safety culture and these patient outcomes. Qualitative approaches can be of help in understanding the processes behind the undesirable outcome, CLABSI, in this study. For practice, although improving safety culture is an ultimate goal, hospital and nurse leaders should take into consideration the reporting bias that may appear in their quality efforts. By all means, they need to encourage reporting as it unveils issues relevant to patient safety from the first-line care providers.

Contributions of the Dissertation

The two analyses presented in this dissertation examine the Integrative Model of Organizational Climate of Staff Working Conditions and Safety from different angles. The model proposes that improving safety culture can lead to improvements in nurse and patient outcomes. Manuscript 1 investigated the first part of this proposition by examining the relationship between safety culture and nurse outcomes. It supported this proposition. Manuscript 2 investigated the relationship between safety culture and patient outcomes. It partially supported this proposition. Furthermore, this model proposes that safety culture has an indirect effect on patient outcomes through nurse outcomes, and vice versa. This study examined the indirect effect of nurse outcomes on the relationship between safety culture and patient outcomes, but it only supported this proposition partially as most nurse outcomes did not appear to have a mediating role in the relationship between safety culture and patient outcomes. However, two nurse outcomes (intent to stay at 1 year and EWF-Respect) had a significant direct effect on onr patient

outcome - CAUTI. Before generalizing the findings, these relationships (direct and indirect) need to be examined in a larger sample.

Both manuscripts addressed several aspects relevant to patient safety. Both supported a theoretical framework that guides research studies on safety culture. Furthermore, in several statistical approaches used across both manuscripts, safety culture stayed significantly associated with nurse outcomes. Thus, this suggests that the Bonner et al. (2009) model, designed for use with certified nurse assistants in long term care facilities, can be expanded to other healthcare settings. However, one proposed aspect of the Integrative Model of Organizational Climate of Staff Working Conditions and Safety that this study has not examined is the mediation effect that patient outcomes could have on nurse outcomes.

Although both manuscripts are aligned with the Integrative Model of Organizational Climate of Staff Working Conditions and Safety, it is harder to completely compare these findings to studies published in the literature that address safety culture and patient and nurse outcomes because of the different measures between studies. Safety culture has been evaluated using several instruments, as described in Chapter 2, but the subscales of the PES-NWI, do not completely overlap with those instruments. Similarly, although its definition is clear, other studies of psychological safety have used different instruments and proxies. Furthermore, reporting patient safety incidents has barriers and obstacles that can obscure how hospital units are actually performing in term of eliminating risks to patients. Safety culture was examined in both studies through the lens of the Practice Environment Scale of the Nursing Work Index

(PES-NWI). Although there are similarities between safety culture surveys and the PES-NWI, the PES-NWI is not a safety culture specific survey. However, it laid out the significance of using safety culture specific measures in databases, such as the NDNQI®.

Recommendations

Findings of this study showed the significant effect of safety culture on nurse and patient outcomes. Thus, these findings suggest the importance of developing national policies in Middle East countries to create data collection processes that can be used to evaluate healthcare outcomes and the factors that influence them. Having national databases to collect data periodically on nurse outcomes and safety culture as well as organizational culture/climate indicators is necessary. Countries with a thorough understanding of baseline quality indicators, including safety culture and patient and nurse outcomes, can (a) set realistic goals, i.e. Key Performance Indicators (KPIs), to improve the quality of their healthcare systems, (b) allocate resources to achieve quality, and (c) and evaluate quality indicators periodically against national and international benchmarks. Furthermore, having regional databases can help researchers to overcome limitations this study had by possibly increasing participation of hospitals and units in such data collection in Middle East countries.

With the movement toward digitization worldwide, technology can facilitate having platforms where several datasets relevant to patients (such as Electronic Health Records), healthcare providers, and others (e.g. such as economic data) can be linked and evaluated comprehensively. Furthermore, having such platforms and databases opens the door for big data approaches in healthcare in the Middle East countries to move from

retrospectively evaluating safety and safety outcomes to proactively predicting the outcomes and work toward eliminating harms to patients. Employing such approaches can change the face of healthcare witnessed now, including how quality indicators are measured.

Conclusions

The two manuscripts are among the few studies that addressed these relationships in the Middle East. Moreover, the two manuscripts provided a wider and deeper view of these relationships across a sample from several hospitals in the Middle East. Thus, this research establishes a foundation for future studies in the Middle East to examine the effect of hospital safety culture on nurse and patient outcomes.

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