Exploring the Role of Climate for Innovation on the Relationship between Leadership Style and Nurses' Perception of Patient Safety

by

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ABSTRACT

Harm to patients remains high in US hospitals despite significant progress to improve the quality of care in our health systems. Leadership, a culture of patient safety, and a climate conducive to innovation in patient care are necessary to advance positive patient safety outcomes. Yet, little is known about how leadership can impact patient safety within a climate of innovation. This study examines the effects of transformational and transactional leadership (singularly and with transactional augmenting transformational leadership) as related to nurses' perception of patient safety, how communication elements of a culture of patient safety may strengthen that relationship, and how the mediating role of team innovation climate may help explain the relationship between transformational and transactional leadership and nurses' perception of patient safety. The variables were measured using three validated and reliable survey instruments: The Multifactor Leadership Questionnaire (MLQ Form 5X), the Team Climate Inventory-short (TCI), the Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture. A convenience sample of all staff registered nurses (N=952) from the single academic medical center with direct patient care responsibility was surveyed via e-mail for this research. A total of 210 surveys were returned, 157 met inclusion criteria for a response rate of 16%. Transformational leadership had a statistically significant relationship with patient safety perception, while the relationship of transactional leadership with patient safety perceptions was not significant. The results of the regression analysis that tested the effect of communication elements of a culture of patient safety on the relationship between transactional and transformational leadership and patient safety perception were not significant.

Transformational leadership was significantly related with team innovation climate after controlling the effect of transactional leadership supporting the augmentation effect. Mediation analysis showed that team innovation climate had a significant mediating effect on the relationship between transformational leadership and patient safety perception. Team innovation climate had a significant mediating effect on the relationship between managers' transformational leadership and patient safety perception after controlling for transactional leadership supporting the augmentation effect. This is the first study known to test the augmentation of transformational leadership related to patient safety and the role of team innovation climate.

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CHAPTER I

Introduction

Patient safety has been an issue of concern for practitioners for decades. The 1999 Institute of Medicine (IOM) report, *To Err is Human,* heightened awareness of the magnitude of preventable adverse safety and quality outcomes and accelerated the search for strategies to reduce the estimated 98,000 avoidable deaths each year. Then in 2004, the IOM released a follow up report, *Keeping Patients Safe: Transforming the Work Environment of Nurses,* that outlined elements of the nursing work environment necessary to strengthen patient safety, including creating and sustaining a culture of patient safety. In the ensuing decade, many healthcare organizations embarked on a mission to create a culture of patient safety and subsequently realized a marked reduction in adverse events in hospitals (Makary & Daniel, 2016).

The culture of patient safety has been a foundational element in healthcare improvement efforts to identify problems and create solutions systematically (Nieva & Sorra, 2003). Research has shown that hospitals that embrace a culture of patient safety have fewer medical errors (Katz-Navon, Naveh, Stern, 2005; DiCuccio, 2015) and leadership has been identified as essential to establishing a safety culture (Zohar, 2014; Merrill, 2015). Further, one defining characteristic of a culture of patient safety is open communication about error, an approach which has been shown to be essential in identifying and correcting errors (Reason, 2000). Leaders play a critical role in establishing a culture of safety defined by trust and evident by the transparent reporting of errors and organizational learning from errors in order for front-line nurses to impact

the safety of the patient positively (Wagner, Capezuti, & Rice, 2009). Therefore, if nurses are communicated with regarding errors and improvement opportunity, they are more likely to participate in safety initiatives; thus they may produce improved outcomes (Wagner, Damianakis, Mafrici, & Robinson-Holt, 2010).

One of the hallmarks of a positive culture of patient safety is the engagement of front-line staff in the measurement, recognition, and reporting of errors that can be translated into specific interventions and guideline development to improve safety (Stavropoulou, Doherty, & Tosey, 2015). For example, 60 percent of surgical site infections have been identified as potentially preventable by using evidenced based guidelines (Meeks et al., 2011). Anderson et al. (2014) published updated guidelines to prevent surgical site infections and cited an overarching culture of patient safety as a strategy for improving teamwork, technical processes (checklists), and organizational wide accountability for infection control in surgery. Additional evidence related to the value of standardized care came in 2013 when the AHRQ updated the 2001 *Making Healthcare Safer* report on patient safety practices as a result of the continued high rates of preventable harm. The resulting report was an in-depth review of 41 patient safety practices that have been shown to be effective in reducing patient harm through standardized approaches. While the evidence on effective patient safety practices has improved since 2001, not all patient safety practices are sufficiently well understood related to the implementation and additional research is indicated (Making Healthcare Safer II, March 2013).

Many improvements have been made resulting from focused efforts by health systems and leadership to find new solutions, including standardized quality improvement methods and activities related to patient safety. Consequently from 2010 to 2015, the Agency for Healthcare Research and Quality (AHRQ), as cited in the national scorecard on hospital acquired conditions (HAC), showed improvements with a 21 percent reduction in HACs compared to the number of HACs that would have occurred if error rates remained at the 2010 level (National Scorecard on Rates of Hospital-Acquired Conditions, December 2016). These improvements are largely attributed to three categories, all of which have successfully implemented focused efforts to standardize practice: a 42 percent reduction in adverse drug events, a 23 percent reduction in pressure ulcers, and a 15 percent reduction in catheter-associated urinary tract infections (National Scorecard on Rates of Hospital-Acquired Conditions, December 2016; Nuckols et al., 2014; Scanlon, Wells, Woolforde, Khameraj, & Baumgarten, 2017; Palfreyman & Stone, 2015). However, the reduction plateaued and remained the same (121 HACs per 1,000 discharges) from 2013 to 2014, and only a modest improvement appeared in 2015 (115 HACs per 1,000 discharges). The slow decline in improvement rates signifies the need for additional improvement in patient safety strategies (National Scorecard on Rates of Hospital-Acquired Conditions, December 2016; Landrigan et al., 2010). As a result of the identified need for continued improvement, the AHRQ cites the need for a multidisciplinary effort to improve patient safety and the continued creation of new knowledge as paramount to making healthcare safer (National Scorecard on Rates of Hospital-Acquired Conditions, December 2016).

The reasons for the aforementioned 21 percent decline in HACs are not fully understood and may include CMS financial incentives and pay for performance, public reporting, and Quality Improvement Organization (QIO) programs. Additional evidence shows that some cases of preventable harm are contextually dependent, including external factors (regulatory requirements, public reporting, local sentinel events), organizational structure, teamwork, leadership, patient safety culture, and availability of management tools (training resources, incentives, feedback, quality improvement consultants) (Making Healthcare Safer II, March 2013; Shekelle et al., 2011). Recent research by Burlison et al. (2016) states that while improvements have been made through improved policy and procedure, those procedural tactics alone will not be enough to minimize patient harm. Improving patient care is complex: No single approach will be sufficient and innovative approaches to patient care are necessary.

As previously described, current approaches that focus on process standardization in key outcomes including central line-associated bloodstream infections (Marschall, et al. 2014), catheter-associated urinary tract infections (Parry, Grant, & Sestovic, 2013), and pressure ulcers (Niederhauser, Lukas, Parker, Ayello, Zulkowski, & Berlowitz, 2012) have been crucial in the progress that has been made since 2010. However, one in ten hospitalized patients (approximately 3,967,000 harmful events) still experience one or more hospital-acquired conditions (AHRQ, 2015, p. 7), an unacceptably high rate considering the national goal of reducing preventable hospital-acquired conditions by 40 percent (AHRQ, 2015, exhibit A3, p. 13). Additionally, the rate of reduction in hospital-acquired conditions has been unchanged since 2013 signifying that new approaches are

required to move the needle on improving patient safety (AHRQ, 2015). Many, if not most of these quality improvement initiatives, focus on reducing variability or standardizing a safe practice approach.

It has been suggested that improvement in patient safety should consist of focused strategies, inclusive of standard approaches, as well as patient centered or personalized approaches to improvement (Riley, et al. 2016). It appears that the approaches that brought initial improvements have now slowed and a 'next practices' search for what might bring the goal of patient safety beyond the current plateau is needed. Although standard practices have brought some relief, the very principle of these methods--following prescriptive rules--may overlook the potential value of more creative and innovative approaches (Nicolay, Purkayastha, Greenhalgh, Benn, Chaturvedi, Phillips, & Darzi, 2012). As a result, this reality suggests an under-exploration of the interplay between an earlier emphasis on a culture of safety, which is integral to standardized approaches, and the newer explorations of the role of creativity and innovation in improving quality (McFadden, Stock, & Gowen 2015). For example, many organizations are moving beyond episodic patient outcomes, typically measured by adherence to standard clinical pathways and associated outcomes, and incorporating longitudinal outcomes as a means to improve value to patients (Porter & Lee, 2013), a sentiment popularized by the Institute for Healthcare Improvement Triple Aim's goal of improving value (improved experience, health of the population, and cost) (Mery, Majumder, Brown, & Dobrow, 2017; Berwick, Nolan, & Whittington, 2008).

From the point of view of the patient, adding value means adding care programs and processes that are responsive to the needs and wishes of patients. The recent trend of personalized medicine is reflective of the customized care trends necessary in treatment strategies that value patient preferences, disease management, and even biological variances in patients (Minvielle, Waelli, Sicotte, & Kimberly, 2014). Personalized medicine has seen rapid advances in disease classification, prevention, and treatment through genomics that provide better targeted therapies and disease management (Pokorska-Bocci, Stewart, Sagoo, Hall, Kroese, & Burton, 2014; Tannock & Hickman, 2016). These patient centered approaches to care that fully respect patient wishes, values, and unique biological variances requires a cultural transition from provider centric to patient as a partner approaches to care delivery (Karazivan et. al, 2015). Adoption and advancement of customized care delivery models will require leading change across multidisciplinary groups (providers, patients, payers) if quality is to exceed cost (Jameson & Longo, 2015).

While there have been improvements in pockets of care related to standard process and procedure, one study estimated that the previous IOM preventable patient death estimate of 98,000 may have been underestimated and could be more than 400,000 preventable deaths annually in hospitals from medical errors (James, 2013). Despite differences in statistical estimates of preventable death, the problem is that patient safety errors still remain high notwithstanding improvement in patient safety through standardization and more traditional approaches that have served as a baseline for improvement (Landrigan, Parry, Bones, Hackbarth, Goldmann, Sharek, 2010; Classen et

al., 2011; Office of Inspector General, 2010). Translating patient safety efforts into further reductions in harm will require a continued commitment from leadership to improving the culture of patient safety as a foundation for blending standardized and innovative approaches (Sherwood, 2015). Many organizations are looking to their staff to engage creatively in improving the safety of patients (Silver et al., 2016). Patient safety has continued to be a top strategic priority for healthcare institutions over the last 20 years and continues to be among the top concerns for hospital CEO's (American College of Healthcare Executives, 2014). This challenge of meeting the demands of improved patient safety in an increasingly complex environment requires creative solutions when the best evidence is unavailable or when required to address patient needs and preferences. Capitalizing on this opportunity, beyond the requisite for standardizing basic patient safety practices, requires effective nursing leadership practices at the front-line of patient care that produce an environment conducive to a whole range of creative efforts necessary to achieve cost reduction while, at the same time, advancing patient safety (Naylor, 2012; Bender, Williams, Su, & Hites, 2016).

Leadership in Patient Safety and Innovation

Today's healthcare environment is more complicated than ever before. Multiple forces are currently at play including an ever-changing regulatory environment filled with uncertainty, increased financial pressures on health systems, evolving provider pay structures, and increased patient engagement (Uhl-Bien & Arena, 2017). Leaders in this ambiguous environment must be capable of balancing the need for standards and order with the necessary creativity productive of innovative solutions to complex healthcare

challenges. Transformational leadership will be used as a model to measure leader behavior and the impact on innovation and patient safety given the expansive application of the transformational leadership theory.

The Full Range of Leadership model (Bass, 1985) encompassing transformational, transactional, and laissez-faire leadership behaviors has emerged over the last three decades as the most popular conceptualization of leadership (Bass & Riggio, 2006). Transformational leaders seek to meet followers' higher needs through the relational elements of transformational leadership including, idealized influence, inspirational motivation, intellectual stimulation, and individual consideration. Idealized influence captures elements of ethical and moral conduct followers seek to emulate. Inspirational motivation inspires a shared vision that provides meaning to work. Intellectual stimulation encourages followers to challenge existing assumptions. Individual consideration describes how the leader attends to the needs of followers through communication and development activities (Bass & Riggio, 2006, p. 7). Functional elements of transactional elements include contingent reward, management-by-exception (active and passive), and one non-leadership construct, laissez-faire leadership (Bass & Riggio, 2006). Contingent reward is the exchange of constructive transactions through setting expectations with followers and rewards for meeting those expectations (Judge & Piccolo, 2004). Contingent reward is considered the most effective transactional leadership behavior. Management-by-exception is based on the corrective actions taken by the leader and is considered either active or passive based on the timing of leader intervention. Active leaders take a proactive approach and anticipate

problems, while passive leaders wait for a problem before taking action (Judge & Piccolo, 2004, p. 756). Management-by-exception active is seen as neutral, neither ineffective nor effective, and management-by-exception passive is considered ineffective (Judge & Piccolo, 2004, p. 757; Bass & Riggio, 2006, p. 9). Finally, laissez-faire leadership is considered ineffective or nonleadership where leaders avoid decision making or taking action (Judge & Piccolo, 2004, p. 756). This model of leadership implies that leaders display both transformational and transactional leadership characteristics to varying degrees (Bass & Avolio, 1997; Bass, 1998). The application of this theory is expansive and includes empirical research from numerous cultures across the globe from varying organizations (Bass & Riggio, 2006, p. 16).

Numerous leadership studies have addressed the impact of transformational and transactional leadership theory on patient safety (McFadden, Stock, & Gowen, 2015). Transformational leadership has been shown to impact an environment conducive to safety and is a crucial component to patient safety initiatives (Auer, Schwendimann, Koch, De Geest, & Ausserhofer, 2014; Schwendimann, Milne, Frush, Ausserhofer, Frankel, Sexton, 2013). Transformational leaders inspire and motivate clinicians to question the status quo through intellectual stimulation and seek out the safest and most effective care models, thereby encouraging empowered clinicians who provide safe patient care (Murphy, 2005). However, transactional leadership behaviors also provide the necessary foundation of adherence to standards in clinical situations with little variability (Casida & Pinto-Zipp, 2008), such as rapid response situations.

The work by Bass (1985) theorized that transactional and transformational leadership were complementary whereby leaders who displayed elements of both can be effective, but transformational leadership also can augment transactional leadership, accounting for variance in outcomes above that accounted for by transactional leadership, behaviors (Bass & Riggio, 2006, p. 11). This differed from the original work of Burns (1978) in which transformational and transactional leadership behaviors were conceptualized at opposite ends of a continuum. According to Bass, the most effective leaders use a combination of both transformational and transactional leadership behaviors (Bass, 1895). The ability for transformational leaders to stimulate performance above set expectations and beyond transactional leadership is referred to as the augmentation effect (Waldman, Bass, & Yammarino, 1990; Bass & Riggio, 2006, p. 10). However, most studies do not use both transformational and transactional leadership and focus solely on the transformational leadership behaviors effect on a vast array of organization outcomes. Fewer studies test the augmentation effect of transformational leadership beyond transactional leadership (Wang, Oh, Courtright, & Colbert, 2011). A broader understanding of leadership is necessary to understand the complexity of how leaders can impact patient care in new and creative ways and potentially impact patient safety.

Need for Innovative Approaches and Current Efforts

Organizations in nearly every competitive environment have an interest in enhancing employee creativity and subsequently innovation (Yoshida, Sendjaya, Hirst, & Cooper, 2014). Driven by reimbursement regulations for improved patient safety, leaders are more engaged than ever before in generating innovative solutions that increase safety

and value to patients (Burwell, 2015; Cosgrove et al., 2013). A 2013 Healthcare Provider Innovation Survey, a collaborative initiative between the Health Information Management Systems Society (HIMSS) and AVIA, found that 65 percent of respondents cited cost reduction as their number one focal point with innovation initiatives. Medical error reduction (54 percent) and reducing readmissions (46 percent) were also cited as top priorities. Additionally, 65 percent of organizations with revenue exceeding $5 billion reported having a Chief Innovation Officer (HIMSS/AVA, January 2014). The catalyst of health innovation is complex and involves many stakeholders, including clinicians and patients, as they demand improved health quality and overall value (Dafny & Mohta, 2017). However, external forces such as the payers and regulators also have a role in setting priorities and incentivizing innovation (Frist, 2014). For example, the Centers for Medicare and Medicaid Services (CMS) is strategically using value based purchasing to meet triple aim objectives that are designed to improve service and patient safety outcomes at a lower cost (VanLare & Conway, 2012; Figueroa, Tsugawa, Zheng, Orav, & Jha, 2016).

Given the US healthcare systems cost and a quality imbalance, the U.S. Department of Health and Human Services (HHS) Partnership for Patients Initiative has encouraged health systems to generate innovative solutions and partnerships in order to exceed quality improvement goals and cost reduction set forth by the Centers for Medicare and Medicaid Services (About the Partnership, 2016). As the largest profession with 3 million registered nurses, the profession of nursing has the responsibility and capacity to impact patient care (Bureau of Labor Statistics, May, 2018). In response to

the changing healthcare landscape, nurses are assuming a central role in identifying and leading the development of creative approaches to providing relevant and safe care (McCarthy, Klein, & Cohen, 2014). Contemporary studies related to patient safety cite that nursing creativity can lead to innovative solutions if an environment supportive of clinical investment in patient safety is created (Tsai, Liou, Hsiao, & Cheng, 2013). Further, there have been various studies devoted to leadership practice in relationship to creativity (Pieterse, Van Knippenberg, Schippers, & Stam, 2009; Gumusluoglu & Ilsev, 2009; Wang & Rode, 2010; Qu, Janssen, & Shi, 2015).

While prior research has shown a direct relationship between transformational leadership and creative outcomes, the literature also demonstrates the central role of the leader in facilitating an environment conducive to creativity and innovation (Soken & Barnes, 2014). For example, in two separate studies, the relationship between transformational leadership and employee creativity was mediated by innovation climate (Wang, Rode, Shi, Luo, & Chen, 2013; Jaiswal & Dhar, 2015). Yet no studies could be found that measured the relationship among transformational and transactional leadership, creativity, and patient safety outcomes in the healthcare setting. Exploring the innovation climate as an indicator of active creativity as a mediating variable between transformational leadership and patient safety may provide a clue regarding how to continue improvement efforts and spark innovative solutions in patient safety. Therefore, a deeper understanding of the leader's role in creating a climate of conducive to innovation at point of service may be necessary in order to improve patient outcomes (Wagner, Smits, Sorra, & Huang, 2013; Volmer, Spurk, & Niessen, 2012).

Healthcare innovation requires nursing leaders to foster transformational change as the role of the nurse evolves to meet the demands of a changing landscape (Ellner, Stout, Sullivan, Griffiths, Mountjoy, & Phillips, 2015). The leader must be prepared to sustain the current advances in healthcare improvement while also creating a culture that is demanding of further improvement. Leaders can support innovation in this complex landscape by promoting the advancement and implementation of evidence-based practices and the continuous access to information necessary for ongoing evolution of nursing practice (Porter-O'Grady & Malloch, 2016, p. 7). Thus, additional research is needed to best identify leadership behaviors that can support nursing creativity within a climate for innovation and productive of increased patient safety (Sullivan & Schoelles, 2013).

Statement of the Problem

Patient safety culture is considered a contextual factor that shapes staff behavior, attitudes, and perceptions that may influence care process and safety interventions (Campione & Famolaro, 2018). The prevention of harm to patients has been empirically linked to a robust patient safety culture (Kohn, Corrigan, & Donaldson, 2000). Strategies shown to improve patient safety have included communication about safety and the importance of leadership within an organization, both essential to the culture of patient safety in an organization (Morello, Lowthian, Barker, McGinnes, Dunt, & Brand, 2013). Significant progress has been made in the last 15 years to improve the quality of care in our health systems, yet there remains room for improvement as suggested by one subsequent study that found that 1 in 3 patients who are hospitalized are harmed (Classen

et al., 2011; Pronovost & Wachter, 2014). Transformational leadership has been shown to be critical to improve patient outcomes through an improved culture of patient safety (Gowen, Henagan, & McFadden, 2009). Transformational and transactional leadership has been shown to impact quality improvement strategies including infection control and prevention and standardization; however, there continues to be a safety deficit in many other measures of clinical outcomes indicating the complexity of improving patient outcomes (Wong, 2015; Dantes et al., 2013). Additionally, transformational and transactional leaders have been shown theoretically and empirically to influence the climate for innovation and, in turn, nurse innovation behavior (Weng, Huang, Chen, & Chang, 2015). The problem is that despite our knowledge of the impact that transformational and transactional leadership has on patient safety and innovation, there remains a lack of understanding on how leaders can impact patient safety while encouraging an environment conducive to innovation.

Significance

This research is significant because the role of the leader has been well established in both creating a climate for innovation and the impact on patient safety independently, but little is known about the role of leadership style relative to a climate for innovation and elements of a patient safety culture and the ensuing impact on patient safety outcomes. Creative nursing practice has been shown to impact many professional practice environment metrics, including job satisfaction and organizational commitment (Kang, 2012). Additionally, the role of the leader has been established in the literature to play a critical role in creating a culture of patient safety and front-line nurses' perception

of patient safety (Sorra, Khanna, Dyer, Mardon, & Famolaro, 2012; Clarke, 2013). However, little is known about how mechanisms within the culture of patient safety, specifically communication about patient safety (feedback and communication about error and communication openness), that may enhance the relationship between transformational and transactional leadership and patient safety. Further, this research affirms the need to expand the literature related to the role of transformational and transactional leadership in establishing an innovation climate and advancing positive patient safety outcomes. Lastly, few, if any, studies have explored the augmentation effect of transformational leadership in relation to the perception of patient safety and a climate for innovation

Nature of the Study

The purpose of this research is to extend the understanding of the role of transformational and transactional leadership in improving the perception of patient safety through a climate that is conducive to creativity and innovation. As previously discussed, empirical research shows that transformational leadership is directly related to patient safety outcomes (Wong, Cummings, & Ducharme, 2013). Given the need for improved patient outcomes in the healthcare setting, the general hypothesis guiding this research is that transformational leadership will be positively related to the nurses' perception of patient safety, as indicated by patient safety grade. The active forms of transactional leadership (contingent reward and management-by-exception active) have been shown to be instrumental in compliance with safety compliance standards and critical to safe patient care in high-risk environments (Clarke, 2013). Therefore, it is

hypothesized that transactional leadership behaviors of contingent reward and management-by-exception active will also be positively related to the nurses' perception of patient safety as indicated by patient safety grade. Further, based on the augmentation effect, it is predicted that transformational leadership will be significantly related to nurses' perception of patient safety beyond transactional leadership (Judge & Piccolo, 2004).

While the research on patient safety culture is expansive and has informed this research, we focus specifically on key aspects of communication about patient safety that has been shown to be critical to improved patient safety. Research from the AHRQ shows patient safety scores to be positively correlated with the patient safety communication within an organization (Kirwan, Matthews, & Scott, 2013; Sorra, & Dyer, 2010). Within the culture of patient safety, communication is measured by two composits, communication and feedback about error and communication openness (Sorra & Dyer, 2010). Communication about error has been shown to be critical to effective information flows regarding communication and reporting of errors within an organization and is a strong predictor of a positive perception of patient safety by nurses (DiCuccio, 2015; Turunen, Partanen, Kvist, Miettinen, & Vehviläinen-Julkunen, 2013). For example, a 2015 study of 414 registered nurses assessed the patient safety culture using the Hospital Survey on Patient Safety Culture from AHRQ. The results showed that nurses who had a higher perception of communication about errors from leaders contribute to higher nurse perception of patient safety (Ammouri, Tailakh, Muliira, Geethakrishnan, & Al Kindi, 2015). Additionally, nurses who feel they can report errors

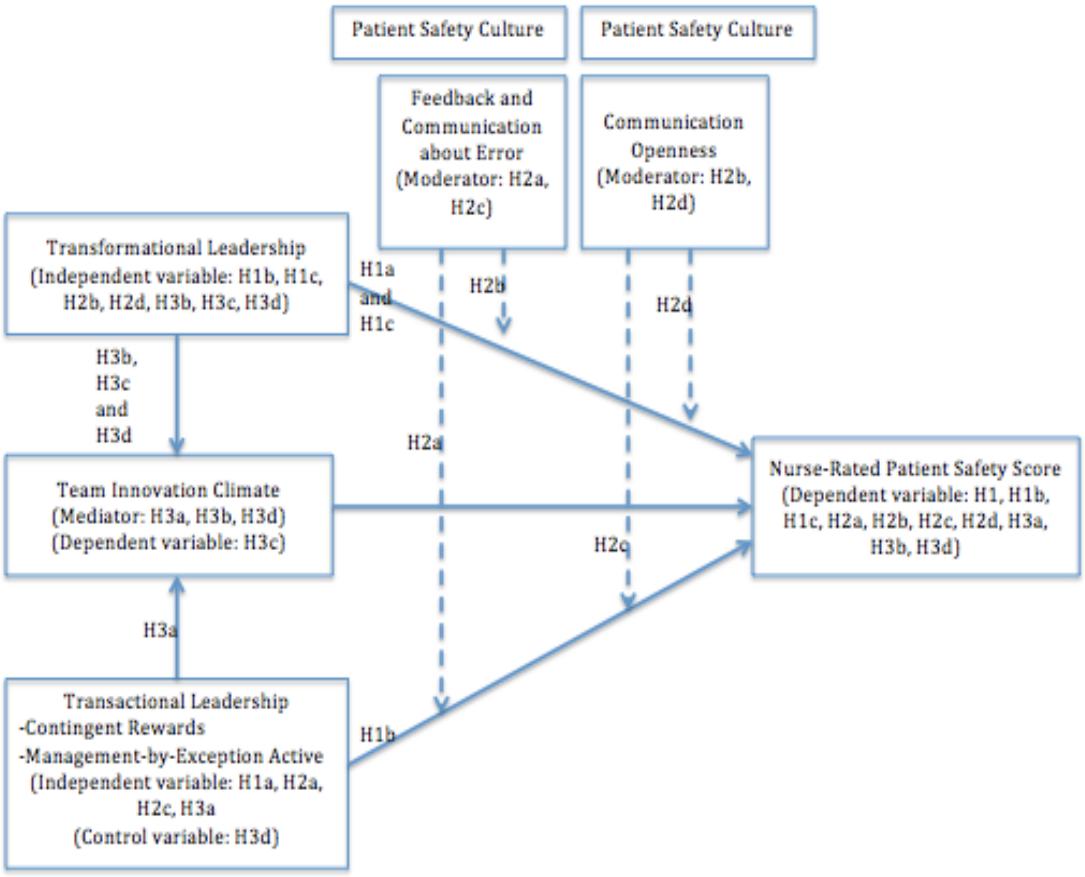
through open communication with leaders are more engaged with creating solutions and improvement in patient care (Sujan & Furniss, 2015). Central to this study is the nature of communication as a foundation to patient safety. This research proposes that communication openness and feedback and communication about error are predicted to be a moderator between transformational and transactional leadership (contingent reward and management-by-exception active) and nurses' perception of patient safety. Analyzing the moderating effect of communication openness and feedback and communication about error will help to depict the conditions under which transformational and transactional leadership are most likely to result in positive nurse perception of patient safety. Specifically, this research predicts that when the moderator communication openness and feedback and communication about error are high, then the relationship between transformational and transactional leadership and nurses' perception of patient safety is stronger. This deeper understanding of how nurse managers can improve front-line nurses' perception of patient safety and the role of communication and feedback about error and communication openness are critical to impacting how nurse managers can influence patient safety.

Lastly, it is hypothesized that improving patient outcomes requires a comprehensive and creative approach to patient safety in uncertain circumstances. The innovation climate has been shown to be critical to promote creativity and innovation among team members (Jaiswal & Dhar, 2015). Further, creativity is part of the quality improvement process through exploring various solutions to promote innovative and high-quality nursing care (Boxer & Goldfarb, 2011, p.10). Research has shown that the

leader's encouragement for creativity has a positive influence on the ability for employees to produce creative work (Amabile, 2013; Wang & Cheng, 2010; Černe, Jaklič, & Škerlavaj, 2013). This study posits that the relationship between transformational and transactional (contingent reward and management-by-exception active) leadership and nurse-rated patient safety scores will be mediated by the team innovation climate. Thus, the mediating role of team innovation climate will help in explaining the contextual reasons why there is a positive relationship between transformational and transactional leadership (contingent reward and management-by-exception active) and nurse-rated patient safety scores. Lastly, passive/avoidant leadership behaviors of management-by-exception passive and laissez-faire has been shown to be ineffective and at times destructive leading to poor employee well-being and will not be studied (Barling & Frone, 2016; Judge & Piccolo, 2004).

Figure 1

Conceptual Model



Summary

This study seeks to explore the effects of transformational and transactional leadership (singularly and with transactional augmenting transformational leadership) as related to nurses' perception of patient safety, how communication elements of a culture of patient safety may strengthen that relationship, and how the mediating role of team innovation climate may help explain the relationship between transformational and transactional leadership (contingent reward and management-by-exception active) and

nurses' perception of patient safety. If findings confirm these relationships, it would help to inform the role of nursing leaders promoting the complex nature of innovation through leadership and communication (Sousa, Weiss, Welton, Reeder, & Ozkaynak, 2015; Anderson, Potocnik, & Zhou, 2014). In this context, leadership is expected to facilitate a positive nursing perception of patient care through the use of communication and facilitates an understanding of the team innovation climate which may lead to improved patient outcomes (Chen, Ng, & Li, 2012).

This new era of health reform requires front-line nurses not only to operate within the current medical model of care delivery while caring for acute diseases, but also to operate across the complex continuum of care to deliver value-based service (Porter-O'Grady, 2014). Leaders must be able to translate the demands of the ever-changing policy environment into new and innovative delivery methods that are needed to improve the value provided to patients (Kirzecky & Jones, 2013). Undoubtedly, leading this change will require creative strategies on the part of nursing leaders to transform health care organizations to a sustainable model aligned with this new value-based paradigm.

On a practical level, this study will contribute to a greater understanding of how to prepare nursing leaders for the challenges of a changing healthcare landscape through an understanding of what leadership behaviors are necessary to generate safe and innovative care delivery models. There is little information in the nursing literature related to patient safety in an climate for innovation, and none could be found that study the leadership behaviors of nursing leaders that are conducive to a climate for innovation and create a positive impact on patient safety outcomes. Therefore, this study seeks to

fill that gap in knowledge and to expand the leadership and innovation literature to include patient safety.

Chapter II will present a literature review to expand upon the constructs of patient safety outcomes, transformational and transactional leadership, elements of the culture of patient safety related to communication and feedback about error, and a team climate for innovation. The data collection methods and statistical analysis used to carry out this study will be presented in Chapter III. Chapter IV will present the data and analysis. Chapter V will present the findings, discussion, conclusion, and future opportunities for research related to this study.

CHAPTER II

The need for leadership to identify and define innovative models of healthcare delivery that transcend traditional models of care delivery is necessary to meet the demands of a shifting economic climate (Courtney, Nash, Thornton, & Potgieter, 2015, p. 11; Grossman & Valiga, 2017, p. 175). Due to the expanding role of nurses, those at the front line of patient care are uniquely positioned to impact innovation in today's climate of ambiguity, external regulatory pressures, and an increased need for efficiency (Bouhali, Mekdad, Lebsir, & Ferkha, 2015; Joseph, 2015). This changing health care landscape will require leaders who are able to engage functionally with front-line nurses to create and implement solutions if patient care is to be positively affected (Kaya, Turan, & Aydın, 2015). The role of the leader has shifted from one of command and control decision-making and planning to the stimulation of learning for knowledge based workforce that adapts to new challenges as a driver of creativity and ultimately innovation (Hlupic, 2014). This chapter will present a theoretical framework of patient safety that advocates how transformational and transactional leadership can impact patient safety efforts. Further, it will show how a team innovation climate and communication elements of patient safety culture can impact patient care.

Patient Safety

Patient safety has long been a topic of concern among practitioners. For the medical profession, physicians take the oath of *first do no harm*, which has Greek roots, but was introduced to Western Medicine by Worthington Hooker in 1847 (Ilan & Fowler, 2005). Within the nursing profession Florence Nightingale is considered a pioneer of

quality improvement. It was her implementation of hand washing standards, sterile procedures, and routine linen changing that improved mortality in her hospital during the Crimean War (Lee, Clark, & Thompson, 2013). However, despite all the scientific advances in medical care, hospitals are not safe places for healing and are fraught with the risk of harm (Emanuel et al., 2008). The role of medical error is complex. The magnitude of this simple statement cannot be understated. A medical error can be inconsequential, or it can end the life of a patient with an otherwise normal life expectancy (Makary & Daniel, 2016). Medical error has been defined in numerous ways, but it is largely considered in a systemic context. In response to the IOM report *To Err is Human* (1999), an inter-governmental task force was created to address patient safety concerns. The task force expanded the definition of medical error and was further defined by the Quality Interagency Coordination Task Force as, "An error is defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. Errors can include problems in practice, products, procedures, and systems" (p. 29).

In the years following the 1999 IOM report, there has been increased focus on specific measurement of error and reporting, however, in order to transform quality in healthcare, a cultural change is required (Leape et al., 2009). As previously discussed, the focus on prevention of error has not yielded the results necessary to make healthcare significantly safer, and new approaches should be implemented. In fact, the most commonly cited number of 44,000-98,000 errors by the IOM in 1999 has been questioned as being too low an estimate. For example, a 2008 review of health records from inpatients by the US Department of Health and Human Services Office of the

Inspector General cited 180,000 deaths of Medicare beneficiaries due to medical error. James (2013) updated the nearly three-decade old patient harm and death estimates from the 1999 IOM report which used 1984 data and concluded that the estimate of preventable death in U.S. hospitals could be as high as 400,000 annually. Classen et al., (2011) found an adverse event rate of 33.2 percent of all hospital admissions and cited that it may be higher due to previous observational studies revealing higher rates than in retrospective reviews. While estimates of preventable adverse events and medical error estimates vary, current efforts at detection and communication of adverse events and medical error have failed and the need for improved systems is critical to increased patient safety (Classen et al., 2011, p. 5). To realize improvement in patient safety, leaders must make patient safety a priority and communicate with employees in a systematic way to prevent future errors from occurring (Mellow et al., 2014).

Leadership

To fully understand contemporary leadership models, it's essential to critically examine the historical development of transformational and transactional models. The concept of leadership is complex and has evolved over the past one hundred years with each theory throughout history building on the thought of previous scholars and blending of ideas (Northouse, 2015, p. 2; Yammarino, 2013).

The trait approach to leadership is one of the oldest and most common approaches to describing leadership through a vast array of personality characteristics (Bass, 2008). Those who adhere to the trait leadership approach suggest that certain individuals have innate qualities that make them leaders; ultimately these behavioral theories separated

leaders from non-leaders (Northouse, 2015). The skills approach to leadership is very similar to the trait approach with the exception of the learned aspect of leadership. In fact, the skills approach includes many components that are very trait like, such as intelligence and personality (Mumford, Zaccaro, Harding, Jacobs, & Fleishman, 2000). However, the skills model of leadership enhances the understanding of leadership, promoting it as a learned ability that can be developed and thus not reserved for a few gifted individuals (Northouse, 2015).

Many of the early leadership theories are based on learned behaviors, such as authority (Lewin, Lippitt, & White, 1939) and charisma (Weber, 1947). The popularity of these leadership theories fit the historical context of the political and social unrest in the 1940s-1960s, a time of war and gender inequality when leaders were men and war heroes were idealized. In 1947 Max Weber proposed a model of transaction and transformation leadership authority that was based on three principles: bureaucratic (transactional) rooted in traditional rules and governance, charismatic (transformer) rooted in heroic qualities, and traditional leadership based on the principles of authoritarian power (feudal) (Conger & Kanungo, 1987). According to Weber (1947), the charismatic leader is endowed with heroic traits and the degree to which followers perceive the leader as trustworthy and admirable (Awamleh, Evans, & Mahate, 2005). Weber's model of bureaucratic leadership and inclusion of charismatic authority suggests that power was in part derived from the personal character of the leader and is central to succeeding as a leader (Humphreys & Einstein, 2003). The leadership model proposed by Weber (1947) is in part situational where the economic and social conditions define

the particular type of leadership, while also allowing for dynamic transfer of leadership styles from one form to the other (Nikezić, Purić, & Purić, 2012). While this model acknowledged the importance of situations, the extraordinary traits of leaders (charisma) are considered foundational in determining the effectiveness of leaders (Zaccaro, 2007).

The work by Weber (1947) influenced a great number of leadership scholars including House (1971) and later Burns (1978) who proposed that leadership was either transactional or transformational. In development of this leadership dyad, Burns (1978) drew on the literature on trait and leader-member exchange research (Lowe, Kroeck, & Sivasubramaniam, 1996). Leader-member exchange (LMX) addressed the deficiency of many of the historical leadership theories by conceptualizing leadership as a process of interactions between leaders and individual followers, not as a general behavior toward the group (Dansereau, Graen, & Haga, 1975). These individual interactions are uniquely conceptualized as vertical dyads between leaders and followers involving two ways of exchanges, supervisory and leadership (Northouse, 2015, p. 138). Relationships between leader and follower are conceptualized as in-group (characterized by mutual trust and respect based on follower exceeding role responsibility) and out-group (a more formal relationship based on job description); ultimately the leader's focus is on developing high quality relationships and bringing followers to the in-group through social exchange (Graen & Uhl-Bien, 1995).

Transformational and Transactional Leadership

Transformational leadership theory (Burns, 1978; Bass, 1985) has emerged as one of the most significant and often cited theories of contemporary leadership (Mhatre &

Riggio, 2014). Burns (1978) was largely interested in the study of political leadership, however management scholars and practitioners quickly gained interest in his study of transactional and transformational leadership (Humphreys & Einstein, 2003). The conceptualization of transactional leadership by Burns (1978) is essentially a cost-benefit exchanged between leader and follower (Den Hartog, Muijen, & Koopman, 1997). Burns conceptualized transformational leadership as separate from transactional where transformational leadership is rooted in the leaders' values and beliefs and the engagement with followers to create change in existing values and beliefs and instill greater commitment (Nikezić, Purić, & Purić, 2012). Burns (1978) conceptualized transformational and transactional as opposite ends of a continuum. Bass built on the transformational and transactional leadership theory by Burns (1978), which explained that transactional leadership was an individual process of exchange of rewards, and transformational leadership was rooted in the leader-follower relationship and motivation (Bass, 1985). This model differed from the Burns model in that Bass (1985) argued that the definition of transactional leadership was much too basic and leaders could demonstrate both leadership behaviors of transformational and transactional behaviors in a complementary fashion. The transformational leader instills vision, mission, pride, and trust in followers through charisma as popularized by Burns in 1978 (Bass, 1990). However, according to Bass (1985), the transformational leader goes beyond the typical exchange mechanisms of transactional leadership to meet the emotional needs of employees and intellectually stimulate employees (Bass & Avolio, 2004; Bass & Riggio, 2006, p. xi). Where the two diverge is the leader's focus. The transformational leader is

focused on engaging and motivating employees in the process of problem solving and change. The transactional leader is concerned with self-interest, directing employees, and tracking progress toward goals.

Laissez-faire leadership represents an absence of leadership or passive avoidance, a situation where decision-making is avoided and has been shown to be ineffective (Antonakis, Avolio, & Sivasubramaniam, 2003). Conversely transactional leadership behaviors are based on contingent reward and management-by-exception where by employees are provided rewards and recognition for achievement of goals (contingent reward) and disciplinary action when ineffective performance is identified (management-by-exception active and passive forms) (Bass, Avolio, Jung, & Berson, 2003).

More specifically, transactional leadership is conceptualized as the exchanges (rewards) between leaders and followers are focused on meeting organizational objectives and maintaining the current organizational status (Bass & Riggio, 2006). The benefits of transactional leadership include the relatively simplistic and effortless means to administer whereby leaders are in a position of power to maintain control over employees through a system of goals and subsequent rewards and punishment based on how well employees perform (McCleskey, 2014). There is also little training required for transactional leadership as it is focused on specific, predetermined organizational goals and tactical mechanisms to achieve those goals. Thus, for the transactional leader, behavior is geared toward obtaining organizational goals through the use of rewards and punishment to achieve those goals. In terms of patient safety, standardization and patient care pathways have been shown to reduce errors and improve patient care including

reducing infections, improved communication, reducing medication errors, and reducing wrong site surgeries (Leotsakos et al., 2014). Transactional leadership has been shown to be beneficial to improving patient safety through adherence to standard patient safety pathways (Flin & Yule, 2004).

There is some evidence of the effectiveness of transactional leadership in limited settings, though most contemporary support for transactional leadership typically includes transformational leadership (McCleskey, 2014). For example, Zhu, Sosik, Riggio, & Yang (2012) examined transformational and transactional leadership and the underlying processes which impact employee organizational identification. Their findings showed that transactional leadership was significantly and positively related to employee organizational identification ($\beta = .41$, $p < .01$), though less than transformational leadership ($\beta = .58$, $p < .01$). Specifically, the study found transactional leaders who display the active form of transactional leadership, active management by exception (MBEA) and contingent reward (CR), were better able to define and communicate what needs to be done, how the task should be completed, and the associated rewards for completion. This study found that transactional leaders can promote organizational identification through rewards and monitoring performance thereby allowing employees to better understand their role in the organization and performance expectations (Zhu, Sosik, Riggio, & Yang, 2012, p. 193). The findings were consistent with that of previous research that has demonstrated the benefit of the active form of transactional leadership behaviors (Avolio, Bass, Walumbwa, & Zhu, 2004; Zhu, Riggio, Avolio, & Sosik, 2011).

In contrast to the benefits of transactional leadership, there are notable deficiencies of transactional leadership. Since transactional leadership is based on an exchange of rewards, employees are not considered to be motivated beyond what is required to achieve reward or avoid punishment (Bass, 1985). Additionally, transactional leaders monitor compliance with standards and take corrective action, forcing employees to change behavior when not meeting standards (Zhu, Sosik, Riggio, & Yang, 2012). What this leads to is transactional leadership being effective in stressful environments where monitoring process and short-term outcomes are aligned with rewards, not suited for work where creativity may be productive of longer-term solutions (Nikezić, Purić, & Purić, 2012, p. 287). This transactional approach assumes that employees are all motivated by tangible rewards and ignores the altruism that may define employees' personal values. Research has also shown that transactional leadership alone is not relevant for most situations as it ignores the intelligence and emotions of employees (McCleskey, 2014, p. 122).

Transformational leadership describes how the leader seeks to motivate followers to higher levels of performance through four dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individual consideration. Bass, Avolio, Jung, & Berson (2003, p. 2008) state that transformational leaders who possess idealized influence place employees' needs above their own self-interest. These leaders are admired, respected and trusted. Employees seek to identify with these leaders through a shared perception of morals, principles and values.

Leaders who exhibit inspirational motivation communicate a desirable future and articulate how and goals can be met. Inspirational motivation can be realized through leader communication of high standards and providing context for meaningful and challenging work. They can motivate employees through enthusiasm and optimism by encouraging their employees to envision a future state that is consistent with their own needs and organizational goals (Rafferty & Griffin, 2004).

Intellectual stimulation refers to the ability for leaders to show support and encouragement for new ideas and solutions to daily problems through engaging employees in the improvement effort. Followers are encouraged to actively and creatively engage in problem solving through questioning assumptions, reframing problems, and proposing new solutions to problems. The transformational leader seeks out solutions from followers that are different from their own without criticism.

Individual consideration refers to the leader's ability to consider employees personal needs for achievement, learning, and growth through mentorship and are employees are developed to higher levels of potential where new learning opportunities are provided in a supportive climate that the employee can achieve their individual goals.

The highest form of transformational leadership is characterized by authenticity where leaders are described as possessing high moral character and a strong relational orientation (Gardner, Avolio, & Walumbwa, 2005). Conceptually central to transformational authentic leadership is self-awareness, relational transparency, balanced processing of information, and internalized moral perspective (Walumbwa, Avolio, Gardner, Wernsing, & Peterson, 2008). Martin Luther King, Jr. is an example of a

transformational authentic leader whose ideology of equality was directed toward a better future his of followers without detriment to others (Bass & Riggio, 2006, p. 40). In contrast, pseudotransformational behaviors are described as authoritarian, self-aggrandizing, and impulsively aggressive. These inauthentic behaviors cater to the leader's self-interest and are characterized by domination over others that are in stark contrast to the transformational leadership social utilitarianism (Bass & Riggio, 2006, p. 41).

Despite the popularity of transformational leadership, there remains criticism of being leader centric, which may obscure the moral and ethical obligation that a leader has to followers, and in the case of healthcare, patients (Van Dierendonck, 2011). A demand for more positive forms of leadership led to the popularity of servant leadership, a value based leadership approach to leadership. Servant leadership, has emerged as a higher form of transformational leadership in the nursing literature as an altruistic means to stimulate change (Jackson, 2008). Van Dierendock (2011) describes servant leadership as encompassing leadership characteristics of accountability, empowerment, humility, stewardship and standing back. While servant leadership has received popular attention due to its philosophical notions of fostering a greater good above self-interest, it lacks robust empirical support due to a lack of theoretical grounding (Parris & Peachey, 2013). It does, however, share a focus on empowering employees to achieve organizational goals, though servant leaders focus on followers' needs first and achievement of organizational goals as an outcome of an enhanced personal connection to the

organization (Parolini, Patterson, & Winston, 2009). Of importance in healthcare is the achievement of patient outcomes and the leadership required to achieve those outcomes.

Leadership scholars across multiple disciplines have spent more than 100 years building on varying definitions of leadership (Northhouse, 2015). Transformational leadership theory has emerged as one of the most popular and often cited across many disciplines; offering a rich base of research to further our understanding of leadership dynamics (Northouse, 2015, p. 161). Transformational leadership has been widely adopted in health care settings and embraced within the profession of nursing and has been the subject of a vast number of studies related to both organizational and patient outcomes (Fischer, 2016). A 2013 meta-analysis by Wong, Cummings, and Ducharme examined the relationship between a wide range of leadership behaviors and patient outcomes. Their findings showed that transformational leadership in nursing was by far the most often cited and repeatedly related to improved outcomes in patient satisfaction, patient mortality, adverse events, patient falls, pain management, and hospital infections (Wong, Cummings, & Ducharme, 2013, p. 714). Given the established research related to transformational leadership and quality outcomes this study will focus on further exploration of how transformational leaders can impact patient outcomes within a climate for innovation.

An exemplar of transformational leadership can be seen throughout Magnet recognized healthcare facilities. The American Nurses Credentialing Center (ANCC) and the Magnet program is a voluntary, fee-based program that is designed to identify healthcare facilities with an extraordinary commitment to patient safety through

exceptional nursing care delivery (ANCC, 2017). Within the nursing environment, transformational leadership is promoted by the American Nurses Credentialing Center (ANCC) as one of the five model components of the Magnet program and productive of new ideas and innovations (ANCC, 2017). The program requires rigorous documentation and evidence of five key principles: transformational leadership, structural empowerment, exemplary professional practice, new knowledge, innovation, improvements, and empirical outcomes. Within Magnet facilities, transformational leadership inspires and encourages collaboration, builds ownership in the decision-making process, and creates connections among followers that raise the motivation of followers (Tinkham, 2013). Structural empowerment involves front-line nursing in a shared governance model of decision making at all levels of the organization. Exemplary professional practice is a multi-disciplinary practice approach to achieving high quality outcomes, grounded in the culture of safety, quality monitoring, and quality improvement. New knowledge, innovations, and improvement refer to the integration of evidenced based practice and research into daily nursing practice. Establishing high quality, effective, and efficient care is considered the outcome of transformational leadership, the expected application of structural empowerment, and exemplary professional practice. Empirical outcomes are the central component of the Magnet organization where the empirical measurement of clinical outcomes specific to nursing, workforce, patient and consumer, and organizational outcomes define Magnet organizations (ANCC, 2017).

Specific to transformational leadership in Magnet organizations, nursing leaders at all levels are expected to demonstrate evidence of alignment of the nursing mission, vision and values with that of the organizations. It is further expected that the Chief Nursing Officer be strategically positioned to influence all levels of the organization and transform the nursing values, beliefs, and behaviors in relation to the organizational mission, vision, and values. According the ANCC Magnet website, "mechanisms must be implemented for nursing evidence based practice to be supported and innovation to flourish" (ANCC, 2017).

Nursing leaders in Magnet organizations have a long history of leadership practices consistent with transformational leadership (Kramer, Schmalenberg, & Maguire, 2010). Recent evidence from a 2015 retrospective review (1998-2012) of Medicare patients hospitalized in Magnet vs. non-Magnet facilities for coronary artery bypass graft surgery, colectomy, or lower extremity bypass showed that patients in Magnet hospitals had a 7.7 percent lower 30-day mortality rate and are 8.6 percent less likely to die after a postoperative complication (failure-to-rescue rate) (Friese, Xia, Ghaferi, Birkmeyer, & Banerjee, 2015). These findings confirmed previous studies of improved patient outcomes in Magnet organizations and a further need to understand and identify factors associated with excellent patient care in Magnet organizations (Aiken, Smith, & Lake, 1994; Lake et al., 2012; McHugh, Kelly, Smith, Wu, & Aiken, 2013).

The nursing environment is often cited as key to organizational success and has been positively linked to specific clinical outcomes, including safe patient care, patient satisfaction, and patient mortality (Wiltse, Sloane, & Aiken, 2013; Lundmark, 2014). In

the healthcare setting, transformational leadership within the Magnet work environment has been found to enable frontline staff to adapt quickly to changing situations and solves problems creatively (Gonzalez, Wolf, Dudjak, & Jordan, 2015). As previously stated, the Magnet nursing environment has adopted transformational leadership as a central leadership foundation in achieving organizational success (McGuire & Kennerly, 2006; Curtis, de Vries, & Sheerin, 2011).

Transformational Leadership and Patient Safety

Leadership that is considered effective has been linked to improved patient safety (Boamah, Laschinger, Wong, & Clarke, 2018) while leadership failure has been linked to poor clinical outcomes (Zaheer, Ginsburg, Chuang, & Grace, 2015; Garling, 2008). Additionally, quality of leadership has been clearly identified as key to the employee's engagement in quality improvement efforts (Singer, Rivard, Hayes, Shokeen, Gaba, & Rosen, 2013; Meyer, 2011; Parand, Dopson, & Vincent, 2013). The actions of the direct nursing manager have been found to be instrumental in improving patient safety by acknowledging poor practice or quality, thereby improving accountability (Whitehead & Barker, 2017). Within the Magnet healthcare environment, transformational leadership has been promoted as core to the achievement of patient outcomes, thus, the focus of this study.

The literature on patient safety suggest that accountability for improving outcomes begins with senior leadership, but must be present at every level, particularly from front-line management (Clarke, 2013). According to the Joint Commission (March, 2017), leaders must identify, understand and contribute to improving systematic flaws

within the health care system that stem from human error. Further, The Joint Commission's Sentinel Event Database reveals that the failure of leadership to create and sustain a culture of patient safety is "a contributing factor to many types of adverse events – from wrong site surgery to delays in treatment" (The Joint Commission, March 1, 2017 p. 1). The Institute of Medicine (IOM) uses the framework of transformational leadership in order to facilitate change and the culture of patient safety (IOM, 2004). The IOM cites that the achievement of a highly reliable organization will require transformational leadership to balance the tensions of efficiency and safety, create trust, actively manage the process of change, involve front-line staff in decision making, and establish a learning organization (Page, 2004, p. 108). Additionally, the *Future of Nursing* report by the Robert Wood Johnson Foundation and the Institute of Medicine (2011) echo previous calls for transformational leadership and foundational to innovation in nursing through new delivery models of care (IOM, 2011, p. 416-417).

Much of the literature related to the role of leadership and culture of patient safety stems from industrial research in high risk industries such as nuclear power (Hofmann, Burke, & Zohar, 2017). Transformational leadership has been shown to increase safety participation through inspirational motivation in which employees are likely to be engaged in the vision of safe patient care (Griffin & Hu, 2013); transactional leaders set expectations for error prevention through adherence to standards (Martínez-Córcoles, & Stephanou, 2017). Early evidence for the benefits of transformation leadership related to safety climate was by Barling, Loughlin and Kelloway (2002) who proposed a mediated model linking transformational leadership and workplace injuries. What their model

showed was that workplace injuries were predicted by safety related events (reported) ($\beta = 0.64$, $p < 0.01$), safety related events were predicted by safety climate ($\beta = 0.39$, $p < 0.01$), safety climate was predicted by transformational leadership ($\beta = 0.30$, $p < 0.01$) (Barling, Loughlin & Kelloway, 2002, p. 491). This model builds on previous research showing that perceived safety climate is a significant predictor of safety outcomes (Zohar, 2000) by showing that transformational leadership can impact safety outcomes through safety climate. The authors state that each of the four components of transformational leadership is relevant to enhancing occupational safety. Leaders displaying idealized influence value safety as a core principle and put an emphasis on safety and what is right rather than on short-term productivity pressures facilitating trust and organizational commitment. Inspirational motivation is exhibited when leaders challenge staff to achieve higher safety goals not previously attained through communication and clarification of a shared mission. Leaders use intellectual stimulation to motivate followers to confront engrained assumptions and encourage innovation that may enhance safety. Lastly, individual consideration is displayed by an active interest in followers' safety and is not satisfied with simply achieving goals, but desire to achieve higher levels of safety (Barling, Loughlin & Kelloway, 2002, p. 489).

Many studies do not include the important concept of transactional leadership, choosing to focus on transformational leadership that is often viewed as superior in relation to many outcomes (Bass & Riggio, 2006). However, there is growing research related to the role that transactional leadership plays in nursing leadership and patient safety consistent with the theoretical underpinnings of Bass' (1985) theory of

transformational and transactional leadership stating that it is not an either-or proposition (Bass & Avolio, 2006, p. 5). One study to examine transactional leadership in relation to patient safety in healthcare was that of Clarke (2013), who conducted a meta-analysis that showed that the application of transactional leadership was critical for safety compliance through monitoring of adherence to standards and actively looking for and anticipating problems in order to take action to correct mistakes. Additionally, the construct of contingent reward and management-by-exception active within transactional leadership has been shown to be critical in the prevention of safety incidents through safety compliance (Clarke, Guediri, & Lee, 2017).

In one of the few studies in health care that has incorporated both transactional and transformational leadership, Merrill (2011) conducted a study of 41 nursing units from nine hospitals exploring the relationship between nurse specific patient safety indicators (fall rate, medication errors, hospital acquired pressure ulcers, and catheter-associated urinary tract infections), transformational and transactional leadership, nurse practice environment and safety climate. The results showed significant correlations between catheter-associated urinary tract infections and transformational ($\beta = 0.53$, $p < 0.05$) and transactional leadership ($\beta = 0.601$, $p < 0.05$) (Merrill, 2011, p.116). Other nurse specific indicators of fall rate, medication error, and hospital acquired pressure ulcers did not produce significant results, indicating that the relationship between leadership and patient outcomes is complex and dependent on moderating and mediating variables. Further, this study is one of few that include transactional leadership correlations. The significant finding of transactional leadership in relation to a decrease

in catheter-associated urinary tract infections may be attributed to the constructs of contingent reward and management-by-exception active. This further supports the importance transactional leadership in the monitoring and rewarding compliance with standard operating procedures or protocols that have been proven effective.

Houser (2003) used structural equation modeling to test a model of the indirect role of transformational leadership on patient outcomes (the outcome variable is an aggregation of hospital acquired pneumonia and hospital acquired urinary tract infections). The results showed a significant indirect path from nursing unit leadership to patient outcomes through staff expertise, indicating that strong leaders recruit and retain competent nurses, and, in turn, the incidence of adverse events declines (Houser, 2003, p. 46). This study was later confirmed by an expanded replication study by Capuano, Bokovoy, Hitchings, and Houser (2005), adding to the literature base of the complex nature of leadership and the indirect effect on patient outcomes.

Nursing staff perception of the quality of care has been shown to be a valid measure of the technical quality of care (Lee, Lee, & Kang, 2012; Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010). A study utilizing nurse perception of patient care was conducted by Westerberg and Tafvelin (2014) in a cross-sectional survey of 469 home health nurses exploring the impact of transformational leadership on quality of care and mediating variables of organizational support, peer support, workload, and job control. The authors found significant indirect effects of transformational leadership on quality of care ($\beta = 0.54$, $p < 0.001$) where the mediated model explained 51 percent of the variance in the nurse-rated quality of care. Specifically, transformational leadership explained 54

percent variance of organizational support, 32 percent of peer support, 10 percent of workload, and 9 percent of job control (Westerberg & Tafvelin, 2014, p. 465). This model confirms that impacting patient outcomes is complicated and that leadership does not independent of the organization.

Recently, a 2016 study by Cheng Bartram, Karimi, and Leggat used structural equation modeling to examine the role of transformational leadership in the development of shared social identity on nursing units and the impact on team climate, intent to leave, burnout, and nurse-rated patient care. The correlation results showed that transformational leadership was significantly related to all of the variables of interest: negative correlations with burnout ($r = -0.311$, $p < 0.01$) and turnover intention ($r = -0.276$, $p < 0.01$), and positive correlations with nursing perceived quality of care ($r = 0.209$, $p < 0.01$), social identity ($r = 0.341$, $p < 0.01$), and team climate ($r = 0.486$, $p < 0.01$). Further mediation analysis was conducted that reveals that the link between transformational leadership and nurse perceived quality of care is mediated by social identity ($\beta = 0.32$, $p < 0.01$). This research shows that while transformational leadership has a direct positive relationship to nurse perception of quality of care, the relationship is strengthened when nurses share the same perspectives in relation to goals and interests as others in the group (Cheng, Bartram, Karimi, & Leggat 2016, p. 1203).

Augmentation of Transformational Leadership

A fundamental component of the transformational and transactional leadership theory proposed by Bass (1985) which differed from the conceptualization of Burns (1978) is the augmentation effect that proposes that transformational leadership adds to

the effect of transactional leadership (Bass & Avolio, 2006; Judge & Piccolo, 2004). In fact, Bass (1985) conceptualizes that without transactions between leader and follower, transformational leadership may not be possible as transformational leaders influence followers to achieve more than the transactional goals. Bass (1985) states the following related to the additive effect of transformational leadership over transactional leadership:

> The transformational leader induces additional effort by further sharply increasing subordinate confidence and by elevating the value of outcomes for the subordinate. This is done by expanding the subordinate's needs, by focus on the transcendental interests, and/or by altering or widening the subordinate's level of need on Maslow's hierarchy. (p. 22).

The current study conceptualizes leadership consistent with that of Bass (1985), inclusive of both transformational and transactional leadership. This study views leadership consistent with previous research that indicates that when tasks are complex and high-risk, transactional leadership (contingent reward and management-by-exception active) serves as a base for effective leadership through rewards and articulating goals and standards while transformational leadership serves as a mechanism to motivate employees to higher levels of performance (Bass, Avolio, Jung, & Berson, 2003, p. 215).

Specifically related to the augmentation effect, evidence shows that transformational leadership accounts for variance beyond that of transactional leadership (Bass & Avolio, 2006, p. 10). For example, a meta-analysis by Judge & Piccolo (2004) showed that transformational leadership and transactional behavior of contingent reward both had significant correlations to outcomes of follower job satisfaction

(transformational: $p\hat{}$=.58; contingent reward: $p\hat{}$=.64), follower motivation (transformational: $p\hat{}$=.53; contingent reward: $p\hat{}$=.59), and satisfaction with the leader (transformational: $p\hat{}$=.71; contingent reward: $p\hat{}$=.55). Further, when controlling for transactional components of contingent reward, management-by-exception active, management-by-exception passive, and laissez-faire, the study showed that transformational leadership significantly predicted follower satisfaction with the leader (β =.52, p<.01), follower motivation (β =.32, p<.01), and leader effectiveness (β =.37, p<.01). Thus, transformational leadership had an augmentation effect after controlling for the transactional leadership effects (Judge and Piccolo, 2004, p. 762).

Zohar (2002) used the transformational and transactional leadership model to test a mediated leadership-climate-work place injury across 411 production workers encompassing 42 work groups at a metal processing plant. The model was based on the augmentation effect of transformational leadership over transformational leadership in which transactional leaders act in a supervisory capacity providing reliability and predictability and in which transformational leaders motivate beyond the expected performance through heightened motivation and development (Zohar, 2002, p. 89). The results showed that transformational leadership (β = -0.38, $p < 0.01$) was a superior predictor of workplace injuries over that of transactional leadership (contingent reward (β = -0.34, $p < 0.05$), and corrective forms of leadership (management-by-exception passive) failed to predict injury rate (Zohar, 2002, p. 85). Further mediation analysis showed that when safety climate was included in the model, mediation was present between transformational leadership and injury rate (TL, β = -0.09, $p < 0.01$; climate, β =

-0.53, $p < 0.001$, $R^2 = -0.33$). The mediation model for transactional leadership (contingent reward-CR) and injury rate when climate was included was also significant (CR, ($\beta = -0.08$, climate, $\beta = -0.45$, $p < 0.001$, $R^2 = -0.33$). Additionally, what the authors refer to as corrective leadership (management-by-exception passive and management-by-exception active) failed to predict injury rate directly, though two paths were significant. The two significant paths in the corrective leadership behavior include management-by-exception active to climate to injury rate was significant ($\beta = 0.48$ and $\beta = 0.62$, $p < 0.01$) and management-by-exception passive to climate to injury rate ($\beta = 0.74$ and $\beta = 0.57$, $p < 0.01$) (Zohar, 2002, p. 85). The results of this study showed that the two models of leadership (transformational and transactional) are complementary and that the transactional supervision of safety efforts serves as baseline for safety leadership and are critical to front-line injury prevention. Transactional leadership (directly contingent reward and indirectly management-by-exception active) was responsible for engendering reliable safety behaviors through close supervision and provision of rewards and punishments. Transformational leadership was shown to influence safety behavior through concern for employee welfare and open communication exchanges. Specifically, in the context of balancing routine technical decision-making (as was the case in this study), situational contingencies not covered by standard procedure make transformational leadership ideal for reduction of workplace injury through group communication and subsequent individual development (Zohar, 2002, p. 89).

Bass, Avolio, Jung, and Berson, (2003) examined how transformational leadership and transactional contingent reward impacts unit performance within a

military context and found evidence consistent with previous research (Zohar, 2002) that transformational leadership augments transactional leadership. The authors used structural path analysis to examine the transformational and transactional leadership behaviors of 72 U.S. Army platoon leaders and sergeants and the association with unit performance in military training exercises. The results showed that when testing the augmentation effect of platoon sergeant transformational leadership, the R^2 value was 0.11, and when transactional leadership (contingent reward) was added, the R^2 value increased significantly ($\beta = 0.16$, $p < 0.05$). This research cites many elements that are consistent with the healthcare environment as foundational transactional behaviors, including the need for articulating clear standards, coordination of complex tasks, and recognizing the achievement of goals. These results are consistent with research related to the science of patient safety that balances standard operating protocols in high-risk areas and the need for continued innovation productive of the best patient outcomes (Leotsakos, et al., 2014). Even so, most strategies utilized for improving the quality of care have relied on standardization to improve patient care, including fall reduction (Coppedge, Conner, & Se, 2016) and reduction in catheter associated urinary tract infections (Tatham, Macfarlane, MacRae, Tully & Craig, 2015).

Transactional leaders are essential to setting a foundation of adherence to standards that sustain a predetermined level of patient safety through providing rewards for meeting these goals (contingent reward) and punitive repercussions for negligent behavior (management-by-exception active) (Clarke, Guediri, & Lee, 2017; Wong, Cummings, & Ducharme, 2013). While these standard approaches to patient safety are a

critical part of a robust patient safety program, continued exploration, analysis, and innovation for next level innovation in patient care is essential if improvement beyond the status quo is to be realized (McFadden, Stock, & Gowen, 2015). Specifically, transformational leaders are expected to engage front line nurses in creative exploration of solutions to dysfunctional or outdated patient care models that may be the current standard of care (Xenikou, 2017). Thus, this study will explore an augmentation effect of transformational leadership over that of transactional leadership related to nurses' perception of patient safety:

H1a: Transactional leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC).

H1b: Transformational leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC).

H1c: Transformational leadership will explain variance in nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active.

Climate and Culture

Climate and culture should be considered distinct concepts to help leaders understand the building blocks of the organization (Schneider, Ehrhart, & Macey, 2011). Climate has been defined as "the shared meaning organizational members attach to the events, policies, practices, and procedures they experience and the behaviors they see being rewarded, supported, and expected" (Ehrhart, Schneider, & Macey, 2014). Climate

is made up of identifiable actions of individuals that affect the deeper, less conscious beliefs and values of an organizational culture (Schneider, Brief, & Guzzo, 1996). The construct of climate is most often associated with the individual perception of environmental attributes and the shared meaning among members of a team or organization and thus can be measured on different levels (Isaksen & Akkermans, 2011). As such, employees shared perceptions are attached to more tangible aspects of the organization, including policies, practice, and procedures employees experience and the observed behaviors associated with compliance or dissidence (Ostroff, Kinicki, & Tamkins 2003).

Alternatively, Schein (2010) describes organizational culture as composed of shared artifacts (visual organizational structure and processes), espoused values (goals, strategies, philosophies), and underlying assumptions (unconscious beliefs, perceptions, thoughts, feelings) by a group or organization that characterize the way people behave in an organization. Culture has deeper foundations, rooted in strongly held values, assumptions, history, traditions, symbols, and rituals, all of which transcend the team level and reside at the organizational level (Isaksen & Akkermans, 2011).

Culture of Patient Safety

Within healthcare, the seminal Institute of Medicine (IOM) report *To Err is Human: Building a Safer Health System* (and later in 2001 *Crossing the Quality Chasm: A New Health System for the 21st Century)* identified a systemic culture of individual blame for error as the biggest challenge to prevent harm (Kohn, Corrigan, & Donaldson, 2000). These reports nearly two decades old spurred an industry wide effort to assess the

cultural attributes of organizations related to patient safety (Nieva & Sorra, 2003). Thus, stemming from other high risk, high reliability industries like aviation, healthcare has attempted to ingrain an intense focus on patient safety as part of the larger organizational culture to improve the reliability of patient care (Ilan & Fowler, 2005).

Developing a culture of safety is often cited as a core element to improving patient care (Nieva & Sorra, 2003; Weaver, Lubomksi, Wilson, Pfoh, Martinez, & Dy, 2013) and is promoted by multiple accrediting bodies and influential research agencies, including the Joint Commission, the World Health Organization (WHO), the Agency for Healthcare Research and Quality (AHRQ) and the Institute of Medicine (IOM). Since the 1999 IOM report, safety culture has become an increasingly important driving force for improving patient outcomes and reducing medical errors in hospitals nationally (Donaldson, Corrigan, & Kohn, 2000). The AHRQ adopted the definition of safety culture from the Health and Safety Commission of Great Britain:

> The safety culture of an organization is 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. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventive measures (Advisory Committee on the Safety of Nuclear Installations, 1993, in Sorra et al., 2016).

Since the focus on safety culture emerged in response to the 1999 IOM report, the evaluation and study of a culture of patient safety has continued to focus on how to improve patient care systemically (Colla, Bracken, Kinney, & Weeks, 2005). According to Singer, Lin, Falwell, Gaba, and Baker (2009) the behavioral norms that produce and promote patient safety culture incorporate important shared values and beliefs about the operation of the organization, all intertwined with the organizational structures and systems. The culture of patient safety has been empirically linked to patient outcomes in several studies. Mardon, Khanna, Sorra, Dyer, and Famolaro, (2010) conducted an exploratory study across 179 hospitals that examined the relationship between the perception of hospital safety culture using the AHRQ Hospital Survey on Patient Safety Culture (HSOPSC) and AHRQ Patient Safety Indicator (PSI) rates. The results revealed that after controlling for hospital bed size, teaching hospital, and ownership (non-profit vs. for-profit), hospitals with higher patient culture scores had fewer adverse events. All the HSOPSC composites were correlated with PSI with 7 items of safety culture being statistically significant (standardized regression coefficients between -0.15 to -0.41). These findings are support for the association between positive safety culture and improved patient safety outcomes (Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010, p. 231).

It is widely accepted that creating a culture of patient safety requires significant systemic change and thus requires the support of top leadership (Buch & Rivers, 2001; McFadden, Henagan, & Gowen, 2009; DiCuccio, 2015; Kristensen, Christensen, Jaquet, Beck, Sabroe, Bartels, & Mainz, 2016). Specifically, the Institute of Medicine (2004) has

stressed the role of transformational leadership in nursing in creating a culture of safety to improve patient outcomes (IOM, 2004). For example, McFadden, Henagan, and Gowen (2009) tested a model of transformational leadership and the role of the culture of safety and impact on patient safety outcomes. The results demonstrated that transformational leadership impacts patient safety outcomes ($SE = 0.73$, $p < 0.001$) through patient safety culture and patient safety initiatives ($SE = 0.56$, $p<0.001$; $SE = 0.52$, $p < 0.001$ respectively) (McFadden, Henagan, & Gowen, 2009, p.10).

The focus on safety culture has also highlighted the need for a greater understanding of the nature of human error and non-punitive error reporting to address systemic vulnerabilities and produce corrective action (Singer & Vogus, 2013). The evidence on how to improve culture change in relation to safety is limited, but empirical support exists that shows that leadership, teamwork, and communication all contribute to positive safety culture (Nieva & Sorra, 2003).

Communication About Safety as a Moderator

While transformational leadership has been shown to impact positive patient outcomes, the environment in which nurses and leaders work has also been shown to contribute to patient safety (Ulrich & Kear, 2014). As previously discussed, the literature continually points to the influence of clinical leadership to instill a safety culture that is reflective of safe patient care (Singer & Vogus, 2013). However, several empirical studies have found varying degrees of leadership commitment to building a culture of patient safety and nursing perception of patient safety indicating that a moderator variable may help explain the conditions under which transformational leadership is more or less

effective in predicting the nursing perception of patient safety (Singer, Gaba, Geppert, Sinaiko, Howard, Park, 2003; Frazier, Tix, & Barron, 2004). Existing research and theory suggests that one possible moderator between transformational leadership and the perception of patient safety is related to communication, specifically communication openness and communication and feedback about error, which has been shown to be a critical composite of the culture of patient safety (Weaver, Lubomksi, Wilson, Pfoh, Martinez, & Dy, 2013; Hickner, Smith, Yount, & Sorra, 2015).

Across the U.S., initiatives to improve the culture of patient safety are currently taking place in health systems with communication about patient safety a common theme (Campione & Famolaro, 2018). The Joint Commission Sentinel Event Alert (March 1, 2017) states that leaders must act to "establish, enforce and communicate to all team members the policies that support safety culture and the reporting of adverse events, close calls and unsafe conditions" (p. 4). Interventions to improve the culture of patient safety through communication include operating room time out (Makary et al., 2006), checklists in the perioperative arena (Haynes et al., 2011), TeamSTEPPS (Gupta, Sexton, Milne, & Frush, 2015), and executive walk rounds (Sexton, et al., 2014). The patient safety literature emphasizes the need for improved communication through open communication flow, nonpunitive approach to error reporting, proactive approach to safety threats, and shared perceptions of the importance of safety as a mechanism to improve patient care (Auer, Schwendimann, Koch, De Geest, & Ausserhofer, 2013). Failure of teams to communicate is one of the leading causes of medical errors and death in the acute care setting (Donaldson, Corrigan & Kohn, 2000; Greenberg et al., 2007;

Makary & Daniel, 2016). Communication is evident in a culture of safety through communication openness and feedback and communication about error. The AHRQ HSOPSC User Guide by Famolaro et al. (2018) defines feedback and communication about error as the extent to which "staff are informed about errors that happen, are given feedback about changes implemented, and discuss ways prevent errors" (p. 4). Additionally, the AHRQ HSOPSC User Guide by Famolaro et al. (2018) defines communication openness as the extent to which "staff freely speak up if they see something that may negatively affect a patient and feel free to question those with more authority" (p. 4).

Communication openness and communication and feedback about error in patient units have been shown to be elements of a culture of patient safety necessary for positive nursing perception of patient safety (Lee, Phan, Dorman, Weaver, & Pronovost, 2016). For example, Ammouri, Tailakh, Muliira, Geethakrishnan, and Kindi (2015) conducted a descriptive, cross-sectional study and surveyed 414 nurses using Hospital Survey on Patient Safety Culture (HSOPSC) to study the perception of patient safety among nurses. The study showed that management support for patient safety had one of the lowest positive scores (25.2 percent) indicating that only one-fourth of nurses surveyed perceive that management was supportive of patient safety efforts. However, this study also found a significant relationship between nurses who perceived higher management expectations for patient safety and nurses overall perception of patient safety ($\beta = 0.280$, $p < 0.001$). Lastly, nurses who perceived more communication and feedback about error had higher perceptions of patient safety ($\beta = 0.314$, $p < 0.001$) (Ammouri, Tailakh, Muliira,

Geethakrishnan, & Kindi, 2015, p. 105). What this shows is that nurses may not feel that patient safety is a top priority and management only acts after adverse events happen. Though, when managers set expectations and promote safety through considering staff suggestions for improving safety, communicate encouragement for a job well done according to established safety procedures, and does not overlook continued patient safety problems, then nurses may perceive higher patient safety (Ammouri, Tailakh, Muliilra, Geethakrishnan, & Kindi, 2015, p. 108).

Further research by Fan et al., (2016) using the HSOPSC survey, confirmed the necessity of communication openness and feedback and communication about error through a cross-sectional study of colorectal surgery medical/surgical units. This study showed feedback and communication about error ($r = -0.92$, $p < 0.05$) and communication openness ($r = -0.85$, $p < 0.05$) as patient safety composites most significantly associated with improved surgical site infections. Interestingly, feedback and communication about error was also shown to vary the most across the surveyed surgical units (21 percent to 79 percent positive scores). What this shows is that despite the evidence confirming the importance of communication in improving patient safety, ineffective communication still exists, which may contribute to medical error (Fan et al., 2016, p. 126).

The two studies are in line with previous findings that shows leadership can improve the engagement of nursing in patient safety through communication openness and providing feedback and communication about error, thus creating mutual ownership of patient safety between leadership and front-line staff (Ammouri, Tailakh, Muliira,

Geethakrishnan, & Kindi, 2015; Ballangrud, Hedelin, & Hall-Lord, 2012). Ultimately, this open access to information and communication can promote a non-punitive work environment and thus improve the culture of patient safety (Liu, Kalisch, Zhang, & Xu, 2009; Singer & Tucker, 2014). One of the benefits of error reporting is the ability to explore the root of the error fully and understand how to improve practice effectively (Anderson, Kodate, Walters, & Dodds, 2013). Within the healthcare environment, employees must feel confident that they can report errors without fear of reprisal from supervisors or peers and, further, that leadership will use that information productively to improve care.

Based on the theory of transformational and transactional leadership (Bass, 1985) and this literature review, communication openness and communication and feedback about error are proposed as a moderator variable in this study. Communication openness and communication and feedback about error have been shown in empirical studies to be vital to both improved patient outcomes (Fan et al., 2016) and the overall perception of patient safety (patient safety grade) (Ammouri, Tailakh, Muliira, Geethakrishnan, & Kindi, 2015). The transactional leaders using contingent reward may incentivize front-line nurses to achieve unit patient safety objectives and thus communicate those goals to front line nurses. Further, when transactional leaders use management-by-exception active, they are monitoring adherence to standards related to patient safety. If nurses are informed about errors that happen on the unit that would be a clear indication of transactional leadership. Consider that under high levels of communication and feedback about error, nurses may perceive that they have the information necessary to improve

patient safety and achieve set patient safety goals and, therefore, engender higher nurse-rated patient safety scores. It is expected that under high levels of communication and feedback about error that nurses will perceive the transactional behaviors of management-by-exception active in a positive fashion through feedback about the efficacy of standard practices and consequently increase their perception of patient safety.

Transformational leadership has been described as having a broader view of patient safety that goes beyond transactional monitoring of established performance (Gluck, 2010) and thus would augment the transactional behaviors (Bass & Riggio, 2006). Transformational leaders establish a culture of safety through personal attention in which employees are inspired and encouraged to go beyond the set standard in unexpected circumstances that threatens patient safety (Zohar, 2002; Flin & Yule, 2004). Thus, as transformational leaders communicate and provide feedback about errors that occur they are signaling to front line nurses that they value patient safety and that new ways of addressing patient safety is encouraged (Bass & Riggio, 2006). Consequently, we expect that nurses who perceive high levels of communication openness and communication and feedback about error to identify with the leader's vision of providing safe patient care thus would be more likely to perceive high levels of patient safety. It is hypothesized that communication openness and communication and feedback about error moderates the relationship between transformational leadership and transactional leadership behavior (contingent reward and management-by-exception active). As such, transformational leadership and transactional leadership behavior (contingent reward and management-by-exception active) will have a stronger positive relationship with nurses'

perception of patient safety under conditions of high levels of communication openness and communication and feedback about error. Examining this proposed relationship will help elucidate under which conditions (when) leadership is related to nurses' perception of patient safety. Based on the above arguments the following hypothesis is proposed:

H2a: Nurses' perception of feedback and communication about error will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H2b: Nurses' perception of feedback and communication about error will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H2c: Nurses' perception of communication openness will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H2d: Nurses' perception of communication openness will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

Analyzing the moderating effect of communication openness and communication and feedback about error will assess the conditions under which transformational and transactional (contingent reward and management-by-exception active) leadership is likely to result in positive nurse perception of patient safety.

Creativity and Innovation

Historically, leadership was a function of command and controlling resources needed for innovation. The definitions of innovation are as numerous as the industries from which they are derived, though they share some common themes. In the early 20th

century Gabriel Tarde, a sociologist, was one of the earliest scholars of innovation, specifically diffusion research, describing the penetration of invention through imitation by individuals (Kinnunen, 1996). Tardes' reductionist view of innovation stemmed from his interest in sociology, whereby he considered innovation as a product of imitation by individuals who are socially influenced in micro-systems. Other notable innovation theorists of this period include Schumpeter (1934), an economist who described innovation through the lens of capitalism as creative destruction, a term that referred to the process of replacing old ways of doing things. Schumpeter is credited with the notion that innovation is successful implementation of an idea or invention to a product. While Tarde used the term *innovation* and *invention* interchangeably, Schumpeter distinguished innovation as a business decision by a firm to apply an invention that it sees as valuable or useful (Godin & Lucier, 2008, p. 35).

The literature on innovation had largely been devoted to the economic benefit of technology adoption as seen with Schumpeter (1939). Later, Rogers (1964) defines an innovation "as an idea, practice, or object that is perceived as new by an individual or other unit of adoption." Rogers' view also included the understanding of innovation through the perception of the idea or process as novel or new. Perception is contextual, and while one individual may perceive a new idea or product as valuable, another may see it as detrimental. Rogers advanced the concept of innovation to explicitly include the diffusion of new ideas within social systems and the adoption of those new ideas over time (referred to as imitation by previous innovations scholars) (Rogers, 2003).

West and Farr (1989) turned their attention to the contextual elements of innovation in organizations and advanced the understanding of innovation through group level dynamics. West & Farr defined innovation as "the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit role performance, the group, the organization or the wider society" (West & Farr, 1989, p. 16). This definition is particularly relevant to healthcare as it includes the social application of relative novelty and the wider society anticipated (intended) benefit (West & Anderson, 1996). Healthcare has a long history of history of applying innovations from other industries to improve the safety of patients. One example is the application of safety standards from the aviation industry, specifically incident reporting, as recommended in the 1999 IOM report *To Err is Human* to reduce patient harm. Since that 1999 report, error reporting has become a pillar of patient safety programs and enjoyed initial success. However, as healthcare has evolved, further innovation is needed to capture the dynamic nature of patient care (Mitchell, Schuster, Smith, Pronovost, & Wu, 2016). For the purpose of this study, the definition of innovation proposed by West & Farr (1989) will be utilized as a foundation for understanding innovation in healthcare.

Many researchers use creativity and innovation interchangeably when describing organizational outcomes (Yoshida, Sendjaya, Hirst, & Cooper, 2014). Amabile (1997) later expanded the concept of innovation to include creativity. A widely accepted definition states that innovation is the successful implementation of creative ideas within an organization (Amabile, 1983, Amabile, 1998, Amabile, Conti, Coon, Lazenby, &

Herron, 1996). This definition included the notion of creativity as part of the change process, which may lead to innovative results. Amabile (1998) included creativity as an antecedent of innovation and considered innovation as a competitive advantage in the constantly changing business environment. Thus, this position extends the understanding of innovation by including the notion that creative ideas or products are socially derived and must be implemented successfully to be innovative (Amabile, 1998, p. 87; Amabile, Conti, Coon, Lazenby, & Herron, 1996, p. 1155). Previous definitions identified innovation as a predetermined goal or objective (Schumpeter, 1934) while this definition outlines the concept of creativity as a starting point, not the end of the innovation process (Amabile, Conti, Coon, Lazenby, & Herron, 1996, p. 1155).

A review of the literature on creativity and innovation reveals that it has become increasingly difficult to distinguish clearly between creativity and innovation. Accordingly, definitions of creativity also vary among scholars; however, the most common definition suggests that a product or idea be (a) novel or original and (b) useful or adaptive (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Mumford, 2003; Gumusluoglu & Ilsev, 2009; Batey, 2012). Noting that innovation is complex and dependent on creative outcomes helps to differentiate innovation from creativity. Defining innovation is much more complicated as it involves many different scholars across a variety of industries. While both definitions of creativity and innovation incorporate elements of novelty, creativity is seen as a requirement of the process of innovation as the implementation of unique and valuable ideas (George, 2007). Increasing our understanding of creativity as a foundational condition for the process of

innovation provides leaders with the framework for change necessary for systematic healthcare improvement.

The concept of innovation has been defined in numerous ways in a wide variety of industries; it is generally thought of as the process of adopting new ideas or behaviors (Amabile, 1988; Rogers, 1995). Innovation has evolved over the last century and is the product of focused efforts to generate economic and technological advances in organizations. The modern understanding of innovation in the healthcare environment considers the socialization that is required for creative ideas to blossom into organizational innovations through change (Birken, Lee, Weiner, Chin, & Schaefer, 2013).

The benefits of creativity and innovation in organizations that are under-represented in the literature include enhanced problem-solving capability and improved organizational effectiveness (Rego, Sousa, Marques, & Pina e Cunha, 2012). A key problem for researchers and leaders of innovation is how to understand and respond to change, especially as it relates to patient safety (Crenshaw & Yoder-Wise, 2013). The nurse leader must be prepared to facilitate the process of innovation through clinical change that supports value over volume (Porter-O'Grady, 2014). Porter-O'Grady and Malloch (2014) describe leading innovation as a core requisite for contemporary leaders in healthcare organizations and the need for leaders to balance stability and standardization with continual course correction to ensure safe patient care. Further, innovation leaders are expected to define necessary roles, accountabilities, and expectations while simultaneously facilitating the evaluation of new ideas and flexibility

to adapt to new evidence based practices (Malloch & Porter-O'Grady, 2017, p. 85). Additional creative efforts to operationalize innovation and promote effective systems of adoption are necessary to reap potential economic benefits in the healthcare environment (Jani & Peter, 2013). If patient safety is to improve, a decisive focus on balancing competing priorities of innovation and current standardized approaches is necessary at the front-line of patient care (Zimmerman, Reason, Rykert, Gitterman, Christian, & Gardam, 2013).

Climate for Innovation

As previously described, creativity and thus innovation are influenced by numerous organizational factors, including climate (Jung, Chow, & Wu, 2003). Minimal work by scholars related to the contextual elements of the work environment existed until work by Amabile (1988) proposed that organizations that support employees in creative pursuits are more likely to produce innovative results. Encouragement, autonomy, resources, pressures, and organizational impediments were included in a conceptual model of climate of creativity developed by Amabile, Conti, Coon, Lazenby, and Herron (1996) to examine the contextual influence on creative behavior (pp. 1158). These contextual elements were found to be important measures of a climate of creativity which individuals were able to adapt to creative ideas, thus defining innovation as a process.

An innovation climate falls into two conceptual categories, cognitive schema approach and shared perceptions, though the two are not mutually exclusive and overlap exists (Anderson & West, 1998). The cognitive schema approach conceptualizes climate as the individual representations of employee's work environment expressed in terms of

psychological sense-making related to the proximal work environment (Anderson & West, 1998, p. 236). The shared perception approach takes a unit or group level approach to conceptualizing the climate as a function of interactions among members and creating a shared climate through socialization (Anderson & West, 1998, p. 237).

Scott and Bruce (1994) based their work on the conceptualization of a psychological climate by Schneider and Reichers (1983) as "meanings an individual attaches to a work context" (p. 21). The definition of innovation climate based on the work of Scott and Bruce (1994) is "a set of employee perceptions about the organization's work environment that encourages risk-taking behavior, allocates sufficient resources and provides a challenging work environment for using a creative approach at work" (Jaiswal & Dhar, 2015, p 32). Scott and Bruce (1994) tested a model of four systems that interacted to produce innovative behavior using individual attributes, leader behavior, workgroup relations, and climate for innovation. This work by Scott and Bruce (1994) is measured through a 22-question survey with two subscales: support for innovation and resource supply. Scott and Bruce (1994) observed that when employees have access to resources and perceive a supportive climate (flexibility, encouragement, tolerance for change), innovative behavior increased. Their results were early support for the role of leadership in creating a positive innovation climate and the impact on innovative behavior in organizations (Scott & Bruce, 1994, p. 601). These findings highlight that the relationship between leadership and employee creativity is partially dependent on a climate supportive of innovation.

In response to a perceived shortcoming in the innovation literature related to an organizational focus of innovation rather than a proximal, or group level focus, West (1990) conceptualized the team climate for innovation as a four-factor theory including vision, participative safety, task orientation, and support for innovation. Vision is conceptualized as a motivating force that encompasses: clarity (understandable), visionary nature (valued outcome to individuals that engenders shared commitment), attainability (goals must be reachable), and sharedness (accepted by individuals within the group). Participative safety involves the active participation of group members in decision-making and is motivated by an atmosphere of non-threatening interactions and ability to propose new ideas. Task orientation is a shared concern for excellence related to a shared vision and outcomes through individual and team accountability through supportive adoption and improvement to established policies, procedures, and methods. Support for innovation is the articulated and enacted support of attempts to introduce new and improved ways of doing things in the work environment (West 1990, p. 38; Anderson & West, 1998, p. 240-241). This theory of team climate for innovation postulates that innovation is enhanced if the vision is understood and valued, team members can propose new ideas without fear of criticism, there is discussion and debate about alternative solutions, and the perceived support of innovation in the organization (Anderson & West, 1998).

Transformational Leadership and Climate for Innovation

The culture and climate of an organization has been described as a significant factor that can promote or hinder organizational innovation and creativity (Rai, 2011).

Given the accelerated demand for innovation in healthcare (Hughes, Peltz, Conway, 2015), there has been an increase in research related to how leaders can impact creative outcomes (Anderson, Potočnik, & Zhou, 2014). Contemporary research on transformational leadership theory has been shown to impact a wide variety of outcomes related to an organization's ability to innovate including creativity (Wang, Kim & Lee, 2016), innovation climate (Jaiswal & Dhar, 2015), organizational learning (Noruzy, Dalfard, Azhdari, Nazari-Shirkouhi & Rezazadeh, 2013), debate among team members (Boerner, Eisenbeiss, & Griesser, 2007), empowerment (Han, Seo, Li, & Yoon, 2016) and work engagement (Breevaart, Bakker, Hetland, Demerouti, Olsen, & Espevik, 2014). Prior research has shown a direct relationship between transformational leadership and employee creativity (Kahai, Sosik, & Avolio, 2003). This is no surprise as one of the constructs within transformational leadership is intellectual stimulation whereby leaders encourage a team member's ability to question assumptions, reframe problems and propose creative new solutions through the concept of intellectual stimulation (Bass & Riggio, 2006). Further empirical research suggests that leaders serve as a creative conduit, stimulating creative performance, rather than the source of innovation (Mumford, Connelly, & Gaddis, 2003).

A 2013 study of 172 individuals working in 31 teams, Wang, Rode, Shi, Lou, and Chen used the MLQ-5X to predict the innovation climate (as measured by the innovation climate scale, Scott and Bruce, 1994). In their study, transformational leadership was significantly associated with innovation climate ($\beta = .37$, $p < 0.05$). Further analysis indicated that an innovation climate mediated the relationship between transformational

leadership and employee creativity through hierarchical linear modeling and a four-step mediation testing. This mediated relationship thereby helped to explain the contextual role of the innovation climate within the relationship between transformational leadership and employee creativity (Wang, Rode, Shi, Lou, & Chen, 2013, p. 347). These creative solutions have been attributed to the role that transformational leaders play in increasing the intrinsic motivation and the creation of a climate for innovation necessary for creative and innovative solutions (Jung, Chow, & Wu, 2003). This research is in line with contemporary creativity research that has shown that intrinsically motivated employees find work more satisfying and enjoyable and thus are more apt to engage in creative improvements (Amabile, 1993; Amabile, Hill, Hennessey, & Tighe, 1994; Yidong, & Xinxin, 2013; Liu, Jiang, Shalley, Keem, & Zhou, 2016).

As previously described, transformational leaders have been shown to impact the innovation climate and subsequently employee creativity. Wang, Rode, Shi, Lou, and Chen (2013) outlined the transformational leadership behaviors related to a climate for innovation and creativity as follows: idealized influence refers to the behaviors demonstrated by leaders to serve as agent of change and create role models by demonstrating the appropriate innovative behaviors necessary for organizational success; inspirational motivation refers to the future vision set forth by leaders and the alignment to employees' own values and goal related to the organizational mission, vision, and values; intellectual stimulation of leaders encourage new and creative approaches to daily problems and provide the support to act; individualized consideration encourages

continuous learning and provide support and encouragement to apply new skills within their daily jobs (p. 339).

Leaders have been shown to impact the environment conducive to employees' engagement in creative thinking, change, and, ultimately, improvement in care (Chung, Baum, Soares & Chan, 2014; Wang & Hsieh, C., 2013). A climate that is conducive to innovation is one in which employees can try out new ideas without fear of failure (Henker, Sonnentag, & Unger, 2015). For example, a study of 120 employees in 35 teams in the aerospace industry showed that the relationship between transformational leadership and adaptive performance was moderated by an innovation climate, suggesting that transformational leadership is more effective when supported by an innovation climate (Charbonnier-Voirin, El Akremi, Vandenberghe, 2010). There are examples in the economic and management literature that describe the benefits of a creative work environment, though empirical evidence is limited within the healthcare setting indicating more research is needed on the mediating role of innovation climate (Oldham & Cummings, 1996; George & Zhou, 2002; Mittal, & Dhar, 2015).

The Mediating Role of Climate for Innovation

Nursing is the largest representation of healthcare providers with more than 3.3 million active registered nurses in the US (Kaiser Family Foundation, October 2017). Because of the volume and impact of nurses at the point of service, it is logical to consider the impact their care will have on patients all across the full continuum of care in addressing critical health issues, as many of these health issues will require new solutions. However, since there is a paucity of nursing specific studies that demonstrates

leadership behaviors that are conducive to improved patient safety while also productive of a climate that values innovation, more study is needed. In addressing these issues of bridging innovation and patient safety, it has been suggested that nursing leadership in healthcare organizations needs to define strategies for facilitating and sustaining an environment conducive to creativity and innovation in order to shape the future of care during the acute episode and beyond the walls of their hospitals (Jing, Young, & Williams, 2014).

Schneider and Reichers (1983) state that when measuring climate, researchers should be specific as to the conceptual clarification of the type of climate being assessed. Therefore, this study uses climate as a mechanism to measure the innovative environment objectively, consistent with past literature that views team innovation climate as the psychological meaning individuals attach to environmental signals regarding expectations about innovative behavior (Scott & Bruce, 1994; Yuan & Woodman, 2010; Schneider, Ehrhart, & Macey, 2013).

Within this study, team innovation climate is conceptualized consistent with the theory of team climate for innovation proposed by Anderson and West (1998) encompassing vision, participative safety, task orientation, and support for innovation and hypothesized to be positively influenced by transformational and transactional (contingent reward and management-by-exception active) leadership behaviors. Transactional leadership sets a foundation of support for innovation through contingent reward and the recognition and reward of team members who provide safe patient care that also values new ideas and creative solutions. For example, a transactional leader

may support a team climate for innovation through contingent reward by providing incentives for participation in process redesign initiatives in which new solutions can safely be proposed and recognized. Further, support for innovation within the team climate for innovation is defined by enacted support by providing resources for innovative projects to be undertaken. This supportive innovation climate could be impacted by behaviors of contingent reward and providing tangible rewards such as monetary support for innovative projects. Conceptually, Anderson & West (1998) describe task orientation as a general commitment to excellence in performance. Transactional leadership, through the element of management-by-exception active, is expected to impact the team climate for innovation task orientation through monitoring performance regarding improvements to established practice, policy, and procedures.

Transformational leaders may encourage a team climate for innovation through individual consideration and inspirational motivation by encouraging team members to reexamine traditional assumptions about their job and form new solutions to the constantly changing clinical environment (Podsakoff, MacKenzie, Moorman, & Fetter, 1990). As a result, transformational leadership may enhance the critical thinking processes and create a climate which creative approaches to problem solving is valued and encouraged (Jung, Chow, & Wu, 2003). Further, transformational leaders may use idealized influence and inspirational motivation to emphasize a common vision of an environment of innovative patient care. The resulting team innovation climate is one that employees feel that innovation is supported and task orientation is high through the

shared vision and expectation of a future state that is defined by increased patient safety (Bass & Riggio, 2006, p. 6).

Empirically, transformational leadership has been shown to be related to the team climate for innovation in a limited number of studies including a 2002 study by Pirola-Merlo, Hartel, Mann, and Hirst, who conducted a mixed methods study of transformational leadership, project team performance, and team innovation climate. Transformational leadership was related to the four components of team innovation climate (vision $\beta=0.45$, $p < 0.01$; participative safety $\beta=0.30$, $p < 0.01$; task orientation $\beta=0.35$, $p < 0.01$; support for innovation $\beta=0.52$, $p < 0.01$). Further, the relationship between transformational leadership and project team performance was not directly correlated, but it did have a positive indirect effect through team climate for innovation. This study highlights the role transformational leadership in enhancing supportive behavior of a team climate for innovation in enhancing supportive behavior among team members to explore creative solutions and a shared commitment for the achievement of organizational objectives (Eisenbeiss, van Knippenberg, & Boerner, 2008).

If leaders are to enable creative and innovative solutions, they must actively enable an environment where employees feel safe to take the appropriate risks of acting outside standard practice (Carmeli, Sceaffer, Binyamin, Reiter-Palmon, & Shimoni, 2014). For example, Cheng, Bartram, Karimi, and Leggat, (2016) showed in a cross-sectional study that transformational leadership has a direct positive impact on the team innovation climate ($\beta = 0.16$, $p < 0.01$) and indirect positive relationship on the team innovation climate ($\beta = 0.80$, $p < 0.01$) through social identity. Further, transformational

leadership was significantly related to nurses' perception of quality of care through a shared social identity ($\beta = 0.32$, $p < 0.01$). This indirect relationship occurred when transformational leadership emphasized a collective mental model by articulating a shared mission and vision, while encouraging risk in pursuit of shared goals. These findings are theoretically consistent with the dimensions within transformational leadership of inspirational motivation (by generating a shared mission and vision) and intellectual stimulation (by stimulating creativity) (Boies, Fiset, & Gill, 2015) that enable conditions of the team innovation climate (Sarros, Cooper, & Santora, 2008).

Further research in nursing has shown that transformational leadership can improve the ability for nurses to respond creatively when faced with complex operational problems (Holden, Rivera-Rodriguez, Faye, Scanlon & Karsh, 2013). Weng, Huang, Chen, & Chang, (2015) conducted a nursing specific study of 439 front-line nurses exploring transformational leadership, patient safety climate, innovation climate, and nurse innovation behavior. Transformational leadership had a significant positive influence on nurse innovation behavior ($\beta = 0.23$, $p < 0.01$), patient safety climate ($\beta = 0.29$, $p < 0.01$), and innovation climate ($\beta = 0.35$, $p < 0.01$). The authors hypothesized that patient safety climate and innovation climate would mediate the relationship between transformational leadership and nurse innovative behavior. The results showed that when patient safety climate and innovation climate were included, the relationship between transformational leadership and nurse innovation behavior did not reach significant levels, ($p < 0.01$) and the β value became 0.13 and 0.25 respectively for safety climate and innovation climate and statistically significant ($p < 001$). Therefore, the model

showed a mediating effect on the relationship between transformational leadership and nurse innovation behavior with patient safety and innovation behavior (Weng, Huang, Chen, & Chang, 2015, p. 434).

Only one study could be found that examined transformational, transactional, and laissez-faire behaviors proposed by Bass (1985), as most studies focus on the transformational aspect of leadership behavior, thus limiting the understanding of how to impact a team climate for innovation. Rose (2014) sampled 95 individual manufacturing team members and used a quantitative, cross-sectional correlational design to examine transformational, transactional, and passive/avoidant leadership behavior and the impact on their team's climate for innovation. The results of Kendall's Tau-b correlation coefficients showed that both transformational and transactional leadership behaviors had a significant positive relationship with the components of team climate for innovation (participation, support, objectives, orientation). Specifically, the elements of contingent reward (.400 to .534) and management-by-exception active (.289 to .363) were statistically significant at $p<0.01$. The passive/avoidant behaviors of management-by-exception passive (.243, $p<0.01$) and laissez-faire (.178, $p<0.01$) had only a small but significant relationship with task orientation. The author suggests that this result may be due to the autonomy that the participants desire as members of research and development teams (Rose, 2014, p. 102). Transactional leadership behaviors of management-by-exception passive are understood as a functional mechanism to clarify job requirements through management-by-exception passive, shown to be detrimental to extra-role requirement necessary to be productive of creative performance (Pieterse, Van

Knippenberg, Schippers, & Stam, 2010). Further, the negative command and control basis of passive/avoidant leadership behaviors of management-by-exception passive and laissez-faire run contrary to the conceptualization of team innovation climate and the ability to enhance employee creativity through support for adoption of innovation (Bain, Mann, & Pirola-Merlo, 2001).

Team climate for innovation has been studied in a limited number of studies related to the health care environment. Bower, Campbell, Bojke, and Sibbald, (2003) explored the team climate for innovation in 42 primary care practices and found that team climate predicts diabetes management (regression coefficient 2.13, 95% CI 0.20 to 4.05, n=42) and overall patient evaluation of the practice (regression coefficient 1.35, 95% CI 0.43 to 2.26, n=42). These results strengthen the case for continued exploration of how the team innovation climate impacts health outcomes and its importance. Additional evidence related to the impact of team innovation climate on outcomes in the health care environment can be found in a study by Proudfoot et al., (2007) who showed that the team innovation climate was a significant predictor of both practitioner job satisfaction and patient rated quality of care. In a cross sectional study of 439 nurses, climate for innovation was been shown to be an important mediating variable between transformational leadership and organizational outcomes, including patient safety (Weng, Huang, Chen, & Chang, 2015). Transformational leadership was related to nurse innovation behavior ($\beta = 0.28$, $p < 0.001$). Further analysis showed that patient safety climate ($\beta = 0.29$, $p < 0.001$) and innovation climate ($\beta = 0.25$, $p < 0.001$) were also statistically significant predictors of nurse innovation behavior. Meditational analysis

showed that both patient safety climate and innovation climate had full mediating effects on the significant relationship between transformational leadership and nurse innovation behavior (Weng, Huang, Chen, & Chang, 2015, p. 434). This supports previous evidence that shows that when clinical leaders use transformational leadership both patient care (McFadden et al., 2009) and nursing innovation (Gumusluoglu & Ilsev, 2009) may be enhanced through a climate that supports innovation.

Consistent with previous research it is expected that transformational and transactional leaders can enhance the climate for innovation through ensuring the vision is understood and valued, team members are provided opportunity to debate and propose new solutions, and the team perceives support of innovation (Anderson & West, 1998). It is hypothesized that a positive team innovation climate inclusive of the elements of vision, participative safety, task orientation, and support for innovation, will enhance nurses' perception of patient safety.

As previously discussed, transformational leaders stimulate followers' willingness to act outside the standard norms to solve problems creatively through individual consideration and intellectual stimulation. Creativity is essential to the process of innovation (Anderson, Potočnik, & Zhou, 2014). In healthcare, innovation is necessary to improve patient care (Donaldson, Corrigan, & Kohn, 2000), yet innovation has been a difficult concept to study in an environment of order sets, clinical pathways, and standard operating procedures (Gilmartin, 1999; Shekelle et al., 2013). Avoidance of risk and harsh criticism of new ideas has been found to be destructive and an impediment to creativity and subsequent innovation (Amabile, Conti, Coon, Lazenby, & Herron, 1996).

It has been shown within the healthcare environment that a non-punitive environment has improved patient outcomes (Wang et al., 2014). Therefore, a team climate for innovation with high levels of participative safety where team members perceive their environment as non-judgmental and new ideas can be proposed without fear of negative criticism, nurses may, in turn, perceive patient care as safer due to their engagement in the creation of solutions (Anderson & West, 1998, p. 240). The ability to take risks is critical for employees to feel the freedom to produce creative solutions that may be outside the boundary of what is considered normal (Anderson, Potočnik, & Zhou, 2014; Hon, Bloom, & Crant, 2014). Nurses must be able to provide patient care in an environment where their willingness to take risks could shape their practice and improve the safety of their patients.

Further, a team climate for innovation is characterized by having a shared vision and objectives that are clear and attainable, which, in turn, engenders commitment and acceptance by team members (Anderson & West, 1998, p. 240). It is expected that nurses who share a vision of constant improvement and attainable patient safety goals will engender a supportive team climate for innovation that will increase the nurses' perception of patient safety. Task orientation within a team climate for innovation is a shared drive for excellence in relation to the vision and objectives characterized by debate of alternative solutions (Anderson & West, 1998, p. 240). Nurses who perceive high task orientation characterized by a climate supportive of adoption of improvements to established policies and procedures are expected to engender increased perception of safe patient care. Finally, support for innovation is both communicated verbally and in

policy and provides tangible resources in which teams perceive support from leadership and team members to develop new solutions creatively (Anderson & West, 1998, p. 240). Therefore, it is anticipated that when nurses have high levels of support for innovation through both articulated and tangible support for creative pursuits they will perceive patient care as safer.

While there have been studies exploring transformational leadership and team innovation climate, no studies exist that explore both transformational and transactional (contingent reward and management-by-exception active) and team climate for innovation and the impact on patient safety scores. The team climate for innovation is characterized by supportive behaviors by leaders and team members that facilitate the safe development and implementation of new ideas (Eisenbeiss, van Knippenberg, & Boerner, 2008). The research on team climate for innovation related to patient care highlights the need for a clear vision, participation in decision-making and support for new ideas, shared orientation to quality standards, and resources to try new ideas (Proudfoot et al., 2007). This study seeks to go beyond answering the question does leadership impact the perception of patient safety. The mediating role of team climate for innovation may provide a deeper understanding of how leadership impacts the nurses' perception of patient safety. If transformational and transactional leaders can engender high levels of the climate for innovation, it is expected that nurses will be engaged in active problem solving and thus perceive the patient care as safe, signified by high patient safety scores. Therefore, transformational leaders may engender high patient safety

scores above that of transactional leaders under high levels of innovation climate as proposed by the following hypotheses:

H3a: Team innovation climate will significantly mediate the relationship between transactional leadership and patient safety grade (AHRQ HSOPSC).

H3b: Team innovation climate will significantly mediate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H3c: Transformational leadership will explain variance in nurses' perception of team innovation climate over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active.

H3d: After controlling for the transactional behaviors of contingent reward and management-by-exception active, the relationship between nurse managers' transformational leadership and nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) will be mediated by team innovation climate.

Nursing is at the forefront of patient care either formally by implementing evidence based practice or informally by seeking to improve the patient care environment through real time interventions to avoid patient harm (Davidoff, Dixon-Woods, Leviton, & Michie, 2015). It is clear that nursing will play a key role in transforming the delivery of healthcare in this complex environment in which quality, cost, and experience of care must be addressed simultaneously (Lis, Hanson, Burgermeister, & Banfield, 2014). Reframing the healthcare value equation, including advancing safe care, will require leading in an environment conducive to creative solutions in order to impact health delivery by nurses and other health professionals positively. Thus, a greater

understanding of how nursing leaders can transform nursing practice through a team innovation climate essential to further enhance the safe patient care within our health system.

Synthesis of Conceptual Framework

In the nearly two decades since the landmark 1999 Institute of Medicine (IOM) report *To Err is Human,* which spawned the modern patient safety movement, leaders have focused on building a culture of patient safety with mixed results on patient safety outcomes (Hewitt, Goldstein, Isenberg, Phillips, & Cowan, 2017). As previously described, the patient safety literature has established a correlation between transformational and transactional leadership and improved patient outcomes (Wong & Cummings, 2007; Wong, Cummings, & Ducharme, 2013). Research shows that effective safety leadership is both transformational and transactional (Clarke, 2013, p. 24), yet no studies could be found related to the augmentation effect of transformational leadership over transactional leadership in relation to patient safety outcomes.

While transformational leadership has garnered support in the patient safety literature, researchers have shown less interest in transactional leadership despite the theoretical foundations and support for the augmentation effect of transformational and transactional leadership (Bass, 1985). Theoretically, Bass (1985) did not agree with the conceptualization of Burns (1978) who viewed transactional and transformational leadership as opposite poles of a leadership continuum (Judge & Piccolo, 2004, Bass & Riggio, 2006). Fundamental to the transformational-transactional theory proposed by Bass (1985) is the extent to which "transformational leadership builds on the

transactional base in contributing to the extra effort and performance of followers" (Bass, 1998, p. 5). This fundamental difference by Bass (1999) asserts that transformational leadership is built on the foundation of transactional leadership and further argues that the most effective leaders are both transformational and transactional (Judge & Piccolo). For example, when leaders display transactional leadership behaviors by providing resources, incentives, and rewards to promote patient safety employees' perception of patient safety is increased (Barling, Loughlin, & Kelloway, 2002).

Congruent with the augmentation effect, transformational leaders value the importance of rewards but seek to motivate beyond what is expected by appealing to the emotional and intellectual needs of employees (Doody & Doody, 2012). Transformational leadership can augment the effectiveness of transactional leadership by promoting a better understanding of patient safety, inspiring employees to exceed expectations, and go beyond meeting safety targets (Conchie, Taylor, & Donald, 2012; Clarke, 2013, p. 26). For example, transformational elements of idealized influence should encourage safety through the leaders behavior and actions geared toward patient safety efforts; leaders with high inspirational motivation embolden employees' patient safety efforts and motivate to the highest patient safety goals; intellectual stimulation encourages employees to participate in improvement efforts and suggest creative approaches to patient safety leading to innovation; leaders who display individualized consideration seek to promote individual well-being and personal goals as it relates to ensuring a safe patient care environment (Clarke, 2013, p. 26). In contrast, passive leadership (management by exception-passive and laissez-faire) has been shown to

contribute to less safety compliance and participation leading to negative safety outcomes including workplace injury (Kelloway, Mullen, & Francis, 2006).

In the context of patient safety, communication and engagement of leadership has been shown to improve the culture of patient safety (Sexton et al., 2014; Ammouri, Tailakh, Muliira, Geethakrishnan, & Al Kindi, 2015). Transformational leadership has been shown improve communication and lead to a better understanding of patient safety issues (Conchie, Taylor & Donald, 2012). In regard to patient safety, active transactional leaders through management by exception-active and contingent reward, communicate standards, expectations, and lay a foundation of rule-based compliance. In this regard, communication openness and communication about error should strengthen the relationship between transactional leadership and patient safety scores when communication about error is high specifically related to the proactive monitoring of performance and rewards for meeting patient safety goals (Clarke, 2013). Further, transformational leaders articulate a vision of patient safety and foster organizational change which is required for creating a culture of safety and implementing quality initiatives (Kotter, 1990, McFadden, Stock, & Gowen, 2014). Thus, communication elements of patient safety may moderate the relationship between transformational leadership and nurses' perception of patient safety when employees informed about patient safety and errors.

If leaders are to enable creative and innovative solutions and improve patient safety, they must actively enable an environment where nurses feel safe to take the appropriate risks of acting outside standard practice (Carmeli, Sceaffer, Binyamin,

Reiter-Palmon, & Shimoni, 2014). The team climate for innovation (Anderson & West, 1998) has been shown to be an important mediating variable between transformational leadership and patient safety (Weng, Huang, Chen, & Chang, 2015). It is expected that transactional leadership sets a foundation of support for innovation through contingent reward and the recognition and reward of team members who provide safe patient care that also values new ideas and creative solutions. Transactional leadership, through the element of management-by-exception active, is expected to impact the team climate for innovation task orientation through monitoring performance regarding improvements to established practice, policy, and procedures.

Nurses are in constant contact with their environment and are expected to adapt to rapidly changing clinical situations (Orchard, Sonibare, Morse, Collins, & Al-Hamad, 2017). The climate for innovation is critical to providing nurses with the ability to respond creatively and to take appropriate risk outside of standard practice (Carmeli, Sceaffer, Binyamin, Reiter-Palmon, & Shimoni, 2014). Transformational leaders may encourage a team climate for innovation through individual consideration and inspirational motivation by encouraging team members to reexamine traditional assumptions about their job and form new solutions to the constantly changing clinical environment (Podsakoff, MacKenzie, Moorman, & Fetter, 1990). As a result, transformational leadership may enhance the critical thinking processes and create a climate which creative approaches to problem solving is valued and encouraged (Jung, Chow, Wu, 2003). Further, transformational leaders may use idealized influence and inspirational motivation to emphasize a common vision of an environment of innovative

patient care. The resulting team innovation climate is characterized by a shared concern for excellence (task orientation) defined by high perception of patient safety scores and promulgated by support for innovation (Bass & Riggio, 2006, p. 6). While there have been studies exploring transformational leadership and team climate for innovation, no studies exist that encompass both transformational and transactional (contingent reward and management-by-exception active), and how this climate can impact nurses perception of patient safety. If transformational and transactional leaders can engender high levels of the team climate for innovation, it is expected that nurses will be engaged in active problem solving and thus perceive the patient care on their unit as safe as signified by high patient safety scores.

Summary

Many nurses work in large, complex organizations that are designed with a formal hierarchy and authoritative structures that exist to maintain performance according to policy and procedures. Safety related policies and procedures have been implemented and serve as a baseline for safe patient care. These formal structures emphasize security, but they may have an unintended consequence of censoring creativity and thus innovation in patient care (Ohlinger, Brown, Laudert, Swanson, & Fofah, 2003). The main role of the nurse is to promote the wellness and safety of the patient as his or her foremost responsibility. Within the clinical environment, problems often evolve over time as nurses take action based on the patient's changing clinical picture, making the nursing role inherently complex. Improvement in preventable harm to patients requires leaders

promoting innovation and engagement of front-line clinicians while avoiding a rigid and prescriptive atmosphere where appropriate (Wachter, Pronovost, & Shekelle, 2013).

Transactional and transformational leadership plays a critical role in the creation of an environment productive of creative solutions that require divergence from the status quo and challenge current mental models that drive behavior and subsequent organizational outcomes (Rodrigo, 2011). However, when calculated risks are undertaken, it is assumed that the provider understands that the outcome may be unintended. Research by Schultz, Zippel-Schultz, and Salomo, (2012) found that when hospital managers encouraged staff to take risks and question current practices, substantial innovations were more likely to occur. Without this ability to undertake calculated risks, creativity will be dampened. While leadership has been shown to be a driving force for both innovation and patient safety, little is known about the interaction of the three variables. Thus, there is an immediate need to further explore the specific transformational and transactional behaviors of front-line leaders that have been shown to enhance innovation and postulate that those behaviors in addition to communication openness and communication and feedback about error could further impact patient safety.

This study seeks to explore the augmentation effect of transformational as related to patient safety scores. Further, this study seeks to expand the literature on when and why transformational and transactional leadership impacts patient safety through exploring moderating and mediating variables. Specifically, this study predicts that the relationship between transformational and transactional leadership and patient safety

scores is stronger when communication openness and about error is high. Lastly, the mediating role of team climate for innovation in nursing units may help explain how and why transformational and transactional leadership (contingent reward and management-by-exception active) impacts patient safety scores.

The literature review has defined the need for continued exploration of the augmentation effect of transformational and transactional leadership (contingent reward and management-by-exception active) as it relates to the positive impact on patient safety scores. Chapter III will describe hypotheses and the methods used to explore the relationships among variables. A review of the survey methodology and sample will be discussed.

CHAPTER III

The purpose of this research is to examine the role that leadership plays in bringing together communication elements of a safety culture and the team climate for innovation that support and enable staff to engage creatively in improving the safety of patient care, beyond the policies and procedures route to patient safety. There has been little research related to the augmentation effect of transformational leadership that builds on a base of transactional leadership related to the perception of patient safety. More specifically, in the context of patient safety, transformational leaders are expected to engage employees in change and shift obsolete patient care practices care through communication about error and the stimulation of a climate for innovation that generates high perception of patient safety among nurses. Chapter III will provide a thorough evaluation and outline of the methodology for this study including the hypotheses, study design and data collection methods, population, sample, and review of the survey instrumentation.

Hypotheses

Based on the relationships illustrated in Figure 1 and the literature review in Chapter 1, the following hypotheses are proposed:

H1a: Transactional leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC).

H1b: Transformational leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC).

H1c: Transformational leadership will explain variance in nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active.

H2a: Nurses' perception of feedback and communication about error will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H2b: Nurses' perception of feedback and communication about error will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H2c: Nurses' perception of communication openness will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H2d: Nurses' perception of communication openness will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H3a: Team innovation climate will significantly mediate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H3b: Team innovation climate will significantly mediate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H3c: Transformational leadership will explain variance in nurses' perception of team innovation climate over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active.

H3d: After controlling for the transactional behaviors of contingent reward and management-by-exception active, the relationship between nurse managers' transformational leadership and nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) will be mediated by team innovation climate.

Appropriateness of Research Design

This research uses a cross-sectional, descriptive correlational design aimed at examining the augmentation effect of nurse manager transformational and transactional leadership on front-line nurse-rated patient safety score. Further, this study seeks to investigate how, if any, does communication about patient safety (as part of the patient safety culture) and the team innovation climate influence the relationship. The variables were measured through the use of three validated and reliable survey instruments: The Multifactor Leadership Questionnaire (MLQ Form 5X), the Team Climate Inventory-short (TCI), the AHRQ Hospital Survey on Patient Safety Culture (feedback and communication about error, communication openness, and patient safety grade) which are all appropriate for collecting data about the perceptions of front-line nurses.

Sample and Setting

The setting for this study is a nationally recognized academic medical center, nationally-verified Level 1 Trauma Center, Magnet hospital for nursing, and serves an area of 30 counties and a population of nearly 750,000 persons in the southern United States. As one of the largest facilities in the region, it has over 4,500 employees, including over 957 nurses across 60 units. It is licensed for 637 beds, which include pediatrics, trauma, medical surgical, and cardiac surgery. The Magnet status of this

academic medical center demonstrates consistent, high quality patient outcomes through excellence in nursing practice.

A convenience sample of all staff registered nurses from the organization with direct patient care responsibility was surveyed for this research. This study anticipated recruiting approximately 300 nurses based on a response of 5 nurses per unit (60 units). A convenience sample is desirable due to the nature of the descriptive study, though not generalizable to outside this sample (Creswell, 2014).

Inclusion and Exclusion Criteria

Registered nurses who work 20 or more hours per week, are fluent in English, and have direct care responsibility were eligible for participation in this study. The IOM has identified patient safety as a key clinical issue for improvement, which incorporates many settings, including the ambulatory, long term care, and acute care units (Kohn, Corrigan, & Donaldson, 2000). PRN (casual) nurses were excluded from this study based on the theoretical assumptions of Anderson and West (1998) necessary for interaction within a workgroup, defined as "group within which their day-to-day tasks and activities at work are carried out" (p. 237). Duplicate surveys were excluded from the sample.

Sampling Method

Recruitment was done through purposive sampling for this study, as the group of interest is front-line nursing within a single Academic Medical Center. Given the limited number of units, all eligible front-line nurses with direct patient care responsibility within the organization constituted the sample. Participation was voluntary, and participants completed an informed consent statement presented at the time they entered the

electronic survey portal, and consent was obtained prior to commencing the survey. Upon agreeing to participate in the survey, two questions determined eligibility:

1. Are you a Registered Nurse who works 20 or more hours per week?

a. Yes

b. No

2. Do you have direct patient care responsibility as part of your daily work?

a. Yes

b. No

If either of the two eligibility questions were answered "No", the employee was not able to progress any further in the survey and the survey ended.

Data Collection, Management, and Ethics

Approval was obtained from the Institutional Review Board (IRB) at both Arizona State University and the academic medical center, where the research was completed. The ability to include all eligible units in this study is a key to soliciting an adequate number of responses overall and within each unit. As such, a study coordinator who is an employee with the academic medical center assisted with recruitment. The survey distribution was carried out via an electronic survey. For the electronic version of the survey, an initial email was sent out by the Chief Nursing Officer to the front-line nursing staff with a brief description of the research objective and link to the survey. A follow up email was sent weekly for the next four weeks. For survey delivery, a procedure outlined by the AHRQ for survey delivery of the Culture of Patient Safety was

followed (Sorra, et al., 2016, p. 44). A detailed outline of the procedure follows in Table 1.

Table 1

Data Collection Protocol

Target Date	Activity
Two weeks prior to survey distribution	Attend nursing leadership meetings to describe the purpose of the study*. Provide flyers for break room. Survey reminder note cards provided at time for distribution to units via nursing Directors with a specific start date.
One week prior to data collection	Email pre-notification sent from the CNO with a message about the survey.
Beginning week 1: start of data collection	Email the survey invitation with a description of the study and a link to the online survey. Visit units and deliver hard copy reminder note card with survey link to unit managers for distribution via unit medical receptionist if not already delivered via Department Directors.
Beginning week 2	Distribute 1st email reminder notice to all front-line nurses. A prepared reminder notice sent via email to all front-line nurses.
Beginning week 3	Distribute 2nd email reminder notice to all front-line nurses. Calculate preliminary response rate. If the rate is high enough, close out data

	collection at the end of week. To increase data collection, extend data collection by one week and distribute 3rd reminder to all front-line nurses.
Beginning week 4-extra week	Distribute last email reminder notice to all front-line nurses to increase data collection.
*Nursing leadership meetings include both executive nursing at the Director level and above, unit manager meetings, and shared governance at the unit level.	

Additional data collection considerations include the following:

- Nurse managers received a pre-notification email regarding the purpose of the study and assurance that their confidentially is maintained in data reporting.
- Flyers were posted in break rooms with a brief description and a link to the online survey.

Study data were collected and managed using REDCap electronic data capture tools hosted at Vanderbilt University. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources (Harris et al., 2009).

Data was collected anonymously without ties to origin of the participant other than the unit surveyed. The nurse manager is inherently identified only to the researcher through identification with the unit and thus was not anonymous in relation to the manager's identity. However, confidentiality of the nurse manager was maintained, as results were coded by number rather than by unit so a particular manager can't be identified based on the results. All electronic surveys were password protected. As this study was entirely optional, nurses could choose not to participate or withdraw at any time. However, since the surveys were anonymous and coded by number rather than by name, once a survey is submitted it was impossible to remove if someone requested to withdraw. No requests were made to withdraw from the study. Obtaining high response rates from front line health care professionals is a well-known challenge in survey research (Cunningham et al., 2015). This study employed two different mechanisms to limit non-response bias and increase response rates: incentive and frequent messaging to nurses as described in Table 1. The use of incentives has been effective at reducing refusal to participate while frequent messaging has been shown to reduce the non-contact rate (Singer & Ye, p. 116). Based on recommendations by previous patient safety research utilizing survey questionnaires to increase response rate, this study included an incentive for participation (Huang et al., 2010, p. 158). The use of incentives in web-based surveys is more likely to increase response rate (Singer & Ye, 2013) therefore this study utilized an incentive in the form of a lottery to increase response rate and reduce non-response bias (Zhang, Lonn, & Teasley, 2016). Each nurse who completed the survey received a message after completion of the last question that informed him or her

of a lottery drawing for a $50 Visa gift card (four gift cards given away). The concluding statement informed the nurse the following:

> Thank you for completing this survey. If you would like to participate in the drawing for the four $50 Visa gift cards please email patientqualitycarestudy@gmail.com. In the subject line please include COMPLETED SURVEY. Winners will be contacted via email one week after the conclusion of the study.

Survey Instruments

AHRQ Hospital Survey on Patient Safety Culture

As previously highlighted, one outcome measure of patient safety is the nurses' perception of patient safety that has been measured through the nurse-rated safety grade in the AHRQ Hospital Survey on Patient Safety Culture (HSOPSC). The patient safety grade as measured by the HOSPSC has been shown to be a valid predictor of quality of care (Sorra et al., 2016; Famolaro et al., 2018). Hospitals in which nurses rate the care as "excellent" have lower rates of serious complications than hospitals whose care is rated as "very good" or "acceptable" (Birkmeyer, Finks, & Greenberg, 2013). The Consumer Report Hospital Safety Score is the mean of five publicly reported and standardized measures, including hospital acquired infections, readmissions, communication about medication at discharge, appropriate use of scanning, and mortality. Smith, Yount, and Sorra (2017) analyzed the relationship between the HSOPSC and Consumer Reports Hospital Safety Score. In the study, the number of staff giving their hospital a patient

safety grade of "excellent" or "very good" was related to higher Consumer Reports Hospital Safety Scores ($\beta = 0.22$).

The AHRQ Hospital Survey on Patient Safety Culture (HSOPSC) was originally developed by Westat (a private research company) and contains 42 items grouped into 12 composite measures. In addition to the 12 composites, there are two outcome questions where respondents are asked to provide an overall grade on patient safety in their specific work unit or area and the number of events they have reported over the past 12 months (Sorra & Nieva, 2003, p. 3). A 2010 psychometric analysis of the HSOPSC showed acceptable reliability on all questions ($\alpha = 0.62$-0.85) except for the staffing dimension ($\alpha = 0.62$) (Sorra & Dyer, 2010).

As outlined in table 2, the safety culture composites of the HSOPSC include teamwork within units, teamwork across units, supervisor expectations and actions promoting safety, organizational learning, management support for patient safety, overall perceptions of patient safety, feedback and communication about error, communication openness, frequency of events reported, staffing, handoff and transitions, and non-punitive response to error. Within this study two composites from the HSOPSC were used for data reporting and analysis: feedback and communication about error and communication openness. These two composites make up the "Communication" section of the AHRQ Culture of Patient Safety Survey. Additionally, this study used the nurse-rated patient safety score (HSOPSC) as an outcome variable for patient safety.

The composite of feedback and communication about error is an average of three items intended to measure the perception of information related to errors and prevention

activity (Famolaro et al., 2018). Communication and feedback about error is defined as "the extent to which staff are informed about errors that happen, are given feedback about changes implemented, and discuss ways to prevent errors" (Famolaro et al., 2018, p. 4). Additionally, feedback and communication about error has also been shown to have acceptable reliability (Cronbachs' Alpha=0.78) as a composite of the HSOPSC that includes three items. An example item is "We are given feedback about changes put into place based on event reports." Responses are a five-point Likert scale (Never, Rarely, Sometimes, Most of the Time, Always). Further, the psychometric analysis of the HSOPSC indicated a statistically significant relationship (0.59, $p<0.05$) between patient safety grade and feedback and communication about error, highlighting the importance that nurses place on communication and the ability to improve in relation to how safe they perceive their work environment (Sorra & Dyer, 2010).

The AHRQ HSOPSC composite communication openness is comprised of three items indented to measure the perception of staff ability to question safety practices and challenge those in leadership positions. Communication openness is defined as, "the extent to which staff freely speak up if they see something that may negatively affect a patient and feel free to question those with more authority" (Famolaro et al., 2018, p. 4). Communication openness has also been shown to have acceptable reliability (Cronbachs' Alpha=0.73) as a composite of the HSOPSC that includes three items. An example question is "Staff will freely speak up if they see something that may negatively affect patient care." Responses are a five-point Likert scale (Never, Rarely, Sometimes, Most of the Time, Always). A psychometric analysis of the HSOPSC by Sorra and Dyer

(2010) indicated a statistically significant relationship (0.56, $p<0.05$) between patient safety grade and communication openness. This indicates that nurses value the ability to communicate with leadership directly when patient care may be negatively affected.

The survey also includes two outcome questions, including a patient safety grade for the work unit (A-Excellent, B-Very Good, C-Acceptable, D-Poor, E-Failing) and an indicator of events reported (No events, 1 to 2 events, 3 to 5 events, 6 to 10 events, 11 to 20 events, or 21 events or more). As previously discussed, this study utilized patient safety grade as an indicator of the quality of patient care consistent with research indicating the variable as a reliable measure of overall patient care (Smith, Yount, & Sorra, 2017). This question is intended to measure the perception of safety on a targeted unit. The patient safety grade items are worded as "Please give your work area/unit in this hospital an overall grade on patient safety." The scale is a five-point Likert scale (A-Excellent, B-Very Good, C-Acceptable, D-Poor, E-Failing).

The AHRQ culture of patient safety survey was not administered in its entirety, however the recent results from the hospital are available by unit for any post hoc analysis. As such, this research is specifically targeted to gaining a better understanding of how communication openness and communication and feedback about error can impact the relationship between transformational and transactional leadership and nursing perception of patient safety. As the literature review in chapter two outlined, communication openness and communication and feedback about error has been shown to be vital to improved surgical outcomes (Fan et al., 2016) and perceptions of patient

safety (Ammouri, Tailakh, Muliira, Geethakrishnan, & Kindi, 2015; Sorra & Dyer, 2010).

Table 2

AHRQ Hospital Survey on Patient Safety Culture Composite Definitions

Section of AHRQ Survey	**Patient Safety Culture Composite**	**Definition: The extent to which....**	**Number of Survey Items**
SECTION A: Your Work Area/Unit	Overall perceptions of patient safety	Procedures and systems are good at preventing errors and there is a lack of patient safety problems	4
	Teamwork within units	Staff support one another, treat each other with respect, and work together as a team	4
	Staffing	There are enough staff to handle the workload and work hours are appropriate to provide the best care for patients	4
	Nonpunitive response to error	Staff feel that their mistakes are not held against them, and mistakes are not kept in their personnel file	3
	Organizational learning--Continuous improvement	Mistakes have led to positive changes and changes are evaluated for their effectiveness	3
SECTION B: Your Supervisor/Manager	Supervisor/manager expectations and actions promoting safety	Supervisors/managers consider staff suggestions for improving patient safety, praise staff for following patient safety procedures, and do not overlook patient safety problems	4
SECTION C: Communications	Communication openness	Staff will freely speak up if they see something that may negatively affect patient care, and feel free to question those with more authority	3
	Feedback & communication about error	Staff are informed about errors that happen, given feedback about changes put into place based on event reports, and discuss ways to prevent errors	3
SECTION D: Frequency of Events Reported	Frequency of events reported	Mistakes of the following types are reported:	3
		1) Mistakes caught and corrected before affecting the patient, 2) mistakes with no potential to harm the patient, and 3) mistakes that could harm the patient, but do not	

SECTION E: Patient Safety Grade	Patient safety grade	Outcome items intended to provide an overall grade on patient safety for their work area/unit	1
SECTION F: Your Hospital	Teamwork across units	Hospital units cooperate and coordinate with one another to provide the best care for patients	4
	Handoffs & transitions	Important patient care information is transferred across hospital units and during shift changes	4
	Management support for patient safety	Hospital management provides a work climate that promotes patient safety and shows that patient safety is a top priority	3
SECTION G: Number of Events Reported	Number of adverse events reported	Outcome item intended to measure the number of reports on adverse events or safety issues filed in the past 12 months.	1
Adapted from: AHRQ Hospital Survey on Patient Safety Culture: User's Guide (Sorra et. al., 2016, p. 3, 35-42)			

Multifactor Leadership Questionnaire (MLQ Form 5X)

Transformational leadership has been established as a key component within Magnet hospitals (ANCC, 2017) and the most researched theory of leadership across all disciplines, including overwhelmingly in nursing (Dinh, Lord, Gardner, Meuser, Liden, & Hu, 2014; Wong, Cummings, & Ducharme, 2013). The most frequently cited instrument to measure transformational and transactional leadership is the Multifactor Leadership Questionnaire (MLQ Form 5X) (Antonakis, Avolio, & Sivasubramaniam, 2003). This is a proprietary instrument and approval was obtained from Mind Garden, Inc. In 2004 the MLQ-5X was revised from it original form (Avolio & Bass, 1995) to increase the validity. This measure of leadership was used for this study since the MLQ-

5X has been extensively researched, tested, and validated to measure the leadership characteristics of transformational, transactional, and passive/avoidant leadership (Bass & Avolio, 2004). The MLQ-5X is comprised of 45 items, 36 items that measure the characteristics of transformational leadership, transactional leadership, and passive/avoidant through nine subscales of leadership (five transformational leadership; two transactional, two passive/avoidant). An additional nine items are a measure leadership outcome that will not be used in this study because the focus is on leadership factors. The MLQ-5X is measured with a five-point Likert scale ranging from 0 identified as not at all to 4 identified as frequently, if not always. Example questions include "Provides me with assistance in exchange for my effort" and "Re-examines critical assumptions to question whether they are appropriate."

The five dimensions of transformational leadership include idealized influence (measured as attributed and behavior), inspirational motivation, intellectual stimulation, and individual consideration (Judge & Piccolo, 2004). The transformational leadership scales' inspirational motivation (IM) represents the articulation of a vision by the leader to followers, and, in turn, followers are motivated to achieve that vision. Idealized influence (attributed) (IIA) refers to the perception of charisma of the leader by followers and if the leader is perceived as confident powerful, and ethical. Idealized influence (behavior) (IIB) is related to the behaviors of the leader that are focused on values and beliefs by followers that are central to the organizational mission. Intellectual stimulation (IS) refers to the actions of the leader that enable followers to think creatively to solve difficult problems. Individual consideration (IC) refers to the behavior of the leader

directed toward mentoring and supporting the individual needs of followers, thus helping followers meet their full potential (Antonakis, Avolio, & Sivasubramaniam, 2003, p. 264).

The transactional leadership scales include contingent reward (CR) that is focused on role clarification and task-oriented exchange with followers and providing material and/or psychological rewards for achievement of goals. Management-by-exception active (MBEA) is the corrective actions by the leaders to ensure that policy and procedure are followed and standards are met. Management-by-exception passive (MBEP) is a situation in which the leader only intervenes only after mistakes are made or compliance with standards, policy, and procedure is not met. Laissez-faire leadership (LF) is non-leadership or the absence of leadership when the leader avoids responsibility and taking action and is considered ineffective (Antonakis, Avolio, & Sivasubramaniam, 2003, p. 265).

The current nine-factor model of the MLQ-5X is a product of multiple revisions based on expert recommendation of leadership scholars and confirmatory factor analyses (CFA) (Bass & Avolio, 2004; Antonakis, Avolio, & Sivasubramaniam, 2003, p. 266; Avolio, Bass, & Jung, 1995, 1999). The MLQ-5X has been shown to be a reliable and valid instrument with Cronbach's alpha for each of the subscales ranging between 0.69 and 0.83 (Bass & Avolio, 2004). In line with the previous validity findings (Bass & Riggio, 2006), a 2008 study by Muenjohn and Armstrong that evaluated the structural validity of the MLQ-5X showed that the current nine-factor model best represents the theoretical constructs and although the transformational constructs were highly

correlated, they still distinctly measured their individual constructs. More recently, Xu, Wubbena, and Stewart (2016) investigated the factor structure of the MLQ-5X in K-12 school principals with Cronbach's alpha for the subscales that ranged from 0.499 to 0.777. The CFA analysis of the construct validity suggested that the nine-factor model of the MLQ-5X provided the best fit for the data consistent with previous research.

Furthermore, Bass and Riggio, (2006, p. 25) suggest that it is acceptable to aggregate the first order factors to create second order factors of transformational leadership or remain as first order factors for transactional elements. Thus, based on previous research, a second-level factor index was created for the transactional and transformational leadership subscales based on adding up and averaging each item within each factor (Judge & Bono, 2000; Antonakis, Avolio, & Sivasubramaniam, 2003; Shin & Zhou, 2003; Judge & Piccolo, 2004; Gumusluoglu & Ilsev, 2009).

The Team Climate Inventory

The team climate inventory (TCI) is a 38-item survey including four scales of vision, participative safety, task orientation, and support of innovation (Anderson & West, 1998). The four factors do not directly measure innovation, rather refer to the aspects of the organizational climate that enhance the ability of organizations and teams to develop and implement creative solutions (Kaiser, Ekelund, Patras, & Martinussen, 2016). The TCI has been used across various disciplines, including healthcare, with acceptable validity and reliability (Kaiser, Ekelund, Patras, & Martinussen, 2016). A 2008 psychometric analysis of the TCI confirmed the validity, reliability, and discrimination capacity of the TCI with teams of front-line nurses and quality

improvement teams in an acute care medical center (Ouwens, Hulscher, Akkermans, Hermens, Grol, & Wollersheim, 2008).

As established by West (1990), team innovation climate refers to elements of a shared work environment theorized to enhance team innovation and creativity through four factors including vision, participative safety, task orientation, and support for innovation. Within this study, the team innovation climate is measured using the team climate inventory (TCI) short form (Kivimaki & Elovainio, 1999) based on the theoretical conceptualization by West (1990). The TCI-short is a 14-item inventory that is based on the original 38-item inventory by Anderson and West (1998). The TCI-short has been used in various organizational settings, including in healthcare (Kivimaki et al., 2007). The TCI-short includes subscales that are broken down to four parts: vision (four items), participative safety (four items), task orientation (three items), and support for innovation (three items). Participants use a five-point Likert scale from 0, not at all, to 4, a very great extent.

The TCI-short was developed and tested by Kivimaki and Elovainio (1999) as a shorter alternative to the longer TCI version by West and Anderson (1998). The correlations between scores from the short version and original TCI ranged from 0.85 to 0.97, indicating that the short version is consistent with the original, longer version (Loo & Loewen, 2002). Additionally, the four shortened scales of the TCI were shown to be reliable with high Cronbach's alpha that ranged between 0.70-0.82 and 0.90-0.93 at two time points respectively. Additionally, the TCI-short has also been confirmed as a reliable measure to team innovation climate in the healthcare setting by Strating and

Nieboer (2009) who tested the factor structure at two time points with quality improvement teams across various disciplines including nursing and social work. Cronbach's alpha ranged between 0.73-0.80 at baseline and 0.79-0.84 in follow up measurements. Examples of questions include "In this work unit we take the time needed to develop new ideas" and "People in the work unit cooperate to help develop and apply new ideas." Based on the work by McMurray, Islam, Sarros, and Pirola-Merlo, (2012) the team innovation climate was analyzed by aggregating the four individual subscales and creating an average (Kivimäki et al., 2007; Goh & Eccles, 2009).

Additional Data Collected

Demographic data collected includes gender, age, and tenure with organization, tenure with unit, education level, and unit type. Identification of control variables is essential in being able to discern alternative justifications for findings (Becker, 2003). Creativity research has shown that age, gender, and education can potentially influence creative and innovative behavior (Amabile, 1988; Richter, Hirst, Van Knippenberg, & Baer, 2012; Jaiswal & Dhar, 2015). These control variables have been used in previous research utilizing the TCI and MLQ-5x in the healthcare setting (Somech & Drach-Zahavy, 2013). Lastly, nursing unit name (example: 9 south, 7 north, 5 south, Cardiac Surgery Clinic) and type was collected (ICU, Medical/Surgical, Outpatient) as a means to differentiate the type of work environment.

Table 3

Survey Breakdown

Survey Topic	Number of Survey Questions
Pre-screen Questions	2
Demographic Questions	8
Multifactor Leadership Questionnaire (MLQ) 5x short form	36
Team Climate for Innovation Scale (TCI) short	14
Communication Openness (AHRQ HSOPSC)	3
Communication and Feedback About Error (AHRQ HSOPSC)	3
Patient Safety Grade (AHRQ HSOPSC)	1
Total number of survey questions	**67**

Power Analysis

The total number of nurses in the organization available for this study is 957. It was anticipated that approximately five nurses from each of the 60 units would respond for a total response of 300 nurses. This results in a response rate of 31 percent. There were a total of 210 respondents to the survey for a response rate of 22 percent. This was lower than the expected response rate of 30 percent. Recent nursing research cites frequent response rates of 20 percent to 30 percent in survey research (Cooper & Brown, 2017; Hewko, Brown, Fraser, Wong, & Cummings, 2015; Priesack & Alcock, 2015). Additionally, nurses at the medical center have recently completed a system wide engagement survey. It is possible that there was an element of survey fatigue that contributed to the low response rate.

Regarding power, a statistical power of 0.80 is normally used in quantitative studies. We need to achieve at least this power in order to reject the null hypothesis

according to Faul, Erdfelder, Buchner, and Lang (2009). However, when testing post hoc power it is critical to look at effects sizes. G*power was used to compute the main effect size for H1a and H1b. Upon conducting a post hoc power analysis using G*power, the power and effect size computation is based on the following factors: (a) statistical test of multiple linear regression: (b) fixed model, R^2 deviation from zero; (c) variance explained by special effect (R^2 change value) 0.37 from the multiple linear regression testing the relationship between transformational and transactional leadership and nurses' perception of patient safety; (d) sample size of 157: (e) level of significance of 0.05, and (f) two predictors (predictors of transformational and transactional leadership). This power analysis yielded an effect size f^2 of 0.59 and a power of 1.0. Thus, the effect size would be considered a large effect size based on Cohen (1988, p. 412) and adequate power.

This procedure was repeated for H1c to determine the effect size and power when accounting for the variance of transformational leadership beyond transactional leadership. A post hoc power analysis using G*power was conducted. The post hoc power and effect size computation is based on the following factors: (a) statistical test of multiple linear regression: (b) fixed model, R^2 increase; (c) variance explained by special effect (R^2 change value 0.16) and residual variance ($1-R^2=0.63$); (d) sample size of 157: (e) level of significance of 0.05, and (f) tested predictors=one (transformational leadership), two predictors (transformational and transactional leadership). This power analysis yielded an effect size f^2 of 0.25 and a power of 0.99. Thus, the effect size would be considered a large effect size based on Cohen (1988, p. 412) and adequate power.

This procedure was repeated for the single mediator model. The post hoc power and effect size computation is based on the following factors: (a) statistical test of multiple linear regression: (b) fixed model, R^2 increase; (c) variance explained by special effect (R^2 change value 0.07) and residual variance ($1-R^2=0.59$); (d) sample size of 157: (d) level of significance of 0.05, and (e) tested predictors=two (transformational leadership and transactional leadership), three predictors (transformational, transactional leadership, mediator). This power analysis yielded an effect size f^2 of 0.12 and a power of 0.98. Thus, the effect size would be considered a medium effect size based on Cohen (1988, p. 412) and adequate power. The H3d hypothesis was also addressed finding an effect size f^2 of 0.07 and a power of 0.78. Thus, the effect size would be considered small based on Cohen (1988, p. 412) and only slightly underpowered.

Effect sizes were also calculated for the moderation analysis based on the following factors: (a) statistical test of multiple linear regression: (b) fixed model, R^2 increase; (c) variance explained by special effect (R^2 change value=H2a 0.01, H2b 0.01, H2c 0.004, H2d 0.001) and residual variance ($1-R^2$= H2a 0.68, H2b 0.59, H2c 0.77, H2d 0.63); (d) sample size of 157: (e) level of significance of 0.05, and (f) four predictors (predictors of transformational, transactional leadership, communication variable, and interaction term). This power analysis yielded an effect size H2a effect size f^2 of 0.002 and a power of 0.21, H2b effect size f^2 of 0.02 and a power of 0.24, H2c effect size f^2 of 0.005 and a power of 0.10, H2d effect size f^2 of 0.002 and a power of 0.06. The effect size would be considered a very small for all moderation hypotheses based on Cohen

(1988, p. 412) and insufficient power. Thus, these hypotheses would be described as exploratory.

Data Analysis

This study uses analytical survey data to examine the effect of transformational and transactional leadership (MLQ-5x) on nurse-rated patient safety scores (AHRQ HSOPSC). Further, this study seeks to investigate how, if any, do the patient safety cultural elements of communication openness and communication and feedback about error (AHRQ HSOPSC) and the team innovation climate influence (TCI-short) the relationship. Lastly, transformational leadership is expected to augment transactional leadership in relation to nurse-rated patient safety grade and the team innovation climate.

Statistical Package for Social Science (SPSS) was utilized for conducting the analysis. Descriptive statistics data were analyzed including mean, standard deviation, and correlations. It is hypothesized that both transformational and transactional leadership (contingent reward and management-by-exception active) are significant predictors of patient safety grade.

It should be noted that the dependent variable of nurses' perception of patient safety is treated as a continuous variable rather than an ordinal variable. Health science research depends heavily on Likert scales for measurement and while not ideal, there is empirical support for treating this ordinal data as continuous for parametric testing (Norman, 2010; Sullivan & Artino Jr, 2013). Much of the research on transformational leadership relies on the outcome variables contained within the MLQ-5x (satisfaction with the leader, extra effort, and effectiveness of the leader-rated 0=Not at all to

4=Frequently if not always), which are ordinal data treated as continuous in many studies. When testing the augmentation hypothesis, multiple regression analysis is used which requires the ordinal data to be treated as continuous (Bass, Avolio, Jung, & Berson, 2003; Vecchio, Justin, & Pearce, 2008; Rights & Sterba, 2017). Additionally, scoring on the dependent variable is reversed such that high scores are negative (poor) perceptions of safety.

Multiple linear regression analysis was used to examine whether transactional leadership and transformational leadership are significantly related to nurses' perception of patient safety to address hypotheses 1a, 1b, and 1c. Transactional leadership and transformational leadership were the independent variables and nurses' perception of patient safety was the dependent variable.

Additionally, this research follows that of (Bass, 1985) and proposes an augmentation effect in which transformational leadership will account for variance above that of transactional leadership. Theoretically, Bass and Riggio (2006) state, "There is value added from transformational leadership over and above the positive effects of transactional leadership" (p. 27). Specifically, a multiple linear regression analysis was conducted to determine how the transformational leadership impacts nurses' perception of patient safety grade after controlling the effects of the transactional leadership behaviors of contingent reward and management-by-exception active. According to Vecchio, Justin, and Pearce (2008), testing the augmentation hypothesis requires multiple regression analysis to determine whether transformational leadership is able to uniquely account for variance beyond the behaviors of transactional leadership as a predictor of

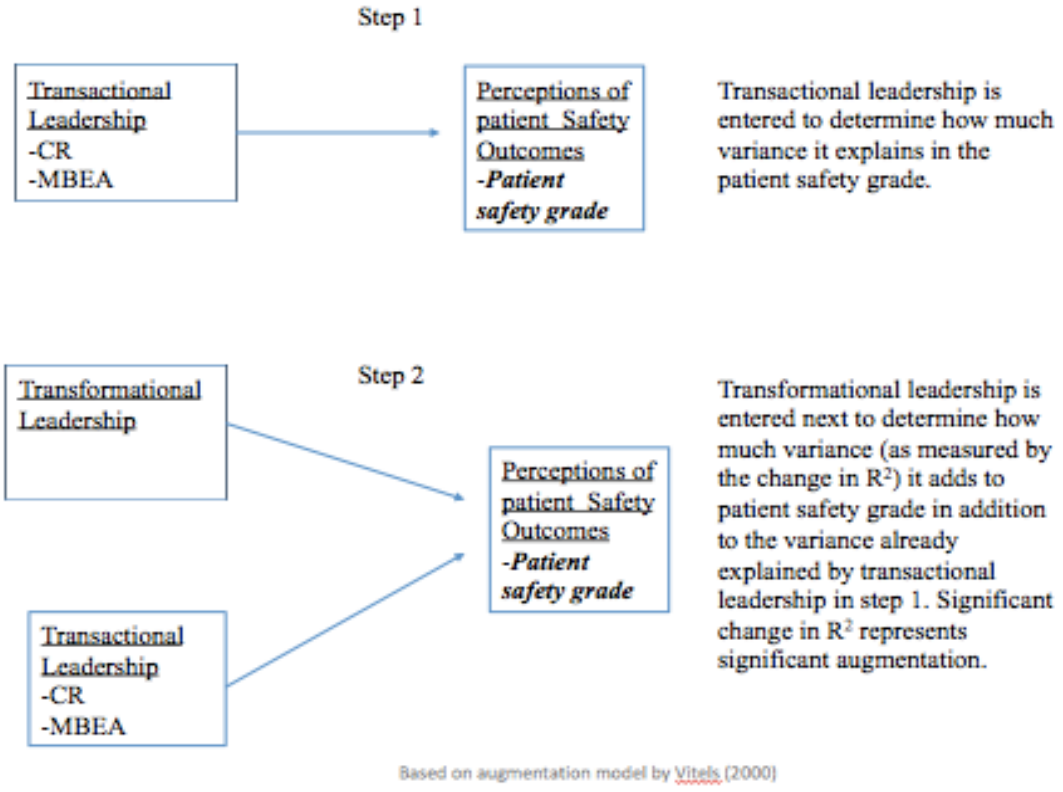
nurse rated patient safety score. Rights and Sterba (2017) outline an approach to using incremental validity using the R-squared statistic with multiple regression methods. In this study, transformational leadership was added as a predictor after initially controlling for the contribution of the transactional leadership dimension. The incremental validity was indicated by the change in *R*-square when transformational leadership is included and hypothesized to add predictive power to the model as illustrated in Figure 2.

To operationalize, the regression included multiple blocks. The first block (model 1) of the regression model analyzes the significance of the relationship between the control variables of transactional leadership behaviors (contingent reward and management-by-exception active) with the dependent variable of nurses' perception of patient safety. This analysis determined whether transactional leadership is significantly related to nurses' perception of patient safety. Then, the independent variable of transformational leadership was added in the second block (model 2) of the regression model to determine how it significantly predicts the dependent variable of nurses' perception of patient safety after controlling the effects of the control variables of transactional leadership behaviors of contingent reward and management-by-exception active. A level of significance value of 0.05 was used in the regression analysis to determine whether the independent variable and control variables were significantly related with the dependent variable. The *F*-statistic was used to determine if the regression model created is a valid or robust model in predicting the dependent variable. Typically, there is valid model when the *F*-statistic of the regression model is statistically significant with a *p*-value less than the level of significance value. The R-square statistic

was used to show if the regression model had a strong or weak explanatory power (Cohen, Cohen, West, & Aiken, 2003). The parameter estimates of beta coefficients of the individual effects was used to determine the degree of the relationships or the magnitude of the impacts of the independent variable and control variable on the dependent variable. This statistic was used to show how much change in the dependent variable could be explained by variations in the independent variable and control variable.

Figure 2

The Augmentation Effect of Transformational Leadership on Patient Safety Grade



A regression analysis was conducted to examine the moderation effects of nurses' perception of feedback and communication about error and communication openness on the relationship between transactional leadership and patient safety grade; and relationship between transformational leadership and patient safety grade to address hypotheses 2a, 2b, 2c, and 2d. In the regression analysis, transformational and transactional leadership (contingent reward and management-by-exception active) were the independent variables, nurses' perception of patient safety was the dependent variable, and nurses' perception of feedback and communication about error and communication openness were the moderators.

According to the procedure outlined by Cohen & Cohen (1983), transformational and transactional leadership were tested with multiple regression using interaction terms between the moderator and the independent variables to represent the moderation effects. There were four interaction terms to represent the moderation effect of feedback and communication about error on the relationship between transactional leadership and patient safety grade (feedback and communication about error x transactional leadership); moderation effect of feedback and communication about error on the relationship between transformational leadership and patient safety grade (feedback and communication about error x transformational leadership); moderation effect of communication openness on the relationship between transactional leadership and patient safety grade (communication openness x transactional leadership); moderation effect of communication openness on the relationship between transformational leadership and patient safety grade (communication openness x transformational leadership). If the

interaction terms to investigate the moderation effects of nurses' perception of feedback and communication about error and communication openness significantly contributes to the variance in the dependent variable (patient safety grade) over the main effects of the independent variable (transformational and transactional leadership), then an interaction effect exists and moderation is supported (Jaccard & Turrisi, 2003). To operationalize the regression analysis, the regression included multiple blocks. A level of significance value of 0.05 was used in the regression analysis to determine whether the moderators significantly influence the relationship between the independent variables and the dependent variable.

Accordingly, a significant moderation effect was evaluated by a significant change in the *R*-square value of the regression model when the interaction terms are added to the regression model (Fairchild, MacKinnon, Taborga, & Taylor, 2009). A significant change in the *R*-square value is observed if the *p*-value of the *R*-square change is equal or less than the level of significance value of 0.05. This would mean that nurses' perception of feedback and communication about error and communication openness have a significant moderation effect on the relationship between transactional leadership and patient safety grade; and relationship between transformational leadership and patient safety grade. The degree and direction of the moderation effect was determined through the beta coefficients of the interaction terms. A higher beta coefficient indicates greater moderation effect.

Further, a regression analysis was conducted to address hypothesis 3a, 3b, and 3c. The independent variable is X, dependent variable is Y, and M is the mediator variable.

The mediation analysis will follow suggestions of Baron and Kenny (1986) and examine the significance test of the direct effect of transformational and transactional leadership (contingent reward and management-by-exception active) (X) on patient safety score (Y), the evidence of an indirect effect through team innovation climate (M), and the size of the indirect effect. The mediation model will be fully supported if the relationship between transformational leadership (X) and patient safety scores (Y) is not significant in the X-M-Y model, or partially supported if the direct relationship between X and Y is lower in the X-M-Y model (Baron & Kenny, 1986). A level of significance of 0.05 was used in the regression analysis. The steps are as follows:

The first step was to show that transformational leadership is correlated with nurses' perception of patient safety. The model used Y as the dependent variable and X as an independent variable estimate and test path *c* in Figure 3). This step determines that the main effects may be mediated. The results of this analysis addresses hypothesis 3c to determine the predictive relationship between transformational leadership (c) and nurses' perception of patient safety (dependent variable) while controlling the effects of transactional leadership. This step determines the direct effect between transformational leadership on nurses' perception of patient safety. A *p*-value of less than or equal to the significance level of 0.05 dictates that there is a statistically significant relationship, and that the hypothesis 3c is rejected. To control the effect of transactional leadership, a multiple regression was conducted by first including transactional in model 1 in the regression. Then, in model 2, the transformational leadership was included as predictor.

This process controls or isolates the effect of transactional leadership on the relationship between transformational leadership and nurses' perception of patient safety.

The second step was to show that the transformational leadership is correlated with the team innovation climate. The model used M (team innovation climate) as the criterion variable and X (transformational leadership) as an independent variable (estimate and test path *a*). This step determines the direct effect of transformational leadership on team innovation climate. A *p*-value of less than or equal to the level of significance of 0.05 shows that there is a statistically significant direct effect by transformational leadership on team innovation climate.

The third step was to show that team innovation climate affects the nurses' perception of patient safety. The model used Y (nurses' perception of patient safety) as the dependent variable and M (team innovation climate) as a independent variable (estimate and test path *b*). This step determines the direct effect of team innovation climate on nurses' perception of patient safety. A *p*-value of less than or equal to the level of significance of 0.05 dictates that there is a statistically significant direct effect by team innovation climate on nurses' perception of patient safety.

The fourth step was to establish that team innovation climate completely mediates the X-Y relationship; the effect of transactional leadership (H3a) and transformational leadership (H3b) on nurses' perception of patient safety controlling for team innovation climate (path *c′*) should be zero. The results of this analysis addressed hypothesis 3a to determine the mediating effect of team innovation climate on the relationship between nurse managers' transactional leadership and nurses' perception of patient safety and

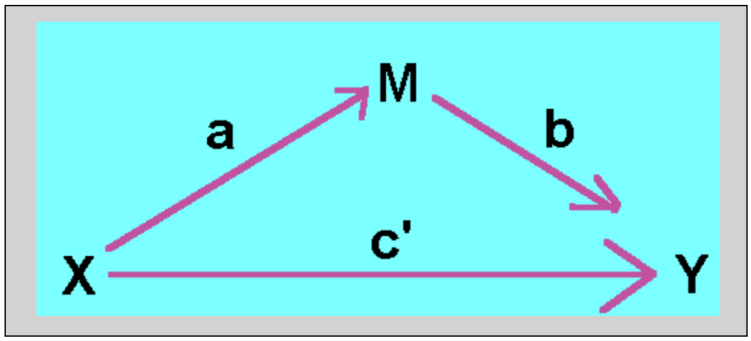
hypothesis 3b to determine the mediating effect of team innovation climate on the relationship between nurse managers' transformational leadership and nurses' perception of patient safety. This step determined the indirect or mediating effect of team innovation climate on relationship between nurse managers' transactional leadership and nurses' perception of patient safety and between nurse managers' transformational leadership and nurses' perception of patient safety. A *p*-value of less than or equal to the level of significance of 0.05 dictates that there is a statistically significant mediating effecting, and that hypotheses 3a and 3b are supported.

The last step was to establish that team innovation climate completely mediates the X-Y relationship after controlling the effects of transactional leadership; the effect of transformational leadership on nurses' perception of patient safety controlling for team innovation climate (path *c'*) should be zero after controlling for transactional leadership. The results of this analysis addresses hypothesis 3d to determine the mediating effect of team innovation climate on the relationship between nurse managers' transformational leadership and nurses' perception of patient safety after controlling the effects of the control variables of transactional behaviors of contingent reward and management-by-exception active. To control the effect of transactional leadership, a multiple regression was conducted, similar in step 1, by first including transactional leadership in model 1 in the regression model. Then, in model 2, transformational leadership was included as predictor. This process controls the effect of transactional leadership on the relationship between transformational leadership and nurses' perception of patient safety. A *p*-value of less than or equal to the level of significance of 0.05 dictates that there is a statistically

significant mediating effecting after controlling the effects of transactional leadership, and that hypothesis 3d is supported.

Figure 3

Illustration of Mediation Effect



(Baron & Kenny, 1986)

Summary

In conclusion, Chapter III has reviewed the research design of the study and the hypotheses guiding this study. Further, the instrumentation was reviewed in addition to data collection procedures. Lastly, the methodological framework and statistical analysis has been reviewed considering the population and appropriate sample size. Chapter IV will provide data analysis and results of the study. Chapter V will present a discussion of the findings and future research.

CHAPTER IV

Introduction

The purpose of this quantitative study was to extend the understanding of the role of transformational and transactional leadership in improving patient safety, and the influences of patient safety communication and creativity and innovation climate. Descriptive statistics, multiple linear regression, moderating regression, and mediating regression analyses were conducted to address the objectives of this current study. The following research hypotheses guided this study:

H1a: Transactional leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC).

H1b: Transformational leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC).

H1c: Transformational leadership will explain variance in nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active.

H2a: Nurses' perception of feedback and communication about error will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H2b: Nurses' perception of feedback and communication about error will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H2c: Nurses' perception of communication openness will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H2d: Nurses' perception of communication openness will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H3a: Team innovation climate will significantly mediate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC).

H3b: Team innovation climate will significantly mediate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC).

H3c: Transformational leadership will explain variance in nurses' perception of team innovation climate over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active.

H3d: After controlling for the transactional behaviors of contingent reward and management-by-exception active, the relationship between nurse managers' transformational leadership and nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) will be mediated by team innovation climate.

Included in Chapter IV is a discussion of the data collection, results, and summary. The data collection section includes the discussion of the results of the data collection conducted and the summaries of the demographic information of the sample. The results section includes the discussion of the descriptive statistics summaries of study

variables, results of the statistical analyses conducted to address the hypotheses of the study. Lastly, the summary of the chapter provides a brief synthesis of the results.

Changes in Data Collection

The data analysis plan that was originally proposed was to be at the unit level. However, sufficiently large sample sizes are a barrier that must be addressed when designing grouped or clustered multilevel models (Dong & Peng, 2013). At issue with the present study is the relatively small size of the hospital surveyed, as there were a total of 60 nursing units that were sampled. Of those 60 units, 45 units have more than 5 nurses per unit. In general, the literature on sample size for hierarchical linear models (nested data) states that a larger number of groups are more important than a large number of individuals (Maas & Hox, 2005; Woltman, Feldstain, MacKay, Rocchi, 2012). This study had a total of 40 units that responded, 23 of which had more than 5 nurses respond. Based on multilevel modeling simulation studies by Maas & Hox (2005) it was estimated that this study would require a sample of 30 units with at least 5 nurses per unit who responded. The simulation by Mass & Hox (2005) concluded that with 30 units, the standard errors for second-level variances are estimated at 15% too small resulting in 8.9% non-coverage of the confidence interval (p. 90). This is considered the low end of an acceptable amount of non-coverage of the second-level standard errors (Mass & Hox, 2005, p. 90). Moving forward with a smaller level-2 sample size in this study would lead to decreased statistical power, increased standard errors, and decreased generalizability of findings (Dong & Peng, 2013; Mass & Hox, 2005), thus the study data was analyzed at level-1 (individual level).

The total number of nurses in the organization who were surveyed for this study was 957. There were a total of 210 respondents to the survey for a response rate of 22 percent. This was lower than the expected response rate of 30 percent. To encourage participation, the data collection period was extended from three weeks to five weeks total. The site study coordinator sent two additional email reminders in weeks four and five to all nurses to enhance participation.

Study data were collected and managed using REDCap. When the survey was completed, the data was transferred to Excel for initial data aggregation and cleaning. As outlined in Chapter III, averages were created for responses to create aggregate scales for transformational and transactional leadership, team innovation climate, communication about error, and feedback and communication about error. There were two respondents that were excluded because they provided a disagree response to the consent question. Another 48 respondents were removed from the dataset because they had more than 50% missing responses in the survey questionnaires. An additional five respondents were excluded since they did not fit in the inclusion criteria of registered nurses who work 20 or more hours per week, are fluent in English, and have direct care responsibility that are eligible for participation in this study. After the data were cleaned, the sample size consisted of 157 respondents who met the inclusion criteria and completed the survey in its entirety.

Demographic Characteristics of the Sample

Table 4 summarizes the demographic information of the 157 registered nurses. A majority of the participants were female (136; 86.6%). The age range was between 20 years old to over 60 years old with more than half between 20 to 34 years old (86; 54.8%). The highest degree completed by a majority of the participants was a Baccalaureate in Nursing (103; 65.6%). More than half of the nurses worked in their current unit for 1 to 5 years (98; 62.4%) and for their current organization for 1 to 5 years (85; 54.1%). Almost half of the nurses worked regularly on medical/surgical units (70; 44.6%). Most worked on the day shift (121; 77.1%).

Table 4

Frequency and Percentage Summaries of Demographic Information

	Frequency	Percent
Gender		
Male	19	12.1
Female	136	86.6
Missing	2	1.3
Age		
20-24	9	5.7
25-29	43	27.4
30-34	34	21.7
35-39	11	7.0
40-44	14	8.9
45-49	16	10.2
50-54	13	8.3
55-59	7	4.5
60 or over	8	5.1
Missing	2	1.3
Highest level of education completed		
Diploma in nursing	39	24.8

Baccalaureate in nursing	103	65.6
Masters in nursing	9	5.7
Missing	6	3.8
Number of years you have worked on your CURRENT unit		
Less than 6 months	12	7.6
6-11 months	11	7.0
1-5 years	98	62.4
6-10 years	17	10.8
11-15 years	8	5.1
16-20 years	5	3.2
More than 21 years	6	3.8
Number of years you have worked for this Organization		
Less than 6 months	7	4.5
6-11 months	6	3.8
1-5 years	85	54.1
More than 21 years	13	8.3
Missing	3	1.9
Type of unit regularly work		
ICU	42	26.8
Medical/Surgical	70	44.6
Outpatient	18	11.5
Other	33	21
Which shift do you typically work?		
Day shift	121	77.1
Night shift	34	21.7
Missing	2	1.3

Model Variables: Descriptive Statistics

Descriptive statistics were analyzed for transformational and transactional leadership (contingent reward and management-by-exception active) behaviors; nurses' perception of patient safety; team innovation climate; and nurses' perception of feedback and communication about error and communication openness. Descriptive statistics are presented in Tables 5 and 6. The histograms of the data of the different study variables

are shown in Appendix D.

For the leadership type the mean score for transformational leadership (M = 3.95, SD = 0.87) was near 4 for "fairly often". For transactional leadership, the mean score was (M = 3.60, SD = 0.72). For nurses' perception of patient safety, it can be seen in Table 6 that most of the 157 registered nurses perceived their patient to have an excellent (68; 43.3%) or very good (62; 39.5%) levels of overall safety in their unit. For team innovation climate, the mean score was 3.88 (SD = 0.64) near 4 for "agree". For communication elements of patient safety, the mean score for feedback and communication about error (M = 3.99, SD = 0.72) was near 4 for "most of the time". The mean score for communication openness (M = 3.29, SD = 0.53) was near 3 for "sometimes". This indicated that the 157 registered nurses have an above average or good rating regarding communication openness. Scoring of nurses' perception of patient safety is reversed such that high scores are negative (poor) perceptions of safety.

Table 5

Descriptive Statistics Summaries of Study Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Team innovation climate	157	1.07	5	3.88	0.63
Transformational Leadership	157	1.6	5	3.95	0.87
Transactional Leadership	157	1.25	5	3.60	0.72
Feedback and communication about error	157	1.33	5	3.99	0.72
Communication openness	157	2	5	3.29	0.53

Table 6

Frequency and Percentage Summaries of Responses on Nurses' Perception of Patient Safety

		Frequency	Percent
Overall patient safety grade	1 Excellent	68	43.3
	2 Very good	62	39.5
	3 Acceptable	23	14.6
	4 Poor	4	2.5
	5 Failing	0	0

Correlation among Study Variables

Pearson correlation analysis was conducted to determine whether there are significant correlations among study variables and to examine possible trends in these relationships. The study variables include transformational and transactional leadership, nurses' perception of patient safety, team innovation climate, nurses' perception of feedback and communication about error and communication openness. The results of the Pearson correlation analysis are shown in Table 7.

All correlations among study variables are significant. Transformational leadership is significantly positively correlated with transactional leadership ($r(157) = 0.85$, $p < 0.001$), nurses' perception of feedback and communication about error ($r(157) = 0.61$, $p < 0.001$) and communication openness ($r(157) = 0.21$, $p = 0.01$). Transformational leadership is significantly negatively correlated with nurses' perception of patient safety ($r(157) = -0.60$, $p < 0.001$). Scoring of nurses' perception of patient safety is reversed such that high scores are negative (poor) perceptions of safety. Transactional leadership

is significantly positively correlated with nurses' perception of feedback and communication about error ($r(157) = 0.61$, $p < 0.001$) and communication openness ($r(157) = 0.20$, $p = 0.01$). Transactional leadership is significantly negatively correlated with nurses' perception of patient safety ($r(157) = -0.46$, $p < 0.001$).

Nurses' perception of feedback and communication about error is significantly positively correlated with nurses' perception of communication openness ($r(157) = 0.35$, $p < 0.001$). Nurses' perception of feedback and communication about error is significantly negatively correlated with nurses' perception of unit patient safety ($r(157) = -0.53$, $p < 0.001$). Nurses' perception of communication openness is significantly negatively correlated with nurses' perception of unit patient safety ($r(157) = -0.21$, $p = 0.01$).

Team innovation climate is significantly positively correlated with transformational leadership ($r(157) = 0.58$, $p < 0.001$) and transactional leadership ($r(157) = 0.45$, $p < 0.001$); and nurses' perception of feedback and communication about error ($r(157) = 0.50$, $p < 0.001$) and communication openness ($r(157) = 0.32$, $p < 0.001$). Team innovation climate is significantly negatively correlated with nurses' perception of unit patient safety ($r(157) = -0.53$, $p < 0.001$).

Table 7

Results of Pearson Correlation Analysis of Correlation among Study Variables

		Transformational Leadership	Transactional Leadership	Feedback and communication about error	Communication openness	Overall patient safety grade
Team innovation climate	Pearson Correlation	0.58*	0.45*	0.50*	0.32*	-0.53*
	Sig. (2-tailed)	0.00	0.00	0.00	0.00	0.00
Transformational Leadership	Pearson Correlation		0.85*	0.61*	0.21*	-0.60*
	Sig. (2-tailed)		0.00	0.00	0.01	0.00
Transactional Leadership	Pearson Correlation			0.61*	0.20**	-0.46*
	Sig. (2-tailed)			0.00	0.01	0.00
Feedback and communication about error	Pearson Correlation				0.35*	-0.53*
	Sig. (2-tailed)				0.00	0.00
Communication openness	Pearson Correlation					-0.21**
	Sig. (2-tailed)					0.01

* $p < 0.001$, ** $p = 0.01$, n=157

Transformational Leadership, Transactional Leadership, and Patient Safety

A multiple linear regression analysis was conducted to determine whether the transactional leadership and transformational leadership scores are significantly related to nurses' perception patient safety to address hypotheses H1a and H1b. The regression result is shown in Table 8. A level of significance of 0.05 was used in the multiple linear regression analysis.

The fit of the regression model was statistically significant ($F(2, 154) = 44.45$). This indicated that the regression model including both transactional leadership and transformational leadership as the predictors of nurses' perception of patient safety had an acceptable model fit. The R Square (R^2) value of the regression model was 0.37, which indicated a moderate effect size, meaning that the combined impact of transactional leadership and transformational leadership explained 37% of the variance in predicting nurses' perception of patient safety.

Investigation of the predictive relationship showed that only transformational leadership ($\beta = -0.75$, $p < 0.001$) was significantly related to nurses' perception of patient safety therefore supporting hypothesis H1b that states, "Transformational leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC)". It should be noted that lower score in the individual nurses' perception of patient safety indicated excellent overall patient safety grade, while higher score indicated poor overall patient safety grade. The negative relationship means that when nurses perceive their managers to be practicing transformational leadership, the higher the nurses' perception of patient safety. On the other hand, transactional leadership ($\beta = 0.18$) was not significantly related with nurses' perception of patient safety rejecting

hypothesis H1a that states, "Transactional leadership will be significantly related to nurses' perception of unit patient safety grade (AHRQ HSOPSC)". Therefore, the summary of this regression analysis rejected hypothesis H1a and supported hypothesis H1b.

Table 8

Results of Multiple Linear Regression Testing Relationships of Transactional Leadership and Transformational Leadership with Nurses' Perception of Patient Safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.75	0.26		14.31	0.00*
	Transactional Leadership	0.20	0.13	0.18	1.45	0.15
	Transformational Leadership	-0.68	0.11	-0.75	-6.15	0.00*

Note. Model: $F(2, 154) = 44.45$, $p < 0.001$; R Square (R^2) = 0.37; N = 154
a. Dependent Variable: Overall patient safety grade
b. Predictors: (Constant), Transformational Leadership, Transactional Leadership
*Significant at level of significance of 0.05

The next multiple linear regression analysis conducted was to test the augmentation hypothesis H1c of transformational leadership over transactional leadership related to nurses' perception of patient safety. The regression result is shown in Table 9. A level of significance of 0.05 was also used in the multiple linear regression analysis.

After controlling for transactional leadership, the regression model was statistically significant ($F(2, 154) = 44.49$, $p < 0.001$). There was a significant R^2 change when transformational leadership ($F(1, 154) = 37.85$, $p < 0.001$) was added in the regression model as a predictor after controlling for the contribution of the transactional leadership.

The R^2 value of the regression model testing the augmentation effect was 0.37, which indicated a moderate effect size, meaning that transformational leadership explained 37% of the variance in predicting nurses' perception of patient safety after controlling for transactional leadership supporting the augmentation hypothesis H1c.

Examination of the beta coefficient (β) showed that transformational leadership (β = -0.75) had a significant negative relationship with nurses' perception of patient safety after controlling for transactional leadership. The negative relationship means that the higher the practice of transformational leadership of nurse managers, the higher the nurses' perception of patient safety after controlling for transactional leadership. With this result, hypothesis H1c was supported which states "Transformational leadership will explain variance in nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active".

Table 9

Results of Multiple Linear Regression Testing Relationship of Transformational Leadership and Nurses' Perception of Patient Safety Grade Controlling for Transactional Leadership

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	3.59	0.29		12.39	0.00*
	Transactional Leadership	-0.51	0.08	-0.46	-6.43	0.00*
2	(Constant)	3.75	0.26		14.31	0.00*
	Transactional Leadership	0.20	0.13	0.18	1.45	0.15
	Transformational Leadership	-0.68	0.11	-0.75	-6.15	0.00*

Note. Model 2: $F(2, 154) = 44.49$, $p < 0.001$; $R^2 = 0.37$; R^2 Change = 0.16, $F(1, 154) = 37.85$, $p < 0.001$, N= 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Transactional Leadership, Transformational Leadership

*Significant at level of significance of 0.05

Moderating Role of Communication

Regression analysis was conducted to determine the moderating effects of nurses' perception of feedback and communication about error and communication openness on the relationship between transactional leadership and nurses' perception of patient safety; and relationship between transformational leadership and nurses' perception of patient safety to address hypotheses H2a, H2b, H2c, and H2d. A level of significance of 0.05 was also used in the regression analysis.

Two regression models were created to determine the moderating effects of nurses' perception of feedback and communication about error and communication openness. The moderating effect is determined using the interaction term between the independent

variables and the moderators. In total, there were four regression models created. The results of this regression analysis are presented in Tables 10 to 13.

Post hoc power analysis as described in Chapter III showed that the moderation analysis is severely underpowered and considered exploratory in nature. Post hoc effect sizes were calculated for the moderation analysis based on the following factors: (a) statistical test of multiple linear regression: (b) fixed model, R^2 increase; (c) variance explained by special effect (R^2 change value=H2a 0.01, H2b 0.01, H2c 0.004, H2d 0.001) and residual variance (1-R^2= H2a 0.68, H2b 0.59, H2c 0.77, H2d 0.63); (d) sample size of 157: (e) level of significance of 0.05, and (f) four total predictors (transformational, transactional leadership, communication variable, and interaction term). This power analysis yielded an effect size H2a effect size f^2 of 0.002 and a power of 0.21, H2b effect size f^2 of 0.02 and a power of 0.24, H2c effect size f^2 of 0.005 and a power of 0.10, H2d effect size f^2 of 0.002 and a power of 0.06. The effect size would be considered very small for all moderation hypotheses based on Cohen (1988, p. 412) and insufficient power. Thus, these hypotheses would be described as exploratory.

The first regression analysis conducted was to determine the significance of the moderating effect of nurses' perception of feedback and communication about error on the relationship between transactional leadership and nurses' perception of patient safety to address hypotheses H2a. The results presented in Table 10 show there was no significant R^2 change when the interaction term of nurses' perception of feedback and communication about error and transactional leadership ($F(1, 153) = 2.47$, $p = 0.12$) was added in the regression model. The insignificance of the R^2 change when adding the interaction term to represent the moderating effect of nurses' perception of feedback and

communication about error means that the moderating effect of nurses' perception of feedback and communication about error on the relationship between transactional leadership and nurses' perception of patient safety was insignificant. Thus, hypothesis H2a that states, "Nurses' perception of feedback and communication about error will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC)" was not supported.

Table 10

Results of Regression Analysis of Moderation Effect of Nurses' Perception of Feedback and Communication About Error on the Relationship between Transactional Leadership and Nurses' Perception of Patient Safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	4.38	0.32		13.74	0.00*
	Transactional Leadership	-0.24	0.09	-0.21	-2.52	0.01*
	Feedback and communication about error	-0.44	0.09	-0.40	-4.74	0.00*
2	(Constant)	6.22	1.21		5.13	0.00*
	Transactional Leadership	-0.82	0.39	-0.74	-2.14	0.03*
	Feedback and communication about error	-0.91	0.31	-0.82	-2.92	0.00*
	Feedback and communication about error x Transactional leadership	0.15	0.09	0.86	1.57	0.12

Note. Model 2: $F(3, 153) = 24.19$, $p < 0.001$; $R^2 = 0.32$; R^2 Change = 0.01, $F(1, 153) = 2.47$, $p = 0.12$, N= 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Feedback and communication about error, Transactional Leadership, Feedback and communication about error x Transactional leadership

*Significant at level of significance of 0.05

The second regression analysis conducted was to determine the significance of the moderating effect of nurses' perception of feedback and communication about error on the relationship between transformational leadership and nurses' perception of patient

safety to address hypotheses H2b. The results presented in Table 11 show there was no significant R^2 change when the interaction term of nurses' perception of feedback and communication about error and transformational leadership ($F(1, 153) = 2.47$, $p = 0.12$) was added in the regression model. Thus, hypothesis H2b that states, "Nurses' perception of feedback and communication about error will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC)" was not supported.

Table 11

Results of Regression Analysis of Moderation Effect of Nurses' Perception of Feedback and Communication About Error on the Relationship between Transformational Leadership and Nurses' Perception of Patient Safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	4.51	0.29		15.65	0.00*
	Transformational Leadership	-0.40	0.07	-0.44	-5.57	0.00*
	Feedback and communication about error	-0.30	0.09	-0.27	-3.41	0.00*
2	(Constant)	5.87	0.92		6.37	0.00*
	Transformational Leadership	-0.80	0.27	-0.88	-2.97	0.00*
	Feedback and communication about error	-0.66	0.25	-0.59	-2.65	0.01*
	Feedback and communication about error x Transformational leadership	0.10	0.07	0.70	1.55	0.12

Note. Model 2: $F(3, 153) = 35.73$, $p < 0.001$; $R^2 = 0.41$; R^2 Change = 0.01, $F(1, 153) = 2.41$, $p = 0.12$, N= 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Feedback and communication about error, Transformational Leadership, Feedback and communication about error x Transformational leadership

*Significant at level of significance of 0.05

The third regression analysis conducted was to determine the significance of the moderating effect of nurses' perception of communication openness on the relationship

between transactional leadership and nurses' perception of patient safety to address hypotheses H2c. The results are presented in Table 12 show there was no significant R^2 change when the interaction term of nurses' perception of communication openness and transactional leadership ($F(1, 153) = 0.77$, $p = 0.38$) was added in the regression model. Thus, hypothesis H2c that states, "Nurses' perception of communication openness will moderate the relationship between transactional leadership and unit patient safety grade (AHRQ HSOPSC)" was not supported.

Table 12

Results of Regression Analysis of Moderation Effect of Nurses' Perception of Communication Openness on the Relationship between Transactional Leadership and Nurses' Perception of Patient Safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	4.08	0.42		9.78	0.00*
	Transactional Leadership	-0.48	0.08	-0.44	-6.00	0.00*
	Communication openness	-0.18	0.11	-0.12	-1.61	0.11
2	(Constant)	5.63	1.81		3.11	0.00*
	Transactional Leadership	-0.89	0.48	-0.81	-1.88	0.06
	Communication openness	-0.64	0.54	-0.43	-1.19	0.24
	Communication openness x Transactional leadership	0.12	0.14	0.53	0.88	0.38

Note. Model 2: $F(3, 153) = 15.02$, $p < 0.001$; $R^2 = 0.23$; R^2 Change = 0.004, $F(1, 153) = 0.77$, $p = 0.38$, N= 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Communication openness, Transactional Leadership, Communication openness x Transactional leadership

*Significant at level of significance of 0.05

The fourth regression analysis conducted was to determine the significance of the moderating effect of nurses' perception of communication openness on the relationship between transformational leadership and nurses' perception of patient safety to address

hypotheses H2d. The results are presented in Table 13 show there was no significant R^2 change when the interaction term of nurses' perception of communication openness and transformational leadership ($F(1, 153) = 0.30$, $p = 0.59$) was added in the regression model. Thus, hypothesis H2d that states, "Nurses' perception of communication openness will moderate the relationship between transformational leadership and unit patient safety grade (AHRQ HSOPSC)" was not supported. In summary, the moderation hypothesis H2a, H2b, H2c, and H2d were not supported.

Table 13

Results of Regression Analysis of Moderating Effect of Nurses' Perception of Communication Openness on the Relationship between Transformational Leadership and Nurses' Perception of Patient Safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	4.27	0.36		11.73	0.00*
	Transformational Leadership	-0.53	0.06	-0.58	-8.84	0.00*
	Communication openness	-0.13	0.10	-0.08	-1.28	0.20
2	(Constant)	5.04	1.46		3.45	0.00*
	Transformational Leadership	-0.72	0.36	-0.79	-2.02	0.05*
	Communication openness	-0.37	0.45	-0.24	-0.82	0.42
	Communication openness x Transformational leadership	0.06	0.11	0.29	0.55	0.59

Note. Model 2: $F(3, 153) = 29.39$, $p < 0.001$; $R^2 = 0.37$; R^2 Change = 0.001, $F(1, 153) = 0.30$, $p = 0.59$, N= 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Communication openness, Transformational Leadership, Communication openness x Transformational leadership

*Significant at level of significance of 0.05

Mediating Role of Team Innovation Climate

Regression analysis was conducted to determine whether team innovation climate had a significant mediating effect on the relationship between transactional leadership and patient safety grade (AHRQ HSOPSC) (H3a) and to determine whether team innovation climate had a significant mediating effect on the relationship between transformational leadership and patient safety grade (AHRQ HSOPSC) (H3b). Additional regression analysis was conducted to test the augmentation hypothesis and determine whether transformational leadership will explain variance in nurses' perception of team innovation climate over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active (H3c).
The last regression analysis was conducted to the augmentation hypothesis and determine if after controlling for the transactional behaviors of contingent reward and management-by-exception active, the relationship between nurse managers' transformational leadership and nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) will be mediated by team innovation climate (H3d). A level of significance of 0.05 was also used in the regression analysis. As stated in Chapter III, the regression analysis conducted involved the four-step process by Baron and Kenny (1986) steps in determining mediation effect.

Step 1. Step 1 involved determining whether the independent variable is significantly related with the dependent variable. This step of the regression analysis determined the predictive relationship between transformational leadership and nurses' perception of patient safety while controlling the effect of transactional leadership behaviors. The results of step 1 of the regression analysis were presented in Table 9.

Examination of the beta coefficient (β) showed that transformational leadership (β = -0.75, $p < 0.001$) had a significant negative relationship with nurses' perception of patient safety after controlling for transactional leadership.

Step 2. Step 2 involves determining whether the independent variable is significantly related with the mediator. This step of the regression analysis determined the predictive relationship between transformational leadership and the mediator of team innovation climate. The results of step 2 of the regression analysis were presented in Table 14.

The model fit of the regression model was statistically significant ($F(1, 155) = 78.72$, $p < 0.001$). The R Square (R^2) value of the regression model was 0.34, which indicated a moderate effect size, meaning that the impact of transformational leadership explained 34% of the variance in predicting team innovation climate. Examination of the beta coefficient (β) showed that transformational leadership (β = 0.58, $p < 0.001$) had a significant positive relationship with team innovation climate.

Table 14

Results of Regression Analysis Testing Relationship of Transformational Leadership and Team Innovation Climate

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	2.23	0.19		11.68	0.00*
	Transformational Leadership	0.42	0.05	0.58	8.87	0.00*

Note. Model: $F(1, 155) = 78.72$, $p < 0.001$; $R^2 = 0.34$; N = 157

a. Dependent Variable: Team innovation climate

b. Predictors: (Constant), Transformational Leadership

*Significant at level of significance of 0.05

Another regression analysis was conducted to address hypothesis H3c to determine the predictive relationship between transformational leadership and the mediator of team innovation climate after controlling the effect of the transactional leadership. The results of this analysis were presented in Table 15. The model fit of the regression model was statistically significant ($F(2, 154) = 40.32$, $p < 0.001$). The R Square (R^2) value of the regression model was also 0.34, which indicated a moderate effect size, meaning that the impact of transformational leadership explained 34% of the variance in predicting team innovation climate after controlling the effect of the transactional leadership. Examination of the beta coefficient (β) showed that transformational leadership ($\beta = 0.71$, $p < 0.001$) had a significant positive relationship with team innovation climate after controlling the effect of the transactional leadership. With this result, hypothesis H3c that states, "Transformational leadership will explain variance in nurses' perception of team innovation climate over and above (independent of) transactional leadership behaviors of contingent reward and management-by-exception active" was supported.

Table 15

Results of Regression Analysis Testing Relationship of Transformational Leadership and Team Innovation Climate Controlling for Transactional Leadership

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	2.46	0.23		10.64	0.00*
	Transactional Leadership	0.39	0.06	0.45	6.26	0.00*
2	(Constant)	2.34	0.21		11.09	0.00*
	Transactional Leadership	-0.14	0.11	-0.16	-1.27	0.21
	Transformational Leadership	0.52	0.09	0.71	5.77	0.00*

Note. Model 2: $F(2, 154) = 40.32$, $p < 0.001$; $R^2 = 0.34$; R^2 Change = 0.16, $F(1, 154) = 33.30$, $p < 0.001$, N= 157

a. Dependent Variable: Team innovation climate

b. Predictors: (Constant), Transactional Leadership, Transformational Leadership

*Significant at level of significance of 0.05

Step 3. Step 3 involves determining whether the mediator significantly affects the dependent variable. This step of the regression analysis determined the predictive relationship between the mediator of team innovation climate and dependent variable of nurses' perception of patient safety. The results of step 3 are presented in Table 16.

The model fit of the regression model was statistically significant ($F(1, 155) = 61.28$, $p < 0.001$). This indicated that the regression model including team innovation climate as the predictor of nurses' perception of patient safety had an acceptable model fit. The R Square (R^2) value of the regression model was 0.28, which indicated a low effect size, meaning that the impact of team innovation climate explained 28% of the variance in predicting nurses' perception of patient safety. Examination of the beta coefficient (β) showed that team innovation climate ($\beta = -0.53$, $p < 0.001$) had a significant negative relationship with nurses' perception of patient safety.

Table 16

Results of Regression Analysis Testing Relationship of Team Innovation Climate and Nurses' Perception of Patient Safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	4.37	0.34		12.96	0.00*
	Team innovation climate	-0.67	0.09	-0.53	-7.83	0.00*

Note. Model: $F(1, 155) = 61.28$, $p < 0.001$; $R^2 = 0.28$; N = 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Team innovation climate

*Significant at level of significance of 0.05

Step 4a. Step 4 involves determining the significance of the mediating effects of team innovation climate on the relationship between transactional leadership and transformational leadership with nurses' perception of patient safety to address hypotheses H3a and H3b. The results of step 4a of the mediating regression analysis were presented in Table 17. After controlling for the effect of the mediator of team innovation climate, the regression model was statistically significant ($F(3, 153) = 36.07$, $p < 0.001$). There was a significant R^2 change when both transactional leadership and transformational leadership ($F(2, 153) = 17.10$, $p < 0.001$) were added in the regression model as predictors after controlling for the contribution of the mediator of team innovation climate. However, investigation of the individual impact or predictive relationship showed that only transformational leadership was significantly related with nurses' perception of patient safety after controlling for mediator of team innovation climate ($\beta = -0.55$, $p < 0.001$). Thus, hypothesis H3b that states, "Team innovation climate will significantly mediate the relationship between transformational leadership

and patient safety grade (AHRQ HSOPSC)" was supported.

Transactional leadership was not significantly related with nurses' perception of patient safety after controlling for mediator of team innovation climate ($\beta = 0.13$, $p < 0.26$). Thus, hypothesis H3a that states. "Team innovation climate will significantly mediate the relationship between transactional leadership and patient safety grade (AHRQ HSOPSC)" was not supported.

Table 17

Results of Regression Analysis Testing Mediation Effect of Team Innovation Climate on the Relationships of Transactional Leadership and Transformational Leadership with Nurses' Perception of Patient Safety

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	4.37	0.34		12.96	0.00*
	Team innovation climate	-0.67	0.09	-0.53	-7.83	0.00*
2	(Constant)	4.55	0.34		13.42	0.00*
	Team innovation climate	-0.34	0.10	-0.27	-3.54	0.00*
	Transactional Leadership	0.15	0.13	0.13	1.13	0.26
	Transformational Leadership	-0.51	0.12	-0.55	-4.29	0.00*

Note. Model 2: $F(3, 153) = 36.07$, $p < 0.001$; $R^2 = 0.41$; R^2 Change = 0.13, $F(2, 153) = 17.10$, $p < 0.001$, N= 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Team innovation climate, Transactional Leadership, Transformational Leadership

*Significant at level of significance of 0.05

Step 4b. Another aspect of step 4 involves determining the significance of the mediating effects of team innovation climate on the relationship between transformational leadership and nurses' perception of patient safety after controlling the effects of the transactional leadership to address hypothesis H3d. This step sought to

explore the augmentation of transformational leadership over transactional leadership in the mediation analysis. The results were presented in Table 18.

After controlling for the effects of the transactional leadership and mediator of team innovation climate, the regression model was statistically significant ($F(3, 153) = 36.07$, $p < 0.001$). There was a significant R^2 change when transformational leadership ($F(1, 153) = 18.30$, $p < 0.001$) was added in the regression model as a predictor after controlling for the contribution of the transactional leadership and mediator of team innovation climate. Examination of the beta coefficient (β) showed that team innovation climate ($\beta = -0.27$, $p < 0.001$) had a significant negative mediating effect on the relationship between nurse managers' transformational leadership and nurses' perception of patient safety after controlling for transactional leadership. Thus, hypothesis H3d that states, "After controlling for the transactional behaviors of contingent reward and management-by-exception active, the relationship between nurse managers' transformational leadership and nurses' perception of unit patient safety as measured by patient safety grade (AHRQ HSOPSC) will be mediated by team innovation climate" was supported. This result should be interpreted with caution given the post hoc power analysis finding an effect size f^2 of 0.07 and a power of 0.78. Thus the effect size would be considered small based on Cohen (1988, p. 412) and slightly underpowered.

Table 18

Results of Regression Analysis Testing Mediation Effect of Team Innovation Climate on the Relationship between Transformational Leadership and Nurses' Perception of Patient Safety Controlling for Transactional Leadership

Model		Unstandardized Coefficients		Standardized Coefficients	t	*p*
		B	Std. Error	Beta		
1	(Constant)	3.59	0.29		12.39	0.00*
	Transactional Leadership	-0.51	0.08	-0.46	-6.43	0.00*
2	(Constant)	4.86	0.35		13.93	0.00*
	Transactional Leadership	-0.31	0.08	-0.28	-3.77	0.00*
	Team innovation climate	-0.52	0.09	-0.41	-5.59	0.00*
3	(Constant)	4.55	0.34		13.42	0.00*
	Transactional Leadership	0.15	0.13	0.13	1.13	0.26
	Team innovation climate	-0.34	0.10	-0.27	-3.54	0.00*
	Transformational Leadership	-0.51	0.12	-0.55	-4.29	0.00*

Note. Model 3: $F(3, 153) = 36.07$, $p < 0.001$; $R^2 = 0.41$; R^2 Change = 0.04, $F(1, 153) = 18.30$, $p < 0.001$, N= 157

a. Dependent Variable: Overall patient safety grade

b. Predictors: (Constant), Transactional Leadership, Team innovation climate, Transformational Leadership

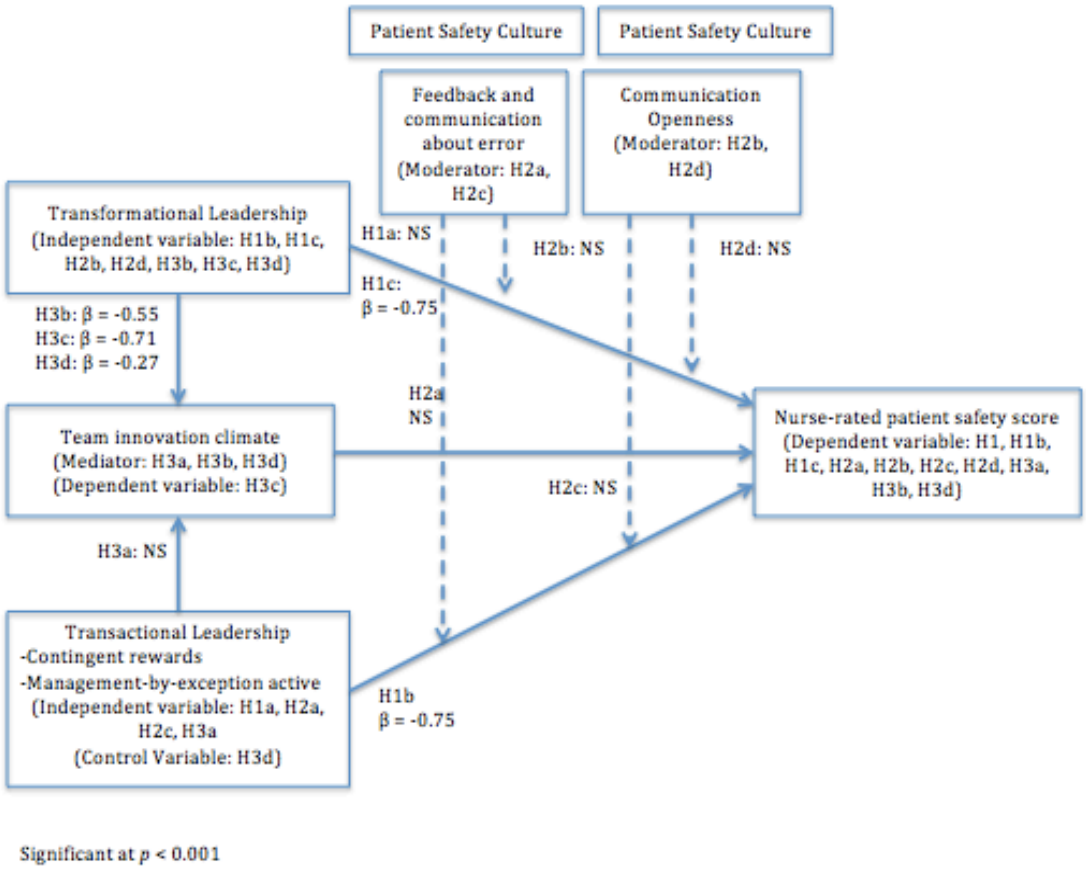
*Significant at level of significance of 0.05

Summary

The purpose of this quantitative study was to extend the understanding of the role of transformational and transactional leadership in improving patient safety and safety culture through a climate that is conducive to creativity and innovation. The results are shown in Figure 4.

Figure 4

Results of Hypothesized Conceptual Model



The results of the multiple linear regression analysis showed that transformational leadership is significantly related to nurses' perception of patient safety supporting hypothesis H1b. Hypothesis H1a was rejected, as transactional leadership was not significantly related to nurses' perception of patient safety. Testing the augmentation hypothesis H1c showed that transformational leadership explains variance in nurses' perception of level patient safety over and above transactional leadership. Regression analysis used to test the moderating effects of patient safety culture (H2a-H2d) showed

that both nurses' perceptions of feedback and communication about error and communication openness did not moderate the relationship between transactional leadership and nurses' perception of patient safety and relationship between transformational leadership and nurses' perception of patient safety. The regression analysis showed that team innovation climate significantly mediates the relationship between transformational leadership and nurses' perception of patient safety supporting H3b. Hypothesis H3a was not supported which tested the mediating role of team innovation climate and the relationship between transactional leadership and nurses' perception of patient safety. Lastly the augmentation hypothesis H3c was supported which showed that transformational leadership explains variance in nurses' perception of team innovation climate over and above transactional leadership; and after controlling for transactional leadership. Lastly, H3d was supported which showed that the relationship between nurse managers' transformational leadership and nurses' perception of patient safety is mediated by team innovation climate after controlling for transactional leadership. Implications of the data analysis based on the information presented will be discussed in Chapter V. Suggestions on how the findings may be applied in an organizational setting and a summary of recommendations for future research are also discussed in Chapter V.

CHAPTER V

This study examined transformational and transactional leadership related to the nurses' perception of patient safety, the mediating role of team innovation climate, and moderating role of communication openness and communication and feedback about error. Significant effects were found between transformational leadership and nurses' perception of patient safety, however the relationship between transactional leadership and nurses' perception of patient safety was not supported. The moderating relationship of feedback and communication about error and communication openness was not supported. Lastly, the augmentation hypothesis of transformational leadership over transactional leadership in relation to nurses' perception of patient safety was supported; and transformational leadership had a significant indirect effect on nurses' perception of patient safety through the mediating variable of team climate for innovation above transactional leadership providing further evidence supporting the original work by Bass (1985).

Discussion

Leadership and Patient Safety

The role of leadership in patient safety has been described as critical to improved patient outcomes and transformational leadership endorsed as a model for improvement by the Institute of Medicine (IOM, 2011, p. 416-417). The relationship between nurses' perception of patient safety and quality of care is often cited as a challenge to assessing patient safety culture (Nieva & Sorra, 2003; Huang et al., 2007). The dependent variable in the current study, patient safety grade, was adopted from the AHRQ Hospital Survey on Patient Safety Culture (HSOPS) which asks front-line nurses to provide an overall

grade on patient safety for their work area/unit (Famolaro et al., 2018). Previous research has shown the importance of nurses' perception of patient safety and relationships with patient safety indicators and reduced complications (from Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010; Birkmeyer, Finks, & Greenberg, 2013). According to the AHRQ Hospital Survey on Patient Safety Culture 2018 User Database Report (Famolaro et al., 2018) 630 hospitals administered the survey with 382,834 providers and staff responding to the survey. The 2018 report found an average percent positive response of 65% across the 12 domains in the survey. The current study showed that 82.8 percent of nurses rated patient safety on their units as "excellent" (43%) or "very good" (40%). This is above the 2018 national average of 78 percent "excellent" (35%) or "very good" (43%) rating in the AHRQ HSOPS database (Famolaro et al., 2018). In the current survey, no responses were recorded "failing", similar to the 1 percent in the 2018 AHRQ HSOPSC database. More research is needed to determine how high nurses' perception of patient safety may be associated with patient safety indicators. One hypothesized reason for higher ratings of patient safety by front line nurses may be attributed to the Magnet status of the medical center, which is an indicator of nursing excellence. A 2016 study by Stimpfel, Sloane, McHugh, and Aiken reviewed data from the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey and found that patients in Magnet hospitals rated the care as more positive, reported more positive nurse communication, and were more likely to recommend the Magnet hospitals compared to non-Magnet hospitals.

The current study sought to explore how transformational and transactional leadership can impact the nurses' perception of patient safety (patient safety grade). The

means and standard deviations in this study for transformational (M = 3.95, SD = 0.87) and transactional leadership (M = 3.60, SD = 0.72) are higher than recent studies including in healthcare by Merrill (2015). Merrill (2015) examined the relationship of transformational and transactional leadership on multiple variables including safety climate. Descriptive statistics showed transformational leadership (M = 2.97, SD = 0.35), transactional leadership (M = 2.56, SD = 0.17), and safety climate (M = 3.8, SD = 0.428). In the current study, transformational leadership (β = -0.75, $p < 0.001$) had a significant negative relationship with nurses' perception of patient safety (H1b), while transactional leadership was not significantly associated (β = 0.18) (H1a). It should be noted that a lower score in the nurses' perception of patient safety indicated a better rating of patient safety grade, while higher score indicated poor overall patient safety rating. The negative relationship means the higher the practice of transformational leadership of nurse managers, the higher the nurses' perception of patient safety.

The relationship between transformational leadership and nurses' perception of patient safety is consistent with previous studies that have shown transformational leadership to be significantly related to positive organizational outcomes (Cheng, Bartram, Karimi, & Leggat, 2016; Clark, 2013; Zohar & Luria, 2004). In a 2013 systematic review, Wong, Cummings, & Ducharme found 20 studies that tested the relationship between leadership and patient outcomes between 1999 and 2012. Six studies used transformational leadership as the leadership variable. A wide range of patient outcome variables (19) was grouped into five common categories: patient satisfaction, mortality/patient safety outcomes, adverse events, complications, and

utilization. Of the six studies that measured transformational leadership, four found significant relationships with improved patient outcomes.

More recently, Cheng, Bartram, Karimi, and Leggat (2016) examined the role of transformational leadership in the development of shared social identity on nursing units and the impact on team climate, intent to leave, burnout, and nurse-rated patient care. Transformational leadership was found to have a significant positive correlation with nursing perceived quality of care ($r = 0.209$, $p < 0.01$) similar to the current study, which revealed a significant association with nurses' perception of patient safety ($r = -0.60$, $p < 0.001$). These results have important implications for front-line nurse leaders who have broad operational responsibility of their units related to unit staffing, quality improvement, and opportunities to engage front-line nurses in improving patient care (Wong, Cummings, & Ducharme, 2013). Transformational leaders on nursing units are likely to use inspirational motivation to engage front-line nurses in the vision of safe patient care (Griffin & Hu, 2013). Nurse managers utilizing intellectual stimulation seek to motivate front-line nurses to challenge the status quo and current mental models to improve care at the bedside (Murphy, 2005). Nurse managers displaying idealized influence to promote safe patient care exhibit safety as a core principal and promote safety over productivity that facilitates commitment and trust. Nurse managers attending to individual interests and development in providing safe patient care would be utilizing individual consideration and contribute to a higher perception of patient safety by front-line nurses (Barling, Loughlin & Kelloway, 2002, p. 489).

On the other hand, the hypothesized relationship between transactional leadership and nurses' perception of patient safety (H1a) was not supported in the current study.

While other researchers have found empirical support for transactional leadership and directly assessed outcomes (safety literature) (Clarke, Guediri, & Lee, 2017), this research did not support the relationship between transactional leadership and nurses' perception of patient safety. One reason for the lack of support for transactional leadership related to nurses' perception of patient safety might be attributed to the structural empowerment of nurses through the Magnet status of the medical center, which has been shown to promote better safety outcomes (Boamah, Laschinger, Wong, & Clarke, 2018). Structural empowerment in nursing is a key element of Magnet recognized facilities and has been linked to nurse rated patient safety climate (Armellino, Griffin, & Fitzpatrick, 2010; Kutney-Lee et al., 2016). It is possible that nurses are practicing in an environment where they are empowered in their work to provide the highest patient care. Thus, in Magnet facilities nurses are empowered to develop policies and standard procedures to improve patient care. While transactional leadership may enforce adherence to policy and standard procedures through MBEA, it is the transformational leader who engages nursing in the development of nurse-managed protocols for patient care thereby improving nurses' perception of patient care.

Transformational and transactional leadership practices have been studied extensively in health care, yet little research has sought to explore the impact on patient care regarding the augmentation effect of transformational leadership over that of transactional leadership. Avolio and Bass (2004) theorize that the most effective leaders use both transformational and transactional leadership and state, "Transactional leadership provides a basis for effective leadership, but a greater amount of Extra Effort, Effectiveness, and Satisfaction is possible from employees by augmenting transactional

with transformational leadership" (p. 21). The current study confirmed the augmentation hypothesis H1c, finding a significant relationship between transformational leadership and nurses' perception of patient safety after controlling for transactional leadership (β = -0.75, $p < 0.001$). No previous research could be found that examines both transformational and transactional leadership in relation to nurses' perception of patient safety. Further, this is one of the first studies to examine the augmentation of nurse managers' transformational leadership over transactional leadership when predicting nurses' perception of patient safety. This is important as many studies only focus on transformational leadership and excludes transactional leadership.

Although improved patient outcomes have been shown to be possible through transactional leadership and adherence to standard protocols (improved UTI rates, Merrill, 2011), this may only provide a base for effective patient care. What the current study suggests is that front-line nurses perceive safety-related care as better on units where nurse managers display transformational leadership above that of transactional leadership supporting the augmentation effect. One of the most important functions of a nurse manager is to facilitate the achievement of shared goals of providing safe patient care (Cipriano, 2011). In order to transform patient care, leaders must not only be able to monitor and reward performance, but motivate front-line nurses to go beyond basic patient safety compliance mechanisms to achieve superior patient safety outcomes.

Moderation of Communication of Patient Safety

The literature review has found a surplus of empirical references regarding the importance of communication related to patient safety. Communication openness and communication and feedback and communication about error have been shown to be

elements of a culture of patient safety necessary for positive nursing perception of patient safety (Lee, Phan, Dorman, Weaver, & Pronovost, 2016). For example, Ammouri, Tailakh, Muliira, Geethakrishnan, and Kindi (2015) showed that nurses who perceived higher management expectations for patient safety and nurses overall perception of patient safety ($\beta = 0.280$, $p < 0.001$) and nurses who perceived more communication and feedback about error had higher perceptions of patient safety ($\beta = 0.314$, $p < 0.001$).

Given the previous findings suggesting a relationship between communication and feedback about error and communication openness, leadership, and perception of patient safety further analysis was warranted. Therefore it was hypothesized that the relationship between transformational leadership and nurses' perception of patient safety may depend on communication and feedback about error and communication openness. Specifically, nurses providing care within an environment where nurse managers disseminate data related to patient safety may be more engaged in solutions and perceive care as safer. Despite the theoretical support, the results of the regression analyses were not significant in all moderation hypotheses 2a, 2b, 2c, and 2d. Moderation effects were tested for nurses' perception of feedback and communication about error and communication openness on the relationship between transactional leadership and nurses' perception of patient safety and relationship between transformational leadership and nurses' perception of patient safety. The moderation analysis was severely underpowered as significant effects would only be possible with a sample size of greater than 550 with a medium effect size (Faul, Erdfelder, Buchner, & Lang, 2009). Despite previous empirical support for communication about patient safety, these results can only be

described as exploratory and more research with adequate sample sizes is needed to determine implications for practice.

The underpowered analysis of the moderation effects of nurses' perception of feedback and communication about error and communication openness is one possible explanation for the lack of significant findings. Another possible explanation may be that nurses' perception of feedback and communication about error and communication openness may act as a mediator between transformational leadership and nurses' perception of patient safety rather than a moderator. A systematic review of quality of care and teamwork in the intensive care unit by Dietz et al. (2016) supports communication processes such as closed loop communication as a possible mediator that may help understand the relationship between leadership and patient outcomes.

A deeper analysis of the communication elements of the AHRQ HSOPSC is presented in table 19. This analysis shows that within the current medical center, nurses perceived communication better than the national average within the 2018 AHRQ HSOPSC database for elements of communication and feedback about error and communication openness. However, more analysis is needed to fully understand this element of communication openness and impact on patient safety.

Table 19

Comparison of positive response to communication elements of patient safety within the 2018 AHRQ HSOPSC database

Feedback and communication about error		
	% Positive	AHRQ Database % Positive
We are given feedback about changes put into place based on event reports.	78	61
We are informed about errors that happen in this unit.	86	69
In this unit, we discuss ways to prevent errors from happening again.	83	76

Communication openness		
	% Positive	AHRQ Database % Positive
Staff will freely speak up if they see something that may negatively affect patient care.	82	79
Staff feel free to question the decisions or actions of those with more authority.	57	50
Staff are afraid to ask questions when something does not seem right.	55	68

As previously described, the outcome variable of perception of patient safety is a global measure of how nurses perceive care on their units. A more granular approach to understanding how communication about error and communication openness can impact care is necessary. This may be best accomplished through a different outcome variable that accounts for the microcultures that exist within different types of nursing units. For example, a study by Jones, Skinner, Xu, Sun, and Mueller (2008) found that nurses in surgical areas were three times more likely to agree with the communication about error

elements of the HSOPSC than those in acute or skilled nursing areas. Surgical areas may value communication and feedback about error related checklists and protocols where the greatest risk for error is lack of communication (Schuenemeyer et al., 2017). Medical or skilled nursing areas may value ongoing open dialogue between leaders and nurses about the nursing process and evaluation of patient goals of care related to care planning (Riley, 2017). These results underscore the importance of communication flow by leaders but also the difference in perceptions and meaning attached to communication about patient safety across different specialty units.

Mediating Role of Innovation Climate

Many organizations have identified transformational leadership as a means to capitalize on the need to enhance organizational creativity and innovation as a competitive advantage (Gumusluoglu & Ilsev, 2009). This study sought to explore the underlying creative conditions that facilitate the relationship between transformational leadership and nurses' perception of patient care through a team climate for innovation. The team innovation climate as conceptualized is consistent with the theory of team climate for innovation proposed by Anderson and West (1998) encompassing vision, participative safety, task orientation, and support for innovation. The mediation analysis was completed according to the four-step process outlined by Barron and Kenny (1986) to determine the significance of the mediating effect of team innovation climate on the relationship between transactional leadership and transformational leadership with nurses' perception of patient safety. The results showed that team innovation climate only had a significant negative mediating effect on the relationship between transformational leadership and nurses' perception of patient safety ($\beta = -0.55$, $p < 0.001$)

thereby supporting H3b. The mediating effect was insignificant with transactional leadership thereby rejecting H3a. This is one of the first studies to show that nurse managers displaying transformational leadership are able to impact front-line nurses' perception of patient safety by supporting a climate for innovation on their units.

A comprehensive patient safety program is critical to providing safe patient care (Aspden, Corrigan, Wolcott, & Erickson, 2004). A robust patient safety program must include leadership support for nurses to promote creative solutions in the pursuit of safer patient care (McFadden, Stock, & Gowen, 2015). This study supports perceptions of nurse managers as transformational leaders impact the nurses' perception of patient safety by creating and sustaining a climate supportive of innovation. This finding is consistent with previous research showing that transformational leaders can enhance the climate for innovation through ensuring the vision is understood and valued, front-line nurses are provided opportunity to debate and propose new solutions, and front-line nurses perceive that innovation is supported on their units (Anderson & West, 1998). For example, Pirola-Merlo, Hartel, Mann, and Hirst, (2002) conducted a mixed methods study of transformational leadership, project team performance, and team innovation climate. Transformational leadership was related to the four components of team innovation climate (vision $\beta = 0.45$, $p < 0.01$; participative safety $\beta = 0.30$, $p < 0.01$; task orientation $\beta = 0.35$, $p < 0.01$; support for innovation $\beta = 0.52$, $p < 0.01$). Recent support for the role of transformational leadership, quality of care, and team innovation climate can be found in a 2016 cross-sectional study by Cheng, Bartram, Karimi, and Leggat, The authors showed that the perception of quality among nurses that transformational leadership can have a direct positive impact on the team innovation climate ($\beta = 0.16$, $p <$

0.01) and indirect positive relationship on the team innovation climate (β = 0.80, $p <$ 0.01) through social identity (β = 0.39, $p < 0.01$). A 2015 study by Weng, Huang, Chen, and Chang, (2015) showed that transformational leadership had a significant positive influence on nurse innovation behavior (β = 0.23, $p < 0.01$), patient safety climate (β = 0.29, $p < 0.01$), and innovation climate (β = 0.35, $p < 0.01$).

The current study continues to show empirical support for the role of transformational leadership and its impact on the team innovation climate (β = -0.58, $p <$ 0.001) and that team innovation climate has a direct effect on nurses' perception of patient safety (β = -0.53). More specifically, transformational leaders can engender high levels perception of patient safety through the establishment of an innovation climate inclusive of the elements of vision, participative safety, task orientation, and support for innovation.

This study proposed that transformational leadership is significantly related to team innovation climate after controlling the effect of the transactional leadership (H3c). The results showed that transformational leadership was significantly related with team innovation climate after controlling the effect of the transactional leadership (β = 0.71, p < 0.001) thereby supporting H3c. What this tells us is that transformational leaders may be able to engage front-line nurses in creative exploration of solutions to dysfunctional or outdated patient care models that may go beyond the current standard of care (Xenikou, 2017). Transactional leadership was not found to impact team innovation climate. Transactional leadership may not provide the leadership support necessary for employees who are intrinsically motivated to produce creative solutions to complex problems (Wang, Kim, & Lee, 2016).

Transformational nurse managers may engender a climate for innovation by using inspirational motivation is to generate a shared mission and vision. However the leader exhibiting inspirational motivation may not only provide a vision for the future but also help provide the resources to do creative work and ultimately lead to innovation (Jaiswal & Dhar, 2015). Additionally, transformational nurse managers may exhibit intellectual stimulation and stimulate creativity in front-line nurses that enable conditions necessary for the development of an innovation climate (Boies, Fiset, & Gill, 2015; Sarros, Cooper, & Santora, 2008).

The augmentation hypothesis H3d was tested to determine the significance of the mediating effect of team innovation climate on the relationship between transformational leadership and nurses' perception of unit patient safety after controlling the effect of the transactional leadership. The results supported the augmentation hypothesis H3d, showing that team innovation climate still had a significant mediating effect ($\beta = -0.27$, $p < 0.001$) on the relationship between nurse managers' transformational leadership and nurses' perception of patient safety after controlling for transactional leadership. This is the first study known to test the augmentation of transformational leadership related to the nurses' perception of patient safety and the mediating effect of team innovation climate. This study shows that transformational nurse managers are able to support a climate for innovation where nurses perceive better patient care. A climate that is conducive to innovation is one in which employees can try out new ideas without fear of failure (Henker, Sonnentag, & Unger, 2015). Transformational nurse managers may use individual consideration and inspirational motivation to impact participative safety and support for innovation to encourage front-line nurses to critically appraise current

approaches to patient care and propose new solutions to obsolete models of care delivery (Bass & Riggio, 2006). As a result, nurses are engaged in a shared vision of safe patient care and may be more likely to enlist creative approaches to patient care when the standard of care is insufficient (Anderson, Potočnik, & Zhou, 2014). Transformational nurse managers may stimulate front-line nurses to act outside the standard norms, reexamine traditional approaches to care, and solve problems creatively through intellectual stimulation. Further, transformational leaders may use idealized influence and inspirational motivation to emphasize a common vision of safe patient care and supportive of high task orientation where the expectation is excellent patient care. The results of this study show that nurse managers can transformational leadership to impact a climate for innovation defined by nurses who feel that innovation is supported and task orientation is high through the shared vision and expectation for excellent patient care.

The Context of Transformational Leadership

It is critical to understand the setting of this study is a Magnet recognized, academic medical center, in a large urban area. While other models of leadership have been shown to be effective at promoting quality patient care (Wong & Cummings, 2013), transformational leadership is promoted in Magnet recognized facilities and in some studies, has been associated with improved patient outcomes (Kutney-Lee, Stimpfel, Sloane, Cimiotti, Quinn, & Aiken, 2015). In a recent study of Magnet vs. non-Magnet hospitals, Magnet hospitals were shown to have lower mortality rates which was specifically attributed to a better professional practice environment and higher portion of nurses with advanced degrees and certifications (McHugh, Kelly, Smith, Wu, Vanak, & Aiken, 2013; Stimpfel, Rosen, & McHugh, 2014). Transformational leadership is one of

five domains of the Magnet environment and serves as a foundation to create the structures and environment to achieve compliance with all areas of the Magnet Recognition Program and subsequent improved patient outcomes (Schwartz, Spencer, Wilson, & Wood, 2011). Thus due to the nature of the Magnet designation, within this study, transformational leadership assessments were used to align with the language and strategic training for nursing leadership initiatives in this facility. While transformational leadership may be enhanced in this facility, unless ceiling effects are found for extraordinarily high levels of this factor, the expected relationships to other aspects of organizational conditions and patient safety may be similarly detected regardless. This was not found in our study; although Transformational Leadership scores were elevated, they were not so to the extent that they attenuated the results in relationship to patient safety scores.

Implications for Nursing Leadership Practice

These findings are important for several reasons. It is well documented in the literature that innovation is necessary to improve patient care (Donaldson, Corrigan, & Kohn, 2000). The Institute for Healthcare Improvement (IHI) noted in 2008 that transformational leadership by nurse managers was an ideal leadership model to support change and transform care at the bedside. Further, the IHI states that nurse managers must be capable of building the capacity of front-line nurses in innovation and process improvement if care is to be transformed (Rutherford, Coughlan, Lee, Moen, Peck, & Taylor, 2008). The literature on quality improvement highlights the need for standard procedures in a small subset of nursing practice (Ernst & Jensen Schleiter, 2018).

However, a robust quality management program must continue to seek improvement opportunities when current practices are found to be outdated or ineffective.

The current research provides a framework for nurse managers to positively impact the perception of patient safety of front-line nurses by utilizing transformational leadership to develop a climate for innovation. This research highlights how the transformational nurse manager can create a climate for innovation where nurses are engaged in a vision of patient safety, feel safe to take risks, share a common goal of excellent patient care, and are supported in creative efforts to improve care. Table 20 outlines elements of a climate of innovation and related specific applications to front-line nursing leadership that may impact quality of care on units. Through inspirational motivation, nurse managers create a vision of safe patient care and ensure that nurses understand safety goals and are engaged in development of tactics to achieve safe patient care. Nurse managers who use intellectual stimulation create an environment where nurses feel safe to challenge the status quo when the standard of care is not met. Through idealized influence, nurse managers inspire a shared vision for safe patient care by acting as a patient safety champion. A nurse manager who demonstrates individualized consideration supports the diverse needs of nurses in their creative pursuits to improve care at the bedside. What this amounts to is the establishment of a climate for innovation that is focused on continuous improvement in patient safety and improves how nurses perceive safety on their units.

Table 20

Framework for Transformational Nurse Managers Impact on Innovation Climate and Nurses' Perception of Patient Safety

Climate for innovation focused on Patient Safety	**Implications for Transformational Nurse Managers**
Vision-quality goals are clear, valued among nurses, attainable, and shared among the group.	A nurse manager who demonstrates inspirational motivation actively engages front-line nurses in goal setting and dissemination of opportunities for improvement at the bedside so that the vision of safe patient care is shared.
Participative Safety-nurses actively propose new ideas in a non-threating environment.	A nurse manager who demonstrates intellectual stimulation calls on nurses to challenge the status quo in a non-threating environment when current practices fail to meet the high goals of excellent patient care.
Task Orientation-nurses share a concern for excellent patient care related to the vision of improved outcomes.	A nurse manager who demonstrates idealized influence is always reaching for higher patient safety goals. They may engage front-line staff in nursing M&M conference and continuous quality improvement committees to demonstrate a shared orientation for excellence.

Support for Innovation-nurses are supported in attempts to introduce new and improved ways of providing care at the bedside.	A nurse manager who demonstrates individualized consideration to provide support for innovation through application of quality improvement methodology training, data, and protected time for improvement activity.

This research provides rich description of how nurse managers can impact the perception of patient care on their units by enhancing the climate for innovation through supporting team members to explore creative solutions and a shared commitment for the achievement of organizational objectives (Eisenbeiss, van Knippenberg, & Boerner, 2008). Transformational leadership by nurse managers is shown in this study to promote an environment where creativity is valued and in response front-line nurses perceive the care as safer. The challenge is for nurse managers to balance the necessary transactional leadership necessary for many nurse standard procedures with the transformational leadership shown to improve the climate for innovation and subsequent improved perception of patient safety.

Limitations

There are several limitations to this study. First, this study was conducted at a single Magnet recognized academic medical center and may not be generalizable to other health care sites. Transformational leadership is promoted as one of five domains foundational to Magnet structure and in some studies, has been associated with improved patient outcomes (Kutney-Lee, Stimpfel, Sloane, Cimiotti, Quinn, & Aiken, 2015). The

overall rating of transformational leadership style was, then possibly higher than in other non-Magnet systems. While transformational leadership was also shown in this study to result in higher levels of nursing perception of patient safety, this relationship may not necessarily be generalized to non-Magnet facilities. Additionally, the nurses volunteered to participate in this research and their self-selection may imply that those who completed the survey have a stronger interest in leadership and outcomes. This in turn may have inflated the ratings of leadership and nurses' perception of patient care. As such, any broad generalization to other hospitals or business units should be interpreted with caution. While transformational leadership has been shown to result in higher levels of nursing perception of patient safety, this cannot be generalized to non-Magnet facilities.

Secondly, this study is limited by the lack of patient level outcomes data. The patient safety literature does support the link between organizational culture and patient safety (Walston, Al-Omar, & Al-Mutari, 2010). This study uses the perception of patient safety (patient safety grade) as a measure of patient safety. This is supported by research by Mardon, Khanna, Sorra, Dyer, and Famolaro (2010) studied the relationship between AHRQ Patient Safety Indicator scores and HSOPS variables. They found that all 15 Hospital Survey on Patient Safety (HSOPS) variables were negatively correlated and all but 3 that were statistically significant, including patient safety grade ($\beta = -0.17$; $p < 0.05$). What this shows is that nurses who gave their hospital a patient safety grade of A (excellent) or B (very good) had lower rates of adverse events (PSI). Further, the sample for this study was derived from the perception of front-line nurses and while these results provide us with clues on how leadership can impact patient safety, it is impossible to draw casual conclusions without an experimental study. Taking this into account, the

results presented here should be considered as a foundation from which to refine current patient safety improvement efforts and incorporate elements of the climate for innovation. Future research should include other objective measures of patient safety to provide additional context for continued improvement in patient outcomes.

Third, the outcome variable of nurses' perception of patient safety is treated as a continuous variable within this study. It is common in educational and health science research that Likert data are often used as continuous variables due to the powerful and comprehensive methods used in parametric methods. Norman (2010) argues that nominal data can be used in parametric methods without major issues of robustness or fear of "coming to the wrong conclusion" (p. 631). It should be noted that these findings are not generalizable to other populations due to the assumption of normal distribution when using parametric methods with nominal data.

Fourth, low power in mediation analysis is common and requires a sample size of greater than 550 for medium effect size and power of 0.80 (Shieh, 2010; Faul, Erdfelder, Buchner, & Lang, 2009). Future research should be designed to take into account the large sample needed for mediation analysis.

Fifth, this study was originally conceptualized at the unit level (group level). Due low number of participants at the unit level analysis was conducted at the individual level that may present a validity issue. Transformational leadership is most frequently conceptualized as individual perceptions and relationships developed between individuals and leaders (Charbonnier-Voirin, El Akremi, & Vandenberghe, 2010). This may be the most useful conceptualization as the leader behavior measured was that of the front line nurse manager. Group level measurement of transformational leadership would be

conceptualized as a transformational climate and would reflect shared norms around the degree of idealized influence, inspirational motivation, intellectual stimulation, and individual consideration displayed by the leader (Charbonnier-Voirin, El Akremi, & Vandenberghe, 2010, p. 701). Similarly, team climate for innovation is considered a multilevel phenomenon and has been conceptualized at both the individual and group level (Jaiswal & Dhar, 2015). Within the current study, the team climate for innovation refers to the unique individual perceptions of vision, participative safety, task orientation, and support for innovation within their work unit (Anderson & West, 1998). This is consistent with the cognitive schema approach to climate for innovation which conceptualizes climate as the individual representations of employee's work environment expressed in terms of psychological sense-making related to the proximal work environment (Anderson & West, 1998, p. 236). Lastly, nurses' perception of patient safety is conceptualized as the individual representation of the work environment.

Finally, low response rate has generally been a barrier to conducting survey research and has continued to decline (Cooper & Brown, 2017; Rindfuss, Choe, Tsuya, Bumpass, & Tamaki, 2015). It should also be noted that in the health care setting, email surveys have also been shown to have lower response rates than mail-based surveys (Cunningham, et al., 2015). Given the limited budget for this research, email was employed as the only viable option for survey distribution. As described in Chapter III a variety of strategies were employed in order to increase participation including: monetary incentive in the form of a lottery for a gift card, flyers in nursing break rooms, frequent communication via email with unit managers, and onsite support from nurse researchers.

Future Research

Despite the plethora of research on transformational leadership, there still remains a lot of work to be done. The current research extends our understanding of how transformational nurse managers are able to impact front-line nurses' perception of patient safety through a climate for innovation above that of transactional leadership. This offers the first support for the augmentation of transformational leadership by nurse managers related to a climate for innovation that enhances nurses' perception of patient care. Future research should focus on testing other research designs and relationships including the relationships in the moderated and mediated models. Specifically, more robust nursing specific outcome measures should be used to assess quality of patient care, including mortality and morbidity measures. Additionally, this study used front-line nurse perception of leadership and perception of patient safety at a single point in time using a survey. Longitudinal observational research design may provide additional clues as to how leadership may develop and sustain innovation in patient care over time on a nursing unit.

Conclusion

Predominate studies within the leadership literature have focused on transformational leadership and little attention paid to the transactional behaviors critical to improving patient care. This study has been able to add to the prolific leadership literature by assessing both transformational and transactional leadership behaviors described by (Bass, 1985). While previous studies have shown transactional leadership to be necessary for adherence to standard protocols and safety (Clarke, 2013), this study found no significant relationship with transactional leadership and nurses' perception of

patient safety. This study shows that transformational leadership is significantly impacts the front-line nurses' perception of patient safety, while transactional leadership was not found to be significant. This may be due to the higher order nature of the nurses' perception of patient safety that is a global measure of how nurses view patient care on their units. Transactional leadership may add value to patient care through contingent reward and active management-by-exception and subsequent adherence to standardized nursing practices, but this appears to have little influence on how nurses perceive quality of care.

Further, the infrequently tested augmentation effect was examined with nursing managers and the impact of transformational behaviors above transactional leadership has on the team innovation climate and nurses' perception of patient safety. The findings of this study are consistent with the theoretical underpinnings of transformational leadership that seeks to elevate nurses' perception of patient safety beyond daily nursing transactions through a climate where nurses can practice at the top of license and be creative in their work. No previous empirical studies could be found that addressed the augmentation effect and patient safety in front-line nursing and a team climate for innovation. This research uniquely contributes to the literature by providing evidence of how a climate for innovation can strengthen the relationship between transformational leadership and nurses' perception of patient safety. If next level patient outcomes are to be realized, health system leadership must create quality management programs that include training nursing managers on how to use transformational leadership to develop a climate conducive to innovation. Overall, the results of this study provide a framework

for nurse managers to use transformational leadership to support front-line nurses in improving care through a climate conducive of creativity and innovation.

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APPENDIX A

SURVEY QUESTIONS

Pre-screening Questions:
Scale: Yes/No

1. Are you a Registered Nurse who works 20 or more hours per week? Yes/No

2. Do you have direct patient care responsibility as part of your daily work? Yes/No

Demographic Data:

1. Gender: Male, Female

2. Age: 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60 or over

3. Highest level of education completed: Diploma in nursing, Baccalaureate in nursing, Masters in nursing, Masters other than nursing, Doctorate of nursing practice, PhD in nursing

4. Number of years you have work on your CURRENT unit: less than 6 months, 6-11 months, 1-5 years, 6-10 years, 11-15 years, 16-20 years, more than 21 years

5. Number of years you have worked for this Organization: less than 6 months, 6-11 months, 1-5 years, 6-10 years, 11-15 years, 16-20 years, more than 21 years

6. Unit type: ICU, Medical/Surgical, Outpatient, other (name)

7. Identify your unit: list of hospital units drop down menu. If your unit is not listed, please list in the blank.

8. Shift: Day Shift, Night Shift

TCI short (Kivimaki & Elovainio, 1999)
Scale: 5-point Likert scale from 0, not at all, to 4, a very great extent

1. How far are you in agreement with the objectives of your work unit?
2. To what extent do you think objectives of your work unit are clearly understood by other members of the work unit?
3. To what extent do you think objectives of your work unit can actually be achieved?
4. How worthwhile do you think these objectives are to the organization?
5. We have a "we are together" attitude
6. People keep each other informed about work related issues in the work unit

7. People feel understood and accepted by each other
8. There are real attempts to share information throughout the work unit
9. Are members of your work unit prepared to question the basis of what the work unit is doing?
10. Does the work unit critically appraise potential weaknesses in what it is doing to achieve the best possible outcome?
11. Do members of the work unit build on each other's ideas to achieve the best possible outcome?
12. People in this work unit are always searching for fresh, new ways of looking at problems.
13. In this work unit we take the time needed to develop new ideas.
14. People in the work unit cooperate to help develop and apply new ideas.

AHRQ HSOPSC (Famolaro et al., 2018)

Section A: Hospital Work Area/Unit
Scale: 1-strongly disagree; 2-disagree; 3-neither; 4-agree; 5-strongly agree

1. People support one another in this unit.
2. We have enough staff to handle the workload.
3. When a lot of work needs to be done quickly, we work together as a team to get the work done.
4. In this unit, people treat each other with respect.
5. Staff in this unit work longer hours than is best for patient care.
6. We are actively doing things to improve patient safety.
7. We use more agency/temporary staff than is best for patient care.
8. Staff feel like their mistakes are held against them.

9. Mistakes have led to positive changes here.
10. It is just by chance that more serious mistakes don't happen around here.
11. When one area in this unit gets really busy, others help out.
12. When an event is reported, it feels like the person is being written up, not the problem.
13. After we make changes to improve patients safety, we evaluate their effectiveness.
14. We work in "crisis mode" trying to do too much, too quickly.
15. Patient safety is never sacrificed to get more work done.
16. Staff worry that mistakes they make are kept in their personnel file.
17. We have patient safety problems in this unit.
18. Our procedures and systems are good at preventing errors from happening.

Section B: Your Supervisor/Manager
Scale: 1-strongly disagree; 2-disagree; 3-neither; 4-agree; 5-strongly agree

19. My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures.

20. My supervisor/manager seriously considers staff suggestions for improving patient safety.
21. Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts.
22. My supervisor/manager overlooks patient safety problems that happen over and over.

Section C: Communication
Scale: 1-never; 2-rarely; 3-sometimes; 4-most of the time; 5-always

23. We are given feedback about changes put into place based on event reports.
24. Staff will freely speak up if they see something that may negatively affect patient care.
25. We are informed about errors that happen in this unit.
26. Staff feel free to question the decisions or actions of those with more authority.
27. In this unit, we discuss ways to prevent errors from happening again.
28. Staff are afraid to ask questions when something does not seem right.

Section D: Frequency of Events Reported
Scale: 1-never; 2-rarely; 3-sometimes; 4-most of the time; 5-always

29. When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?
30. When a mistake is made, but has no potential harm the patient, how often is this reported?
31. When a mistake is made that could harm the patient, but does not, how often is this reported?

Section E: Patient Safety Grade
Scale: A-excellent; B-very good; C-acceptable; D-poor; E-failing
32. Please give your work area/unit in this hospital an overall grade on patient safety.

Section F: Your Hospital
Scale: 1-strongly disagree; 2-disagree; 3-neither; 4-agree; 5-strongly agree

33. Hospital management provides a work climate that promotes patient safety.
34. Hospital units do not coordinate well with each other.
35. Things "fall between the cracks" when transferring patients from one unit to another.
36. There is good cooperation among hospital units that need to work together.
37. Important patient care information is often lost during shift changes.
38. It is often unpleasant to work with staff from other hospital units.
39. Problems often occur in the exchange of information across hospital units.
40. The actions of hospital management show that patient safety is a top priority.
41. Hospital management seems interested in patient safety only after an adverse event happens.
42. Hospital units work well together to provide the best care for patients.

43. Shift changes are problematic for patients in this hospital.

SECTION G: Number of Events Reported
Scale: A-no event report; B-1 to 2 event reports; C-3 to 5 event reports; D-6 to 10 event reports; E-11 to 20 event reports; F-21 even reports or more

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

MLQ-5X (Bass & Avolio, 2004) (36 questions).
Scale: 5-point Likert scale from 0 identified as not at all to 4 identified as frequently, if not always.

Available at: http://www.mindgarden.com/multifactor-leadership-questionnaire/226-mlq-

remote-online-survey-license.html

APPENDIX B

LETTERS

INITIAL NURSE MANAGER EMAIL CONTACT

INITIAL EMAIL TO ALL RN STAFF

REMINDER EMAIL TO ALL RN STAFF

Initial Nurse Manager Email Contact

Dear Colleague:

I am a doctoral nursing student at Arizona State University in the College of Nursing and Health Innovation. Your hospital has agreed to participate in a study I am conducting in order to gain a deeper understanding about leadership behaviors, particularly Transformational Leadership, and the impact on patient safety in your unit. Additionally, I am interested in gaining an understanding of the Innovation Climate within your unit and how this may influence patient safety.

The nursing staff on your unit will be asked to complete a questionnaire in which they rate your leadership behavior, their perceptions of: the unit innovation climate, the unit patient safety grade, and communication openness and feedback and communication about error. All information will be kept strictly confidential. Although surveys are coded according to unit, you will be identified as the manager for the unit(s) you manage.

Individual staff responses will not be shared with anyone outside the research team. Your name will never be identified and results of the study will only be reported at grouped level to ensure that specific information related to you and your unit remains confidential.

While staff participation is entirely voluntary, I hope you will encourage their participation by reminding them of their anonymity and that the results of this study will be very helpful in understanding the impact of nursing leadership on a patient safety environment and patient outcomes. I would encourage you to take four specific steps to help with participation: 1.) Post the attached flyer in your break room that describes the study, 2.) Include the following statement in your weekly communication to your nurses, 3.) Include the importance of this survey on any upcoming meetings you have with staff, and 4.) Please let me know if I can present a brief 5 min overview of this research to your staff at your next meeting.

After the survey concludes, nurses will have the option to enter a drawing for four, $50 Visa gift cards. Winners will be contacted via email one week after the conclusion of the study.

Thank you in advance for your support,

Samuel J. Younger, MHA, MSN, AGPCNP, FACHE
Email: patientqualitycarestudy@gmail.com

Phone: 615-585-8831

Initial Email to All RN Staff

Dear Colleague:

You are invited to participate in an important survey to further understand the climate for innovation in your unit and how the unit leadership can impact patient safety through transformational leadership behaviors and communication and feedback about error. All nursing staff with direct patient care responsibilities are being asked to complete this survey. Your participation is voluntary, but I encourage you to complete the survey to help in gaining a deeper understanding of how to impact patient safety. It will take about 10 to 15 minutes to complete the survey will be very useful in understanding how leadership behaviors influence safe and innovative workplaces.

After the survey concludes, you will have the option to enter a drawing for four, $50 Visa gift cards. Winners will be contacted via email one week after the conclusion of the study.

To access the secure survey Web site, click on the following link: http://www...

Please contact Samuel J. Younger if you have any questions about the survey or have any technical problems.

Sincerely,

Samuel J. Younger, MHA, MSN, AGPCNP, FACHE
Email: patientqualitycarestudy@gmail.com
Phone: 615-585-8831

Reminder Email to All RN Staff

Dear Colleague:

Approximately 1 week ago, a survey was sent to you seeking your perspectives on your nurse manager's leadership style, unit innovation climate, unit patient safety grade and feedback and communication about error on your unit.

If you have already completed and returned the survey, please accept my sincere thanks. If not, please take the time to do so today. All nursing staff with direct patient care responsibilities are being asked to complete this survey. Your participation is voluntary, but I encourage you to complete the survey to help in gaining a deeper understanding of how to impact patient safety. It will take about 10 to 15 minutes to complete the survey will be very useful in understanding how leadership behaviors influence safe and innovative workplaces.

To access the secure survey Web site, click on the following link: http://www...

After the survey concludes, you will have the option to enter a drawing for four, $50 Visa gift cards. Winners will be contacted via email one week after the conclusion of the study.

Thank you for considering this request. Your time is greatly appreciated.

Sincerely,

Samuel J. Younger, MHA, MSN, AGPCNP, FACHE
Email: patientqualitycarestudy@gmail.com
Phone: 615-585-8831

APPENDIX C

DEFINITION OF TERMS

Climate - The shared meaning organizational members attach to the events, policies, practices, and procedures they experience and the behaviors they see being rewarded, supported, and expected (Ehrhart et al., 2014).

Communication openness - the extent to which staff freely speak up if they see something that may negatively affect a patient and feel free to question those with more authority (Famolaro et al., 2018, p. 4).

Creativity - A product or idea that is considered to be (a) novel or original and (b) useful or adaptive (Mumford, 2003).

Culture – 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 (Schein, 2010).

Culture of Patient Safety - The safety culture of an organization is 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. (Health and Safety Commission Advisory Committee on the Safety of Nuclear Installations, 1993).

Feedback and Communication about Error - staff are informed about errors that happen, are given feedback about changes implemented, and discuss ways prevent errors (Famolaro et al., 2018, p. 4).

Innovation - The intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of

adoption, designed to significantly benefit role performance, the group, the organization or the wider society (West & Farr, 1989, p. 16).

Nurse Manager - A formal organizational leadership position that has operational responsibility at the unit level for functions including budget and staffing. Typically reporting to a Director or above.

Team Innovation Climate - West (1990) and later Anderson and West (1998), conceptualized the team climate for innovation as a four-factor theory including; vision, participative safety, task orientation, and support for innovation. *Vision* is conceptualized as a motivating force that encompasses: clarity (understandable), visionary nature (valued outcome to individuals that engenders shared commitment), attainability (goals must be reachable), and shardeness (accepted by individuals within the group). *Participative safety* involves the active participation of group members in decision-making and is motivated by an atmosphere of non-threatening interactions and ability to propose new ideas. *Task orientation* is a shared concern for excellence related to a shared vision and outcomes through individual and team accountability through supportive adoption and improvement to established policies, procedures, and methods. *Support for innovation* is the articulated and enacted support of attempts to introduce new and improved ways of doing things in the work environment (West 1990, p. 38; Anderson & West, 1998, p. 240).

Transactional Leadership – A process of social exchange between leader and follower directed toward the achievement of organizational objectives (Bass & Riggio, 2006).

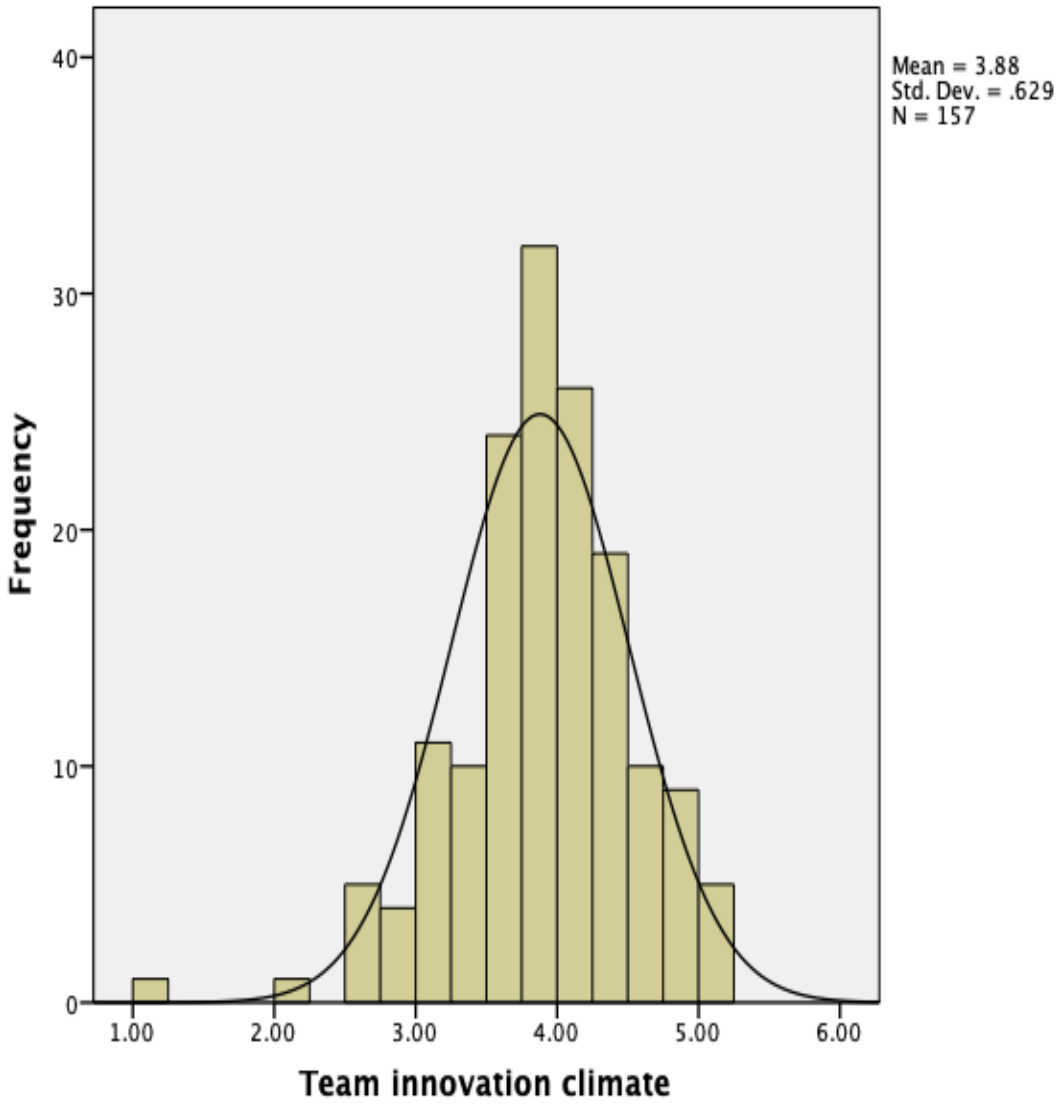
Transformational Leadership – Inspiring followers to commit to a shared vision and goals for an organization or unit, challenging followers to be innovative problem solvers,

and developing followers' leadership capacity via coaching, mentoring, and provision of both challenge and support (Bass & Riggio, 2006).

Work group – The group within which day-to-day tasks and activities at work are carried out (Anderson & West, 1998).

APPENDIX D

STUDY VARIABLE HISTOGRAM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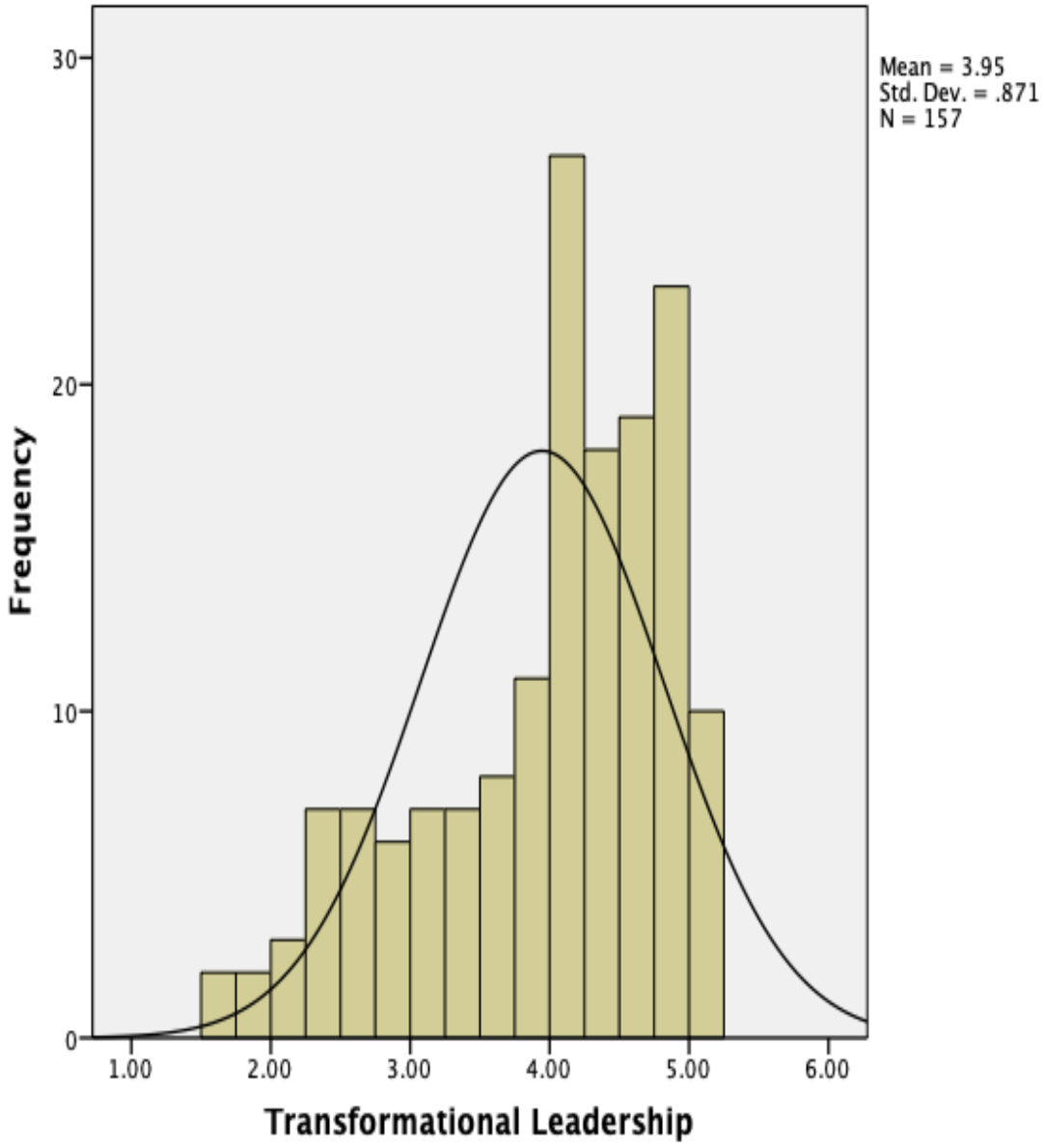
4.00
5.00
6.00
Team innovation climate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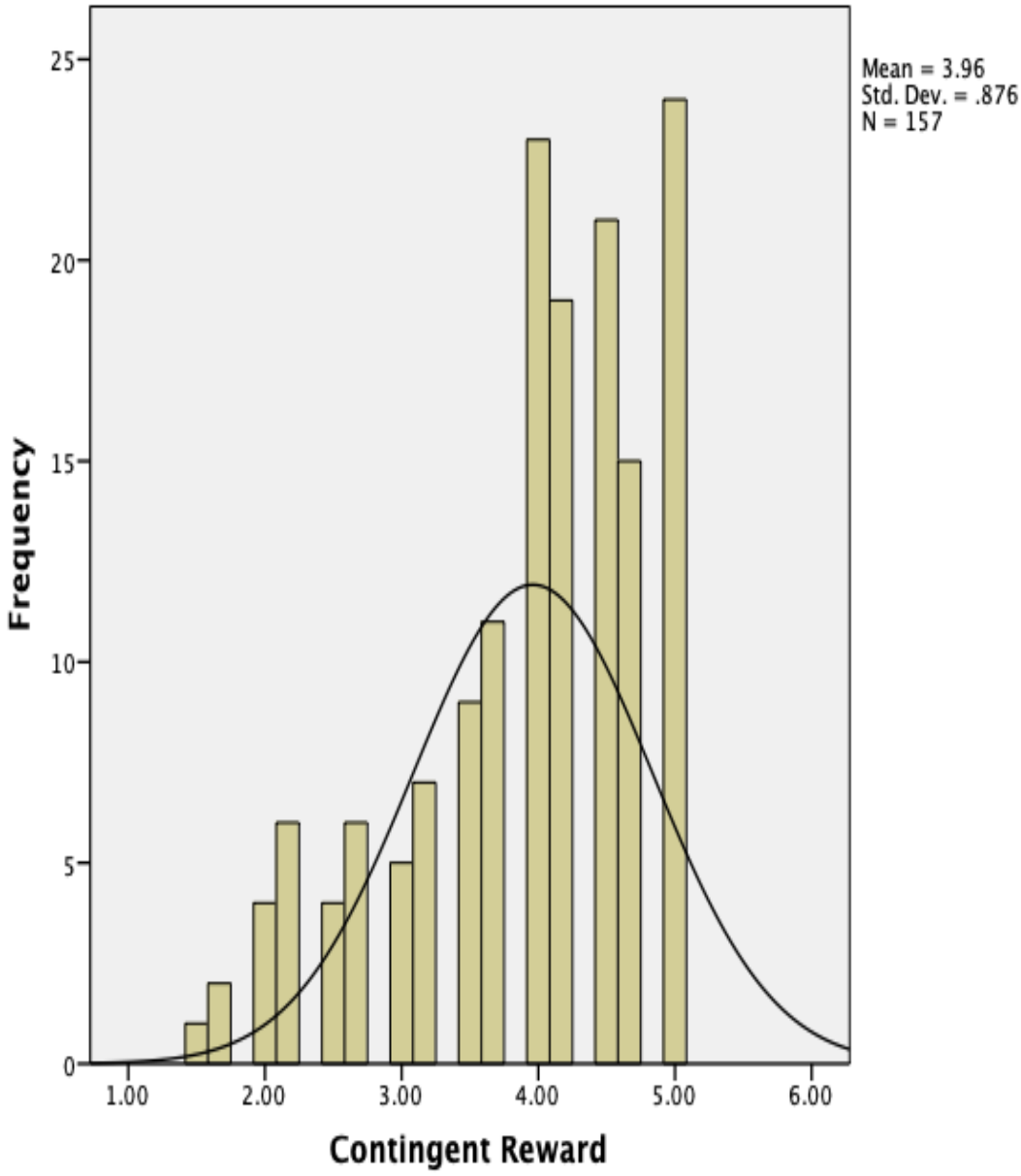
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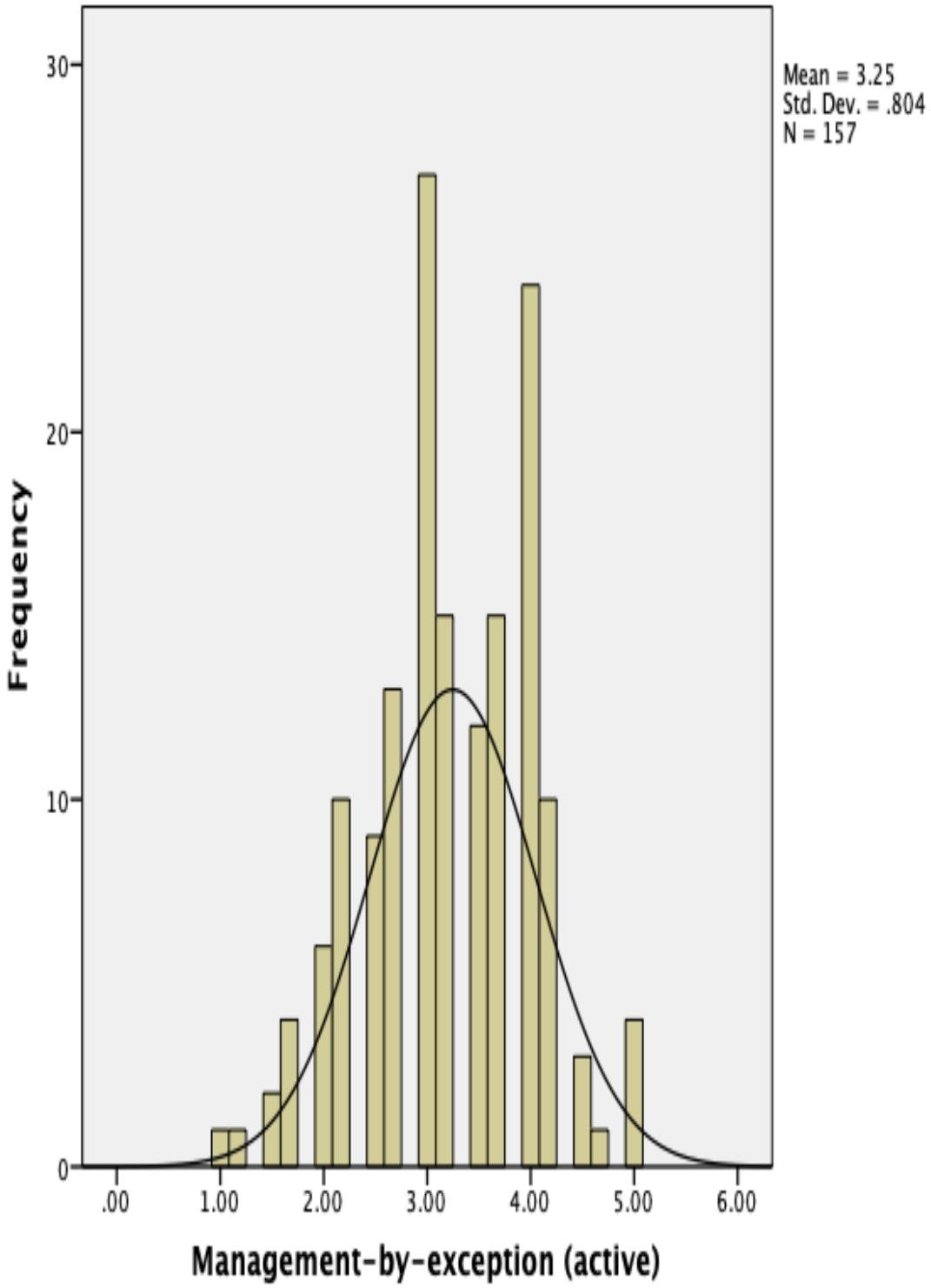
5.00
6.00
Contingent Reward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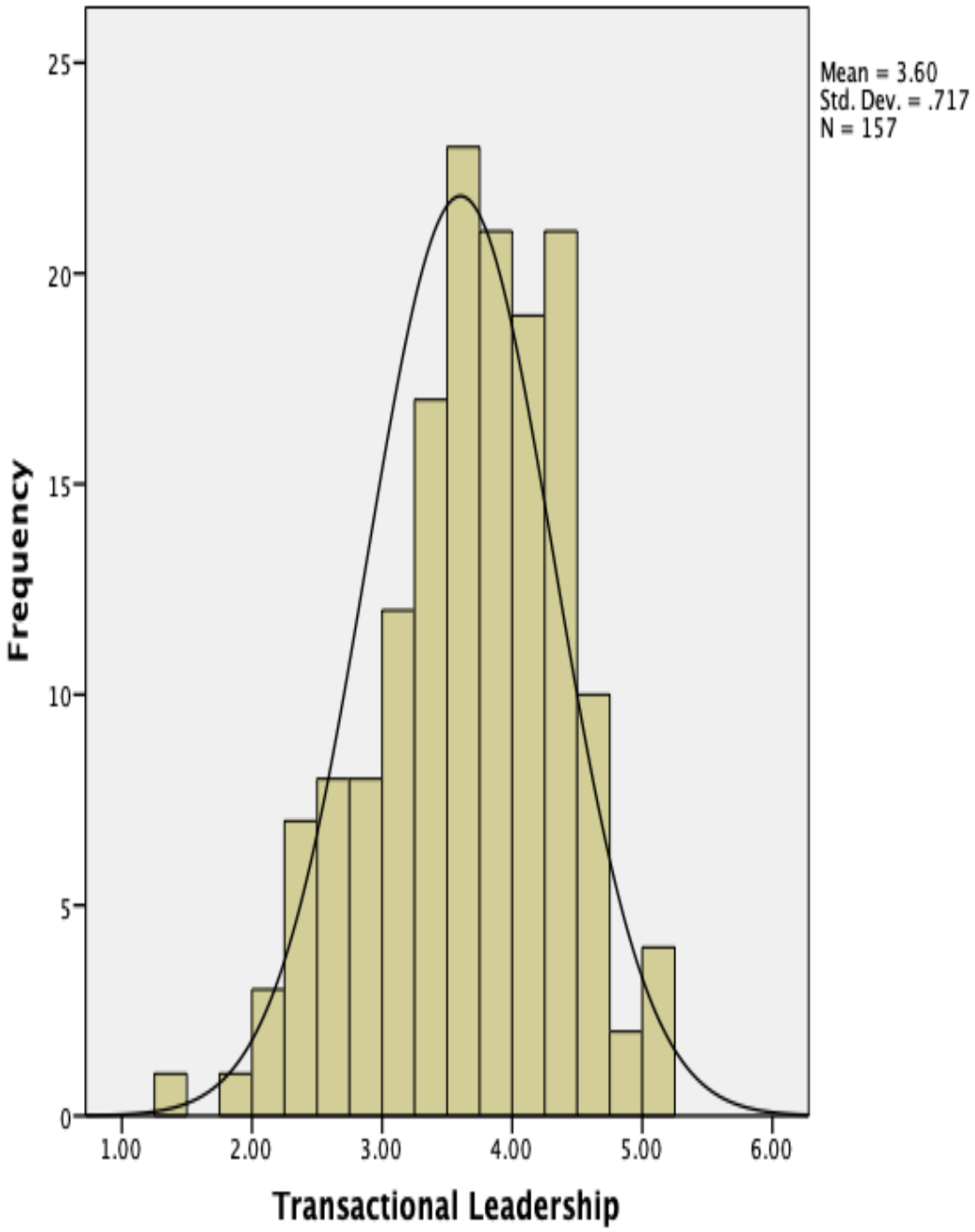
Management-by-exception (active)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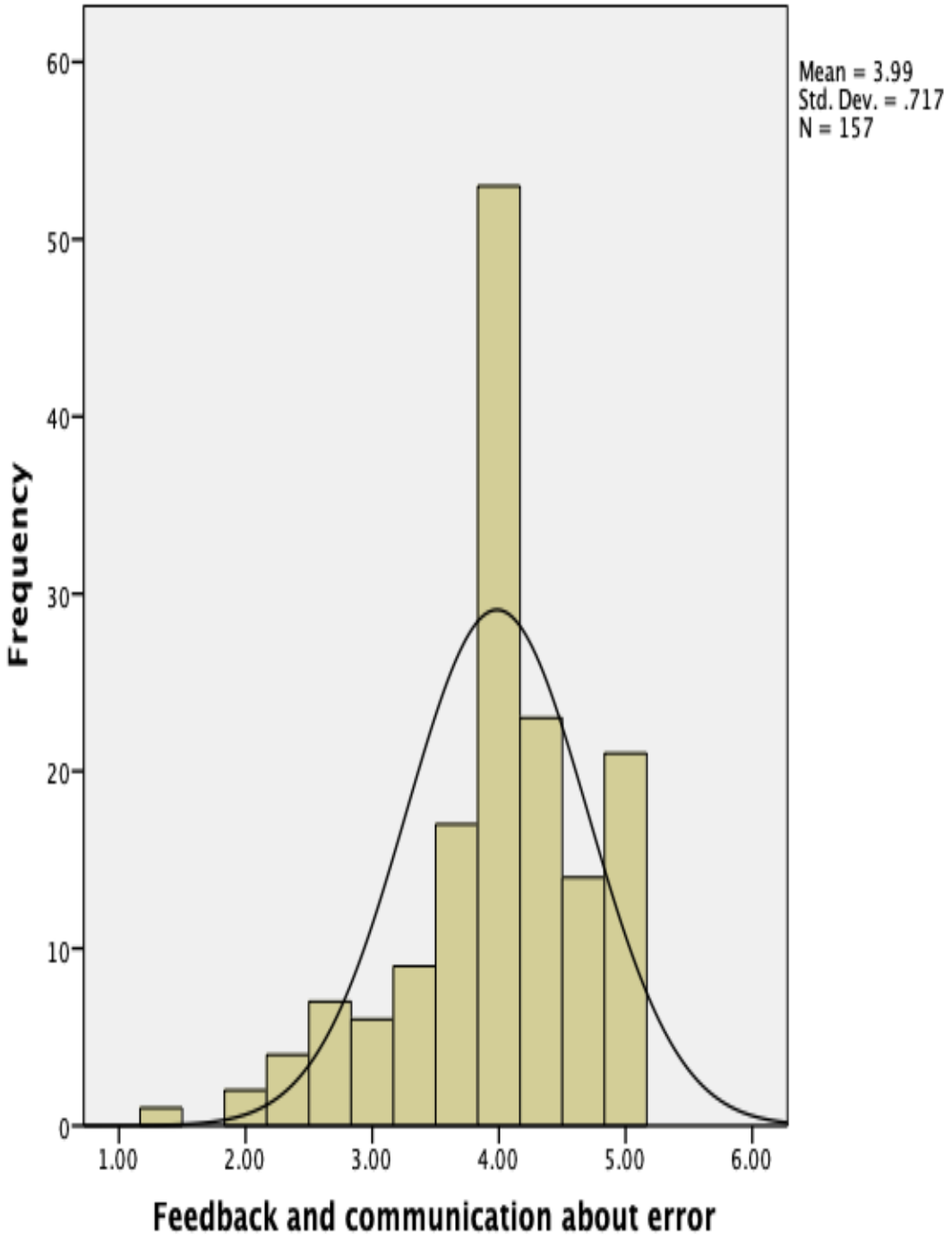
6.00
Transactional Leadership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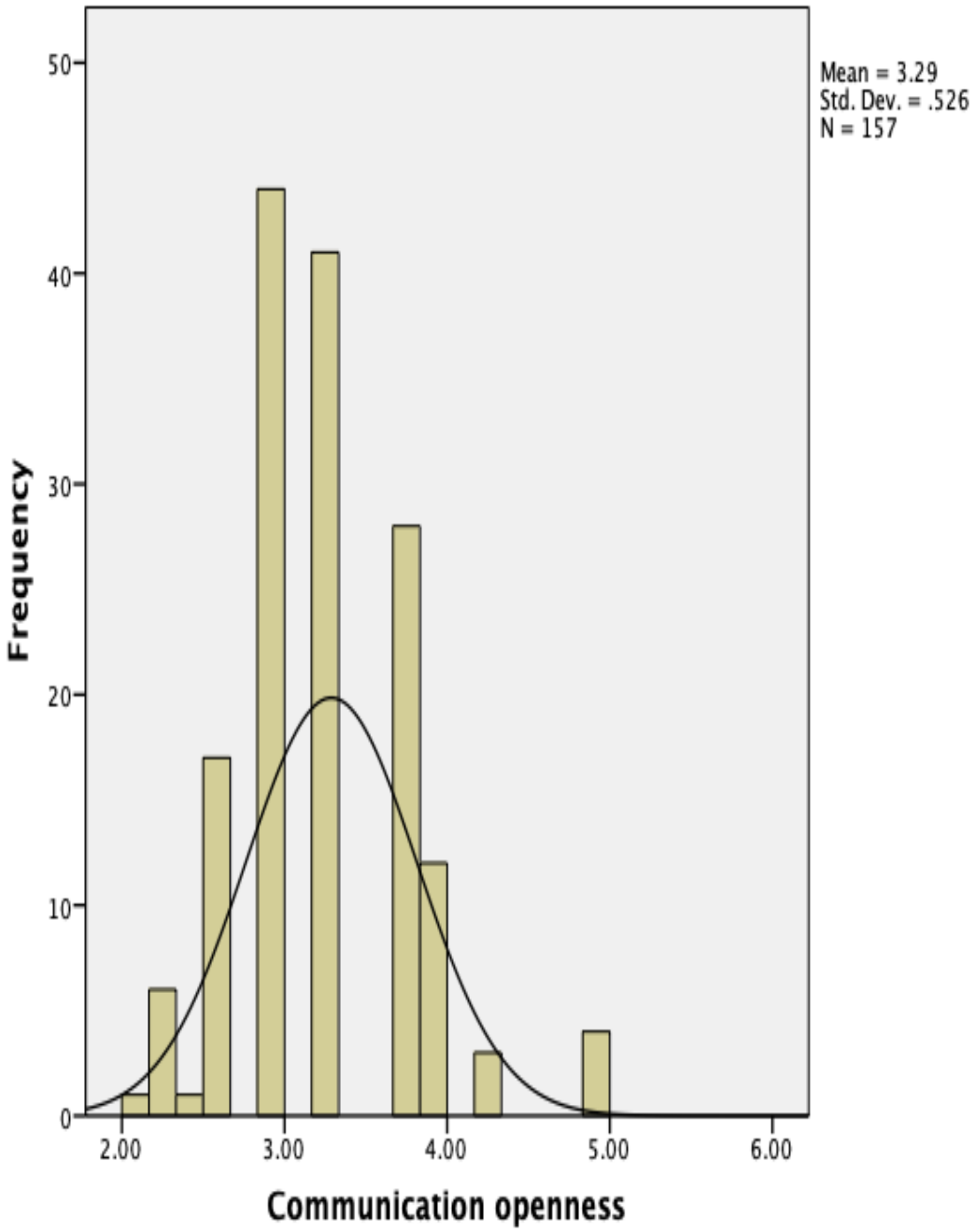
6.00
Feedback and communication about error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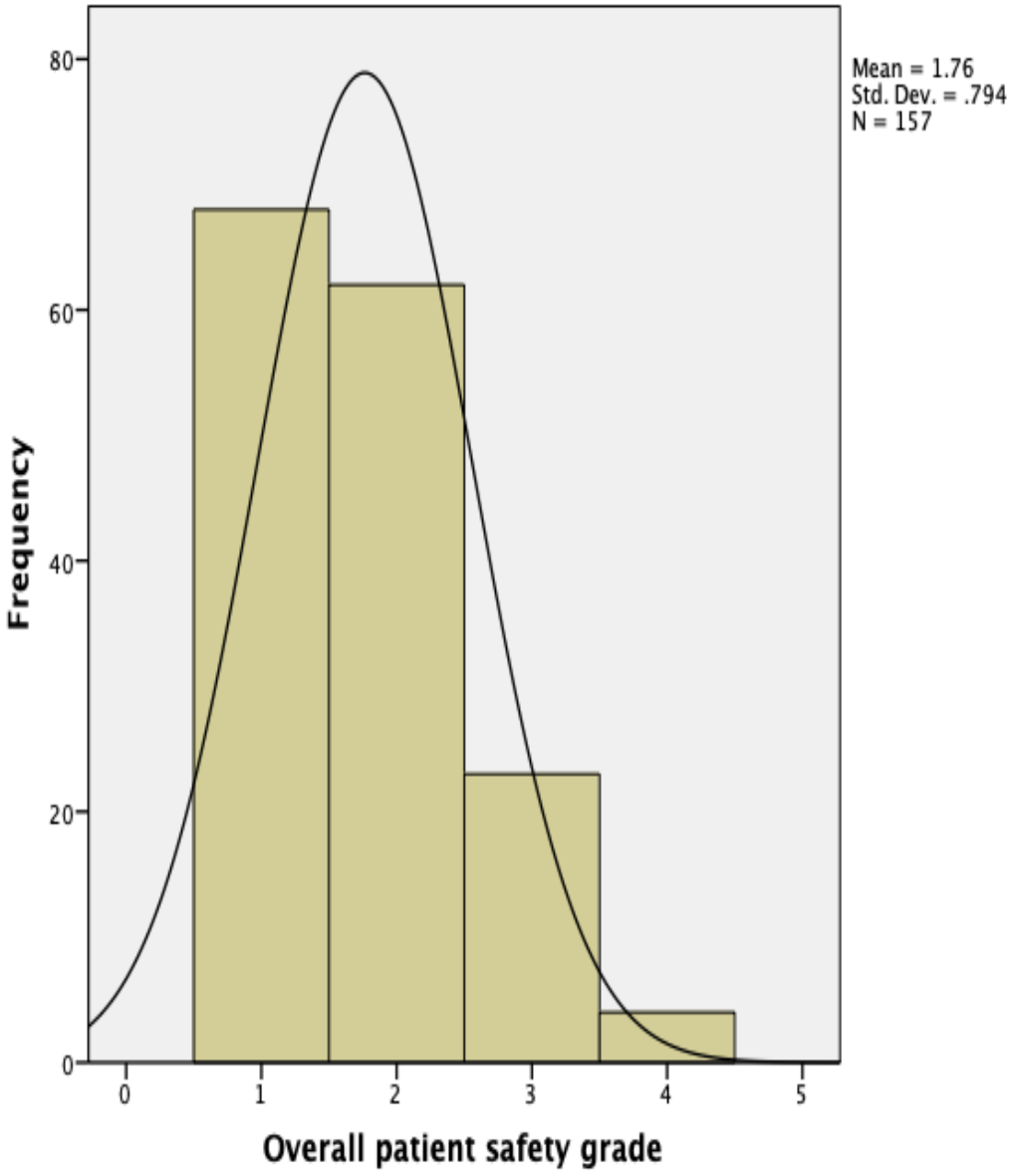
Communication openness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3
4
5
Overall patient safety grade