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CULTURE AND PATIENT SAFETY OUTCOMES: EXAMINING THE IMPACT OF THE DEPARTMENTAL WORK ENVIRONMENT ON OUTCOMES

by

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A DISSERTATION

Submitted to the graduate faculty of The University of Alabama at Birmingham,
in partial fulfillment of the requirements for the degree of
Doctor of Science in Health Services Administration

BIRMINGHAM, ALABAMA

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CULTURE AND PATIENT SAFETY OUTCOMES:
EXAMINING THE IMPACT OF THE DEPARTMENTAL
WORK ENVIRONMENT ON OUTCOMES

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HEALTH SERVICES ADMINISTRATION

ABSTRACT

This study examined the relationship between the departmental work environment and patient safety outcomes to determine if there were particular subcomponents of a department's work environment that had a more significant impact on patient safety outcomes. The work environment was defined as the culture of an individual nursing department which consisted of the employee's perception of engagement and patient safety culture. The research was informed by the commitment-based theory. Based on this theory, it was predicted that a team-based approach in the work environment would lead to a learning and positive environment, which would be positively associated with quality of care.

The findings suggest that there are subcomponents of the work environment that are more impactful on patient safety outcomes. Specifically as employee's perception of workload and pace improves, falls with injury and pressure ulcers reduce. The findings could provide insights to hospitals focused on improving patient safety outcomes. The study was based on data from two hospitals in one community. Therefore, further research could be beneficial to corroborate and expand on these results.

Keywords: patient safety, culture, work environment

DEDICATION

I dedicate this dissertation to my three daughters – Emily, Grace, and Katy. I hope to have instilled in you the value of life-long learning.

ACKNOWLEDGMENTS

I am grateful to my committee chair, Dr. Larry Hearld, for his tremendous support, no-nonsense approach to his review and comments, and his incredible timeliness in responding to any questions or drafts throughout the process. I could not have completed this process without his support. I would also like to acknowledge the time, assistance and expertise from my other committee members: Dr. Stephen O'Connor, Dr. William Opoku-Agyeman, and Dr. Jennifer Richards.

To my current boss, Dr. Anthony Slonim, for providing tremendous support that allowed me to pursue this degree. In memory of my former boss, Jim Miller, you always pushed me to reach higher. Just as I felt I was reaching a bar you had set, you moved the bar higher. Thank you for your guidance and support and for taking a chance on me in my career during the twenty years I had the pleasure of working for you.

Anything that takes you away from your family for as long as this degree did, takes a toll on the family. I am grateful to my husband, Gregg, for being the steady and present parent while I pursued this degree.

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CHAPTER 1
INTRODUCTION

Over 15% of all deaths in the United States are due to failures in healthcare systems (James, 2013). The enormity of this problem was initially highlighted in the 1999 landmark report titled *To Err is Human*: *Building a Safer Health System* (Kohn, 1999), which also outlines recommendations for reducing these errors. One of the prominent recommendations was that healthcare organizations develop a culture of safety through training and organizational commitment to increase the reliability of care processes (Kohn, 1999).

Five years after the report, there was little evidence to suggest that substantial improvements in patient safety had been made (Leape & Berwick, 2005). Ten years later, in a report published by the Agency for Healthcare Research and Quality, some of the safety measures for hospitals had improved; however, infections in hospitals remained a "significant problem" (National Healthcare Quality and Disparities Report, 2010). Likewise, in 2016 Makary and Daniel estimated medical errors as the third most common cause of death in the United States following heart disease and cancer (Makary & Daniel, 2016). In sum, it seems that medical errors leading to adverse patient outcomes are an ongoing challenge for United States' hospitals, raising a number of important questions about the role of a 'culture of safety' in reducing these errors.

Purpose of the Study

The Institute of Medicine in their follow up to the first report, *To Err is Human*, indicated that "the biggest challenge toward a safer health system is changing the culture from one of blaming individuals for errors to one in which errors are treated not as personal failures, but as opportunities to improve the system and prevent harm" (IOM, 2001). Culture is most commonly defined as "a complex set of values, beliefs, assumptions, and symbols that define the way in which a firm conducts its business" (Barney, 1986). Organizational culture is taught to members of a group as the correct way to think and feel (Schein, 1984). Previous research on the relationship between a 'culture of safety' and patient safety outcomes has suffered from two primary limitations. First, much of the research has adopted the organization as the unit of analysis (Aiken, Cimiotti, Sloane, Smith, Flynn & Neff, 2011; Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010; Singer et al., 2009), which ignores potential subunit differences in culture and may obscure important relationships (Danielsson, Nilsen, Ohrn, Rutberg, Fock & Carlfjord, 2014; Davies, Nutley, & Mannion, 2000; Lok, Rhodes, & Westwood, 2011). Second, research conducted at the department-level has tended to focus on self-reported outcomes (Aiken, Clarke, Sloane, Lake, & Cheney, 2008; Van Bogaert, Clarke, Roelant, Meulemans, & Van de Heyning, 2010), which may be biased.

This study built upon this research and addressed these limitations in several ways. Relative to most previous research on 'culture of safety,' this study took a more granular approach, on one hand, by focusing on departmental culture as opposed to organizational culture. On the other hand, it took a more comprehensive approach by using a broader definition of 'culture.' Specifically, this study defined culture as the

internal work environment of a hospital department. Consistent with this more granular yet comprehensive approach, the study acknowledged that there are multiple dimensions of culture with different subcomponents (e.g., workload and pace, supervisor support). The study considered these individual subcomponents to assess whether certain subcomponents are particularly important for improving patient safety outcomes and/or whether a certain subcomponent had a consistent relationship for different patient safety outcomes. In sum, this study addressed the limitations of previous research and filled a gap in the extant literature by empirically evaluating the relationship between different dimensions of a hospital department's work environment and patient safety outcomes. Specifically, the study addressed the following research questions:

1. What is the relationship between a hospital department's work environment and patient safety outcomes in that department?
2. Do certain dimensions of a hospital department's work environment impact the relationship with patient safety outcomes differently?
3. How much variation exists between a hospital department's work environment within one health system?

An overview of the study relationships is provided in Figure 1.

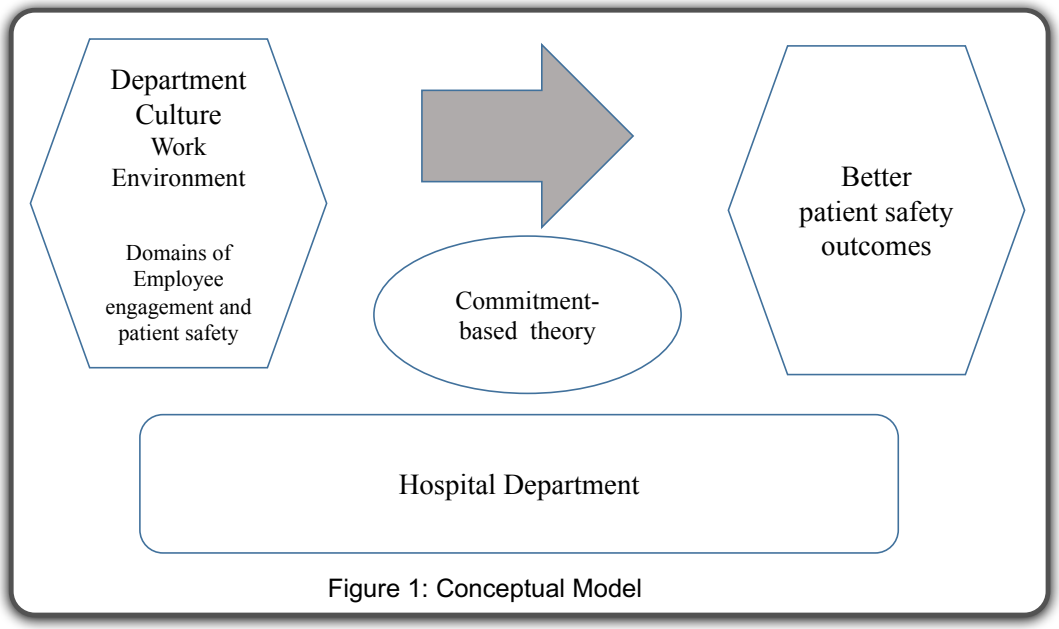

Figure 1: Conceptual Model

Significance of the Study

Culture has been recognized as an important contributor to patient safety. A culture and work environment that empowers nurses to speak up, share concerns, promote reporting, and learn from others has been determined to have a positive impact on patient safety (El-Jardali, Dimassi, Jamal, Jaafar, & Hemadeh, 2011; Weaver, Lubomksi, Wilson, Pfoh, Martinez & Dy, 2013).

Strategies have been developed in hospitals to impact culture and improve patient safety, including leadership rounds, educational programs, and team-based strategies such as interdisciplinary rounds (Morello, Lowthian, Barker, McGinnes, Dunt & Brand, 2013). Safety culture assessments have also become popular in hospitals to

help measure various cultural dimensions of an organization. These cultural assessments are a way to provide metrics that can be trended and compared at a department level (Nieva & Sorra, 2003). However, limited research exists that compares information from these department-level assessments to patient safety outcomes. A better understanding of how they relate to each other across multiple dimensions of the work environment would be beneficial to hospitals seeking to improve their performance. Specifically, the findings may benefit hospitals in determining the dimensions of their work environment that have the biggest impact on patient safety outcomes. Doing so may provide hospital administrators the ability to focus their improvement efforts. Given the increase in regulatory scrutiny and its impact on reimbursement for quality outcomes, hospital administrators will continue to be pressured to increase their patient safety outcomes. Moreover, as consumers push for better quality outcomes, hospitals that have not improved their outcomes might find their market share deteriorating over time as consumers make different choices.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is three-fold. First, I review the empirical research literature on patient safety. Second, I use control-based and commitment-based management theories to explain why departmental culture may be associated with patient safety outcomes. Finally, I offer a number of hypotheses for empirical testing. The sections that follow elaborate on these objectives.

Review of the Patient Safety Literature

Existing research regarding factors associated with improving patient safety outcomes centers around the use of technology (Ballard, Ogola, Fleming, Heck, Gunderson, Mehta & Kerr, 2008; Kaushal, Shojania, & Bates, 2003), clinical interventions based on evidence-based medicine (Leape, Berwick, & Bates, 2002; Shojania, Duncan, McDonald, Wachter, & Markowitz, 2001), and nurse staffing (Blegen, Goode, & Reed, 1998; Friese, Lake, Aiken, Silber, & Sochalski, 2008; Kovner & Gergen, 1998; Laschinger & Leiter, 2006; Nahrgang, Morgeson, & Hofmann, 201; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002). Research has shown that the use of computerized technology such as clinical decision support systems can reduce adverse patient outcomes such as medication errors (Kaushal et al., 2003). In addition, the consistent use of order sets or pre-defined orders in the electronic medical record has also

been shown to decrease mortality and improve care processes (Ballard et al., 2008). Given the relative immaturity of most electronic medical record systems in the United States, this realm of research is still developing.

Clinical interventions to reduce patient safety events have also been studied, especially the use of evidence-based medicine. Those that support the use of evidence-based medicine believe that medical decisions should be based on scientific evidence rather than the opinions of individual providers. The Agency for Healthcare Research and Quality commissioned the University of California San Francisco - Stanford University to evaluate the clinical evidence that supports improved patient safety outcomes (Leape, Berwick & Bates, 2002). This study resulted in the identification of eleven 'best practices' that had been empirically shown to reduce adverse outcomes, such as the use of antibiotics in surgical patients to reduce infections, the use of pressure relieving bedding to prevent pressure ulcers, and the use of prophylaxis to prevent venous thromboembolism in patients at risk (Shojania et al., 2001).

Nurse to patient ratios have also become heavily scrutinized in the healthcare industry over the last ten years with some states requiring specific staffing ratios. Research related to the nursing environment predominantly consists of reviewing nurse staffing levels and their impact on patient outcomes (Blegen et al., 1998; Friese et al., 2008; Kovner & Gergen, 1998; Needleman et al., 2002). Furthermore, research also exists that reviews the impact of nurse exhaustion from too few nurses in the workplace on patient safety outcomes (Laschinger & Leiter, 2006; Nahrgang et al., 2011). These studies consistently support a relationship between adequate nurse staffing and better patient safety outcomes.

As noted earlier, some research has examined the relationship between culture and patient safety outcomes, which generally consists of two types of studies. The first type focuses on hospital-level relationships which may mask important departmental differences (Aiken et al., 2011; Mardon et al., 2010; Singer et al., 2009). The second type uses more subjective measures of patient safety which can be problematic or incomplete from a measurement standpoint (Aiken et al., 2008; Van Bogaert et al., 2010), A smaller set of studies has examined the relationship between department culture and patient safety outcomes; however, these studies were primarily focused on hospitals outside of the United States (Aiken, Van den Heede, Sloane, Busse, McKee & Moreno-Casbas, 2012; Kirwan, Matthews, & Scott, 2013), which may present problems for generalization to U.S.-based hospitals, especially pertaining to culture.

Theoretical Framework: Control-based versus Commitment-based Management Theory

In 2006, based on the lack of a comprehensive framework to center an organization's focus on patient safety, Khatri et al. developed a model to link the overall management approach to clinical outcomes (Khatri, Baveja, Boren, & Mammo, 2006). This framework is an extension of McGregor's Theory X and Theory Y from 1960 that concludes that Theory X employees do what they can to avoid work and prefer to be directed (control-based) as compared to Theory Y employees who are self-motivated, prefer teamwork and with satisfying work will be committed to an organization (commitment-based) (McGregor, 1960). Control-based management is the more traditional management approach with centralized decision-making and hierarchy that

leads to a culture of blame and low employee morale, which in turn results in poor quality of care (Khatri et al., 2006). Conversely, commitment-based management is a team-based approach that supports transparency and information sharing.

In 2007, Khatri et al. tested the commitment-based theory and determined that it was negatively associated with a culture of blame and positively associated with learning from mistakes, camaraderie, and motivation (Khatri, Halbesleben, Petroski, & Meyer, 2007). Learning from mistakes and camaraderie, in turn, were negatively associated with medical errors and positively associated with quality of care (Khatri et al., 2007). This study concluded that hospitals could improve their quality of care by learning from their mistakes and promoting employee engagement. In 2009, Khatri et al. further developed the distinctions between control-based management and commitment-based management by linking them with a "blame" culture and "just" culture, respectively (Khatri, Brown, & Hicks, 2009). A culture of blame was characterized as one where employees were unwilling to accept responsibility for their mistakes due to a fear of retribution by management. A just culture was characterized by psychological safety, or an environment that encourages questioning, learning, expressing opinions and owning mistakes without fear of ridicule or retribution (Khatri et al., 2009). Khatri et al. proposed that a commitment-based management culture was necessary to learn from mistakes and establish a motivated workforce that results in better quality care (Khatri et al., 2009).

Conceptual Model and Hypotheses

For purposes of this research, culture was broadly defined as the shared perceptions of the work environment in a department and consisted of two dimensions: 1. how committed or engaged the employees are (i.e., how favorably employees perceive factors in the workplace such as support, civility, trust, learning, and workload); and 2. how the employees perceive factors of patient safety in their department (i.e., how well the department's processes, staffing, and approach to errors support patient safety).

Internal work environment/Job characteristics

In general, this study proposed that departments where employees have a more positive perception of the work environment are reflective of a more "just" culture. Consistent with the commitment-based theory, a more "just" culture will lead to better functioning and better quality care. This is because departments where members are in greater agreement about the positive aspects of the work environment are more likely to be environments where employees feel that they can speak up when they see problems and admit mistakes that can foster learning to prevent adverse outcomes (Leonard, Graham, & Bonacum, 2004; Okuyama, Wagner, & Bijnen, 2014). In sum, it is hypothesized that:

Hypothesis 1: Hospital departments with more positive perceptions of the work environment will be associated with better patient safety outcomes.

Less research has focused on the individual domains of the internal work environment, thus, there is little reason to believe that one domain may be more effective at promoting better patient safety outcomes than another. Nevertheless, based on the

same arguments as the overall work environment, we suggest that more positive perceptions of individual domains of the work environment will be associated with better patient safety outcomes. Thus,

H2a: More positive perceptions of the department's workload and pace will be associated with better patient safety outcomes.

H2b: More positive perceptions of the department's civility will be associated with better patient safety outcomes.

H2c: More positive perceptions of the department's supervisor support will be associated with better patient safety outcomes.

H2d: More positive perceptions of the department's career and learning opportunities in the organization will be associated with better patient safety outcomes.

H2e: More positive perceptions of the department's trust and values in the organization will be associated with better patient safety outcomes.

H2f: More positive perceptions of the department's exhaustion/resilience will be associated with better patient safety outcomes.

Attitudes regarding patient safety

Similar to the arguments for the general work environment, this study proposed that departments where employees have more positive attitudes toward patient safety are reflective of a more "just" culture. Departments where employees have more positive attitudes regarding patient safety may be more likely to agree on the value and goals of patient safety (Nieva & Sorra, 2003), and thus, may be more likely embrace initiatives to

improve patient safety. Likewise, employees may feel more "safe" speaking up in departments where attitudes about patient safety are more strongly held. Consequently, it is hypothesized that:

Hypothesis 3: Hospital departments with more positive employee attitudes towards patient safety will be associated with better patient safety outcomes.

Once again, there is little reason to believe that one domain of employee attitudes toward patient safety may be more effective at promoting better patient safety outcomes than another, but it does seem plausible that more positive attitudes within each of the individual patient safety domains will be associated with better patient safety outcomes.

H4a: Hospital departments with more positive overall perceptions of staffing will be associated with better patient safety outcomes.

H4b: Hospital departments with more positive overall perceptions of nonpunitive responses to errors will be associated with better patient safety outcomes.

Variations in "just" culture between departments

Relatively little research has empirically considered how much variation in culture exists between departments in the same organization, despite acknowledgments that such variations exist (Van Bogaert et al., 2010). Moreover, there are no reasons to believe that one department may have a more "just" culture than another. Consequently, the analysis pertaining to this question is exploratory and will be used to provide baseline knowledge about how much variation in department culture exists within the same health system. Thus, no a priori hypotheses are offered for research question 3.

CHAPTER 3

METHODS

Research Design

The purpose of this study was to examine the relationship between a hospital department's culture and the patient safety outcomes for that department. The study used an observational, quantitative, cross-sectional design to assess the relationship between department culture and patient safety outcomes. The unit of analysis was the hospital department.

Study Context

The hospitals used for this study were Renown Regional Medical Center and Renown South Meadows Medical Center. Renown Regional owns and operates an 808-licensed bed acute care facility located in Reno, Nevada. It is the primary acute care hospital of Renown and is a major tertiary provider in Northern Nevada, providing a broad range of medical/surgical inpatient services including pediatrics, cardiology, orthopedics, oncology, and neurosciences. Renown Regional operates the region's only Level II trauma center, as well as the Renown Children's Hospital, which includes Northern Nevada's only pediatric intensive care unit and a Level III neonatal intensive care unit. Renown Regional also operates a graduate medical education program through its affiliation with the University of Nevada School of Medicine.

Renown South Meadows Medical Center is a 76-licensed bed, acute-care, community hospital located in south Reno. The South Meadows hospital was completed in January 2004 to meet the needs of the expanding population of south Reno. The hospital includes 68 medical/surgical beds, eight intensive care beds, and a 51,000 square foot diagnostic and treatment pavilion, which houses a surgical unit, laboratory, electrocardiogram services, comprehensive imaging services, full-time emergency department, and family and urgent care clinics. Both Renown Regional and Renown South Meadows are wholly-owned subsidiaries of Renown Health.

Data Sources

Department culture for this study was measured by an online employee engagement and patient safety culture survey. All Renown Health employees took the survey for employee engagement and patient safety during a two-week period in June of 2016 and 2017. The survey had an overall response rate of 82% and 89% for Renown Health (N=5,290 and 5,861) for 2016 and 2017, respectively.

The survey was based on a tool from the firm Pascal Metrics. Pascal Metrics is an organization based out of Washington DC that provides resources to support the improvement of patient safety and experience. The internal work environment portion of the survey consisted of seven domains: (1) engagement; (2) workload and pace; (3) civility; (4) supervisor support; (5) organizational trust and values; (6) exhaustion and resilience; and (7) career and learning opportunities. These survey domains for employee engagement were developed by Pascal's survey development team. Pascal developed

reliability estimates by calculating Cronbach's alpha for the following domains across multiple datasets (Table 1).

Table 1: Pascal's Employee Engagement Survey Validation

Domain	Cronbach Alpha
Employee Engagement	0.89
Workload and Pace	0.65
Civility	0.81
Supervisor Support	0.94
Career and Learning Opportunities	0.83
Organizational Trust and Values	0.91
Exhaustion/Resilience	0.92

The patient safety portion of the survey for the hospital had the following three domains: (1) overall perceptions of patient safety and quality; (2) staffing; and (3) non-punitive response to errors. The safety culture domains are from the Agency for Healthcare Research and Quality (AHRQ) Surveys on Patient Safety. This is a consistent set of questions used across the hospital industry. These survey questions have been shown to have acceptable validity and reliability with the exception of the staffing subscale; however, the staffing subdomain continues to be utilized given the conceptual

importance of staffing to patient safety (Blegen, Gearhart, O'brien, Sehgal, & Alldredge, 2009; Sorra & Dyer, 2010).

The patient safety outcomes were based on scores for the following metrics at the department level: falls, pressure ulcers, medication events, sentinel events, and hospital-acquired infections. The scores were based on data collected at the department level for the two most fiscal years ended June 30, 2016 and 2017. The data for patient outcomes were collected by Renown's quality department for all departments at the hospital and was based on data from the hospital's electronic medical record (EPIC). This data is also publicly reported at an organizational level and validated by a contracted vendor.

Variables

Dependent variables

The dependent variables in this study were patient safety outcome measures calculated by department. These measures represent, for each of the below categories, the count of occurrences for each patient safety event. For example, the fall with injury event was the total number of falls with injury for a department. The data were collected for two periods (July 1, 2015 to June 30, 2016 and July 1, 2016 to June 30, 2017). The following patient safety events were included:

1) Catheter Associated Urinary Tract Infections (CAUTIs)
2) Central-Line Associated Blood Stream Infections (CLABSIs)
3) Falls with injury
4) Pressure ulcers
5) Medication events

6) Other sentinel events

Given the small sample size, the frequency of the dependent variables was analyzed and based on that review, CAUTIs, CLABSIs, pressure ulcers, and the total patient safety events were modified so that any hospital department with more than 3 of those events indicated three events.

Independent variables

There were two sets of independent variables for this study. The first set of independent variables was department based work environment scores for the following seven domains: (1) engagement; (2) workload and pace; (3) civility; (4) supervisor support; (5) career and learning opportunities; (6) organizational trust and values; and (7) exhaustion and resilience. Each domain had a list of questions that are asked related to that topic (Table 2).

Table 2: Employee Engagement Domain Questions

Domain	Question
(1) Employee Engagement	a. I am proud of the work I do. b. My work provides me with a sense of purpose. c. I get a sense of personal fulfillment from my work. d. While at work, I get absorbed in my job. e. I get excited about my work. f. I get so involved in what I'm doing at work, I often lose track of time. g. I look forward to each workday.
(2) Workload and Pace	a. My work demands often interfere with my personal life. * b. I spend too much time on tasks that are not essential to my core job responsibilities.* c. My work is often interrupted.* d. My work requires me to make choices among high priority tasks.*
(3) Civility	a. My interactions with coworkers are always respectful. b. I am treated with respect. c. Bullying frequently occurs in my workgroup.* d. Members of my workgroup always behave with consideration for each other.
(4) Supervisor Support	My direct supervisor: a. Provides constructive feedback on my performance. b. Can be counted on to help with difficult problems. c. Encourages people to talk about their concerns. d. Seeks out employee input on decisions that impact their work.
(5) Career and Learning Opportunities	a. This organization provides opportunities for continuing education & training. b. I have the opportunity to learn new skills at work. c. Opportunities for career advancement are available at this organization.
(6) Organizational Trust and Values	a. I believe in the mission of this organization. b. The values of this organization are consistent with my own. c. This organization consistently demonstrates its written values. d. I trust the direction this organization is going in.
(7) Exhaustion/Resilience	a. Working all day is really a strain for me. b. I feel burned out from my work. c. I feel tired when I get up and have to face another day on the job. d. I feel emotionally drained from work. e. I feel used up at the end of the day.

*Reverse scored

All responses except Exhaustion/Resilience were recorded on a 5-point scale:

(1) Strongly disagree

(2) Disagree

(3) Neutral

(4) Agree

(5) Strongly agree

The assumption was that a one unit increase from (1) to (2) is the same as a one unit increase from (2) to (3). The scoring for each of the domains was consistently applied so that a score of "5" always reflected the most favorable response. For some questions that most favorable response was 'strongly agree' and for other questions, the most favorable response may be 'strongly disagree' – see the questions noted with an asterisk. A composite score for each domain was constructed as the average score for each question within the domain. The average score was calculated by first multiplying the number of responses and the response option (e.g., "1", "2", etc.). Next, these values were summed and the total was divided by the number of respondents for that question.

Exhaustion/Resilience was scored on a 7-point scale as follows:

(1) Every day

(2) A few times a week

(3) Once a week

(4) A few times a month

(5) Once a month or less

(6) A few times a year or less

(7) Never

Similar to the 5-point scale, the higher score of seven was the most favorable score. The composite scores for Exhaustion/Resilience were calculated similarly to the 5-point scale domains as described above.

The second set of independent variables were the employee's perceptions of patient safety, which consists of the following three domains: (1) overall perceptions of patient safety and quality; (2) staffing; and (3) non-punitive response to errors. Each domain has a list of questions that were asked related to that topic (Table 3).

Table 3: Patient Safety Domain Questions

Domain	Question
(1) Overall Perceptions of Patient Safety	a. Patient safety is never sacrificed to get more work done. b. Our procedures and systems are good at preventing errors from happening. c. It is just by chance that more serious mistakes don't happen here.* d. We have patient safety problems in this unit.*
(2) Staffing	a. We have enough staff to handle the workload. b. Staff in this unit work longer hours than is best for patient care.* c. We use more agency/temporary staff than is best for patient care.* d. We work in "crisis mode" trying to do too much, too quickly.*
(3) Nonpunitive Response to Errors	a. Staff feel like their mistakes are held against them.* b. When an event is reported, it feels like the person is being written up, not the problem.* c. Staff worry that mistakes they make are kept in their personnel file.*

*Reverse scored

Responses to each item were recorded on a 5-point scale:

(1) Strongly disagree

(2) Disagree

(3) Neutral

(4) Agree

(5) Strongly Agree

A composite score for each domain was constructed as the average score for each question within the domain. This average was calculated similarly to what is described above. Consistent with employee engagement, the scoring for each of the domains was applied so that a score of "5" always consisted of the most favorable response.

Control variables

The control variables used in this study were (1) the type of department (0 = medical/surgical; 1= critical care; 2 = telemetry); (2) the hospital (0=Renown South Meadows; 1= Renown Regional;) (3) the size of the hospital department as measured by the number of employees in each department; and (4) the number of opportunities for a patient safety event to occur (i.e., number of inpatient days). This last control variable was included to account for varying risks of an event occurring for the different types of patient safety outcomes. For department type, medical/surgical departments included: General Surgical, Medical Nephrology, Neurosciences, Orthopedics, and Cancer. Critical care departments included: Intensive Care and Coronary Intensive Care. Telemetry departments included Medical Telemetry. These departments were categorized in this manner consistent with how they are staffed at Renown. For example, medical/surgical departments are staffed at a ratio of one nurse for every five patients; intensive care at

one nurse for every 1.8 patients; and telemetry at one nurse for every four patients. This categorization was intended to account for the varying risk of a patient safety event occurring due to a different level of staffing in the nursing unit.

Analytic Strategy

The data was analyzed using Stata 15.0. Initially, the data was reviewed for missing variables, data anomalies, or outliers. The results of exploratory factor analysis resulted in a Heywood case. When utilizing factor analysis, a Heywood case is the term used when the estimates from the analysis are "out of bounds" or don't converge. Confirmatory factor analysis was conducted to confirm the domain structure suggested by the survey instruments; however, the models would not converge. The problems with exploratory factor analysis and confirmatory factor analysis are likely due to the small number of observations in the study. Nevertheless, there are still reasons to believe that the use of the employee engagement and patient safety survey tools are valid given the psychometric results noted above by Pascal for employee engagement and others using the AHRQ patient safety survey questions.

Descriptive statistics for the department culture (employee engagement and patient safety) and the patient safety outcomes were examined, followed by bivariate correlations.

Finally, given the count nature of the patient safety outcomes, a series of Poisson multiple regression models were used to estimate the relationship between department culture and the patient safety outcomes. Separate models were run for each patient safety

outcome. For the patient safety outcomes of medication errors and other sentinel events, the analysis attempted to estimate the relationships; however, estimates were not feasible due to the small number of these types of patient safety events.

Due to the small sample size, the two domains of departmental culture (internal work environment and perceptions of patient safety) were examined separately. The exhaustion/resilience domain was also examined separately due to the response scale being different than the other survey questions, i.e. a 7-point instead of a 5-point scale. These scores were only available for the fiscal year 2017. The general specification for these models is below.

Work Environment Regression Equation

$$\text{Log } \lambda_i = \beta_0 + \beta_1(\text{Work Environment}_{i1}) + \beta_2(\text{Hospital}_{i2}) + \beta_3(\text{Department size}_{i3}) + \beta_4(\text{Department Type}_{i4}) + \beta_5(\text{Number of Patient Safety Event Opportunities}_{i5})$$

Where *i* indicates the different hospital departments.

Perceptions of Patient Safety Regression Equation

$$\text{Log } \lambda_i = \beta_0 + \beta_1(\text{Perceptions of Patient Safety}_{i1}) + \beta_2(\text{Hospital}_{i2}) + \beta_3(\text{Department size}_{i3}) + \beta_4(\text{Department Type}_{i4}) + \beta_5(\text{Number of Patient Safety Event Opportunities}_{i5})$$

CHAPTER 4

RESULTS AND FINDINGS

Introduction

This chapter will present the results of the data analysis conducted to investigate the study hypotheses. The chapter will begin with a description of the study sample, including descriptive statistics. Next, the results of the bivariate analysis are presented. Finally, the results of the multivariate analysis are presented with a summary of the findings by hypothesis.

Descriptive Results

Of the 17 hospital departments, 3 (17%) were from Renown South Meadows Hospital and 14 (83%) were from Renown Regional Hospital (Table 4). Among the 17 departments, 8 (47%) were medical/surgical; 6 (35%) were critical care; and 3 (18%) were telemetry. These statistics were consistent across both years of the study (fiscal year 2016 and 2017). For fiscal years 2016 and 2017, the size of the department (based on the number of employees) and the total opportunities for patient safety events (or the total number of days the patient had an opportunity for an event) are summarized in Table 4.

Table 4: Descriptive Statistics

	FY 2016 N/(%)	FY 2017 N/(%)
The hospital		
Renown South Meadows = 0	3 (17%)	3 (17%)
Renown Regional = 1	14 (83%)	14 (83%)
Type of hospital department		
Medical/surgical = 0	8 (47%)	8 (47%)
Critical care = 1	6 (35%)	6 (35%)
Telemetry = 2	3 (18%)	3 (18%)
	Mean/(Std. Dev.)	Mean/(Std. Dev.)
Size of the hospital department (# of employees in department)	56.53 (23.57)	59.47 (24.60)
Total opportunities for patient safety events	225.07 (217.23)	216.35 (218.82)

Descriptive Analysis for Employee Engagement Domains

A comparison of the mean score for each question within the employee engagement domains is presented in Table 5. For all domains, a score of "5" represents the most favorable response. The highest overall mean domain score was career and learning opportunity, for both fiscal year 2016 and 2017 (M=4.33 and 4.34, respectively). The lowest overall mean domain score was workload and pace, for both fiscal year 2016 and 2017 (M=2.82 and 2.83, respectively). Most of the employee engagement domains have relatively small ranges of average scores across the questions in the domain. For example, the difference between the highest and lowest average scores for the supervisor support domain was 0.13 and 0.10 in fiscal years 2016 and 2017, respectively. In contrast, the largest range of average scores within a domain was for the workload and pace domain, where the difference between the lowest and highest scoring question was 1.62 and 1.53 in years 2016 and 2017, respectively.

Table 5: Descriptive Characteristics Employee Engagement Domains - Independent Variables

	FY 2016 Mean/(Std. Dev.)	FY 2017 Mean/(Std. Dev.)
Employee Engagement - Overall	4.08 (0.17)	4.05 (0.13)
I am proud of the work I do	4.56 (0.16)	4.53 (0.13)
My work provides me with a sense of purpose	4.31 (0.24)	4.30 (0.17)
I get a sense of personal fulfillment from my work	4.30 (0.23)	4.29 (0.18)
While at work, I get absorbed in my job	4.13 (0.15)	4.05 (0.14)
I get excited about my work	4.04 (0.25)	4.03 (0.24)
I look forward to each work day	3.67 (0.28)	3.63 (0.24)
I get so involved in what I'm doing at work, I often lose track of time	3.52 (0.25)	3.52 (0.11)
Workload and Pace - Overall	2.82 (0.25)	2.83 (0.24)
My work demands often interfere with my personal life	3.45 (0.31)	3.40 (0.33)
I spend too much time on tasks that are not essential to my core job responsibilities	3.34 (0.34)	3.35 (0.30)
My work is often interrupted	2.68 (0.31)	2.70 (0.29)
My work requires me to make choices among high priority tasks	1.83 (0.24)	1.87 (0.23)
Civility - Overall	4.29 (0.18)	4.20 (0.18)
My interactions with coworkers are always respectful	4.37 (0.17)	4.30 (0.18)
I am treated with respect	4.33 (0.15)	4.28 (0.16)
Bullying frequently occurs in my workgroup	4.23 (0.24)	4.11 (0.24)
Members of my workgroup always behave with consideration for each other	4.23 (0.22)	4.11 (0.20)
Supervisor Support - Overall	4.21 (0.37)	4.24 (0.18)
My direct supervisor:		
Can be counted on to help with difficult problems	4.27 (0.40)	4.28 (0.20)
Encourages people to talk about their concerns	4.22 (0.36)	4.26 (0.19)
Provides constructive feedback on my performance	4.22 (0.33)	4.24 (0.18)
Seeks out employee input on decision that impact their work	4.14 (0.40)	4.18 (0.21)
Career and Learning Opportunities - Overall	4.33 (0.18)	4.34 (0.09)
This organization provides opportunities for continuing education & training	4.44 (0.16)	4.42 (0.10)
I have the opportunity to learn new skills at work	4.37 (0.21)	4.40 (0.09)
Opportunities for career advancement are available at this organization	4.18 (0.22)	4.22 (0.12)
Organizational Trust and Values - Overall	3.90 (0.26)	3.98 (0.26)
I believe in the mission of this organization	4.20 (0.17)	4.24 (0.17)
The values of this organization are consistent with my own	3.98 (0.27)	4.06 (0.22)
I trust the direction this organization is going in	3.73 (0.32)	3.83 (0.34)
This organization consistently demonstrates its written values	3.70 (0.34)	3.80 (0.35)
Exhaustion and Resilience - Overall (See Note 1)	-	4.11 (0.39)
Working all day is really a strain for me	-	5.20 (0.35)
I feel used up at the end of the day	-	4.37 (0.47)
I feel emotionally drained from work	-	4.03 (0.45)
I feel tired when I get up and have to face another day on the job	-	3.80 (0.46)
I feel burned out from my work	-	3.13 (0.43)

Note 1: All question were measured on a 5-point scale except Exhaustion and Resilience which is a 7-point scale

Descriptive Analysis for Patient Safety Domains

A comparison of the mean score for each question within the patient safety domains is presented in Table 6. The highest overall mean domain scores were the overall perceptions of patient safety domain for both fiscal year 2016 and 2017 (M=3.63 and 3.51, respectively). The lowest overall mean domain scores were staffing for both fiscal year 2016 and 2017 (M=2.95 and 2.88, respectively). The largest variation in mean score for the questions within the domains was in the staffing domain, where the differences between the highest and lowest average response were .84 and .82 for fiscal years 2016 and 2017, respectively.

Table 6: Descriptive Characteristics Patient Safety Domains - Independent Variables

	FY 2016 Mean/(Std. Dev.)	FY 2017 Mean/(Std. Dev.)
Overall Perceptions of Patient Safety	3.63 (0.34)	3.51 (0.28)
Our procedures and systems are good at preventing errors from happening	3.82 (0.30)	3.72 (0.26)
It is just by chance that more serious mistakes don't happen here	3.65 (0.37)	3.55 (0.21)
We have patient safety problems in this unit	3.65 (0.47)	3.48 (0.40)
Patient safety is never sacrificed to get more work done	3.41 (0.35)	3.30 (0.32)
Staffing - Overall	2.95 (0.46)	2.88 (0.43)
Staff in this unit work longer hours than is best for patient care	3.28 (0.26)	3.33 (0.30)
We work in "crisis mode" trying to do too much, too quickly	2.99 (0.51)	2.98 (0.47)
We use more agency/temporary staff than is best for patient care.	3.09 (0.69)	2.71 (0.56)
We have enough staff to handle the workload	2.44 (0.55)	2.51 (0.52)
Nonpunitive Response to Errors - Overall	3.21 (0.50)	3.28 (0.44)
Staff feel like their mistakes are held against them	3.31 (0.50)	3.36 (0.42)
When an event is reported, it feels like the person is being written up, not the problem	3.30 (0.53)	3.33 (0.44)
Staff worry that mistakes they make are kept in their personnel file	3.03 (0.50)	3.15 (0.49)

Descriptive Analysis for Patient Safety Events

The most frequently reported patient safety event at the hospital department level in fiscal year 2016 and 2017 was central line-associated blood stream infections (1.88 and 1.35 events per year, respectively; Table 7). The least frequently reported events for fiscal year 2016 and 2017 were medication errors (M=0.00 and 0.11, respectively) and other sentinel events (M=0.13 and 0.06, respectively). The total patient safety events declined from fiscal year 2016 to fiscal year 2017, from a mean of 6.00 to 4.59. Likewise, the average number of patient safety events declined from 2016 to 2017 for each type of patient safety event, except medication errors.

Table 7: Descriptive Characteristics Patient Safety Events - Dependent Variables

	FY 2016 Mean/(Std. Dev.)	FY 2017 Mean/(Std. Dev.)
Patient Safety Events - Total	6.00 (3.72)	4.59 (3.28)
Central Line-Associated Blood Stream Infection (CLABSI)	1.88 (0.99)	1.35 (1.11)
Pressure Ulcer	1.18 (1.19)	1.18 (1.07)
Catheter Associated Urinary Tract Infection (CAUTI)	1.53 (1.50)	0.77 (2.66)
Fall with Injury	0.60 (0.99)	0.35 (0.49)
Medication Error	0.00 (0.00)	0.11 (0.33)
Other Sentinel Events	0.13 (0.35)	0.06 (0.24)

Correlation Analysis by Domain

The correlations between each of the employee engagement and patient safety culture domains are shown in Table 8 for fiscal year 2016 and 2017. All correlations were positive with the exception of civility and employee engagement, which was -0.15. The positive correlations between the domains are, for the most part, strong ($r > .50$).

The analysis showed that most of the domains were statistically correlated with the exception of civility. Likewise, the employee engagement scale was not significantly correlated with any other domain in fiscal year 2017.

A one-way ANOVA was conducted to determine if the employee engagement and patient safety domains differed across the two hospitals included in the study (Renown Regional or Renown South Meadows). For the employee engagement domains, there was a statistically significant difference between the hospitals for two domains: workload and pace ($F(1,32) = 5.29$, $p = .03$) and civility ($F(1,32) = 6.32$, $p = .02$). A post-hoc test revealed that the average workload and pace score was statistically significantly higher for Renown South Meadows ($M=3.02$, $SD=.29$) compared to Renown Regional ($M=2.79$, $SD=.22$). Likewise, the average civility score was statistically significantly higher for Renown South Meadows ($M=4.40$, $SD=.09$) compared to Renown Regional ($M=4.21$, $SD=.18$).

For the patient safety domains, there was one statistically significant difference between the hospitals for the staffing domain ($F(1,32) = 16.26$, $p = .0003$). A post-hoc test revealed that the average staffing score was statistically significantly higher for Renown South Meadows ($M=3.46$, $SD=.28$) compared to Renown Regional ($M=2.80$, $SD=.39$).

Additionally, a one-way ANOVA was conducted to determine if the domain for employee engagement or patient safety differed between the types of departments included in the study (medical/surgical, telemetry, or critical care). For the employee engagement domains, there was a statistically significant difference between the type of departments for two domains: workload and pace ($F(2,31) = 7.14$, $p = .003$) and

organizational trust and values ($F(2,31) = 8.13$, $p = .002$). A post-hoc test revealed that the average workload and pace score was statistically significantly higher for a medical/surgical department (M=2.96, SD=.24) compared to a critical care department (M=2.67, SD=.14). Likewise, the average organizational trust and values score was statistically significantly higher for a medical/surgical department (M=4.08, SD=.22) compared to a critical care department (M=3.74, SD=.21).

For the patient safety domains, there were no statistically significant differences between the department types.

Table 8: Correlations: Employee Engagement and Patient Safety Culture Domains

FY 2016

	Employee Engagement		Workload and Pace		Civility		Supervisor Support		Career and Learning Opportunities		Organizational Trust and Values		Overall Perceptions of Patient Safety		Staffing		Nonpunitive Response to Errors
Employee Engagement	1.00																
Workload and Pace	0.62	**	1.00														
Civility	0.24		0.21		1.00												
Supervisor Support	0.64	**	0.54	*	0.16		1.00										
Career and Learning Opportunities	0.65	**	0.44		0.42		0.87	***	1.00								
Organizational Trust and Values	0.51	*	0.64	**	0.41		0.83	***	0.82	***	1.00						
Overall Perceptions of Patient Safety	0.63	**	0.67	**	0.47		0.81	***	0.86	***	0.90	***	1.00				
Staffing	0.47		0.53	*	0.35		0.40		0.50	*	0.52	*	0.77	***	1.00		
Nonpunitive Response to Errors	0.62	**	0.53	*	0.17		0.79	**	0.77	***	0.72	**	0.88	***	0.78	***	1.00

* p < .05; ** p < .01; ***p < .001

FY 2017

	Employee Engagement		Workload and Pace		Civility		Supervisor Support		Career and Learning Opportunities		Organizational Trust and Values		Overall Perceptions of Patient Safety		Staffing		Nonpunitive Response to Errors
Employee Engagement	1.00																
Workload and Pace	0.35		1.00														
Civility	-0.15		0.17		1.00												
Supervisor Support	0.23		0.63	**	0.37		1.00										
Career and Learning Opportunities	0.18		0.61	**	0.52	*	0.66	**	1.00								
Organizational Trust and Values	0.11		0.83	***	0.34		0.54		0.72	**	1.00						
Overall Perceptions of Patient Safety	0.31		0.80	***	0.25		0.52		0.57	*	0.81	***	1.00				
Staffing	0.39		0.88	***	0.34		0.51	*	0.66	**	0.82	***	0.79	***	1.00		
Nonpunitive Response to Errors	0.30		0.54		0.02		0.45		0.37		0.54	*	0.79	***	0.49	*	1.00

* p < .05; ** p < .01; ***p < .001

Regression Results by Hypothesis

A series of Poisson multiple regression models were used to estimate the relationship between department culture and patient safety outcomes. Separate models were run for each patient safety outcome. Regression models for the dependent variables of medication errors and other sentinel events were run, but the models would not converge due to the due small number of events. Therefore, the results for medication errors and other sentinel events are not presented. The two domains of departmental culture (internal work environment and perceptions of patient safety) were examined separately due to the small number of observations. In all models, the control variables of department type, hospital, size of department and total opportunities were included to account for other department characteristics that may have confounded the primary relationships of interest. Results are reported as the average marginal effects (ME) to facilitate interpretation.

For each independent variable (domain), there were five dependent variables (patient safety events) run separately for the two fiscal years; therefore, there were ten estimated relationships for each independent variable. The discussion below adopts the position that zero to 1 significant relationships provides no support for the hypothesis; 2 to 4 significant relationships will provide weak support; 5 to 7 significant relationships will provide moderate support, and 8 to 10 significant relationships will provide complete support for the hypothesis.

Hypothesis 1: Work Environment and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 1 stated that hospital departments with more positive perceptions of the work environment will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of employee engagement were associated with 0.69 and 77.78 more patient safety events per year, on average, for fiscal years 2016 and 2017, respectively (Table 9). However, the relationship between perceptions of employee engagement and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. The results indicated that for fiscal year 2016, departments with a one-unit more positive perception of employee engagement were associated with .53 less falls with injury on average per year ($p<.05$, Table 9). There were no other significant relationships between employee engagement and any of the other patient safety indicators for either fiscal year.

Collectively, the analysis does not support Hypothesis 1, with only one relationship being statistically significant in the direction hypothesized.

Hypothesis 2a: Workload and Pace and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 2a stated that more positive perceptions of the department's workload and pace will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of workload and pace were associated with 6.92 and 5.79 more patient safety events per year, on average, for fiscal years 2016 and 2017,

respectively (Table 10). However, the relationship between perceptions of workload and pace and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. The results for workload and pace indicated that for fiscal year 2017, departments with a one-unit more positive perception of workload and pace were associated with .35 fewer falls with injury on average per year (ME=.35, $p < .05$, [Table 10]). Departments with a one-unit more positive perception of workload and pace were associated with .79 and 1.08 fewer pressure ulcers per year, on average, for fiscal year 2016 and 2017, respectively (ME=.79, $p < .05$ and ME=1.08, $p < .001$ [Table 10]). There were no other significant relationships between workload and pace and any of the other patient safety indicators for either fiscal year.

Collectively, the results for workload and pace provided weak support for Hypothesis 2a with three relationships being statistically significant in the direction hypothesized.

Table 9: Poisson Regression Results: Marginal Effects (ME)
Employee Engagement and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Employee Engagement	0.69 (4.33)	77.78 (169.94)	-0.98 (0.58)	14.39 (64.96)	1.43 (3.76)	0.68 (7.29)	-0.53 (0.22) *	-0.29 (0.44)	-0.55 (0.90)	1.45 (11.19)
Controls:										
Critical care department	1.84 (1.85)	1.96 (2.01)	0.61 (1.09)	0.55 (0.96)	-0.41 (1.11)	0.06 (1.01)	-0.60 (0.32)	-1.49 (2.25)	2.07 (1.96)	0.28 (0.93)
Telemetry department	2.67 (3.72)	0.17 (2.45)	0.46 (1.78)	0.03 (1.29)	-1.26 (1.32)	-0.72 (1.11)	5.78 (13.89)	-1.39 (2.25)	11.04 (18.07)	0.18 (1.20)
Hospital	4.16 (1.76) *	4.13 (1.19) **	1.38 (0.31) ***	1.16 (0.32) ***	-0.54 (2.72)	1.53 (0.35) ***	0.63 (0.85)	-1.26 (3.19)	2.51 (3.09)	-0.11 (1.56)
Number of employees	-0.01 (0.07)	0.06 (0.04)	0.03 (0.04)	0.002 (0.02)	0.02 (0.04)	0.02 (0.02)	-0.04 (0.04)	0.03 (0.02)	-0.05 (0.04)	0.03 (0.02)
Total opportunities	0.01 (0.005) *	0.005 (0.004)	0.003 (0.003)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.002 (0.002)	-0.001 (0.001)	0.004 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Table 10: Poisson Regression Results: Marginal Effects (ME)
Workload and Pace and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Workload and Pace	6.92 (9.36)	5.79 (10.84)	3.19 (8.78)	-0.76 (0.63)	0.73 (2.94)	0.08 (2.81)	1.97 (6.05)	-0.35 (0.15) *	-0.79 (0.36) *	-1.08 (0.31) ***
Controls:										
Critical care department	1.78 (1.81)	1.00 (1.83)	0.36 (0.94)	-0.22 (0.89)	-0.40 (1.12)	0.002 (1.02)	-0.61 (0.32)	-3.14 (6.14)	2.16 (1.76)	-0.87 (1.43)
Telemetry department	2.10 (3.49)	-0.76 (2.27)	0.22 (1.54)	-0.71 (1.01)	-1.26 (1.34)	-0.78 (1.09)	1.70 (3.65)	-3.07 (6.14)	12.15 (18.40)	-0.99 (1.51)
Hospital	3.53 (2.06)	3.63 (1.26) **	1.37 (0.31) ***	1.07 (0.27) ***	-0.57 (2.93)	1.52 (0.34) ***	0.38 (0.73)	-5.13 (15.80)	4.17 (7.01)	-2.46 (4.18)
Number of employees	0.03 (0.08)	0.06 (0.04)	0.05 (0.04)	-0.001 (0.02)	0.02 (0.04)	0.02 (0.02)	-0.009 (0.03)	0.03 (0.02)	-0.07 (0.04)	0.03 (0.02)
Total opportunities	0.009 (0.005) *	0.003 (0.004)	0.003 (0.002)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.001 (0.002)	-0.001 (0.001)	0.004 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Hypothesis 2b: Civility and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 2b stated that more positive perceptions of the department's civility will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of civility were associated with 2.29 and 3.92 more patient safety events per year, on average, for fiscal years 2016 and 2017, respectively (Table 11). However, the relationship between perceptions of civility and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. Civility was significantly associated with reductions in falls with injury ($p < .01$, [Table 11]) in fiscal year 2016. The results indicated that for fiscal year 2016, departments with a one-unit more positive perception of civility were associated with .60 ($p<.01$; Table 11) fewer falls with injury per year, on average. Civility was not significantly associated with the other patient safety outcomes.

Collectively, the analysis does not support Hypothesis 2b, with only one relationship being statistically significant in the direction hypothesized.

Hypothesis 2c: Supervisor Support and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 2c stated that more positive perceptions of the department's supervisor support will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of supervisor support were associated with 1.75 and

14.16 more patient safety events per year, on average, for fiscal years 2016 and 2017, respectively (Table 12). However, the relationship between perceptions of supervisory support and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. The results indicated that supervisor support was not significantly associated with any other patient safety outcome – CAUTIs, CLABSIs, falls or pressure ulcers.

Collectively, the results do not support Hypothesis 2c.

Table 11: Poisson Regression Results: Marginal Effects (ME)
Civility and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Civility	2.29 (5.95)	3.92 (6.03)	-0.03 (2.23)	10.63 (17.52)	0.95 (3.47)	0.49 (2.40)	-0.60 (0.20) **	16.54 (68.45)	0.49 (3.06)	3.09 (6.32)
Controls:										
Critical care department	1.66 (1.84)	0.40 (1.38)	0.37 (1.02)	0.51 (0.66)	-0.42 (1.08)	0.05 (0.80)	-0.63 (0.49)	-0.88 (0.99)	1.51 (1.43)	0.29 (0.67)
Telemetry department	2.73 (3.68)	-1.36 (1.82)	0.26 (1.60)	0.08 (1.20)	-1.14 (1.34)	-0.73 (0.91)	1.29 (3.88)	-0.73 (1.01)	7.58 (11.02)	0.26 (0.99)
Hospital	4.29 (1.68) *	3.40 (1.21) **	1.37 (0.31) ***	1.19 (0.32) ***	-0.09 (2.28)	1.53 (0.33) ***	0.07 (1.22)	-0.39 (1.07)	1.90 (1.36)	-0.005 (1.12)
Number of employees	-0.01 (0.07)	0.05 (0.04)	0.04 (0.04)	-0.009 (0.02)	0.02 (0.04)	0.02 (0.02)	-0.02 (0.03)	0.03 (0.02)	-0.04 (0.03)	0.03 (0.02)
Total opportunities	0.01 (0.005) *	0.004 (0.004)	0.003 (0.002)	0.003 (0.002)	0.001 (0.002)	0.000 (0.002)	0.001 (0.002)	0.000 (0.001)	0.004 (0.003)	0.001 (0.002)

* p < .05; ** p < .01; ***p < .001

Table 12: Poisson Regression Results: Marginal Effects (ME)
Supervisor Support and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Supervisor Support	1.75 (2.85)	14.16 (17.14)	-0.75 (0.51)	-0.29 (1.34)	1.49 (2.17)	5.20 (10.94)	-0.44 (0.24)	-0.24 (0.45)	0.41 (1.86)	0.71 (3.58)
Controls:										
Critical care department	1.75 (1.81)	0.84 (1.48)	0.60 (1.07)	0.09 (0.65)	-0.36 (1.12)	0.21 (0.82)	-0.67 (0.46)	-1.29 (1.58)	1.54 (1.27)	0.22 (0.72)
Telemetry department	2.35 (3.57)	-1.26 (1.76)	0.44 (1.77)	-0.40 (0.89)	-1.35 (1.30)	-0.64 (0.89)	7.81 (19.98)	-1.17 (1.55)	7.32 (10.61)	0.08 (0.92)
Hospital	3.90 (1.85) *	3.61 (1.12) **	1.38 (0.32) ***	1.10 (0.27) ***	-0.96 (3.18)	1.57 (0.34) ***	0.68 (0.90)	-1.21 (2.79)	1.71 (1.25)	-0.18 (1.30)
Number of employees	-0.007 (0.07)	0.06 (0.04)	0.03 (0.04)	0.002 (0.02)	0.02 (0.04)	0.02 (0.02)	-0.04 (0.04)	0.03 (0.03)	-0.04 (0.04)	0.03 (0.02)
Total opportunities	0.009 (0.005) *	0.004 (0.004)	0.004 (0.003)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.003 (0.002)	-0.001 (0.001)	0.003 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Hypothesis 2d: Career and Learning Opportunities and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 2d stated that more positive perceptions of the department's career and learning opportunities in the organization will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a more positive perception of career and learning opportunities were associated with .007 fewer and 38.76 more patient safety events per year for fiscal years 2016 and 2017, respectively (Table 13). However, the relationship between perceptions of career and learning opportunities and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. Career and learning opportunities were significantly associated with reductions in catheter associated urinary tract infections (CAUTIs) ($p < .05$, [Table 13]) in fiscal year 2016. The results indicated that for fiscal year 2016, departments with a one-unit more positive perception of career and learning opportunities were associated with 1.06 fewer CAUTIs per year. Likewise, career and learning opportunities were significantly associated with reductions in falls with injury ($p < .01$, [Table 13]) in fiscal year 2016. The results indicated that for fiscal year 2016, departments with a one-unit more positive perception of career and learning opportunities were associated with .57 fewer falls with injury per year, on average. The results indicated that career and learning opportunities were not significantly associated with CLABSIs or pressure ulcers.

Collectively, the results provided weak support for Hypothesis 2d with two relationships being statistically significant in the direction hypothesized.

Table 13: Poisson Regression Results: Marginal Effects (ME)
Career and Learning and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Career and Learning Opportur	-0.007 (3.81)	38.76 (84.78)	-1.06 (0.48) *	254.07 (1019.26)	1.79 (4.32)	-0.06 (5.00)	-0.57 (0.21) **	-0.18 (1.39)	-0.28 (1.44)	3.75 (20.43)
Controls:										
Critical care department	1.91 (1.94)	0.65 (1.46)	0.95 (1.35)	0.51 (0.73)	-0.49 (1.11)	-0.02 (0.79)	-0.57 (0.31)	-1.24 (1.60)	1.89 (1.90)	0.27 (0.76)
Telemetry department	2.77 (3.79)	-1.72 (1.64)	0.76 (2.06)	-0.38 (0.75)	-1.29 (1.33)	-0.80 (0.86)	6.72 (16.96)	-1.12 (1.52)	9.52 (15.13)	0.08 (0.89)
Hospital	4.22 (1.74) *	3.60 (1.16) **	1.39 (0.32) ***	1.18 (0.31) ***	-0.52 (2.68)	1.52 (0.33) ***	0.62 (0.87)	-0.93 (2.59)	2.11 (2.03)	-0.13 (1.25)
Number of employees	-0.02 (0.07)	0.07 (0.04)	0.03 (0.04)	0.009 (0.02)	0.02 (0.04)	0.02 (0.02)	-0.04 (0.04)	0.03 (0.02)	-0.05 (0.04)	0.03 (0.02)
Total opportunities	0.01 (0.005) *	0.004 (0.004)	0.004 (0.003)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.002 (0.003)	-0.001 (0.001)	0.004 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Hypothesis 2e: Organizational Trust and Values and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 2e stated that more positive perceptions of the department's trust and values in the organization will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of organizational trust and values were associated with .78 fewer and 5.54 more patient safety events per year, on average, for fiscal years 2016 and 2017, respectively (Table 14). However, the relationship between perceptions of organizational trust and values and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. Organizational trust and values were significantly associated with reductions in falls with injury ($p < .01$, [Table 14]) in fiscal year 2016. The results indicated that for fiscal year 2016, departments with a one-unit more positive perception of organizational trust and values were associated with .56 fewer falls with injury on average per year.

Collectively, only the relationship between organizational trust and values and falls with injury for one fiscal year supported Hypothesis 2e; therefore, there is no support for this hypothesis.

Hypothesis 2f: Exhaustion/Resilience and Patient Safety Outcomes

Hypothesis 2f stated that more positive perceptions of the department's exhaustion/resilience will be associated with better patient safety outcomes. The data for

this hypothesis was only available for fiscal year 2017. The Poisson model results indicated that departments with a one-unit more positive perception of exhaustion/resilience were associated with .85 more patient safety events per year, on average (Table 15). However, the relationship between perceptions of exhaustion/resilience and the total number of patient safety events was not significant for fiscal year 2017. Overall, the results of the Poisson model showed that exhaustion/resilience was not significantly associated with any patient safety outcomes (Table 15).

Collectively, these findings failed to support Hypothesis 2f.

Table 14: Poisson Regression Results: Marginal Effects (ME)
Trust and Values and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Organizational Trust & Values	-0.78 (2.48)	5.54 (11.29)	-0.80 (0.64)	10.49 (28.50)	0.64 (2.18)	-0.67 (1.39)	-0.56 (0.20) **	-0.30 (0.30)	-0.49 (0.76)	1.45 (6.53)
Controls:										
Critical care department	1.82 (1.85)	1.42 (2.49)	0.29 (0.99)	1.16 (1.58)	-0.27 (1.17)	-0.36 (1.26)	-0.75 (0.56)	-2.17 (4.36)	1.85 (1.52)	0.54 (1.43)
Telemetry department	2.93 (3.87)	-1.38 (1.67)	0.47 (1.91)	-0.16 (0.78)	-1.17 (1.29)	-0.93 (1.03)	7.60 (18.80)	-1.97 (4.11)	11.93 (20.15)	0.12 (0.85)
Hospital	4.29 (1.71) *	3.49 (1.23) **	1.37 (0.31) ***	1.17 (0.31) ***	-0.37 (2.51)	1.50 (0.32) ***	0.58 (0.84)	-1.58 (3.86)	2.48 (2.81)	-0.04 (1.33)
Number of employees	-0.02 (0.07)	0.07 (0.05)	0.03 (0.04)	0.02 (0.02)	0.02 (0.04)	0.01 (0.03)	-0.04 (0.04)	0.03 (0.02)	-0.05 (0.04)	0.04 (0.03)
Total opportunities	0.01 (0.005) *	0.003 (0.003)	0.003 (0.003)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.002 (0.003)	-0.001 (0.001)	0.004 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Table 15: Poisson Regression Results: Marginal Effects (ME)
Exhaustion/Resilience and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Exhaustion/Resilience	-	0.85 (3.23)	-	3.51 (6.12)	-	0.46 (1.96)	-	6.80 (23.03)	-	3.76 (6.61)
Controls:										
Critical care department	-	-.20 (1.54)	-	-0.35 (0.87)	-	-0.13 (0.89)	-	-3.42 (6.58)	-	-0.34 (1.04)
Telemetry department	-	-2.22 (2.19)	-	-1.09 (0.99)	-	-1.00 (1.11)	-	-3.47 (6.68)	-	-0.91 (1.29)
Hospital	-	2.90 (1.54) *	-	1.04 (0.26) ***	-	1.50 (0.33) ***	-	-6.27 (17.46)	-	-2.42 (4.30)
Number of employees	-	0.06 (0.04)	-	0.00 (0.02)	-	0.02 (0.02)	-	0.03 (0.02)	-	0.03 (0.002)
Total opportunities	-	0.003 (0.003)	-	0.002 (0.002)	-	0.00 (0.002)	-	0.00 (0.001)	-	0.00 (0.002)

* p < .05; ** p < .01; ***p < .001

Hypothesis 3: Perceptions of Patient Safety and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 3 stated that hospital departments with more positive employee attitudes towards patient safety will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of patient safety culture were associated with .004 and 4.13 more patient safety events per year, on average, for fiscal years 2016 and 2017, respectively (Table 16). However, the relationship between perceptions of patient safety and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. Perceptions of patient safety were significantly associated with fewer falls with injury in both fiscal year 2016 and 2017 (ME=0.53, $p<.01$ and ME=0.35, $p<.05$, respectively; Table 16).

While there are two significant relationships between perceptions of patient safety and patient safety outcomes, these findings provided weak support for Hypothesis 3.

Hypothesis 4a: Staffing and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 4a stated that hospital departments with more positive overall perceptions of staffing will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of staffing were associated with .09 and .82 fewer patient safety events per year, on average, for fiscal years 2016 and 2017,

respectively (Table 17). However, the relationship between perceptions of staffing and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. Staffing perceptions were significantly associated with reductions in central line-associated blood stream infections (CLABSIs) in fiscal year 2017 (ME=1.07, $p < .05$, [Table 17]). Additionally, perceptions of staffing were significantly associated with reductions in falls with injury (ME=.58, $p < .01$, [Table 17]) in fiscal year 2016. The results showed that perceptions of staffing were not significantly associated with CAUTIs or pressure ulcers.

Collectively, the results of two statistically significant relationships provided weak support for Hypothesis 4a.

Table 16: Poisson Regression Results: Marginal Effects (ME)
Perceptions of Patient Safety and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Perceptions of Patient Safety	0.004 (2.12)	4.13 (6.27)	-0.54 (0.70)	2.61 (6.04)	0.56 (1.52)	0.06 (1.98)	-0.53 (0.20) **	-0.35 (0.15) *	-0.30 (0.76)	-0.23 (1.34)
Controls:										
Critical care department	1.90 (1.86)	0.66 (1.50)	0.49 (1.03)	0.33 (0.66)	-0.42 (1.11)	-0.007 (0.85)	-0.61 (0.36)	-4.33 (9.75)	1.99 (1.82)	0.08 (0.83)
Telemetry department	2.77 (3.79)	-1.24 (1.83)	0.40 (1.74)	-0.17 (1.01)	-1.27 (1.33)	-0.79 (0.92)	8.88 (21.32)	-4.23 (9.74)	10.74 (17.57)	-0.02 (0.98)
Hospital	4.22 (1.74) *	3.42 (1.20) **	1.37 (0.31) ***	1.13 (0.29) ***	-0.50 (2.68)	1.52 (0.33) ***	0.74 (0.98)	-5.62 (15.83)	2.33 (2.48)	-0.44 (1,57)
Number of employees	-0.02 (0.07)	0.07 (0.04)	0.03 (0.04)	0.007 (0.02)	0.02 (0.04)	0.02 (0.02)	-0.04 (0.04)	0.04 (0.03)	-0.05 (0.04)	0.03 (0.02)
Total opportunities	0.01 (0.005) *	0.003 (0.003)	0.003 (0.003)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.002 (0.002)	-0.001 (0.001)	0.004 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Table 17: Poisson Regression Results: Marginal Effects (ME)
Perceptions of Staffing and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Staffing	-0.09 (2.35)	-0.82 (3.05)	-0.49 (1.08)	0.29 (2.48)	0.50 (1.51)	-1.07 (0.51) *	-0.58 (0.20) **	-0.25 (0.41)	-0.42 (0.73)	-0.66 (0.86)
Controls:										
Critical care department	1.94 (2.04)	-0.29 (1.82)	0.63 (1.26)	0.20 (0.78)	-0.55 (1.21)	-0.73 (1.25)	-0.83 (0.80)	-1.95 (3.99)	2.22 (2.23)	-0.21 (1.11)
Telemetry department	2.80 (3.85)	-2.19 (2.31)	0.42 (1.71)	-0.28 (1.18)	-1.35 (1.43)	-1.64 (1.36)	14.19 (33.93)	-1.89 (4.07)	10.75 (16.69)	-0.45 (1.35)
Hospital	4.23 (1.72) *	2.75 (2.09)	1.37 (0.31) ***	1.12 (0.33) **	-0.46 (2.64)	1.41 (0.30) ***	0.27 (0.85)	-3.25 (14.69)	2.22 (2.07)	-1.91 (5.18)
Number of employees	-0.02 (0.08)	0.05 (0.04)	0.03 (0.05)	0.003 (0.02)	0.02 (0.04)	0.01 (0.02)	-0.06 (0.04)	0.03 (0.02)	-0.05 (0.04)	0.03 (0.02)
Total opportunities	0.01 (0.005) *	0.003 (0.004)	0.003 (0.003)	0.002 (0.002)	0.000 (0.002)	0.001 (0.002)	0.002 (0.002)	-0.001 (0.001)	0.004 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Hypothesis 4b: Nonpunitive Response to Errors and Patient Safety Outcomes

Number of Total Patient Safety Events. Hypothesis 4b stated that hospital departments with more positive overall perceptions of nonpunitive response to errors will be associated with better patient safety outcomes. The Poisson model results indicated that nursing departments with a one-unit more positive perception of non-punitive response to errors were associated with .011 and 4.36 more patient safety events per year for fiscal years 2016 and 2017, respectively (Table 18). However, the relationship between perceptions of nonpunitive responses to errors and the total number of patient safety events was not significant for either year.

Number of Specific Patient Safety Events. The Poisson model results showed that nonpunitive response to errors was significantly associated with reductions in catheter associated urinary tract infections (CAUTIs) (ME=.90, $p < .05$, [Table 18]) in fiscal year 2016. Likewise, perceptions of nonpunitive response to errors were significantly associated with reductions in falls with injury (ME=.50, $p < .05$, [Table 18]) in fiscal year 2016. The results did not indicate any significant associations with CLABSIs or pressure ulcers.

Collectively, the results of two statistically significant relationships provided weak support for Hypothesis 4b.

Table 18: Poisson Regression Results: Marginal Effects (ME)
Nonpunitive Response to Errors and Patient Safety Outcomes

	Patient Safety Events Aggregate		Catheter Associated Urinary Tract Infection (CAUTI)		Central Line-Associated Blood Stream Infection (CLABSI)		Fall with Injury		Pressure Ulcer	
	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)	FY 2016 ME (Std Error)	FY 2017 ME (Std Error)
Nonpunitive Response to Errors	0.11 (1.60)	4.36 (4.05)	-0.90 (0.38) *	1.29 (2.50)	0.93 (1.29)	1.13 (2.17)	-0.50 (0.20) *	1.38 (4,71)	0.28 (1.02)	-0.05 (0.90)
Controls:										
Critical care department	1.86 (1.91)	0.35 (1.35)	1.27 (1.45)	0.17 (0.62)	-0.65 (1.24)	0.005 (0.76)	-0.70 (0.53)	-1.41 (1.90)	1.57 (1.27)	0.15 (0.71)
Telemetry department	2.70 (3.81)	-0.96 (1.97)	0.95 (2.15)	-0.19 (1.08)	-1.56 (1.45)	-0.65 (0.95)	31.37 (88.67)	-1.16 (1.79)	7.76 (10.97)	0.02 (0.97)
Hospital	4.18 (1.81) *	3.08 (1.26) *	1.39 (0.32) ***	1.09 (0.27) ***	-1.36 (3.87)	1.52 (0.32) ***	1.77 (3.20)	-0.33 (1.03)	1.76 (1.25)	-0.34 (1.31)
Number of employees	-0.02 (0.07)	0.08 (0.05)	0.02 (0.04)	0.01 (0.02)	0.03 (0.04)	0.03 (0.03)	-0.06 (0.05)	0.04 (0.03)	-0.04 (0.04)	0.03 (0.02)
Total opportunities	0.01 (0.005) *	0.004 (0.004)	0.004 (0.003)	0.002 (0.002)	0.000 (0.002)	0.000 (0.002)	0.003 (0.003)	-0.001 (0.001)	0.004 (0.003)	0.000 (0.002)

* p < .05; ** p < .01; ***p < .001

Control Variable Relationships

The control variable relationships in the Poisson models showed a statistically significant relationship between the hospital and the patient safety events aggregate, CAUTIs and CLABSIs for most years across all models. Specifically, the results indicated that Renown Regional, as compared to Renown South Meadows, was associated with one to four more patient safety events per year, on average. Finally, the results showed a statistically significant relationship between total opportunities and the aggregate patient safety events for fiscal year 2016 across all the models. There was no other statistically significant relationship in the results related to the covariates.

Summary of Findings

There were no significant relationships with the total number of patient safety events. In contrast, there were a number of significant relationships with specific types of patient safety events as the dependent variable. Falls with injury was the patient safety indicator with the most consistent statistically significant relationships. Also, fiscal year 2016 showed substantially more significant associations than fiscal year 2017. The number of significant relationships found out of the total possible relationships and the level of support for the hypotheses are summarized in Table 19.

Table 19: Summary of Findings by Hypothesis

Hypothesis		Significant Relationships	Overall Support	Patient Safety 2016	Patient Safety 2017	CAUTIs 2016	CAUTIs 2017	CLABSIs 2016	CLABSIs 2017	Falls with Injury 2016	Falls with Injury 2017	Pressure Ulcers 2016	Pressure Ulcers 2017
1	Employee Engagement	1/10	None	NS	NS	NS	NS	NS	NS	S	NS	NS	NS
2a	Workload and Pace	3/10	Weak	NS	NS	NS	NS	NS	NS	NS	S	S	S
2b	Civility	1/10	None	NS	NS	NS	NS	NS	NS	S	NS	NS	NS
2c	Supervior Support	0/10	None	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2d	Career and Learning Opportunities	2/10	Weak	NS	NS	S	NS	NS	NS	S	NS	NS	NS
2e	Organizational Trust and Values	1/10	None	NS	NS	NS	NS	NS	NS	S	NS	NS	NS
2f	Exhaustion and Resilience	0/5	None	-	NS	-	NS	-	NS	-	NS	-	NS
	Total	8/65=12%											
3	Perceptions of Patient Safety	2/10	Weak	NS	NS	NS	NS	NS	NS	S	S	NS	NS
4a	Staffing	2/10	Weak	NS	NS	NS	NS	NS	S	S	NS	NS	NS
4b	Nonpunitive Response to Errors	2/10	Weak	NS	NS	S	NS	NS	NS	S	NS	NS	NS
	Total	6/30=20%											
	Grand Total	14/95=15%											

NS: Not supported; S: Supported

CHAPTER 5
DISCUSSION

Introduction

The purpose of this chapter is to discuss the findings of the study and the study implications for hospital and healthcare leaders and patients. A summary level and discussion of the findings related to each group of hypotheses is discussed in the following sections. Next, the limitations of the study will be addressed as well as recommendations for future research as a result of the study findings.

Perceptions of the Work Environment

The research question for the first group of hypotheses related to the relationship between a hospital department's work environment and patient safety outcomes in that department. The work environment consisted of seven domains: engagement, workload and pace, civility, supervisor support, organizational trust and values, exhaustion and resilience, and career and learning opportunities. While there were a few statistically significant relationships for some of the work environment domains, workload and pace was the work environment characteristic that had the most consistently significant relationships in the direction predicted with patient safety outcomes, specifically falls with injury and pressure ulcers. This finding is consistent with other research that has

reviewed nurse staffing and workload on patient safety outcomes and found a relationship between adequate nurse staffing and better patient safety outcomes (Blegan, et al., 1998; Friese et al., 2008; Kovner & Gergen, 1998; Laschinger & Leiter, 2006; Nahrgang, et al., 2011).

One possible explanation for the association of workload and pace to patient falls and pressure ulcers is that patient interventions to prevent falls and pressure ulcers require assistance, observation, and repositioning of the patient. Essentially, the interventions for preventing falls and pressures ulcers require time with the patient that may not occur if the workload and pace are too cumbersome. In contrast, for the other two types of patient safety outcomes included in the study (catheter associated urinary tract infections and central line-associated blood stream infections), the single most effective intervention for prevention is appropriate hand-washing (Allegranzi & Pittet, 2009). Hand-washing has been a focus for years in healthcare and also at the study hospitals, and regardless of the level of workload, the practice of hand-washing is compulsory. It is also notable that the workload and pace domain had the lowest average score of all of the work environment domains and the greatest variation between questions within the domain. It is plausible that another reason why this domain exhibited a more robust relationship with patient safety events is that there is simply greater opportunity for improvement.

None of the other domains under employee perceptions of the work environment: employee engagement, civility, supervisor support, organizational trust and values, or exhaustion and resilience individually had more than one significant relationship with patient safety outcomes. Career and learning opportunities had two significant

relationships with patient safety outcomes. Similar to the workload and pace domain, one potential explanation is that fewer opportunities exist to improve in these areas, with average perceptions at or above 4.0 for most of the domains and relatively low levels of variations between questions within the domains. This pattern suggests that not only do organizational members feel generally positive about these aspects of their work environment, but there is a high level of agreement among the members.

Another possible explanation for the lack of a substantial number of significant relationships for these domains is that these cultural factors may impact patient safety events more indirectly. Employee engagement, civility, organizational trust, and exhaustion/resilience relate to "how you feel" at work and about work, and thus, may provide insight into your motivation at work. While motivation is important, it may not directly influence patient safety outcomes. For example, greater engagement based on how you feel at work can result in higher levels of respect, teamwork, and psychological safety, all of which have been shown to create a stronger group culture (Edmondson, 1999). Stronger cultures that support speaking up, in turn, may lead to better problem solving regarding patient care that ultimately result in better quality of care.

Supervisor support and career and learning opportunities, on the other hand, are less about how you feel at work and more about the level of support you have from your leader and the organization. A possible explanation for the lack of significant relationship for these domains to patient safety outcomes is that while feeling supported at work has been shown to increase job satisfaction and reduce stress (Hall, 2007), these feelings of support do not directly influence work activities that would result in reduced adverse patient outcomes. Higher job satisfaction and less stress ultimately lead to lower

turnover and a more learning environment (Egan, Yang & Bartlett, 2004). A work environment of less turnover, more learning, and higher satisfaction may ultimately lead to better group collaboration regarding patient care and ultimately better quality of care.

Perceptions of Patient Safety

The second group of hypotheses compared employees' perceptions of patient safety in their work environment to patient safety outcomes. Perceptions of patient safety included three domains: overall perceptions of patient safety and quality, staffing, and non-punitive response to errors. Similar to the first group of hypotheses, significant associations were restricted to certain patient safety outcomes, particularly patient falls with injury. There were significant associations between patient falls with injury and all three domains - overall perceptions of patient safety, staffing, and nonpunitive response to error – for at least one year.

The association between perceptions of patient safety and falls with injury is consistent with the previous discussion in that there were a number of different subdomains of culture that were significantly related to patient falls with injury. Thus, falls appear to be more impacted by culture than other patient safety outcomes. Likewise, there were ten independent variables (culture domains) for two separate years; therefore, twenty models were run for the dependent variable (patient safety event) of falls with injury. These models resulted in nine significant relationships between the various culture domains and falls with injury. No other dependent variable (patient safety event) had more than two significant relationships.

There were no significant associations between the perceptions of patient safety domains and either of the infection patients safety outcomes (CAUTIS or CLABSIs). Consistent with the discussion for the employee engagement domains, the most significant factor to reduce infections is handwashing (Allegranzi & Pittet, 2009). The study hospital has, over the last five years, promoted the need for handwashing, educated and trained their staff, and measured performance through direct observation. This focused effort on handwashing at the study hospitals has improved compliance substantially; therefore, this is one possible explanation as to why there are not as many significant relationships between the patient safety perception domains and infections.

Perceptions of patient safety, regardless of whether viewed in aggregate or by subdomain, were not significantly associated with reductions in pressure ulcers. With the exception of falls with injury, that was significantly related to many of the subdomains of culture, the other patient safety outcomes had only a few statistically significant relationships. For the perceptions of patient safety domains, the subdomain with the lowest average score was staffing. While the average score for the questions within the perceptions of staffing domain was lower than some of the employee engagement domains, the variation between the highest and lowest question were .84 and .82 for fiscal year 2016 and 2017, respectively. This compares to the variation for the employee engagement subdomain of workload and pace which was almost double at 1.62 and 1.53 for fiscal year 2016 and 2017, respectively. This suggests that subdomains with less variation have a higher level of agreement among the department members and fewer opportunities to impact the patient safety outcome.

Study Implications

Resources are limited in hospitals. However, with public and payor pressure to continue to improve patient outcomes, hospitals are focused on many different initiatives simultaneously. Findings from this study can help hospital leadership focus their efforts on the subcomponents of employee engagement and patient safety culture that are most promising in impacting patient outcomes. For example, the study indicated that workload and pace were significantly associated with falls and pressure ulcers. A closer review of the specific Pasqual survey questions for workload and pace suggests that perceptions of work being interrupted and making choices around high priority tasks, in particular, varied considerably between departments. Focused efforts to improve perceptions in this area might be beneficial and effective at further reducing adverse events. For example, training and practice in delegation and decision-making, resulting in a broader distribution of responsibilities on the nursing unit, could improve these scores and reduce the demands on the staff.

Those hospitals specifically focused on fall prevention due to a higher than national average number of falls could also find value from this study which showed that most of the domains for employee engagement and patient safety were significantly related to a reduction in falls. Therefore, hospitals have many different opportunities for interventions to improve this patient safety outcome.

Alternatively, the study showed that 12 percent of the possible relationships were significant for the perceptions of employee engagement domains; whereas, 20 percent of the relationships were significant for the perceptions of patient safety domains. Moreover, there were certain subcomponents of employee engagement, such as

supervisor support and exhaustion/resilience, that exhibited no significant relationships with patient safety events. Together, these findings suggest that hospital leaders with limited resources may want to focus more on the elements of patient safety culture than employee engagement if reducing patient safety events is a priority. Efforts to develop a culture of safety, including implementing systems to catch errors, creating a culture of process improvement and learning from the errors, as well as celebrating "good catches" and increasing the reporting of patient safety events could result in increases in the employee's perceptions of patient safety.

From an organizational perspective, if hospital leadership chose to measure and focus on only aggregate scores of employee engagement, this approach may mask important variations that this study has shown to be associated with patient safety events. For example, there were more significant relationships in the subdomains of employee engagement (workload and pace and career and learning opportunities) than there were in the overall domain. Organizations should ensure that their survey instruments for culture provide a sufficient level of detail to allow a focus on the subcomponents of employee engagement.

The results also suggest that a continued focus on improving quality and reducing adverse effects, similar to the study organization, may result in fewer significant relationships between employee perceptions of engagement and safety and outcomes over time. The fiscal year 2016 and 2017 significant relationships in the study were ten and four, respectively. The study organization has had an ongoing focus on increasing quality of care and improving outcomes during the study period. This suggests that organizations need to continue to monitor their progress on outcomes as continued

investment in developing a culture of safety, beyond a certain point, may have a diminishing return. This presents a challenge for a hospital that achieves a low level of any particular patient safety event as once the occurrence of an event is low, it becomes more challenging to be vigilant and maintain that low occurrence level. Hospitals in this scenario should strive for the successful interventions to become embedded in their culture, similar to handwashing in the study organization, as "the way things are done around here."

In addition to hospital leadership, the study implications extend to patients who are clearly impacted by a hospital's efforts to reduce bad outcomes. One approach patients can take to support programs to build a stronger culture in a hospital is by their participation in patient advocacy committees. Many hospitals utilize these committees of former patients or family members of former patients to discuss and influence initiatives to improve quality and patient safety. Additionally, hospitals like the subject hospital, include patients in process improvement initiatives so that teams working on improvement projects for patient safety can understand the implications of their work from the firsthand perspective of the patient. These patient stories have a significant and lasting impact on the work of these teams as well as the culture of the organization.

Limitations and Future Research

Several study limitations should be noted. First, the study was conducted using data from two hospitals at Renown Health in Reno, Nevada. Therefore, the findings from the study may not be applicable to other hospitals in the country.

In addition, the sample size for the study was small, which could result in an inability to detect significant relationships even if they were present. Future research using a larger sample size could help both corroborate the results of this study and identify other relationships that were not apparent using the smaller sample sizes from this study. Alternatively, different analytic approaches designed for smaller samples could be used (e.g., qualitative comparative analysis). Likewise, qualitative or mixed method studies might be beneficial in mitigating some of the shortcomings of a small sample size.

Third, the survey data for the study were available for only two years. A longer study period would have provided additional data, and thus greater statistical power, for testing the study hypotheses. Likewise, additional years of data would have enabled a more rigorous longitudinal analysis that could have examined trends in these relationships.

Fourth, the employee's perceptions of the work environment and patient safety culture were based on a survey developed by Pascal. The responses to the Pascal survey were aggregated at the department level for each of the domains, and there was not an ability to test the appropriateness of this aggregation or the correlation of the questions within each domain. The Pascal survey was the only data source utilized to evaluate culture. Other data sources (e.g., qualitative interviews) would have been helpful in corroborating some of the study constructs. Future research could consider other methods of evaluating department culture whether that was by interviewing staff or utilizing other culture surveys that could provide additional perspectives on the subcomponents of culture that could influence patient outcomes, such as organizational

structure, decision-making processes or ethnic and other demographic characteristics of the workforce.

Finally, there may be other confounding variables that were not be included in the study that could have an impact on the findings. For example, the survey did not control for the type of position in the department that was completing the survey. Department respondents could be nurses, unit clerks, leaders or other positions in each of the individual nursing departments, which may influence their perceptions of employee engagement and patient safety culture. Factors such as the skill mix in the nursing department, the patient case mix on the unit, and the volume of patient turnover on the unit could also impact the study. Additionally, the educational level of the nurse workforce (e.g., bachelor-prepared versus associate-prepared registered nurses), years of experience, or perceived collaboration and coordination among department members could also have an impact on the study.

Summary

The purpose of this study was to examine the relationships between the culture in a nursing department and patient safety outcomes. Most hospitals have multiple initiatives in place to improve the quality of their care and reduce bad outcomes. This study attempted to determine how impactful a department's culture is on patient safety outcomes as well as determine if there were particular subcomponents of culture that had a larger impact on patient safety outcomes. The study findings suggest that there are relationships between subcomponents of culture and the patient safety outcomes in a

hospital department. The study confirms previous research about the impact of workload and pace on quality and outcomes. It also suggests that there are other important relationships between subcomponents of culture and outcomes that should be investigated further. As hospitals continue to seek strategies to reduce patient harm, culture should be a part of the discussion.

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APPENDIX A

LETTER OF APPROVAL FROM THE UNIVERSITY OF ALABAMA AT BIRMINGHAM INSTITUTIONAL REVIEW BOARD

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 | irb@uab.edu

APPROVAL LETTER

TO: Ahner, Dawn

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)

DATE: 14-Dec-2017

RE: IRB-300001055
Culture and Patient Safety Outcomes

The IRB reviewed and approved the Initial Application submitted on 07-Dec-2017 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

Type of Review: Exempt (Category 4)
Determination: Exempt
Approval Date: 14-Dec-2017
Approval Period: No Continuing Review

Documents Included in Review:

- exempt.171205.clean

APPENDIX B

LETTER OF APPROVAL FROM THE UNIVERSITY OF NEVADA, RENO INSTITUTIONAL REVIEW BOARD

University of Nevada, Reno

Research Integrity Office
218 Ross Hall / 331,
Reno, Nevada 89557
775.327.2368 / 775.327.2369 fax
www.unr.edu/research-integrity

DATE:	November 8, 2017
TO:	Dawn Ahner
FROM:	University of Nevada, Reno Institutional Review Board (IRB)
PROJECT TITLE:	[1139376-1] Culture and Patient Safety Outcomes
REFERENCE #:	Social Behavioral
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	November 8, 2017
REVIEW CATEGORY:	Exemption Category # 4

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The Research Integrity Office, or the IRB reviewed this project and has determined it is EXEMPT FROM IRB REVIEW according to federal regulations. Please note, the federal government has identified certain categories of research involving human subjects that qualify for exemption from federal regulations.

Only the Research Integrity Office and the IRB have been given authority by the University to make a determination that a study is exempt from federal regulations. The above-referenced protocol was reviewed and the research deemed eligible to proceed in accordance with the requirements of the Code of Federal Regulations on the Protection of Human Subjects (45 CFR 46.101 paragraph [b]).

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Reviewed Documents

- Abstract/Summary - Dawn Ahner Study Proposal for UNR IRB 110217.docx (UPDATED: 11/2/2017)
- Application Form - DA Exempt 4 Review of Existing Records Medical BIO 031017.docx (UPDATED: 10/27/2017)
- CV/Resume - Dawn Ahner CV.doc (UPDATED: 10/17/2017)
- Training/Certification - D. Ahner CITI.pdf (UPDATED: 10/6/2017)
- University of Nevada, Reno - Part I, Cover Sheet - University of Nevada, Reno - Part I, Cover Sheet (UPDATED: 11/2/2017)

If you have any questions, please contact Valerie Smith at 775.327.2370 or at valeries@unr.edu.

NOTE for VA Researchers: You are not approved to begin this research until you receive an approval letter from the VASNHCS Associate Chief of Staff for Research stating that your research has been approved by the Research and Development Committee.

Sincerely,

Richard Bjur, PhD
Co-Chair, UNR IRB
University of Nevada Reno

Janet Usinger, PhD
Co-Chair, UNR IRB
University of Nevada Reno