Association Between Nurse Staffing Indicators, Patient Falls, and Hospital Acquired Pressure Ulcers in the Acute Care Setting

Cheryl Renee Moates
Kennesaw State University, cmoates1@students.kennesaw.edu

Follow this and additional works at: http://digitalcommons.kennesaw.edu/etd
Part of the Nursing Commons

Recommended Citation
ASSOCIATION BETWEEN NURSE STAFFING INDICATORS, PATIENT FALLS, AND HOSPITAL ACQUIRED PRESSURE ULCERS IN THE ACUTE CARE SETTING

by

CHERYL MOATES

A Thesis
Presented in Partial Fulfillment of Requirements for the
Degree of
Master’s in Nursing Science
in the
Wellstar College of Health and Human Services
Kennesaw State University

Kennesaw, GA
2014
Thesis/Dissertation Defense Outcome

Name: Cheryl Renee Moates  
KSU ID: 

Email:  
Phone Number:  

Program: Advanced Care Management & Leadership

Title: ASSOCIATION BETWEEN NURSE STAFFING INDICATORS, PATIENT FALLS, AND HOSPITAL ACQUIRED PRESSURE ULCERS IN THE ACUTE CARE SETTING

Thesis/Dissertation Defense:  ✓ Passed  ❋ Failed  Date: 9-25-14

All courses required for the degree have been completed satisfactorily  ✓ YES  ❋ NO

Signatures

Thesis/Dissertation Chair/Major Professor

Nancy Ballard  
Date: 9-25-14

Committee Member

Committee Member

Committee Member

Committee Member

Committee Member

Program Director

Department Chair

Graduate Dean

Date

Date

Date

Date

Date

Rev. 2/15/12
ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to my thesis chair, Dr. Patricia Hart. She has been a constant source of support and inspiration. She was always available to offer guidance when I needed direction and encouragement when I was feeling overwhelmed. She is truly a role model for all nurses and genuinely demonstrates and cultivates a commitment to lifelong learning.

I would also like to thank my co-chair, Dr. Nancy Ballard. Her dedication and commitment to the profession of nursing is an inspiration to all nurses. Her knowledge and advice were invaluable in the writing of this thesis.

Finally, I would like to thank my family. I would like to thank my daughters and son-in-law who are always loving and supportive throughout all my endeavors. My daughters, who have also been working toward a degree, understand the commitment, and we have motivated each other. My father has always been my champion and a constant source of love. I wish my mother was still present to witness my accomplishment, but her spirit has been with me throughout this venture. Both my parents exemplified the spirit of lifelong learning by committing their lives to teaching others. My extended family has supported me in pursuing my education and my career goals. Without everyone’s support, this thesis would not have been possible.
<table>
<thead>
<tr>
<th>TABLE OF CONTENTS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iii</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF FIGURES</td>
<td>v</td>
</tr>
<tr>
<td>TABLE OF TABLES</td>
<td>vi</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>vii</td>
</tr>
<tr>
<td>CHAPTER 1: INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>CHAPTER 2: REVIEW OF LITERATURE</td>
<td>10</td>
</tr>
<tr>
<td>CHAPTER 3: METHODS</td>
<td>27</td>
</tr>
<tr>
<td>CHAPTER 4: RESULTS</td>
<td>34</td>
</tr>
<tr>
<td>CHAPTER 5: DISCUSSION</td>
<td>37</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>51</td>
</tr>
<tr>
<td>APPENDIX A: Nursing Research Committee Approval</td>
<td>59</td>
</tr>
<tr>
<td>APPENDIX B: Permission to use NDNQI® Data</td>
<td>60</td>
</tr>
<tr>
<td>APPENDIX C: IRB Approval</td>
<td>61</td>
</tr>
</tbody>
</table>
TABLE OF FIGURES

Figure 1. Quality Health Outcomes Model ..........................................................5
TABLE OF TABLES

Table 1: Means and Standard Deviations for TNHPPD, RNNHPPD, Staffing and Resource Adequacy, Patient Falls, and HAPU .................................................................35

Table 2: Correlation Matrix between TNHPPD, RNNHPPD, Staffing and Resource Adequacy, Patient Falls, and HAP .................................................................36
ABSTRACT

**Purpose:** To determine if there is an association between nurse staffing indicators, direct care nurses’ perceptions of staffing and resources adequacy, patient falls, and hospital acquired pressure ulcers.

**Design:** A non-experimental, descriptive, correlational design using secondary data was used.

**Methods:** The study took place at a large metropolitan hospital located within the southeast United States. Unit level data for 11 medical-surgical nursing units from the hospital’s National Database for Nursing Quality Indicators survey conducted in October 2011 were obtained.

**Results:** A statistically significant relationship was found between TNHPPD and RNNHPPD. No statistically significant relationship was found between nurses’ perception of staffing and resource adequacy as it relates to patient falls and pressure ulcers. In addition, there was no statistically significant relationship between nurse staffing indicators and patient falls and HAPU among the 11 acute care hospital units studied.

**Conclusion:** Additional research at the unit level is indicated to focus on evidence based practices that promote a culture of patient safety and enhance quality outcomes. The nursing sensitive outcomes of patient falls and HAPU will be reported in the public domain. Therefore, it is important for hospitals to understand the dynamics associated with nurse characteristics, patient risk factors, and organizational framework that impact the patient care delivery models that produce quality outcomes.
Keywords: nursing hours per patient day, nursing process, patient falls, pressure ulcers, patient outcomes, patient care delivery models, staffing and resource adequacy.
CHAPTER 1: INTRODUCTION

Quality patient care is an area of major concern within healthcare systems (Kavanagh, Cimiotti, Abusalem, & Coty, 2012). The United States (U.S.) spends more on healthcare than any other industrialized nation, over 16% in 2008, according to the U. S. Department of Health and Human Services (DHHS) (Shi & Singh, 2012), but continues to rank poorly in the area of quality outcomes. Consumers are dissatisfied with the current healthcare system. Patients are experiencing adverse events in hospitals and nurses feel overwhelmed by daily responsibilities. Healthcare costs are skyrocketing and the number of uninsured increases daily (Russell, 2012). As a result, the U.S. has initiated the Affordable Care Act (ACA) to address the issues of costs, hospital performance, and patient outcomes (U.S. DHHS, Health and Human Services, 2014).

A skilled nursing staff is fundamental to providing quality patient care. A hospital cannot achieve quality outcomes without an adequate nursing workforce. In an era of reform, when cost constraints are so significant, it is important to provide data that supports an effective nursing workforce which will meet patient needs and positively impact nursing sensitive outcomes.

This chapter presents the purpose of the study, background and significance, statement of the problem, and the theoretical framework that guides this study. Research questions, definitions, assumptions, and limitations for the study will be included in this chapter.
Purpose

The purpose of the study was to determine if there was an association between nurse staffing indicators (nursing hours per patient day [NHPPD] and registered nurse nursing hours per patient day [RNNHPPD]), and direct care nurses’ perceptions of staffing and resources adequacy. This study further explored the association between nurse staffing indicators, direct care nurses’ perceptions of staffing and resources adequacy, patient falls and hospital acquired pressure ulcers.

Background and Significance

Healthcare is undergoing many changes. Hospital systems are restructuring and merging with other systems, and many times they are decreasing staff. Cost containment, along with funding from the government has decreased profit margins, which only compounds the present nursing shortage (Kavanagh et al., 2012). The bad news is that the nursing shortage is only expected to worsen. The U.S. Department of Health and Human Services (2002) predicts a nursing vacancy rate of 30% by the year 2020. In this era of cost containment, it is important to identify the impact of nursing in providing efficient, quality outcome based patient care. Nurses must demonstrate a correlation between adequate nurse staffing and patient outcomes as hospitals are restructuring to meet the demands of increased patient loads and legislative mandates. Nurses as the primary patient caregiver should be included in formulating appropriate care delivery models that improve outcomes, reduce admissions, and ultimately reduce costs.
Statement of the Problem

A current lack of funds for healthcare institutions, increasing demand for healthcare services, and the decreasing number of nurses in the workforce has contributed to an unsafe environment for nurses and patients (Kane, Shamliyan, Mueller, Duvall & Wilt, 2007). An association between nursing care and patient outcomes, specifically in relation to patient falls (Lucero, Lake, & Aiken, 2010) and hospital acquired pressure ulcers (Lyder & Ayello, 2008) have been demonstrated. The Institute of Medicine (IOM) report, To Err is Human reported the number of deaths related to adverse events in hospitals to be as high as 98,000 annually (Kohn, Corrigan, & Donaldson, 1999). Newer reports (Classen et al., 2011) estimate the number may be as much as ten times higher than previously published. The number of practicing registered nurses is expected to decrease with a shortage of 260,000 positions by the year 2025 (American Association of Colleges of Nursing [AACN], 2012) which will result in an increased burden to a workforce that already has a deficit. In addition, the number of seniors requiring medical care is on the rise. The projected number of people over the age of 65 is estimated at 61 million by the year 2030 (Knickman & Snell, 2002). The sobering statistics do not stop there. Medical errors cost hospitals, the healthcare system, and society a significant amount of money in terms of increased length of stay (LOS), increased treatment procedures, increased insurance premiums, and decreased employment productivity (Andel, Davidow, Hollander, & Moreno, 2012). A patient who falls in the hospital will incur an increase of $4,200 more than a patient who does not fall (Hitcho et al., 2004).
Pressure ulcers can be very costly as much as $37,800 (Lyder & Ayello, 2008). Overall, the cost of 98,000 deaths per year is estimated to cost the U.S. as much as 98 million dollars in quality of life years (Andel et al., 2012). That is a staggering number, but can human life be measured in monetary terms?

Nursing research is rapidly expanding and proving to be an invaluable tool in the improvement of patient care (Polit & Beck, 2012). More research studies are needed to document adverse events in relation to nurse staffing and resources. Previous researchers have shown a definite association between appropriate nursing staff numbers and adverse events (Dunton, Gajewski, Klaus, & Pierson, 2007; Kane et al., 2007). The conclusion suggests that increased numbers of nurses in the workforce should decrease complications, adverse events, and costs (Dunton et al., 2007; Kane et al., 2007). Registered nurses and appropriate patient care delivery models are crucial to providing high quality care, but more studies are necessary to substantiate this fact and to provide a quantitative cost effective analysis for healthcare organizations.

**Theoretical/Conceptual Framework**

The Quality Health Outcomes Model developed by the American Academy of Nursing (Mitchell, Ferketich, & Jennings, 1998) is a more recent modification of Donabedian’s Theory of Healthcare Quality (Donabedian, 1985). Donabedian’s (1985) original theory proposes that there are three factors that determine quality of care within a system: structure, process, and outcome. The newer Quality Health Outcomes Model (Mitchell et al., 1998) implies a more dynamic process and takes into account patient characteristics and system processes. The model includes four components: (1) system
characteristics, 2) interventions, 3) patient characteristics, and 4) outcomes (Mitchell et al., 1998). System characteristics involve the organizational system including physical and human factors (protocols, resources, environment). The organizational structure not only includes the facilities, resources, and treatment procedures, but the various staffing levels and patient care delivery models. Interventions are the clinical or nursing processes implemented in the delivery of care. The intervention or nursing process includes the assessment and plan of care provided by the registered nurse (RN), which varies among nurses, hospitals, and patient care delivery models. Patient characteristics refer to the demographics and health status of the client. Outcomes are the end result of the nursing process and the delivery method to provide an integrated positive patient experience. The result or the outcome is affected by the organizational structure and the patient characteristics (Mitchell et al., 1998). There is not a direct link from interventions to outcomes, because there are so many variables in healthcare that impact the end result, which is the health status of the patient. All of these properties influence patient outcomes and nurses’ perceptions of satisfactory patient care. The following diagram illustrates the Quality Health Outcomes Model (Mitchell et al., 1998):

![Quality Health Outcomes Model](image-url)

*Figure 1: Quality Health Outcomes Model*
Research Questions

The research questions that guided the study were:

1. What is the relationship between nurse staffing indicators (TNHPPD and RNNHPPD) and nurses’ perceptions of staffing resource adequacy on acute care nursing units?

2. What is the relationship between nurse staffing indicators, patient falls and hospital acquired pressure ulcers on acute care nursing units?

3. What is the relationship between nurses’ perceptions of staffing and resource adequacy and patient falls and hospital acquired pressure ulcers on acute care nursing units?

Conceptual Definitions


Adverse patient events. Problems that occur during the course of providing health care such as medication errors, falls, wrong-site surgery, post surgical infections, pneumonia, or pressure ulcers. These events increase length of stay, increase costs, and can result in death (Kohn et al., 1999).

Direct care staff nurse. Nurses who have direct patient care responsibilities for greater than 50% of their shift (ANA, 2013).
**Nursing hours per patient days (NHPPD).** Number of hours of nursing care provided on a hospital unit in a 24 hour period, compared to the number of patients on the unit (ANA, 2013).

**Registered nurse nursing hours per patient day (RNNHPPD).** “Total number of productive hours worked by RNs with direct patient care responsibilities for at least 50% time” (ANA, 2013, p. 60)

**Nursing process.** Implementation of an individualized nursing care plan utilizing evidence based practice within the context of hospital protocols and procedures (ANA, 2013).

**Patient care delivery models.** An organizational framework that facilitates nursing work and outcomes through evidence-based care (ANA, 2013).

**Staffing and resource adequacy.** Adequate staffing and support resources to provide quality patient care (Lake, 2002).

**Patient outcome.** This is the end result of patient care, which is the relationship of the health outcome to the process of care. The outcome should demonstrate functional status and symptom management as a measure of health related quality of life (National Quality Forum [NQF], 2012a).

**Patient fall.** “Sudden, unintentional descent, with or without injury to patient, that results in the patient coming to rest on the floor or another object” (ANA, 2013, p. 67).

**Pressure ulcer.** “A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear” (ANA, 2013, p.100).

**Operational Definitions**
Nursing hours per patient day (NHPPD). “The average of the number of productive hours worked by nursing staff assigned to the unit who have direct patient care responsibilities for greater than 50% of their shift” over eight quarters as reported by the healthcare organization’s National Database of Nursing Quality Indicators (NDNQI®) database (ANA, 2013, p. 57).

Registered nurse nursing hours per patient day (RNNHPPD). “The average of the total number of productive hours worked by RNs with direct patient care responsibilities for at least 50% time” on an acute care nursing unit over eight quarters as reported by the healthcare organization’s NDNQI® database (ANA, 2013, p. 60).

Fall rate. The average of “total falls per 1,000 patient days” on an acute care nursing unit over eight quarters as measured by the healthcare organization’s NDNQI® database (ANA, 2013, p. 67).

Staffing and resource adequacy. The total score of the staffing and resource adequacy subscale of the Practice Environment Scale (PES) will measure nurses’ perception of staffing and resource adequacy for each acute care nursing unit obtained through the healthcare organization’s NDNQI® database (ANA, 2013).

Unit acquired pressure ulcer rate. “The number of patients who acquired a pressure ulcer after arrival to the unit divided by the total number of patients in the population studied” on an acute care nursing unit as reported by the healthcare organization’s NDNQI® database (ANA, 2013, p. 100).

Assumptions
The assumptions for this research study include: 1) higher nursing hours per patient day decreases the incidence of falls and pressure ulcers, 2) higher RN hours per patient day decreases the incidence of falls and pressure ulcers, and 3) higher nursing hours per patient day and higher RN hours per patient day will be associated with higher levels of nurses’ perception of staffing and resource adequacy.

Limitations

There are limitations to this particular type of research. Only one hospital within the U.S. is represented, and only 11 acute care units within that hospital were surveyed. In addition, participation in completing the staffing and resource adequacy subscale of the Practice Environment Scale was voluntary which means that all nurses may not be represented. These limitations restrict the generalizability of the findings.
CHAPTER 2: REVIEW OF LITERATURE

This chapter will provide a review of the literature on nurse staffing indicators, nurses’ perception of staffing adequacy, and two patient outcomes, patient falls and hospital acquired pressure ulcers. Examining the relationships between nurse staffing indicators, nurses’ perception of staffing adequacy, and patient outcomes (patient falls and hospital acquired pressure ulcers) will highlight the necessity of providing adequate staffing in order to increase quality patient outcomes and increase cost effectiveness within the hospital setting.

The Quality Healthcare Model (Mitchell et al., 1998), which is an expanded variation of Donabedian’s Model (Donabedian, 1985), defines quality of care as a process that involves four interdependent variables. These variables are organizational structure, patient characteristics, process interventions, and outcomes. Mitchell et al. (1998) proposes that when a healthcare organization is supportive of nurses and teamwork is promoted, nurses feel greater job satisfaction and patients have better outcomes. The effectiveness of each individual is dependent upon leadership that promotes mutual goals, frequent communication, and shared governance. When an organization has successful leadership, nurses feel empowered and productive (Hughes, 2008).

Research studies (Kane et al., 2007; Lang, Hodge, Olson, Romano, & Kravitz, 2004) have demonstrated a definite relationship between the work environment of nurses
As part of the Agency for Healthcare Quality and Research study of organizational climates as they relate to patient and worker outcomes, a group of interdisciplinary scholars developed a model to test various healthcare organizations and processes as they relate to work design and quality outcomes (Stone, Hughes, & Dailey, 2008). The investigation involved various inpatient and outpatient settings, and a total of 14 studies were reviewed. The overall conclusion stated that the organizational climate affects worker and patient outcomes. The organizational climate involves perceptions of workers related to leadership, policies, autonomy, safety and cleanliness of work site, and good communication among team members and administration. A positive organizational climate, especially related to patient safety, promotes greater job satisfaction for the nurse, which in turn impacts the quality of healthcare delivery. Stone, Hughes, and Dailey’s (2008) study supported a definite link between the nursing work environment and patient outcomes. Stone et al. (2008) reported that organizational climate is one of the most important aspects found in the work environment. However, it is not the only aspect related to patient safety and worker satisfaction. Other environmental aspects include actual workload such as nurse-to-patient ratios, scheduled work hours such as length of shift, mandatory overtime, and information systems for decision support. Work environments affect attitudes and behaviors among nurses, which in turn affect outcomes (Stone et al., 2008).

The perfect setting in which to assess staffing loads and nurse satisfaction is the state of California (CA). California was the first state to issue a mandated nurse patient ratio in the acute care hospital setting. Implementation of the legislative mandates began
in 2004. The California Board of Registered Nursing conducted a survey in 2004 and
again in 2006 to assess the nursing workforce and nurses’ perception of the work
environment (Spetz, 2008). The purpose of the study was to determine if higher staffing
ratios created increased job satisfaction with the practice environment. Each survey had
over 5000 respondents. The survey items were compared to identify any changes in the
satisfaction of RNs. Spetz (2008) found an increase in satisfaction ratings in 17 of the 22
items measured. The greatest increase was seen in overall job satisfaction, and adequate
numbers of staff and clerical support. There was also improved satisfaction with
involvement with managerial policies. Other significant findings included support from
nurses, time for interaction and education of patients, and a sense of quality patient care
(Spetz, 2008). It is possible that increased nurse satisfaction would improve nurse
retention, which in turn would improve patient care.

In 2010, Aiken and colleagues also surveyed nurses in California after the
benchmark legislation and found similar results (Aiken et al., 2010). Aiken et al. (2010)
compared these responses with nurses in New Jersey and Pennsylvania. California nurses
reported a statistically significant increase in satisfaction with the practice environment as
compared to the other two states. Obviously, RNNHPD were higher after the state
mandated ratios went into effect, and nurses were happier with the practice environment.
Aiken et al. reported nurses felt workloads were reasonable, support was available for
performing tasks, there was increased time to interact with patients, and perceptions of
providing higher quality patient care were demonstrated.
A project by the Registered Nurses of Ontario and Health Canada initiated an international evidence review of literature to identify patterns and practices that impact the work environment of nurses (Pearson et al., 2006). The results indicated that a greater proportion of licensed staff is associated with improved outcomes including pressure ulcers and falls, and more specifically, an increase in the number of RNNHPD is associated with improved patient outcomes in falls and pressure ulcers. In addition, increased patient-nurse ratios were associated with more errors and injuries and lower quality of care. Nurses who experienced an increase in patient load reported less job satisfaction and a greater intention to quit nursing. Nurses feel more capable of coping with job stressors and collaborating with other healthcare professionals when they experience low nurse patient ratios. Interestingly, perceived workloads were ambiguous. Nurses perceived an increase in workload regardless of increased or decreased patient-nurse ratios. This would imply that organizational characteristics play a role in nurses’ perceptions of the amount of work to be performed. In addition, Pearson and colleagues (2006) found three characteristics that impact the practice environment. They are patient characteristics, nurse characteristics, and system characteristics. Increased severity of the patient, the quantity of staff as well as the skill mix can impact the workflow, and system policies related to scheduling, management, and staffing ratios can influence the practice environment. As a result of the study by Pearson and colleagues, recommendations included addressing issues of patient acuity, and the relationship between RNNHPD and patient outcomes. Utilizing evidence based research that indicates a relationship between staffing and decreased adverse patient events is necessary to support nurse staffing. In
addition, decreasing the use of agency nurses and allowing nurses to determine their shift assignments will positively influence the workflow and the practice environment. All of these factors influence the nurses’ perception of job satisfaction and quality patient care.

A study by Covell and Sidani (2013) substantiate this premise that studies related to staffing numbers do not provide a complete understanding of the practice environment. Covell and Sidani studied the impact of nursing knowledge on patient outcomes and developed the nursing intellectual capital theory to better understand the role of nurses’ knowledge and how it impacts the patient outcome. Nursing intellectual capital theory is composed of two interdependent concepts, nursing human capital and nursing structural capital. Nursing human capital is the knowledge, skill, and experience of nurses, and structural capital includes practice guidelines, care maps, information systems, and computerized technology to assist in the delivery of care. The study tested this theory using data from 91 inpatient care units from 6 hospitals and found that a relationship exists between higher levels of nursing human capital and increased quality of patient care. This means that nurses with higher educational levels and more years of experience positively impact patient outcomes. Only a limited amount of nursing research has attempted to explain the relationships among nursing knowledge within the work environment and patient outcomes. The Nursing Intellectual Capital theory (Covell & Sidani, 2013) attempts to provide an explanation of the components responsible for a quality practice environment. It identifies the work environment as a major influence on the development and use of nursing knowledge, which affects the quality of patient care and the retention of nurses. These findings are consistent with the Magnet philosophy of
quality work environments promoting a positive influence on patient care and nurse retention.

An additional study of 34 Magnet hospitals throughout the U.S. over an 18-month period confirmed the presence of healthy work environments (Kramer, Maguire, & Brewer, 2011). The unit level scores were grouped as very healthy work environments (VHWE), healthy work environments (HWE), and work environments needing improvement (WENI). The survey tool, Essentials of Magnetism II, was designed to measure healthy, magnetic, productive clinical unit work environments. Magnet defines a healthy work environment in terms of eight work processes. They are: (1) working with clinically competent peers, (2) collegial/collaborative nurse–physician relationships, (3) clinical autonomy, (4) support for education, (5) perception of adequate staffing, (6) supportive nurse manager relationships, (7) control of nursing practice, and (8) transmission and adoption of patient-centered cultural values (Kramer et al., 2011). The results of a very healthy work environment or healthy work environment was confirmed by 82% of nurses on 540 clinical units. Additionally, more nurses educated at the BSN level reported healthy work environments, and nurses’ ratings of quality patient care were in direct correlation to quality of work environment. Nurses on VHWE units rated quality of patient care higher than their counterparts on HWE and WENI units. The quality of care rating scale was 8.61 for VHWE units, 7.95 for HWE units, and 7.43 for WENI units. The findings confirm that a HWE can be created and maintained through visionary leadership, empowerment, and support, regardless of demographics related to nurses, patients, or hospitals.
The Nursing Organization and Outcomes Model (Aiken, Clarke, & Sloane, 2002) defines a supportive nursing practice environment as the presence of a core set of modifiable organizational traits that support professional nursing practice. These traits include participation in organizational decisions, a receptive management, collaborative relationships, a focus on quality care, and adequate resources (Aiken et al., 2002). It has been proposed that these characteristics enhance the quality of nursing care processes and result in superior outcomes. Adequate staffing will also increase nurse surveillance. The practice environment is the mechanism by which facility characteristics influence the quality and outcomes of care.

In support of this theory, Flynn, Liang, Dickson, and Aiken (2010) conducted a study of nursing homes in New Jersey investigating the relationships between facility characteristics, the nursing practice environment, and occurrences of pressure ulcers. A sample of 63 nursing homes and 340 RN respondents comprised the data. The nurses completed the PES-NWI survey to evaluate the practice environment and data from Nursing Home Compare (NHC), a public national database containing patient outcome assessments, were used in a cross sectional design. Total composite scores of the PES and four of the five subscale scores were inversely associated with the percentage of residents with pressure ulcers, one subscales being resource adequacy. The study findings supported higher practice environment scores were related to lower incidence of pressure ulcers (Flynn et al., 2010). Flynn et al. (2010) concluded that a more supportive nursing practice environment was associated with better outcomes and more specifically, less incidence of pressure ulcers.
Dunton et al. (2007) conducted a similar survey utilizing NDNQI® data from July 2005 through June 2006. Data was collected from over 1600 acute care units and an analysis of the RN survey was matched to quarterly data on staffing and outcomes. Dunton et al. (2007) found that lower fall rates and lower rates of hospital acquired pressure ulcers were related to a higher percentage of nursing hours by RNs and a higher percentage of nurses with more than 10 years experience. For every increase of one hour in total nursing hours per patient day, fall rates were 1.9% lower. For every one percent increase in RNNHPPD, the fall rate was .7% lower. For every one-year increase in RN experience, the fall rate was 1% lower. Lower hospital acquired pressure ulcer (HAPU) rates demonstrated a similar relationship in terms of RNNHPPD. An increase of 1 % in RNNHPPD decreased HAPU rates by .7%. Every one-year increase in RN experience meant a 1.9% decrease in HAPU. Conversely, an increase in TNHPPD indicated an increase in patient falls. Dunton and colleagues (2007) determined that the knowledge base of the registered nurse is important, but also the level of experience is very valuable.

Another study by Lucero et al. (2010) examined unmet patient needs and incidence of medication errors, falls with injury, and nosocomial infections as reported by nurses. The study was a secondary analysis of cross-sectional data collected in 1999 from nurses in Pennsylvania (PA) in regards to the work environment. The original data was analyzed with a focus on unmet patient needs and nurse reports of adverse events using current data involving nurses from multiple specialty areas within 168 acute care hospitals in PA. The nursing work environment was measured by the Practice Environment Scale (Lake, 2002), and nurse staffing was measured by the number of
patients cared for by nurses on their most recent shift. Nurses in 23% of hospitals reported working under favorable conditions, while 11% of nurses reported working in unfavorable environments. In addition, nurses reported leaving two out of seven nursing care activities undone. Forty-one percent of nurses stated that care plans were not developed or updated, and 12% stated they did not prepare their patients for discharge. In terms of adverse events, over one-third of the nurses reported that nosocomial infections occurred occasionally or frequently. Approximately 20% of nurses reported patient falls with injury occurring occasionally or frequently. The overall conclusion indicated a significant association between unmet nursing care needs and adverse events involving patient falls and nosocomial infections (Lucero et al., 2010).

Nurses are critical to providing high-quality care and this is further illustrated in a study funded by the Agency for Healthcare Research and Quality (AHRQ) (Needleman, Buerhaus, Pankratz, Leibson, Stevens, & Harris, 2011). Needleman and colleagues (2011) conducted a retrospective, observational study collecting data from a large academic Magnet hospital between 2003 and 2006 which examined information from 43 units including patient census, admissions, transfers, and discharges and staffing levels for each unit. The study focused on patient-specific and unit-specific factors related with a direct measurement of individual patients and staffing levels. Needleman and colleagues concluded that the risk of death increased by 2% for those units with high patient loads and 4% for those units with high turnover rates. Staffing models rarely account for multiple admissions, discharges and transfers, but the findings from Needleman et al. (2011) indicates the need for continued reevaluation of staffing and
patient needs throughout the day. Efforts to reform the delivery of healthcare, increase quality, and decrease costs mean increased accountability for healthcare facilities. New payment systems are forcing hospital leaders to focus on appropriate staffing that meets patient needs and has a positive effect on patient outcomes. Quality outcomes mean increased savings and financial rewards for healthcare facilities.

Cho, Ketefian, Barkauskas, and Smith (2003) examined nurse staffing in relation to adverse patient events in 232 acute care California hospitals. Cho and colleagues (2003) found that increased RN hours per patient days decreased the incidence of pneumonia. In addition, a 10% increase in RN proportion was associated with a 9.5% decrease in the odds of pneumonia. The incidence of pneumonia increased the length of stay from seven days to twelve days and costs ranged from $30,000 to $60,000. Cho et al. (2003) also found an increased proportion of RN staffing was associated with an inverse relationship with urinary tract infections, wound infections, and patient falls. The study findings supported that patients did have adverse events, which increased the length of stay and doubled the costs incurred during the hospital stay related to the proportion of RN staffing (Cho et al., 2003). Cho et al. concluded that because nurses act as patient advocates, they are instrumental in early detection and prevention of many of these complications, which in turn decreases costs.

Another study conducted by McGillis Hall and Doran (2004) identified various staffing models in connection to nurses’ perception of delivery of care. They examined different staffing models related to varied staffing mix. One model consisted of all RNs, a second model was RNs and licensed practical nurses (LPN), and the third was a mix of
RN, LPN, and unlicensed nursing personnel. Care delivery models included primary care and team nursing. McGillis Hall and Doran concluded that an all RN staff was found to have a statistically significant positive relationship on nurses’ perception of quality care. A statistically significant negative association regarding individual approaches to coordination of care and overall unit communication was observed with an all licensed staffing mix of RNs and LPNs. In contrast, a mix of licensed and unlicensed staff had a statistically significant positive influence on coordination of care and overall unit communication. In addition, RN staffing with a mix of licensed and unlicensed personnel working as a team, as opposed to total patient care, promoted a greater sense of satisfaction with coordination of patient care and communication among team members.

McGillis Hall, Doran, and Pink (2004) conducted a similar study in 19 teaching hospitals in Canada, which focused on the relationships of nurse staffing models and adverse patient events such as falls, medication errors, wound infections, and urinary tract infections. A descriptive correlational design was used to determine the association between nurse staffing models, costs, and patient safety outcomes. McGillis Hall et al. (2004) concluded that higher levels of RN staff produced lower rates of medication errors and wound infections. McGillis Hall et al. also found that patient acuity accounted for utilization of more nursing hours and therefore, more costs.

Understanding the association between staffing and fall rates will assist hospital managers in making decisions related to staffing and care delivery models that will support nurses and promote patient safety. A study conducted by Staggs, Knight, and Dunton (2012) utilizing data from NDNQI® database examined the relationship between
unassisted fall rates and levels of registered nurse and non-RN staffing on five different
types of nursing units. The sample consisted of 1504 nursing units from 248 acute care
hospitals in the U.S. All were adult units including critical care, step-down, medical,
surgical, medical/surgical, and rehabilitation. Monthly data was collected from October
2009 to September 2010. Staggs et al. (2012) found that higher non-RN staffing was
associated with higher rates of unassisted falls across all units except rehab. The
estimated average fall rates for these unit types were 3 to 4 % higher per additional non-
RN hour per patient day (HPPD). On medical/surgical units, increased numbers of RN
staffing indicated a slightly decreased fall rate. Staggs et al. concluded that quantity of
staff does not indicate an increase in quality of care.

Choi and Boyle (2013) performed a study related to inpatient falls utilizing NDNQI®
data from 2009. Unit level data consisted of stepdown, medical, surgical and medical-
surgical units in 576 hospitals with 63,034 RN respondents. Results indicated with every
1% increase in RNNHPPD, a decrease in falls by 0.3% resulted. In addition, a 1% increase in job satisfaction resulted in a 5.9% decrease in falls. Again, these findings
indicate that staffing and job satisfaction are important predictors of patient outcomes.

In 2010, Lake and colleagues performed a study with results similar to those
found by Staggs et al. (2012). They conducted a cross sectional multivariate study of
5,388 acute care units that provide data for NDNQI®. Lake and colleagues (2010) found
that Magnet hospitals had a 5% lower fall rate than non-Magnet hospitals. At the unit
level, a higher proportion of RNs was significantly associated with lower fall rates in
critical care, while higher proportions of licensed practical nurses and nursing assistants
was associated with higher fall rates. One explanation would be that hospitals utilize less expensive staff to address high fall rates rather than RN staffing. Also, a multivariate regression analyses revealed that the fall rates in Magnet hospitals were independent of the RN staffing level (Lake et al., 2010). What qualities are inherent in Magnet hospitals that promote lower fall rates and overall quality outcomes? Research continues to determine why Magnet hospitals have better overall performance ratings than non-Magnet hospitals.

Another important priority for hospitals is prevention of Hospital Acquired Pressure Ulcers (HAPU). Studies that demonstrate an association between nurse staffing and incidence of pressure ulcers is important in terms of patient safety and cost constraints. A study by Choi and colleagues in 2013 (Choi et al., 2013) utilized a cross-sectional correlational design of 561 NDNQI® hospitals. The sample included 3,329 acute care units and responses from the annual job satisfaction survey conducted by NDNQI® in 2009, in which 271,000 RN’s participated. The purpose of the study was to determine a relationship between RN job satisfaction and incidence of HAPU. Overall, the findings indicated that higher job satisfaction rates were negatively associated with pressure ulcer rates. A significant association was demonstrated among critical care, medical, and rehab units. Upon examination of Magnet vs. non-Magnet hospitals, it was determined that HAPU rates were 19% lower in Magnet hospitals. In contrast, RNNHPPD indicated a positive relationship with HAPU with an occurrence rate of 5% for each additional RNNHPPD.
Other research studies (Hart & Davis, 2011; Stone et al., 2007) have shown an inverse relationship between RN staffing and development of HAPU. Hart and Davis (2011) studied 26 acute care nursing units over a 24 month period using NDNQI® data reported by the health system. The study conducted by Hart and Davis (2011) demonstrated a significant relationship between nurse staffing and pressure ulcers. Higher TNHPPD and higher RNNHPPD were associated with a decrease in HAPU on medical-surgical units, although there was no significant relationship found among critical care units and incidence of pressure ulcers. Stone and colleagues (2007) examined staffing in critical care units. Higher staffing had lower incidences of pressure ulcers at a statistically significant level. These studies indicate a need for nursing care delivery models that allow nurses time to assess patients and implement interventions that promote quality outcomes.

Interestingly, a study (Cook et al., 2010) of CA mandated nurse patient ratios revealed that the likelihood of pressure ulcers increased with lower nurse patient ratios after the mandate was implemented, and the units that originally had low nurse patient ratios remained stable in terms of development of pressure ulcers. These results seem surprising, but it does support the premise that staffing is not the only factor in patient outcomes. Again, this could be the result of increased education related to detection of pressure ulcers, which intensifies nurse surveillance.

Decreasing the incidence of adverse patient events is ethically and socially beneficial, but is safety cost effective? Needleman, Buerhaus, Stewart, Zelevinsky and Mattke (2006) of the School of Public Health at the University of California were able to
substantiate that conclusion. Needleman et al. (2006) analyzed data from 799 nonfederal acute care hospitals in 11 states. A regression analyses revealed an association of nurse staffing and adverse patient events. From the study findings, Needleman et al. were able to substantiate that safety is also cost effective. The study findings identified the costs involved in increasing RN staff in the short term, but pointed out that long term the costs would only represent approximately 1.5% of annual expenditures and could result in a net savings of $1.8 billion over time (Needleman, Buerhaus, Stewart, Zelevinsky, & Mattke, 2006). The real cost savings were attributed to 5,000 fewer deaths per year. The cost of providing more registered nurses was less than the cost of adverse events or increased lengths of stay (Needleman et al., 2006).

Despite numerous studies (Dunton et al., 2007; Kane et al., 2007; Lang et al., 2004; Lucero et al., 2010; Staggs et al., 2012; Lake et al., 2010; Choi et al., 2013) that have identified the relationships between nursing staff indicators and patient outcomes, there is more work that needs to be done. Much of the previous research (Dunton et al., 2007; Kane et al., 2007; Lang et al., 2004; Lucero et al., 2010; Staggs et al., 2012; Lake et al., 2010; Choi et al., 2013) is limited in three important characteristics. First, most information is based on large hospital data sets rather than unit based data. Units vary and patient populations vary according to units. Second, nursing hours and ratios are measured, but education levels, staff satisfaction, and turnover rates need to be measured. Finally, quality data is needed to assess the association of the nursing process, which includes assessment, monitoring, and communication, as it relates to patient outcomes and quality of care should be evaluated. In order to prove causal relationships, unit level
data consisting of larger sample sizes and longitudinal studies must be performed as well as an examination of the quantity and quality of resources and equipment devoted to patient care.

As public reporting of patient satisfaction and adverse medical events becomes more common, nurses and the nursing process must be included. Currently, nursing is under reported or not reported at all in terms of quality indicators or studies related to value based purchasing, but nurses are the primary care providers. The knowledge gained from nursing research will assist nurse managers in staffing according to nurse hours, experience, patient acuity, and skill mix. It will also help government leaders and insurers to understand the cost effectiveness related to nursing process and patient safety (Dunton et al., 2007).

Summary

In summary, the research studies (Dunton et al., 2007; Kane et al., 2007; Lang et al., 2004; Lucero et al., 2010; Staggs et al., 2012) discussed in this chapter have demonstrated the importance of adequate nurse staff to preventing adverse patient events. Cost analyses have shown that being proactive in regards to staffing will ultimately reduce cost by preventing complications, increasing job satisfaction, and promoting quality outcomes for patients, which is very important in this era of healthcare reconstruction. Hospitals will receive less money from third party payers due to the advent of value based purchasing. The Centers for Medicare and Medicaid services (U.S. Department of Health and Human Services, 2014) are now providing financial incentives for hospitals to improve the quality of care. The intention is to improve hospital staffing
which provides better quality of care and better patient outcomes. This translates to a healthier population, which will ultimately decrease healthcare costs nationwide. Public reporting of a facility’s outcome measures can affect negotiations with insurance companies and may impact referrals. The economic incentives should impact the clinical setting in positive ways that will mean improvements for nurses and for patients.

Increasing quality outcomes and decreasing medical costs are the primary focus of health system reform. Ensuring patient safety is the first step in meeting these goals.
CHAPTER 3: METHODS

This chapter describes the research methodology utilized for this study including the research design, setting and sample population, procedure for data collection, data collection instruments, and threats to validity. In addition, protection of human rights and confidentiality of information is addressed.

Design

A non-experimental, descriptive, correlational design using secondary data was used. A descriptive, correlational design evaluated the relationship between staffing indicators and patient falls and hospital acquired pressure ulcers. In addition, the design allows for evaluation of nurses’ perception of staffing and resource adequacy in relation to patient falls and hospital acquired pressure ulcers. The research questions guiding this study are:

1. What is the relationship between nurse staffing indicators (TNHPPD and RNNHPPD) and nurses’ perceptions of staffing resource adequacy on acute care nursing units?
2. What is the relationship between nurse staffing indicators, patient falls and hospital acquired pressure ulcers on acute care nursing units?
3. What is the relationship between nurses’ perceptions of staffing and resource adequacy and patient falls and hospital acquired pressure ulcers on acute care nursing units?
4. **Setting**

The setting for this research is a large corporate healthcare system within an urban setting in the southeast United States. The system provides multiple care specialties and employs over 5000 nurses.

**Population and Sample**

The study focused on 11 units within the largest hospital within the corporate structure. The hospital employs over 2000 nurses. Unit level data related to nurse staffing indicators, patient falls, and hospital acquired pressure ulcers was obtained from the healthcare organization’s NDNQI® data. In addition, nurses’ perceptions of staffing and resource adequacy was obtained from the healthcare organization’s NDNQI® registered nurse (RN) Survey data. Data will be derived from the survey completed in October 2011.

**Procedure for Data Collection**

Secondary data was obtained from the healthcare organization’s Center for Nursing Excellence from the NDNQI® Quality data report and the NDNQI® RN Survey. Staffing indicators and outcome data for a consecutive 24-month period were used. The original data was collected and analyzed according to ANA’s standards for the NDNQI® database (NDNQI®, 2013). Nursing sensitive measures that reflect the structure, process and outcomes of nursing care are identified and measured at the unit level. In addition, The Practice Environment Scale of the Nursing Work Index (Lake, 2002) is included in the NDNQI® RN Survey used by the facility with nurse participation that is strictly voluntary per the NDNQI® protocol (NDNQI®, 2013). The staffing and resource
adequacy subscale unit level data was derived from the 2011 Practice Environment Scale survey data.

**Data Collection Tool**

The National Database of Nursing Quality Indicators was established in 1998 by the American Nurses Association in response to the ANA’s Safety and Quality Initiative (NDNQI®, 2013). NDNQI® is a nursing quality measurement program of nursing data at the unit level. It is designed to allow data review of nursing performance relative to patient outcomes within the hospital setting and to allow hospitals to compare quality performance with hospitals throughout the country. Nursing-sensitive measures reflect the structure, process, and outcomes of nursing. Structure is indicated by the supply, skill level, and education of staff. Process measures include assessment, intervention, and job satisfaction of the staff nurse, and outcomes are measured by specific indicators that reflect the impact of nursing interventions. Current nursing-sensitive indicators related to patient outcomes include fall rates, hospital acquired pressure ulcer prevalence, catheter associated urinary tract infections, ventilator-associated pneumonia, and central line bloodstream infections. Staffing indicators are also measured as Nursing Hours per Patient Day and Nursing Staff Skill Mix. Participation in NDNQI® is voluntary and 1500 hospitals throughout the U.S. contribute. Unit level data is the foundation of the NDNQI®, and data must be collected according to definitions and standards established by NDNQI®. All data is confidential and is owned by ANA. Hospital, patients, and staff are not identified. Hospitals are issued a random identification code and this code must be used in all communications with NDNQI® (NDNQI®, 2013).
The Practice Environment Scale was derived from an existing nurse survey, the Nursing Work Index (NWI) (Lake, 2002). The NWI was originally developed from research of hospitals that were successful in retaining nurses. The survey consisted of organizational characteristics found in these hospitals. The Practice Environment Scale was developed from the NWI in order to provide empirically derived subscales that would provide reference values for these original magnet hospitals (Lake, 2002). From these values, researchers could determine a relationship, if any, between practice environment and patient outcomes. The PES was developed from research efforts involving the original magnet hospitals, the NWI development, and the use of the NWI to measure organizational aspects of hospitals. For this reason the PES is ideal as a universal measure of the nurse practice environment.

The Practice Environment Scale of the Nursing Work Index (PES-NWI) has been reported to be a valid and reliable tool (Lake, 2002). The scale development proceeded in five stages. First, the NWI items were reviewed and a subset was selected for analyses. Forty-eight items were selected that represented the nursing practice environment within the context of organizational characteristics. The second stage identified subscales through exploratory factor analysis representing different domains of the practice environment. Through factor analysis procedures, the PES-NWI was determined to consist of 5 subscales: Nurse Participation in Hospital Affairs; Nursing Foundations for Quality of Care; Nurse Manager Ability, Leadership, and Support of Nurses; Staffing and Resource Adequacy; and Collegial Nurse/Physician Relations (Lake, 2002). The five
domains of the subscales range from the broad hospital context to the immediate nursing-unit context. In the third stage, the individual and hospital level reliabilities of the subscales and composite were examined. Internal consistency reliability at the nurse level was judged by Cronbach’s alpha using a criterion of .80. In the fourth stage, the construct validity of the subscales and the composite as measures of the nursing practice environment was evaluated by comparing the scores of nurses in the magnet and non-magnet hospital subsamples. In the final stage, the selected subscale structure was tested for generalizability using an oblique multiple-group principal-components cluster analysis. Internal consistency of the PES-NWI measures at both individual and hospital levels was high, and the construct validity of the scale was supported by higher mean scores in magnet hospitals compared with non-magnet hospitals. The composite survey with five distinct subscales is an accurate and generalizable measure of the nursing practice environment.

The survey consists of 31 items describing organizational characteristics with 5 subscales of 3 to 5 items each. The response format consists of a 4-point Likert scale ranging from strongly disagree (1) to strongly agree (4). The PES-NWI demonstrates strong reliability coefficients ranging from .83 to .94 (Lake, 2002, NQF, 2012b).

For this study, the staffing and resources adequacy subscale data was retrieved from the healthcare organization’s NDNQI® RN Survey report for 2011. The unit mean score for each of the 11 acute nursing units was obtained.
Threats to Validity

There are limitations of non-experimental correlational studies. Researchers do not control the independent variable which is the outcome variable. There are many factors that might affect the outcome variable, such as preexisting differences. Correlational studies are weak in support of causal inferences due to the fact that behaviors, attitudes, and characteristics are interrelated in complex ways (Polit & Beck, 2012).

Secondly, only one hospital within the U.S. is represented, which may not reflect the attitudes of the general nursing population. This may limit the generalizability of the findings.

Another limitation is the truthfulness of the respondents, and the ability to understand the survey questions. Respondents may answer the survey questions based on how they feel nursing administration would like them to respond to the questions versus their honest opinions.

Data Analysis

Descriptive statistics were conducted to describe each unit’s TNHPPD, RNNHPPD, staffing and resource adequacy scores, patient fall rates, and hospital acquired pressure ulcer rates. Pearson correlation coefficients will be conducted to examine the relationships between staffing indicators (TNHPPD, RNNHPPD), unit staffing and resource adequacy scores, and patient outcomes evidenced by patient fall rates and hospital acquired pressure ulcer rates. A statistically significant relationship will have a p value < .05
Protection of Human Subjects

Approval was obtained from the healthcare organization’s Nursing Research committee (Appendix A) and the Chief Nursing Officer (Appendix B) of the hospital to gain access to the existing NDNQI® data. In addition, approval was obtained from an Institutional Review Board (IRB) (Appendix C) to ensure ethical rights and guidelines are followed and maintained.

As stated previously, all data obtained through the NDNQI® database is strictly confidential. The data is de-identified so the data cannot be linked back to the nursing staff, patients, or hospitals. The research team had access to data from the eleven units that are to be evaluated and data was kept strictly confidential.

Data Security

Data was stored on a jump drive and secured in a locked file cabinet in the researcher’s office when not in use. Access to data is restricted to the researcher, researcher’s faculty, and the statistician. The data was stored in a locked file cabinet at the healthcare organization’s Center for Nursing Excellence for a minimum of 3 years and then destroyed.
CHAPTER 4: RESULTS

This chapter discusses a summary of the data analyzed. The data analysis plan and the results of the study are presented. The following research questions guided the data analysis for the study: 1) What are the relationships between nurse staffing indicators (TNHPPD and RNNHPPD) and nurses’ perceptions of staffing resource adequacy on acute care nursing units? 2) What are the relationships between nurse staffing indicators, patient falls and hospital acquired pressure ulcers on acute care nursing units? 3) What are the relationships between nurses’ perceptions of staffing and resource adequacy and patient falls and hospital acquired pressure ulcers on acute care nursing units?

Data Analysis

Descriptive statistics were conducted to describe each unit’s TNHPPD, RNNHPPD, staffing and resource adequacy scores, patient fall rates, and hospital acquired pressure ulcer rates. Pearson correlation coefficients were conducted to examine the relationships between staffing indicators (TNHPPD, RNNHPPD), unit staffing and resource adequacy scores, and patient outcomes evidenced by patient fall rates and hospital acquired pressure ulcer rates. A statistically significant relationship was defined as a $p$ value < .05.

Eleven acute care units that participated in the Quality reporting and the RN survey were evaluated. The mean TNHPPD was 9.2 ($SD = .46$) and the mean RNNHPPD was 5.6 ($SD = .53$). Nurses’ perceptions of staffing and resource adequacy
mean score was 2.59 ($SD = .17$). The mean score for falls was 2.9 ($SD = .56$) and the mean score for unit acquired pressure ulcers was .77 ($SD = 1.22$).

Table 1

Means and Standard Deviations for TNHPPD, RNHPPD, Staffing and Resource Adequacy, Patient Falls, and Hospital Acquired Pressure Ulcers.

<table>
<thead>
<tr>
<th>Variables</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNHPPD</td>
<td>9.17</td>
<td>.46</td>
</tr>
<tr>
<td>RNHPPD</td>
<td>5.60</td>
<td>.53</td>
</tr>
<tr>
<td>Staffing and Resource Adequacy Scores</td>
<td>2.60</td>
<td>.17</td>
</tr>
<tr>
<td>Patient Falls</td>
<td>2.90</td>
<td>.56</td>
</tr>
<tr>
<td>Pressure Ulcers</td>
<td>.77</td>
<td>1.22</td>
</tr>
</tbody>
</table>

Research Questions

**Research question one.** Research question one examined the relationships between nurse staffing indicators (TNHPPD and RNHPPD) and nurses’ perceptions of staffing resource adequacy on acute care nursing units. A statistically significant relationship was found between TNHPPD and RNHPPD ($r = .759, p < .01$). No statistically significant relationship was found between TNHPPD and nurses’ perception of staffing and resource adequacy ($r = -0.452, p = .162$). In addition, no statistically significant relationship was found between RNHPPD and nurses’ perception of staffing and resource adequacy ($r = -0.327, p = .327$).

**Research question two.** Research question two examined the relationship between nurse staffing indicators (TNHPPD and RNHPPD), patient falls and hospital acquired pressure ulcers on acute care nursing units. No statistically significant
relationship was found between TNHPPD and patient falls ($r = -0.535, p = .090$) or between TNHPPD and unit acquired pressure ulcers ($r = .318, p = 0.341$). No statistically significant relationship was found between RNNHPPD and patient falls ($r = -0.505, p = .113$) or between RNNHPPD and unit acquired pressure ulcers ($r = 0.261, p = .437$).

**Research question three.** Research question three examined the relationships between nurses’ perceptions of staffing and resource adequacy and patient falls and hospital acquired pressure ulcers on acute care nursing units. No statistically significant relationship was found between nurses’ perceptions of staffing and resource adequacy and patient falls ($r = 0.178, p = .600$) or between nurses’ perceptions of staffing and resource adequacy and unit acquired pressure ulcers ($r = 0.388, p = .238$).

Table 2

*Correlation Matrix between TNHPPD, RNNHPPD, Staffing and Resource Adequacy Scores, Patient Falls, and Pressure Ulcers.*

<table>
<thead>
<tr>
<th></th>
<th>TNHPPD</th>
<th>RNNHPPD</th>
<th>Staffing and Resource Adequacy</th>
<th>Patient Falls</th>
<th>Pressure Ulcers</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNHPPD</td>
<td>1</td>
<td>0.759**</td>
<td>-0.452</td>
<td>-0.535</td>
<td>0.318</td>
</tr>
<tr>
<td>RNNHPPD</td>
<td></td>
<td>1</td>
<td>-0.327</td>
<td>-0.505</td>
<td>0.261</td>
</tr>
<tr>
<td>Staffing and Resource Adequacy Scores</td>
<td>1</td>
<td>1</td>
<td>0.178</td>
<td>0.388</td>
<td>0.011</td>
</tr>
<tr>
<td>Patient Falls</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pressure Ulcers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

* $p < .05$, ** $p < .01$
CHAPTER 5: DISCUSSION

The purpose of this chapter is to discuss the findings of the study and relate them to the proposed research questions. Data interpretation addresses each question individually, examining the importance of the study results, and the implications for nursing practice, nursing education, and future nursing research. Limitations of the study are described, and the significance of these limitations is also discussed.

In this study, no significant relationship was found between TNHPPD and nurses’ perceptions of staffing and resource adequacy. In addition, no statistically significant relationship was found between RNNHPPD and nurses’ perceptions of staffing and resource adequacy. Previous literature states otherwise (Spetz, 2008, Aiken et al., 2010).

In this study, no statistically significant relationship was found between TNHPPD and patient falls or between TNHPPD and unit acquired pressure ulcers. No statistically significant relationships were found between RNNHPPD and patient falls or between RNNHPPD and unit acquired pressure ulcers. Other research studies (Choi, Bergquist-Beringer, & Staggs, 2013; Cho, Ketefian, Barkauskas, & Smith, 2003; Cook, Gaynor, Stephens, & Taylor, 2013; Dunton et al., 2007; Staggs et al., 2012; Lake et al., 2010) have shown varying results. Some studies (Dunton et al., 2007; Staggs et al., 2012) have shown a direct relationship in terms of TNHPPD and patient falls, but an inverse relationship with increased RN staffing. Lake (2010) substantiated the findings of Dunton
et al. (2007) and Staggs et al. (2012). Alternative research studies (Hart & Davis, 2011; Stone et al., 2007) have shown an inverse relationship related to RN staffing and HAPU.

Choi et al. (2013) found that RNNHPPD were significantly associated with an increase in HAPU. For every additional RNNHPPD, the odds of HAPU occurrence increased by 5%. Choi et al. also found that the incidence of HAPU was lower across all units in Magnet hospitals by 19%. Dunton et al. (2007) found a similar association with TNHPPD and HAPU. This was not the expected outcome, but the studies did not take into account the differences between units and patient acuity levels. Possible reasons for these findings could be increased patient surveillance due to increased staff.

The study by Cook et al (2012), revealed similar findings. Again, these results seem surprising, but the results may be due, in part, to the attention on pressure ulcers due to legal action. As a result of much litigation related to pressure ulcers, Centers for Medicare and Medicaid Services (CMS) has initiated value based purchasing which means hospitals are not reimbursed for treatment of hospital acquired pressure ulcers. Therefore, hospitals have increased assessment interventions to educate nurses regarding diagnosis of pressure ulcers that are present on admission.

Falls are another important measure of patient safety related to quality care, and like HAPU, they have received national attention. Joint Commission (Currie, 2008) has issued a list of initiatives to increase patient safety in acute care settings. One of these goals is to decrease the rate of patient falls. JCAHO requires that all patients be evaluated using a fall risk assessment to identify at risk patients and perform appropriate
interventions. Again, CMS has issued payment incentives for hospitals to decrease the incidence of patient falls. Understanding the association between falls and staffing is an important area of research that may assist hospitals in improving patient outcomes and decreasing costs.

Dunton et al. (2007) demonstrated similar findings related to patient falls. Increased staffing showed an inverse relationship with patient falls in terms of total staffing, RN staffing, and also level of unit experience. Units with higher levels of experienced RN’s demonstrated decreased fall rates. Dunton and colleague’s study also determined that Magnet hospitals had a 10.3% decrease in patient fall rates when compared to non-Magnet hospitals. The question remains whether or not Magnet hospitals utilize increased staffing ratios or implement more supportive workforce characteristics that ultimately influence patient outcomes.

In similar findings, Staggs et al. (2012) reported that an increase in quantity does not mean an increase in quality. Staggs et al. found an increase in patient falls was associated with an increase in total numbers of staff, but there was a slight decrease in falls with increased numbers of RN staff on medical-surgical units. The study did not account for patient acuity. Units with high patient acuity have more patients that are non-ambulatory and therefore at lower risk of falling. They are also more likely to have higher levels of RN staffing. This could explain the difference among unit types.

Lake’s (2010) study supported the findings of Dunton et al. (2007) and Staggs et al. (2012). Higher fall rates were reported with decreased numbers of RN’s. Again,
Magnet hospitals reported lower patient fall rates overall when compared to non-Magnet hospitals. A more thorough review of Magnet hospitals is needed to understand these findings. As previously discussed, other factors in addition to adequate staffing impact the quality of care. Studies involving the quantity and quality of equipment and resources, educational efforts related to best practice, and efficiency of management practices are necessary to fully understand the Magnet environment and how it impacts the care delivery process.

In this study, no statistically significant relationship was found between nurses’ perceptions of staffing and resource adequacy and patient falls or between nurses’ perceptions of staffing and resource adequacy and unit acquired pressure ulcers. Research studies (Aiken et al., 2002; Choi et al., 2013; Stone et al., 2008) have identified that quality patient outcomes are predicated on more than just staffing numbers. If this is true, what are the factors inherent in practice environments that support standards of nursing excellence?

It would seem reasonable to assume that increased numbers of staff, particularly licensed personnel, would increase nurses’ satisfaction with the work environment, but some studies (Aiken et al., 2002; Staggs et al., 2010; Stone et al., 2008) focus on the holistic practice environment and not strictly staffing numbers. These studies (Aiken et al., 2002; Staggs et al., 2012; Stone et al., 2008) indicate that organizational framework and support systems impact the nurses’ perception of quality care, which in turn contribute to a healthy work environment.
A healthy work environment is a practice setting that maximizes the health and well-being of nurses and patients (Pearson et al., 2006). The American Nurses Association (ANA) definition of a healthy work environment is a culture of safety that promotes a sense of professionalism, accountability, transparency, involvement, efficiency, and effectiveness (ANA, 2014). Quality patient outcomes and efficient organizational performance are the result of a healthy work environment. Nurses in particular, desire participation in decision-making, autonomy over work role, strong clinical leadership, competency among coworkers and a positive perception of work life balance.

Researchers (Aiken et al., 2002; Pearson et al., 2006; Stone et al., 2008) have shown that the work environment affects nurse satisfaction and patient outcomes. All three of these studies implicate organizational characteristics as having a significant impact on the practice environment and the attitudes of nurses. Aiken’s study reports that receptiveness of organizational leaders and collaboration of colleagues plays an important role in the practice environment. Pearson confirms that patient, nurse, and system characteristics work together to influence the nurses’ perception of a satisfactory workload. Stone revealed that work environments affect attitudes which result in nurse behaviors through the delivery of care that affect patient outcomes. On the basis of these studies, healthcare organizations should empower nurses to be involved in decision making at the bedside and support shared governance entities. In addition, resources should be available in terms of support staff, informational technology, and adequate time
for professional development. Providing quality patient care is the primary focus of the nurse, and achieving quality patient outcomes should be the primary focus of the organization. If these two goals are closely aligned the nurse will feel supported in the work environment.

Another study that examined the relationship between work environments and patient outcomes was Choi and colleagues utilizing NDNQI® data from 2009. Findings from Choi’s (2013) study indicated a positive relationship with pressure ulcers and staffing, but a decrease in HAPU was found with increased RN job satisfaction. Choi also found that the incidence of HAPU was lower across all units in Magnet hospitals by 19%. Magnet hospitals are recognized for excellent work environments that support nurses and produce quality patient outcomes. Preventing HAPU requires an interdisciplinary team effort and organizational support, but nurses, as primary caregivers, are key players in assessment and intervention.

The three largest healthcare systems in the U.S. have implemented organizational initiatives to achieve the National Quality Strategy’s three aims, which include Better Care, Healthy People/Healthy Communities and Affordable Care (Weston & Roberts, 2013). Kaiser Permanente, Veteran’s Administration, and Ascension Health have initiated performance improvements to improve clinical workflow and created a safer patient care delivery system. The overall goal within the hospital is to improve patient safety and provide an enhanced patient care experience. The project address several aspects of patient care including reduction of hospital-acquired conditions, patient
engagement, and implementation of technologies and other informatics solutions to improve clinical workflows and increase the nurses’ access to knowledge resources. All of these performance improvements involve some form of information technology to enhance communication between nurses, providers, and patients. The VA is expected to release a nationally integrated, Real Time Locator System (RTLS) over the next five years. This will include equipment tracking, temperature monitoring, bed flow and sterile process workflow. All of this will significantly impact nursing and patient workflow. All hospitals now have some form of risk assessment tool to evaluate skin integrity, but Kaiser Permanente has taken that one step further. Clinical decision-making tools are built into the EHR to alert the nurse to patients who are high risk for things such as falls and pressure ulcers, and a clinical care dashboard that reminds nurses to turn patients every 2 hours. Ascension Healthcare has initiated a system wide mobile application that provides information on various hospital-acquired conditions. Nurses can access patient information on a handheld “smart” device. All of these innovations will improve the workflow effectiveness of nurse practice environments and improve quality and safety for the patient.

**Limitations**

The primary limitation with this particular study is the small sample size within only one hospital organization within the southeast United States. This limits generalizability to other hospitals. Patient traits were not addressed in this study. Patient diagnosis, risk factors, and prognosis were not evaluated, but these factors significantly
impact the end result. Furthermore, each hospital has a different structural framework and process implementation, which impacts the workflow. In addition, each hospital unit has different structural characteristics and policies. The organizational framework impacts the care delivery system, which impacts patient outcomes as well as the nurses’ perception of the practice environment. Nursing workforce attributes such as staff skill mix, age, experience, and nurse retention were not factored into the analysis. As illustrated by the Quality Health Outcomes Model (Mitchell et al., 1998), organizational and patient characteristics influence the process of care, which impact the patient outcome. None of these particular characteristics were evaluated within this study, but all of the above components influence patient outcomes.

**Future Implications**

This research study, like other research studies (Choi et al., 2013; Cho et al., 2003, Cook et al., 2013; Dunton et al., 2007; Hart & Davis, 2011; Stone et al., 2007; Staggs et al., 2012) is significant because of the implications for future nursing research, practice, and education. Many changes are occurring within our nation as a result of healthcare reform, patient safety is closely scrutinized, the public is expected to make informed decisions regarding healthcare, and third party reimbursement is based on patient outcomes. All of these factors indicate a need for significant research that guide the way to a safer, more equitable, cost effective, and superior healthcare system.
Nursing Research

Further research is needed utilizing NDNQI® data. The large sample size and the unit level detail enhance the reliability and validity of the research. The national database is crucial in providing evidence-based guidelines for the delivery of care. The information available through NDNQI® benefits hospitals in providing evidence to support policies and protocols, assists nurses in terms of enhanced practice environments, and rewards patients with improved lifestyles.

Research at the unit level is necessary to further clarify the relationship between appropriate staffing models and patient outcomes. Repeating this study with a larger sample size might be helpful to see if there are any variations. A future comparison study utilizing similar data from the same hospital organization would be interesting to determine if findings were unchanged. The findings from this study, because they deviate from what is expected, require further study to establish a clear relationship between the practice environment and quality patient care.

Hospital staffing is an area of major concern across the nation. In order to provide evidence-based guidelines for reasonable and safe staffing, research studies at the unit level such as this one, are needed to identify factors to improve patient outcomes as well as increase satisfaction within the practice environment. This research study has indicated that staffing numbers alone do not improve patient outcomes of HAPU and inpatient falls. The findings indicate that something other than mandated ratios are necessary to increase quality outcomes. This study in combination with future studies of acute care
units will provide valuable information about the variations in staffing among hospitals. Hospital units vary according to organizational framework and patient characteristics and more research is needed to determine the impact of nursing workforce characteristics on patient outcomes.

There is currently a national debate related to nurse staffing. Many states have already passed legislation addressing staffing issues, and the conversation continues as healthcare reform provides the momentum for change. In light of this fact, multiple research studies are needed to understand the impact of nursing care on patient outcomes. Although, statistically significant findings were not shown in this research study, it provides valuable data conducted by nurses. Extensive data from multiple organizations, over a period of years, and numerous patient care units is important to provide information concerning the nurse practice environment that best supports quality patient care and successful outcomes. This study is only one of many that seek to provide evidence for safe staffing that enhances patient safety and nurse satisfaction. Studies such as these increase public awareness, and provide information for legislators to develop public healthcare policy that will provide effective safe healthcare for all Americans.

**Nursing Practice**

Many patient outcomes and hospital satisfaction scores are now publicly reported. Nursing research is essential in understanding the role of nurses on these outcomes. Hospitals and consumers need to understand the impact of nurse staffing in relation to quality nursing care and patient outcomes. The publicly reported findings will influence
consumer decisions and affect hospital revenues. Potential findings will also influence government and private party payors. Reimbursement will be influenced by nursing education, staffing skill mix, and nurse patient ratios. This study is significant because nurse administrators must understand that while staffing ratios are very important, a supportive practice environment is the very foundation which guides evidence-based practice to provide appropriate care delivery models.

The study by Kramer and colleagues (2011) regarding healthy work environments provided information indicating that practice environments impact nurses perceptions of quality care. The eight work processes defined within the Magnet structure are essential to developing a healthy work environment. All 34 of the Magnet hospitals in the study had a collaborative interdisciplinary relationship between organizational leadership, nurse management, and professional staff at the unit level, which supported the development of a productive, healthy work environment that created staff satisfaction and quality patient outcomes. It is important for nurse leaders to empower nursing staff, provide necessary resources, and encourage decision-making to increase nurse performance, job satisfaction, and retention of knowledgeable, dedicated professionals.

The Nursing Intellectual Capital theory by Covell and Sidani (2013) suggests to nurse leaders that organizational support of nursing staff is necessary to promote better patient outcomes. Encouraging nurses to continue educational development and obtain specialty certification and providing time and financial support for these activities are important for optimal patient care and for organizational performance. Retention of
experienced nurses should be a major priority of healthcare organizations. These nurses positively influence patient care, which impacts patient outcomes, patient satisfaction, and ultimately, financial reimbursements for hospitals. Certainly, these are priorities for the future of quality healthcare delivery.

**Nursing Education**

Finally, this study, along with others (Choi et al., 2013; Cho et al., 2003, Cook et al., 2013; Dunton et al., 2007; Hart & Davis, 2011; Stone et al., 2007; Staggs et al., 2012) establishes data, which is the foundation for evidence based practice to educate future nurses. Nursing research establishes valuable educational material to help nurses of the future provide evidence-based care, and encourages nurses to be involved in research that promotes the science and the practice of professional nursing.

All nurses need to understand the role of unit level research in the practice of nursing. Nursing schools must focus on the science and research behind the implications of staffing, resources, and financial assets that allow an organization or unit to function effectively. Caring for patients is no longer just an act of compassion, but a highly skilled science and an innovative art. Nurses, through educational support will learn how to more efficiently care for their patients, retain existing nurses in the workforce, and encourage nurses who want to continue career development. Healthcare is undergoing a major transformation, and it is imperative that nurses are involved in the restructuring of patient care delivery and redefining the role of nursing in care delivery systems. Creating
a productive practice environment will improve the quality of patient care and strengthen the nursing profession.

Healthcare organizations should form partnerships with schools of nursing to offer programs related to research that guides evidence based practice. Student nurses who are in the academic setting need opportunities to learn research skills and mentor with nurses in the field of research. Experienced nurses at the bedside understand the complexities of delivering patient care. Therefore, they are well positioned to collect data that will assist in making practice decisions that will improve patient care. Experienced and novice nurses need to learn skills to conduct meaningful research. Nurse involvement and empowerment are the trademarks of a thriving practice environment that will revitalize the profession of nursing.

**Conclusion**

This study indicates the need for further research to clarify the role of nurse staffing to a healthy work environment and its impact on patient outcomes. Intuitively, it would seem that increased numbers of RN’s would increase patient safety and improve patient outcomes, but studies are inconclusive in this respect. Nonetheless, Magnet hospitals demonstrate improved patient outcomes and improved nurse job satisfaction and generally employ more nurses per patient. Thus, improved nurse staffing might be crucial in creating a safe patient environment, but other elements contribute to a healthy work environment that benefits the patient and the nurse. It is important for healthcare organizations to provide appropriate equipment in terms of quantity and quality.
Educational efforts to provide staff with best practice guidelines and the latest scientific developments are essential to maintaining a knowledgeable and efficient nursing staff that promote a safe patient environment. A responsive, collaborative, and quality focused leadership will empower nurses to provide care that produces quality outcomes. An organizational framework that supports nurses will enhance satisfaction, promote staff retention, and produce quality, healthy outcomes for patients. In addition, nurses have a responsibility to the profession and to the health of their patients to stay up to date on best practice guidelines, participate in research that promotes a better understanding of nursing quality indicators, and advocate for patient safety to ensure quality healthcare for all Americans.
REFERENCES


APPENDIX A

Nursing Research Committee Approval

From: Jayne Petefish, RN, MS, ACNS-BC
To: Cheryl Moates
Date: 5-07-14
Subject: NRC Approval for Study 14-04

Dear Ms. Moates:

Study Number: 14-04
Study Title: Association Between Nurse Staffing Indicators, Patient Falls, and Hospital Acquired Pressure Ulcers in the Acute Care Setting.

Your research proposal was approved by the WellStar Nursing Research Committee on April 28, 2014. You may begin your study as described effective immediately. We need you to fax a copy of your IRB approval once it has been received and any changes to the study must be reported promptly to the Nursing Research Committee for approval. We require an electronic copy of the Conflict of Interest (attached), Investigator Assurance Statement (attached), your CITI and CV which we still need from you.

A Progress Report (attached and may download from the Center for Nursing Excellence website) is due in May, 2015 unless the study is closed before that date. At the completion of the study, please contact me to schedule a date to report the results of your study to the Nursing Research Committee.

Please contact me if you have any questions or need additional information.

Best wishes for your research,

Jayne Petefish MS, ACNS-BC
Wellstar Kennestone Medical Center
Clinical Nurse Specialist
Surgical/Trauma
Chair WellStar Research Committee
677 Church St.
Appendix B

Permission to use NDNQI® Data

From: Caramanica, Laura
Sent: Wednesday, April 02, 2014 9:52 AM
To: Moates, Cheryl
Cc: Patrick, Sara
Subject: RE: thesis

Cheryl, the delay was on my end - my apology. I will be glad to help. I copied Sara Patrick who is the coordinator for our NDNQI data and ask her to assist you, let me know what else I can do on my end to be of help, Laura

Laura Caramanica, PhD, RN, CENP, FACHE, FAAN
Vice President and Chief Nursing Officer
WellStar Kennestone Hospital
677 Church Street
Marietta, GA 30060
Office: 770-793-5187
Fax: 770-793-7904
Laura.caramanica@wellstar.org

From: Moates, Cheryl
Sent: Tuesday, April 01, 2014 10:38 PM
To: Caramanica, Laura
Subject: thesis

Laura,
As I have mentioned to you on previous occasions, I am completing my master’s degree from KSU, and I am currently writing my thesis. The title of my thesis is “The association between nurse staffing indicators and the incidence of patient falls and pressure ulcers in the acute care setting”. I am writing to request permission to access the NDNQI - PES data from the Kennestone survey issued in 2011. Unit level data from 15 acute care units at Kennestone will be evaluated. I will be happy to arrange a meeting to discuss this further, and I can submit a formal letter of request, if necessary. I appreciate any advice and suggestions. Thank you for your assistance.
Cheryl Moates

P.S. I apologize if this is the second email. My mailbox said it had not been sent so I am sending again.
Study 14-416: Association between nurse staffing indicators, patient falls, and hospital acquired pressure ulcers in the acute care setting

From: zieglerirb@kennesaw.edu

Subject: Study 14-416: Association between nurse staffing indicators, patient falls, and hospital acquired pressure ulcers in the acute care setting

To: cmoates1@students.kennesaw.edu

Cc: zieglerirb@kennesaw.edu, phart@kennesaw.edu

5/13/2014

Cheryl Moates, Student
KSU WellStar School of Nursing

RE: Your application dated 5/12/2014, Study #14-416: Association between nurse staffing indicators, patient falls, and hospital acquired pressure ulcers in the acute care setting

Dear Ms. Moates:

Your application for the new study listed above has been administratively reviewed. This study qualifies as exempt from continuing review under DHHS (OHRP) Title 45 CFR Part 46.101(b)(4) - collection or study of existing data. The consent procedures described within your application are in effect. You are free to conduct your study.

Please note that all proposed revisions to an exempt study require IRB review prior to implementation to ensure that the study continues to fall within an exempted category of research. A copy of revised documents with a description of planned changes should be submitted to irb@kennesaw.edu for review and approval by the IRB.

Thank you for keeping the board informed of your activities. Contact the IRB at irb@kennesaw.edu or at (678) 797-2268 if you have any questions or require further information.

Sincerely,

Christine Ziegler, Ph.D.
KSU Institutional Review Board Chair