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The Impact of Nursing Staff Ratios on Falls Rates In Skilled Nursing Facilities

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This is to certify that the doctoral dissertation by

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Abstract

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In Skilled Nursing Facilities

by

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BSN, University of New York, 2000

MBA University of Hartford, 2005

Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Falls and complications from falls are a common problem among adults aged 65 years and older. About 60% of older adults fall every year, causing injuries, hospitalization, nursing home placement, and even death. Most studies on falls among skilled nursing facility (SNF) residents focus on fall preventive measures that fail to include staffing variables such as nursing hours. Although researchers have examined the relationship between nursing staff and patient outcomes in hospital settings, similar studies have not occurred in long-term care facilities. The purpose of this retrospective longitudinal study was to determine whether a correlation exists between nursing staff hours per shift and rate of falls. The secondary data included Minimum Data Set 3.0, Certification and Survey Provider Enhanced Reporting, and residents' event reports from four skilled nursing facilities over 6 months. Statistical analysis of Latent Growth Curve Model of SPSS informed this retrospective longitudinal study. The theoretical framework of Donabedian's model of structure, process, and outcome provided the background for this study. The findings suggested that there is no correlation between higher nursing staff ratios and decreased fall rates. However, there were more falls during the day shift, with a higher nursing staff ratio. The study findings have implications for social change. The dissemination of study findings could assist Medicare and Medicaid services to improve SNF staff rating systems. Additionally, findings could inform and influence SNF administrators, policymakers, and health care providers in the development and implementation of policies and intervention programs that assist in fall prevention measures.

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Dedication

To my Father John Ejiogu, my mother Hellen Ejiogu and my step mother Rachel Ejiogu who have all passed away but influenced me to pursue my education. I love you all.

Acknowledgments

I must, first, thank the Almighty God for guiding us through this journey. I am very grateful for my committee Chair Dr. Cheryl Anderson for her mentorship and support throughout this milestone. I appreciate her motivation, honesty, positive outlook and timely feedback to meet Walden University high-quality standard of education. Dr. Anderson proved that she genuinely has the interest of her students at heart. Dr. Anderson, you are a good human being, and I appreciate you. My gratitude also goes to my committee member Dr. Earla White for her inspirational words and guidance to excellence.

To my husband, Samuel Okeorji who went through this journey side by side with me and always reminded me to keep my eyes on the prize that the end will justify the means. Thank you, honey; we made it. To our children, Uzomaka, Chika, Onyekachi, Chinweike; Chinaemerem, our son-in-law, Aly, and our lovely granddaughter Prosperity, thank you guys for your patience, encouragement, and unconditional love. You guys are troopers, and we love you. Thanks to our friends and families for all your prayers, your persistent un-returned phone calls checking up on us and the food you brought to us when we didn't have the time to cook due to study.

Table of Contents

List of Tables v

Chapter 1: Introduction to the Study 1

Introduction 1

Background 3

Problem Statement 4

Purpose of the Study 4

Research Questions and Hypotheses 6

Theoretical Framework 7

Nature of the Study 8

Definition of Terms 8

Assumptions 9

Scope and Delimitations 10

Limitations 10

Significance 10

Summary 11

Chapter 2: Literature Review 13

Introduction 13

Literature Search Strategy 13

Theoretical Framework 14

Nursing Staff and Patients Falls 16

Fall Risk Factors 19

Polypharmacy 20
Chronic Illness 21
Urinary Incontinence 22
Change in Mental Status. 23
Decline in Vision. 25
Environmental Factors 26
Resident and Staff Behaviors. 27
Effect of Falls on Older Adults and Their Quality of Care 28
Impacts of Falls on Health Care Costs 29
Government Policies and Regulations on Falls 31
Fall Prevention Strategies 32
Alarm Devices 33
Use of Restraints 33
Staff and Resident Education 34
Injury Prevention 36
Other Fall Prevention Strategies. 36
The Role of Nurses in Preventing Falls in Skilled Nursing Facilities 37
Limitation of Previous Studies 38
Differences in Data Sources 39
Measurement and Operational Definitions of Nurse Staffing 41
Summary 44
Chapter 3: Research Method 45

Introduction....45
Research Design and Rationale....45
Research Questions....47
Methodology....48
Sampling and Sampling Procedure....48
Instrumentation....49
Data Analysis....50
Threats to Validity and Reliability....50
Ethical Procedures....52
Summary....53
Chapter 4: Statistical Analysis....54
Introduction....54
Data Collection....54
Descriptive Statistics....56
Summary....67
Chapter 5: Discussion, Conclusions, and Recommendations....68
Introduction....68
Interpretation of the Findings....70
Limitations of the Study....74
Recommendations....75
Implications of the Findings....78
Conclusion....82

References 84

Appendix A: National Institutes of Health Training Certification 104

Appendix B: Data Access Request (Email) 105

Appendix C: Data Collection Agreement 106

Appendix D: G*Power Sample Size Computation involving Repeated Measure ANOVA 109

Appendix E: G*Power Sample Size Computation involving Correlational Analysis 110

List of Tables

Table 1. Descriptive statistics by Skilled Nursing Facility site #1 57

Table 2. Descriptive statistics by Skilled Nursing Facility site #2 58

Table 3. Descriptive statistics by Skilled Nursing Facility site #3 59

Table 4. Descriptive statistics by Skilled Nursing Facility site #4 61

Table 5. ANOVA comparing mean differences between SNFs 63

Table 6. Correlations..... 64

Table 7. Parameter estimates for RQ1 65

Table 8. Parameter estimates for RQ2 65

Table 9. Parameter estimates for RQ3 66

Table 10. Parameter estimates for RQ4 67

Chapter 1: Introduction to the Study

Introduction

Falls are among the most common critical problems for adults aged 65 years and older. Falls are significant concerns to those who fall, family members, healthcare providers, insurance companies, policymakers, and the public. The debilitating and disabling impact of falls in this population age group has contributed to increased health care costs and poor quality of care and quality of life (Li & Ali, 2015; Quigley et al., 2012). About 30% of older adults sustain at least one fall per year, and nearly two-thirds of those who fall enter into skilled nursing facilities (SNFs) due to irreversible complications from the fall (Pohl, Nordin, Lundquist, Bergström, & Lundin-Olsson, 2014). People who fall depend on nursing staff for care, safety, and well-being. Thus far, not much is known about the impact that nursing staff ratios may have on fall rates among this population.

Older adults who fall experience emotional, psychological, physical, and financial consequences (Staggs, Knight, & Dunton, 2012). In 2006, the National Quality Forum listed fall-related injuries and deaths as serious preventable health concerns (Staggs et al., 2012). As a result, the forum suggested that Medicare creates a nonpayment mechanism for treatment and services provided by the hospital where the patient has sustained fall-related injuries (Staggs et al., 2012). The proposal suggested extending this policy to SNFs by 2016 (Staggs et al., 2012). Consequently, it is imperative that SNF administrators identify and implement strategies to reduce falls and health complications from falls.

There is a consensus among health care providers that an adequate nursing staff is essential in providing quality care for patients. Sufficient hours of available nursing help result in better health care outcomes, including falls (Shin & Bae, 2012). As a result, Centers for Medicare & Medicaid Services (CMS), under the Patient Protection and Affordable Care Act (PPACA) of 2010, mandated SNFs to report a total number of staffing hours to their state departments of health during annual surveys (CMS, 2015).

In October 2015, CMS amended SNFs' annual staff reporting systems. The new system requires SNFs to include quarterly electronic submission of hands-on staffing hours based on payroll data and resident census (CMS, 2015). The availability of this data now offers the ability to analyze how staffing hours may impact patient outcomes, including falls. The study may help fill this gap by using secondary data to measure the relationship between the frequency of falls and nursing staff ratios during a 6-month period in four SNFs. Postive social change implications include the knowledge that healthcare administrators and directors of nurses could gain from this study, that may lead to a reduction of falls among older adults. Subsequently, enhancing health care organizational processes that improve fall prevention strategies, and result in resident safety, good quality of care, improved healthcare services, and decreased health care costs. Chapter 1 contains the overview of the study, including the background, problem and purpose statements, and nature of the study. This chapter also encompasses definitions of terms, limitations, delimitations, social change, and implications of the study.

Background

Older adults living in SNFs depend on staff for their care and safety. In 2013, 1.4 million older adults resided in SNFs (Centers for Disease Control and Prevention [CDC], 2013). Direct care nursing staff provides approximately 70% to 80% of paid hands-on care (Clancy, Balteskard, Perander, & Mahler, 2015). This group of employees includes registered nurses, licensed practical nurses, and certified nursing assistants'. During the provision of care, SNF residents expect to receive quality care in a safe environment, that promotes health and prevents accidental hazards that increase fall risk or harm (Lin, 2014). If the older adults experience a fall, their expectations of quality of care may not be met. Due to the continued nature of falling, it is essential to investigate strategies that reduce falls and fall-related complications, by exploring the potential impact that nursing staff ratios (nursing hours in a facility) have on fall rates.

Many older adults who fall are likely to fall again. About 9% to 15% of falls result in injury, amounting to an estimated cost of $43 billion by 2020 (Quigley et al., 2012). Injuries resulting from falls among older adults are one of the leading causes of hospitalization, SNF admission, increased health care costs, and morbidity (Quigley et al., 2012). In 2011, injuries from falls in this population resulted in 21,649 deaths (Quigley et al., 2012). The rate of falls and SNF admissions is expected to increase as the U.S. population continues to age, and the subsequent health decline during the aging process (CDC, 2015). Therefore, it is essential to identify strategies that prevent falls among older adults.

Problem Statement

The problem is that the impact of nursing staff ratios on the incidence of falls in SNFs is unknown. Direct care staff made up approximately 60% of SNF's human resources and provides 70% to 80% of care to SNF residents to ensure safety and prevent adverse occurrences including falls (Shin & Bae 2012). Little is known about the influence of nursing staff ratios on the incidence of falls rates in SNFs. Falls impose physical, psychological, and economic concerns to older adults, their families, healthcare providers, and policymakers (Damián, Pastor-Barriuso, Valderrama-Gama, & de Pedro-Cuesta, 2013; Staggs, Knight, & Dunton, 2012). In their study, Leland, Gozalo, Teno, and Mor (2012) found that fall rates in U.S. SNFs range from 29% to 39% annually. Among those who fall, approximately 20% to 30% suffer hip fractures and most develop anxiety about falling again (Nyman, Ballinger, Phillips, & Newton, 2013). Consequently, those who fall may experience depression, isolation, deterioration in performing daily activities, and depend on staff for their safety and well-being (Parry, Finch, & Deary, 2013). Identifying the effects of nursing staff ratios on patient falls may help SNF administration and health service policymakers to develop fall preventative strategies that are effective among this population to ensure SNF's older adults' safety and well-being.

Purpose of the Study

The purpose of this retrospective, longitudinal, quantitative study was to assess SNF factors that may influence residents' fall rates over time. Secondary datasets were used to determine whether nursing staff ratios impact the frequency of falls among older adults in four SNFs. The purpose of the study was to examine the correlation between

nursing staff ratios per shift and frequency of falls per shift. Dissemination of study findings may contribute to existing strategies for targeting fall prevention interventions.

A panel of international experts (Van den Heed, Clarke, Sermeus, Vleugels & Aikens, 2007) identified that hours per patient day (HPPD) or hours per resident per day (HPRD) are the most accepted ways to measure nursing staff hours and determine staff ratios. In SNFs, staffing ratios are important in helping administrators and directors of nurses make accurate predictions about the appropriate level of staffing required to meet federal and state requirements, as well as provide adequate patient care. Determining the proper level of staffing also helps SNF administrators and directors of nurses make sound financial decisions regarding patient census and the amount of resources needed to provide quality patient care without exceeding budgetary projections.

In this study, nursing staff ratios were measured by dividing the total number of nursing hours by the total number of residents in a 24-hour period. Falls were calculated by the total number of falls per shift per day, divided by the number of days per month. Nursing staff ratios refer to the total nursing staff hours which include all Registered Nurses (RN), Licensed Practical Nurses (LPN), and Certified Nursing Aides (CNA) hours per day, divided by the total number of patients per day. The types of possible data sources used to measure the impact of nursing staff ratio on fall rates included the Minimum Data Set 3.0 (MDS), Certification and Survey Provider Enhanced Reporting (CASPER) and Area Resource File (ARF) from four SNFs in Hartford, Connecticut.

The nursing staff ratios were the independent variable, while fall rates were the dependent variable. I analyzed the reported falls according to the shift in which the fall

occurred: day shift, 7:00 am to 3:30 pm; evening shift, 3:00 pm to 11:30 pm; and night shift, 11:00 pm to 7:30 am. Data collection from the adjusted schedule excluded vacation time, sick time, and personal days from four study facilities for a 6 month period.

Research Questions and Hypotheses

The research questions for this study were:

RQ1: Is there a correlation between nursing staffing ratios and the number of reported resident falls in four SNFs in each shift?

$H_0$1: There is not a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities in each shift

H_a1: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities in each shift

RQ2: Is there a significant correlation between the nursing staff ratios and the number of reported falls for the day shift?

$H_0$2: There is not a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for day shift.

H_a2: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the day shift.

RQ3: Is there a correlation between the nursing staff ratios and the number of reported falls for the evening shift during the study period?

$H_0$3: There is no statistically significant correlation between the nursing staff ratios and the number of reported falls for the evening shift during the study period.

H_a3: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the evening shift.

RQ4: Is there a significant correlation between the nursing staff ratios and the number of reported falls for the night shift?

$H_0 4$: There is not a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the night shift.

$H_a 4$: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the night shift.

Theoretical Framework

SNF healthcare providers have designed various methods over the years that are aimed to coordinate and measure the quality of care for older adults living in their facilities. Radwin, Castonguay, Keenan, and Hermann (2015) pointed out that care coordination efforts vary considerably. As a result, strategies to optimize effective care coordination have been hampered by the lack of a universally acceptable framework for care coordination and measurements for quality of care. The theoretical framework of Donabedian's (1968) model was used to guide this study. The theory addressed and examined the process and quality of health service delivery. It drew from three distinct categories: structure, process, and outcomes (Unruh & Wan, 2004). Structure focused on the context in which healthcare providers deliver patient care, including the type of location, staff, cost, and equipment. The process involved service exchanges between patient and care providers during provision of care. Finally, outcomes refer to the effects

of care on the patient's health status. There will be more discussion on this theory in Chapter 2.

Nature of the Study

This study is a retrospective quantitative study that used secondary data from four SNFs. The staffing data for 6 months per each SNF was pulled from the Connecticut Department of Health's annual staffing data sheets. The MDS 3.0 resident reporting tool was the source of data for fall rates for the four facilities. The CASPER was the source of data for staffing ratios.

Definition of Terms

These terms are operationalized in this study:

Certification and Survey Provider Enhanced Reporting (CASPER): A dataset used by the Center for Medicare and Medicaid (CMS) to store statistical information that surveyors collect from skilled nursing facilities during annual surveys. CASPER provides comprehensive information on SNF facility operations, patient census, and regulatory compliance. Other information includes staffing levels, inspection results, type of ownership and other statistics by state (Center for Medicare and Medicaid, 2015).

Fall: Asudden, unintentional lowering of the patient's body to the floor or ground by the patient, staff or visitors (Kalisch, Tschannen, & Lee, 2012).

Fall events: Fallsreported by the patients, family members or witnessed by nursing staff (Haines et al., 2013).

Injury: Harm inflicted on a patient by others or sustained by the patient (Currie, 2008).

Minimum Data Set (MDS) 3.0: A comprehensive assessment tool containing 26 quality indicators used to assess SNF residents and is submitted electronically to a state survey agency on a quarterly basis (Hyun, 2013).

Nursing staff: Refers to registered nurses (RN), licensed practical (LPN) or licensed vocational nurses, and certified nursing assistants (CNA). This group of nursing staff is also called hands-on-staff or direct care staff and provides up to 80% of care to SNF residents (CDC, 2015b).

Nursing staff ratios: Refers to the total nursing care hours (by registered nurses, licensed practical nurses, and nursing assistants) divided by the total number of patients (CDC, 2015b).

Assumptions

The assumptions of this study were the elements that I presumed to be true, and would guide the readers to interpret the data within the context of my assumptions. Another assumption was that administrators, directors of nurses, nursing staff, and SNF owners were interested in fall prevention strategies, and were willing to make staffing changes that result in staffing policies that reduce falls and fall related injuries. Without proper preventative strategies, fall rates and injuries will continue to increase. The study assumed the following:

- All SNF staff were knowledgeable on what constitutes a fall.
- Staff reported falls when they occured, and nurses documented falls appropriately, per facility policy on documentation including MDS.

- The data reported for nursing staff hours and falls were correct.

Scope and Delimitations

The scope of this study was limited to quantitative data from four SNFs in Hartford, Connecticut. Datasets were from MDS 3.0, RAI manual, and the CASPER databases. The scope of this study consisted of older adults who are 65 years of age and older residing in SNFs. The delimitations for this study was that only four facilities in one geographical area was used to gather data. Also, the analysis was based only on reported falls. There is a possibility that unreported falls have occurred at each respective SNF.

Limitations

Limitations of this research were that the study included only four SNFs of variable sizes and clientele. Some SNFs have locked units that provide care to dementia residents who are prone to frequent falls due to mental status changes. The variation in SNF residents might be a confounding variable in the findings. This study was conducted in one state only. Therefore, the study may be limited in generalizability to older adults in other parts of the nation.

Significance

This quantitative study of the correlation of nursing staff ratios to the frequency of falls among older adults (65 years and older) living in SNFs, is valuable because it may produce useful information about the influence of staffing ratios on falls among older adults. Additionally, the findings from this study may provide information that may enable SNF directors of nurses to develop effective clinical interventions to prevent falls and fall-related complications. Thus, this research may result in changes that could

improve older adults' quality of care and quality of life. This improvement would allow them to enjoy healthier, happier, and longer lives, free from the physically and psychologically disabling complications of falls. These complications include fractures, a decline in performing routine daily activities, anxiety, fear of falling again, and premature death (Rigler et al., 2013). Possible positive social changes may be found in determining if the amount of dedicated hours of patient care impact fall rates in SNFs. Understanding the potential implications of SNF staffing on fall risk outcomes may help residential facilities tailor fall prevention programs to decrease falls and enhance the safety and well-being of this population.

Summary

Nearly one-third of older adult falls result in injury, hospitalization, nursing home admission, and death (Liu, Obermeyer, Chang, & Shankar, 2015). An older adult who has experienced a fall often develops a fear of falling again, a decline in their activities of daily living, isolation and an increased risk of losing their independence (Clancy et al., 2015). Studies have suggested several fall preventative programs and interventions to assist older adults in reducing falls (Heinrich et al., 2013; Hill & Fauerbach, 2014). However, the frequency of falls among this population, specifically fall rates for those residing in SNFs, continues to rise (Goodwin et al., 2014). Consequently, understanding the impact that nursing staff ratios may have on fall rates for this population may help administrators and directors of nurses tailor fall prevention policies and interventions to reduce falls.

Chapter 1 included the introduction to the status of falls among older adults who are 65 years and older. Chapter 1 also included an overview of the organization and design of the remainder of the paper. Chapter 2 consists of a review of literature that highlights the prospective of other researchers on the subject of nursing staff and resident falls; limitations of previous research, including variations in data sources; measurement and operation definitions; and lack of consistency of framework.

Chapter 2: Literature Review

Introduction

The review of literature for this study examined the empirical evidence surrounding the phenomenon of falls among older adults. The incidences of falls among older adults is one of the leading causes of injury-related deaths (Clancy, Balteskard, Perander, & Mahler, 2015). Falls present a significant safety concern to the public, policymakers, and health care providers. This study focused on establishing the possible relationship between nursing staff ratios in skilled nursing facilities (SNFs) and the potential impact on fall rates among older adults.

Chapter 2 includes eight sections. The first section describes the search strategy used to find relevant studies. The second section analyzed the theoretical framework of the study. The third section presents current literature related to nursing staff and patient falls. The fourth section explores the factors that place older adults at risk for falls. The fifth section addresses the effects that falls may have on older adults and health care costs. The sixth section is a discussion of government policies and regulations on falls, fall prevention strategies, and the role of nurses in preventing falls in SNFs. The seventh section provides a review of previous studies on falls. Lastly, Chapter 2 closes with a summary and an introduction to Chapter 3.

Literature Search Strategy

Multiple databases in the Walden University Library were searched to find relevant articles on the impact of staffing ratios on fall rates among older adults (65 years and older) living in SNFs. The databases accessed included Expanded Academic ASAP,

ProQuest Central, Sage Premier, Thoreau, and Web of Science. Other databases used with various word combinations included Google Scholar, CINAHL, Medline, and Ovid. The keywords were searched using a broad general search statement that yielded some results within each search engine. Key words included: (a) *staff, staffs, staffed, staffing; personnel, employee, employees, worker; workers, workforce; (b) nursing home, nursing homes, nursing facility, nursing facilities; skilled nursing facility, skilled nursing facilities, hospital, and hospitals; (c) fall, falls, falling, fell and senior, seniors, aged, geriatric; geriatrics, older, elderly.* Additional mixed terms used included: *patient injuries, safety, care outcome, quality,* and *patient occurrences*. The articles used in this study were published within the last 5 years and were published originally in evidence-based, peer-reviewed journals

Theoretical Framework

The Donabedian model for structure-process-outcome (SPO, 1968) guided this study. SPO is a widely accepted theoretical framework that gives a clear understanding of how the quality of nursing and medical care affects patient outcomes (Unruh & Wan, 2004). This conceptual framework addressed and examined how healthcare providers deliver healthcare services to patients and the qualities of care that patients receive. It draws from three distinct categories: structure, process, and outcomes. Structure focuses on the context in which care is provided to patients, including the type, location, staff, cost, and equipment (Unruh & Wan, 2004). Structure refers to the organizational characteristic that influenced its capability to provide care to patients (Donabedian, 1968).

The process involves clinical, administrative policies, procedures and service exchanges between patient and staff during provision of care (Donabedian, 1968; Sovie & Jawad, 2001). Finally**,** outcomes were the effects of care on the patient's health status (Donabedian, 1968; Sovie & Jawad, 2001). Structure discusses all the attributes of SNF settings. These characteristics include nursing staff mix (RN, LPN, and CNA), characteristics of SNF such as size and ownership (for-profit and not for profit), characteristics of residents such as payer source (private, insurance, Medicaid, and Medicare), and SNF demographics. Process refers to the interaction between residents and staff during care, treatment and service delivery to prevent physical and psychosocial ill effects. These interactions includes fall preventative policies and procedures, fall-risk assessments, fall prevention interventions and communication about high-risk residents to the staff. For example, through updating CNA assignments and care plans to indicate appropriate fall interventions (Donabedian, 1968; Lake et al., 2010).

Outcome discusses the impact of care and services to residents' overall well-being and health status that include outcome measures and patients' overall satisfaction with care (Donabedian, 1968; Donabedian, 1988; Donabedian, 1992). Thus, the model presupposes that organizational structure has significant effects on patient care. It also assumes that patient care influences patient outcomes. The Donabedian model for Structure-Process-Outcome is appropriate for this study because it is a commonly-used research model to study the relationship between staffing and other variables in healthcare settings. For example, Kalisch, Tschannen, and Lee (2012) used Donabedian (SPO) to study the relationship between missing or not completing fundamental aspects

of nursing care and poor patient outcomes in hospital settings. The researchers found that hospitals that provided daily patient care in its entirety--especially ambulation--had the tendency to minimize patient falls.

Similarly, Spilsbury, et al., (2011) used a Donabedian theoretical framework of SPO to conduct a systematic review of the relationship between nursing staff and quality of care in nursing homes. Their study produced an inconsistent and contradictory result about the link between nursing staff and quality of care. Castal, Engberg, and Men (2007) used a structural perspective to study the effect of staff turnover and quality of care. In their study, they used structural perceptive without applying process. By isolating process indicators from structural indicators, they noted that reducing staff turnover from high to medium levels was related to better quality of care (Castal et al., 2007).

Nursing Staff and Patients Falls.

Before 1996, the Institute of Medicine (IOM) reported on the sufficiency of nursing staff in hospitals and nursing homes. There was little research conducted on nursing staff and patient falls. Research findings were inconsistent and inconclusive for many earlier studies. Although some researchers found adverse impacts of nursing staff ratios on patient outcomes (Fine, 1959), other researchers found positive impacts (Blegen, & Vaughn, 1998). However, some studies prior to 1996 provided inconclusive results on nursing staff ratios and patient outcomes (Kustaborder & Ringer, 1983; Morse, Tolko, & Dixon, 1987). These studies have limitations because of ineffective technology to track and calculate nursing staff hours and other variables such as location and size. Moreover, previous studies were cross-sectional, which minimized the ability to make

causal inference. Despite the fact that these articles contributed to the knowledge of nursing staff and patient falls, and laid the groundwork for future studies, these older studies lacked the ability to discover statistically significant relationships. The findings appear anecdotal. There is a consensus that nursing staff is critical to providing quality patient care in SNFs. More importantly, SNFs residents are older, and often frail, with comorbidities which increase their need for help and their risk for falls (Hill, 2014). Therefore, governmental organizations began to explore the relationship between staffing levels and patient outcomes.

The IOM first proposed to study the impact on patient staffing levels and patient safety(IOM et al., 1996). In 1999, IOM organized a committee to investigate the issues surrounding adequacy of nursing staff in hospitals and SNFs. The committee reported that nursing staff is a significant component in the delivery of quality patient care in the U.S. and requested further research to understand the relationship between nurse-sensitive outcomes and staffing (IOM et al., 1996). Prior to the 1996 IOM study, there was no clearly defined association between nursing staff and patient outcomes (Blegen & Vaughn, 1998). Furthermore, there were challenges to methodologies and poorly defined conceptualizations of the relationships.

These flaws limited the researchers' ability to efficiently and meaningfully compare the variables (Blegen & Vaughn, 1998). Subsequently, researchers often agreed theoretically on the importance of nurse staffing and accepted that nurses play a critical role in patient safety, quality of care, and quality of life. However, there was no consensus in the literature on how to measure staffing (Clark & Donaldson, 2008).

Because the 1996 IOM reports on the adequacy of nurse staffing, health care providers, policymakers and researchers increased the awareness of patient safety issues it lead to a massive growth in peer-reviewed articles (Blegen & Vaughn, 1998).

Some of the articles concluded that a higher nursing staff ratio was associated with a decrease in mortality rates (Aiken et al., 2011; Needleman et al., 2011), pressure ulcers (Horn, Buerhaus, Bergstrom, & Smout, 2005; Unruh, 2003), urinary tract infections (Horn et al., 2005), medication errors, facility acquired infections (Aikens, 2010; Lucero, Lake, & Wan, 2003), fractures (Damián, Pastor-Barriuso, Valderrama-Gama, & de Pedro-Cuesta, 2013; Quigley et al., 2012), and pneumonia (Kovner, & Gergen, 1998; Rochefort, Buckeridge, & Abrahamowicz, 2015). However, the impact of nursing staff ratios on fall rates among SNF residents was not included in the variables used in these studies.

In 2010, the CMS implemented the use of staff rating to compare SNFs quality of care. CMS (2010) found that SNFs were not giving accurate reports of direct care staff. The inaccuracy of reporting staffing levels made it difficult for CMS to efficiently gauge staffing impact on the quality of care in SNFs (CMS, 2015). In October 2015, because of the inaccuracy in reporting staffing data, CMS initiated a system that would allow SNFs to submit electronic reports of staffing hours based on payroll. By July 2016, all Medicare and Medicaid SNFs were to use payroll reports to electronically submit the number of staff, hours each employee worked and the census during the payroll period (CMS, 2015). The electronic reporting of staffing hours will enhance the understanding of the impact of staffing on resident outcomes. Despite a considerable amount of

literature over the past decades on the relationship between nursing staff and patients' adverse outcomes, only a few studies have been conducted on the impact of nursing staff ratios on patient fall rates. The reason may be attributed to the fact that falls differ considerably from other types of adverse patient outcomes (Mark, Hughes & Jones, 2004), especially for those living in SNFs. The relationship between nursing staff ratios and patient falls was another consideration examined in this study.

Fall Risk Factors

Many factors place older adults at risk for falls. These factors may be related to the person's physical, mental or environmental conditions, including polypharmacy, chronic illness, urinary incontinence, changes in mental health status, a decline in vision, and environmental factors (Williams et al., 2015). When older adults fall, they can sustain severe injuries that may lead to premature death (Liu et al., 2015). Older adults who fall are at a higher risk of repeated falls (Tariq, Kloseck, Crilly, Gutmanis, & Gibson, 2013). Therefore, it is essential to conduct the older adults' comprehensive fall risk assessment, as fall risks link with other factors. For example, a history of fall occurrence is vital in helping nursing staff to identify those who are at risk for falls. Obtaining a detailed description of circumstances surrounding previous falls would also help nursing staff recognize other factors such as time of past falls, activities before falls, last time resident received medication, type and potential side effects (Hill & Fauerbach, 2014). Identifying older adults as high risk for falls is essential in preventing falls and fall-related injuries.

Polypharmacy

Older adults often take multiple medications for chronic condition management, which has been found to contribute to falls (Mukete & Ferdinand, 2016). Researchers (Mukete & Ferdinand, 2016) found that older adults are already more susceptible to experiencing falls because of decline in health status associated with the aging process. One out of three individuals aged 65 and older, takes more than three medications for medical reasons (Mukete & Ferdinand, 2016). Some medications are known to cause falls, such as antipsychotic drugs, anticonvulsants, sedatives, laxatives, hypnotics, benzodiazepines, antidiabetic medications, and cardiovascular agents (Hill & Fauerbach, 2014). These findings suggest that increasing the number of combinations of medications that individuals take may increase the risk of drug reaction and drug-to-drug interaction. These adverse effects increase the fall risk for older adults (Fried et al., 2014). Older adults receiving multiple medications need to be adequately monitored to minimize unintended consequences such as falls.

In SNFs, polypharmacy is a common problem. About 50% of SNF residents use nine or more drugs due to the availability of new drug therapy to treat multiple age-related diseases (Cherubini, Corsonello, & Lattanzio, 2016). About 40% of medications prescribed in SNFs are inappropriate and associated with adverse events such as falls (Cherubini, Corsonello, & Lattanzio, 2016). Some studies have attributed the prevalence of polypharmacy in SNFs to unnecessary medication prescriptions (Liu, 2014). In a systematic review of withdrawals of antihypertensive and antipsychotic drugs by Liu (2014), 20-85% of SNF residents remained asymptomatic after antihypertensive drugs

were discontinued. When residents take five to nine medications for various health conditions, they become predisposed to experiencing falls and fall related health complications. Hence, close monitoring by nursing staff is necessary to minimize the impact of adverse events such as falls.

Chronic Illness.

Older adults are more vulnerable to develop chronic illnesses due to complex reasons. In 2008, 67% of all Medicare recipients age 65 years had two or more chronic diseases, with the prevalence rate increasing to 81.5% for Medicare beneficiaries age 85 years and older (Fried et al., 2014). As individuals age, there is an increased burden of morbidity and mortality associated with chronic illness and falls (Williams et al., 2015). Most older adults have chronic conditions such as hypertension, chronic obstruction pulmonary disease, osteoporosis, neurological illness, diabetes mellitus, pain, and osteoarthritis (Fried et al., 2014; Rheaume, 2015). Most of these chronic conditions present signs and symptoms that place older adults at risk for falls, including confusion, lethargy, dizziness, and unsteady gait. Furthermore, these chronic diseases require the use of multiple medications to control symptoms. The combination of polypharmacy and chronic illnesses further places older adults at risk for fall.

In SNFs, a significant percentage of residents' experience greater fall risks compared to older adults in community-dwellings (Moore, Boscardin, & Schwartz, 2014). SNFs residents comprise of mostly elderly adults with many functional limitations in activities of daily living (Moore et al., 2014). In the study of patterns of chronic comorbid conditions of male and female SNF residents, Moore et al. (2014), found most

common combinations of two or three comorbid diseases. These conditions included vascular diseases, dementia, depression, arthritis, gastroesophageal reflux and hypertension (Moore et al., 2014). The increased burden of chronic illness among SNF residents' challenges nurse staffing in optimizing therapeutic interventions to prevent adverse outcomes including falls.

Urinary Incontinence.

Urinary incontinence is a falls risk factor prevalent among older adults (Kashyap, Tu, & Tannenbaum, 2013). It is a medical condition that affects older adults' quality of life. Urinary incontinence refers to an adult's inability to control the urge to urinate, or to experience urine leakage (Kashyap et al., 2013). Urinary incontinence can lead to isolation, depression, and decreased activities of daily living, and may, therefore, become the key factor contributing to falls (Kashyap et al. 2013). Furthermore, older adults who are incontinent may restrict their fluid intake to minimize frequent urination at night (Kashyap et al., 2013). For this reason, they may become dehydrated.

Researchers (Kashyap et al., 2013) found that 13 million older adults in the United States suffer from urinary incontinence, and over 50% of older adults living in institutions experience the adverse effects of urinary incontinence including falls. Older adults with bladder weaknesses tend to hurry to the bathroom and occasionally wet themselves before reaching to the bathroom (Hill & Fauerbach, 2014). As a result, they may slip on their urine and fall (Hill & Fauerbach, 2014). Therefore, older adults who have lost their bladder control due to chronic illness are at a higher risk to experience falls especially, those living in SNFs.

Urinary incontinence is a common problem among SNF residents'. It occurs in 60% to 78% in women and 45% to 72% in men and significantly contributes to fall among this population (Mathis, Ehlman, Dugger, Harrawood, & Kraft, 2013). The most common urinary incontinence among SNF residents includes functional, overflow, stress, mixed, and urge incontinence (Mathis et al., 2013). SNF residents with urinary incontinence may experience a significant decline in their quality of lives due to the adverse effects such as falls. Researchers Mathis et al. (2013) noted that urinary incontinence places residents at risk for developing urinary tract infection, yeast infection, skin rashes, pressure ulcer, fall, and fall-related injuries.

Nursing staff in SNFs use different strategies to manage and treat urinary incontinence. Behavioral interventions are the most commonly used approach that involves bladder training, scheduled toileting, and prompted voiding (Kashyap et al., 2013). When SNFs' nursing staff establishes a management program at the onset of incontinence and receives adequate training to manage residents with urinary incontinence, it may improve the quality of lives for residents by reducing effects of urinary incontinence including falls and fall-related complications.

Change in Mental Status.

Many older adults develop mental status changes. Approximately 13% - 25% of adults 60 years and older have mild cognitive impairments, and this number doubles every 5 years after age 70 (Booth, Logan, Harwood, & Hood, 2015). Cognitive impairment occurs with other debilitating health conditions including depression (Booth et al., 2015). Consequently, older adults who are cognitively impaired are more prevalent

to a higher risk of adverse outcomes for physical health, functional status, including falls and mortality (Booth et al., 2015). Mental status change among older adults is a common problem and a public health concern. Cognitive impairment negatively affects the person's overall well-being and makes them vulnerable to falls. Researchers (Hsu et al., 2014) conducted a 12-month exploratory study of 44 older adults from Vancouver whose ages ranged from 70 to 80 years old. The researchers divided the participants into two groups to determine differences in functional connectivity: fallers, consisting of individuals with a history of two or more falls, and non-fallers. The researchers concluded that older adults with disrupted functional connectivity were more susceptible to falls due to reduced cognitive abilities. Researchers (Taylor, Delbaere, Lord, Mikolaizak & Close, 2013) also asserted that cognitively impaired older adults performed worse on tests of reaction time, muscle strength, balance, tandem standing, and mobility. Older adults identified with a decline in mental status who are at high risk of falls may benefit from effective fall interventions.

Older adults living in SNFs experience cognitive impairment at greater rates than older adults living in the community. About 70% of SNFs residents' have some form of cognitive impairment and 50% meet criteria for dementia (Mace, Mansbach, & Clark, 2016). The primary concern with SNF residents who experience cognitive impairment is the inability of SNF staff to conduct a timely and accurate assessment of residents' mental capacities (Mace et al., 2016). SNF Social workers use a brief interview of mental status (BIMS) to assess residents who present with subjective or objective memory complaints (Mace et al., 2016). BIMS test does not assess executive function, which is a

key indication of dementia, therefore, fails to accurately identify residents with dementia (Mace et al., 2016). Furthermore, the cutoff score between residents with cognitive impairment and those without are based on the modified mini-mental state examination which may not be sensitive to mild cognitive impairment (Mace et al., 2016). SNF residents with cognitive impairment may not be acutely aware of their surroundings and safety measures to prevent fall. Hence, rely on nursing staff for their safety and well-being.

Decline in Vision.

Older adults experience vision loss at a higher rate because aging decreases vision acuity and depth receptors (D'Silva, Lin, Staecker, Whitney, & Kluding, 2016). Vision impairment is a common risk factor for gait instability and falls among older adults (D'Silva et al., 2016). Vision impairment among older adults cause a decrease in proprioceptive feedback during walking, this may cause an older adult to walk more slowly with greater stride variability, placing them at a higher risk for falls (D'Silva et al., 2016). Because SNF residents' experience vision and depth perception decline at a higher rate, the presence of comorbid conditions makes these residents less likely to recover their vision (Dev, Paudel, Joshi, Shah, & Subba, 2014). Vision impairment exerts enormous physiological stress on SNFs residents that makes them prone to adverse effects of poor vision such as falls and fall-related injuries (Dev et al., 2014). In their study of the psycho-social impact of visual impairment on the quality of life for SNF residents, Dev et al., 2014, conducted a cross-sectional study of 272 adults, 60 years and older in seven SNFs. The researchers performed a comprehensive ocular examination of

near and distance vision assessment. After the statistical analysis of the data, they concluded that poor vision has a negative association with health-related quality of life among SNF residents. With the increase in life expectancy and baby boomers turning 65 years old, vision impairment is a significant risk factor for adverse events in SNF including falls.

Environmental Factors.

Environmental factors, also called extrinsic factors, are components of the living environment that place individuals at risk for falls (Hill & Fauerbach, 2014). Older adults residing in SNFs are at higher risk to encounter environmental hazards that expose them to falls and injuries (Hill & Fauerbach, 2014). For example, nursing staff use bed rails and restraints to restrict residents' movements in an attempt to prevent fall. Perversely, residents fall as they attempt to free their movements. Broken equipment such as walkers, wheelchairs, mechanical lifts and other assistive devices also contribute to falls, if the damages are not detected and repaired before use (Hill & Fauerbach, 2014). Furthermore, poor lighting, uneven floor surfaces, and ill-fitting footwear places residents at a higher risk for falls as well (Hill & Fauerbach, 2014). Likewise, call bells, and other residents' items that are not within resident's reach contribute to falls (Hill & Fauerbach, 2014; Rheaume, 2015; Ward-Smith et al., 2015). Other environmental factors may include devices that restrict residents' movement, such as oxygen tubing, urinary catheter tubing, and intravenous tubing (Rheaume, 2015). These extrinsic factors frequently cause falls among older adults because of their decline in balance and vision, predisposing them to trip on objects, and sliding on uneven surfaces and wet floors (Hill & Fauerbach, 2014).

Moreover, older adults tend not to look where they are going or pay attention to their environment. This behavior may result from distraction created by extraneous sensory input and decrease the ability to modulate sensory stimuli makes older person venerable for falls (Van Impe et al., 2013). A clutter-free environment is essential to minimize environmental hazard and reduce the falls rate and injuries associated with falls among older adults (Van Impe et al., 2013). Nursing staff could promote environmental safety by ensuring residents and staff education on fall risks and injury prevention.

Resident and Staff Behaviors.

Residents' behaviors may contribute to falls. Older adults have adapted to their daily routines, and altering it may result in increased confusion, placing them at risk for falls (Rheaume, 2015). The older adult who goes to the bathroom independently prior to admission to SNF may find it difficult to ask and wait for nursing staff assistance to the bathroom because they want to maintain control of their life and their independence (Rheaume, 2015). They may not want to bother the nursing staff and believe that they can complete that task independently without considering the decline in their health status (Rheaume, 2014). Staff behavior may also contribute to resident falls. Sometimes nursing staff may be rushing to finish their assignment and may not follow a resident's plan of care (Rheaume, 2015). For instance, a resident's plan of care may require two staff members to assist in getting resident out of bed. Staff may decide to transfer the resident alone believing that they are capable of safely completing the procedure. Staff may also be unaware that residents require two persons to assist due to lack of, or inadequate

communication (Juvé-Udina, 2013). Staff and residents' education on a resident's plan of care are important in minimizing fall rates among older adults.

Fall prevention in SNFs has been challenging due to the multidimensional nature of SNFs, and some residents are unable to provide reliable information to SNF staff to adequately assess their level of fall risk. Accurately identifying and treating residents at risk for falls requires the coordinated efforts of the resident, family, nursing staff, and the organization (Juvé-Udina, 2013). When SNF employees are unable to identify factors that cause falls, the results are more falls, potentially causing tremendous adverse effects on the residents' quality of care as well as healthcare costs (Rheaume, 2015) .Although several factors have been identified to place older adults at risk for falls, falls remain a public health concern. My study of the impact of nursing staff ratios on falls may contribute to identifying fall preventive measures to improve better health outcomes for older adults who are at risk for falls.

Effect of Falls on Older Adults and Their Quality of Care.

Over the years, there has been a growing focus on fall prevention in SNF settings in the interest of quality of care (Quigley et al., 2012). Although there is no definite definition or measurement of quality, there is a need to identify aspects of care that most impact quality of care among older adults (Courtney, O'Reilly, Edwards, & Hassall 2009). The adverse effect of falls on the quality of care presents a serious public health concern.

Most SNF adults require assistance with their care. In 2013, 1.4 million older adults resided in SNFs and depended on SNF staff to provide them quality care and

prevent accidental hazards related to falls (CDC, 2013). Between 30% and 40% of older adults fall each year (Orces, 2013; Schonnop et al., 2013). Among those who fall, 30% die within one year (Liu et al., 2015). Those who survive may suffer from physical and psychological injuries such as hip fractures, wrist fractures, head injuries, a decrease in activities of daily living, loss of independence, fear of falling again, anxiety, depression and immobility (Clancy, Balteskard, Perander, & Mahler, 2015; Robins, 2013). Older adults who experience falls often develop a fear of repeat falls (Parry, Finch, & Deary, 2013). Psychological medical intervention may often be required.

The consequences of falls cause older adults who fall to reduce their activities of daily living and mobility (Hill & Fauerbach, 2014). When older adults decline in their routine activities and movement, the deterioration can present a cascading effect through which they become frail and dependent on others for care. Thus, they become isolated, developing signs and symptoms of depression, along with increased comorbidity and death (Heeren et al., 2014; Parry, Finch, & Deary, 2013). Falls have a profound effect on older adults' health care quality, quality of life and the health care costs. Understanding the correlation between nursing staff per shift and incidences of falls is important, and may contribute to an effective approach to fall prevention.

Impacts of Falls on Health Care Costs.

Besides the deleterious consequences of falls on the quality of care that SNF older adults receive, falls have an economic impact on health care organizations. Fall injuries are one of the 20 most expensive medical conditions, with an average medical cost of $35,000 per patient (CDC, 2015a). The financial impact of falls is evident through the

cost of treating fall-related injuries such head injury and hip fracture, which are the most common cause of post-fall injury hospitalizations, resulting in 700,000 hospitalizations annually (CDC, 2015b). Older adults are at higher risk of fracture. Ten to twenty-five percent of SNF falls result in a fracture, and the cost of treating fractures increases with age (CDC, 2015b; Sorensen et al., 2006). Older adults who experience falls tend to have longer hospital stays due to comorbidities (Hall, 2015). Falls therefore cause increased utilization of health care services and resources (CDC, 2015a). Finding effective strategies to reduce falls will help decrease healthcare costs.

Most falls are preventable. Therefore, falls resulting in injuries, pain and suffering, result in potential litigation charges that may contribute to increased health care cost (Robins, 2013). The cost of treating fall-related injuries continues to escalate. The CDC (2015a) pointed out that in 2013, the direct medical cost of falls totaled $34 billion. As the U.S population continues to age, it is likely that the number of falls and the cost of treating fall-related injuries will rise (CDC, 2015a). The annual estimated direct and indirect healthcare costs for treating fall-related injuries could reach $50 billion by the year 2020 (CDC, 2015a). Note that Medicare pays about 78% of fall costs (CDC, 2015a). There is an urgent need to identify strategies to prevent falls and fall complications, and to reduce health care costs associated with treating fall complications. The inherent cost associated with falls prompted the government to enforce policies and regulations around falls.

Government Policies and Regulations on Falls.

Falls have a detrimental impact on older adults and present serious threats to their safety and well-being. Besides the emotional, psychological and physical impact of falls on older adults, falls poses a financial burden on the health care system (Staggs, Knight, & Dunton, 2012). The government reacted to this concern by enacting several policies and regulations to reduce falls and fall complications.

In 2006, the National Quality Forum listed fall-related injuries and deaths as serious preventable health concerns (Staggs, Knight, & Dunton, 2012). As a result, in 2008, CMS implemented a policy that declared non-payment for treatment and services provided by the hospital where the patient has sustained fall-related injuries. Furthermore, CMS proposed to extend this regulation to SNFs by 2016 (Bae & Yoder, 2015; CMS, 2008; Staggs, Knight, & Dunton, 2012). It is possible that findings from my study may assist SNF administrators to identify effective fall-prevention programs and avoid penalties of non-payment for care and services for avoidable injuries.

This policy of non-payment for treatment at facilities where patients fall was intended to replace the previous payment system where the government reimbursed healthcare providers for treatment and services for avoidable incidences that patient sustained while under their care (CMS, 2008). This policy was intended to reduce healthcare costs; increase the quality of care, and inspire healthcare providers to take meaningful action to prevent falls (CMS, 2008). But, it is unclear whether this policy has had any impact in reducing falls, because fall rate continues to rise (Rochefort, Buckeridge, & Abrahamowicz, 2015). Concerns about the burden of falls in older adults

prompted the federal government to work together with Healthy People 2010 to set a goal to reduce falls and minimize fall complications along with the rate of fall-related deaths (CDC, 2015). However, there is no notable change in fall incident rates. Instead, between 2004 and 2013 there was an upward trend in reported deaths resulting from fall-related injuries, increasing from 41 deaths per 100,000 to 57 death per 100,000 (CDC, 2015). Although the federal government allocated resources to Healthy People 2010 initiatives, their effort to reduce falls, fall-related complications and death were unsuccessful.

The uncertainty of how best to reduce falls among the older population, especially those residing in SNFs, remains a grave concern. Therefore, it is important to identify the underlying causes of falls in SNFs to target specific interventions that reduce falls, improve the quality of care, and reduce the healthcare costs of treating fall-related injuries.

Fall Prevention Strategies.

Falls among older adults have become a safety threat in hospitals, Skilled Nursing Facilities and communities. As a result, finding strategies to prevent falls becomes a necessity (Jung, Shin, & Kim, 2014). Several approaches have been used at the resident and organizational levels to prevent falls. Prevention strategies include the use of alarming devices, use of restraints, reduction of anti-psychotic medications, ambulation, exercise programs and use of vitamin D. Other fall prevention methods comprise of assessment tools, resident, and staff education.

Alarm Devices.

The adverse effects of falls and its negative health impacts on older adults has heightened public and private interests for technological advancement in finding efficient monitoring gadgets that can help predict the occurrence of a fall. Alarms devices are designed to perform two essential functions, detection of fall and communication of fall incidences to nursing staff (El-Bendary, et al., 2013). Healthcare providers regard alarm devices as practical solutions to falls and wandering (El-Bendary et al., 2013). The commonly used devices to prevent fall in SNFs and hospitals include, bed and chair alarm, floor mat alarm, and motion sensors. In SNF environments, there is a possibility of one direct care staff, as certified nurse's aide providing care for 8-10 residents on their assignment on day shift. When nursing staff are in a room providing care to another resident, they may not hear the alarm ringing. Eventually, by the time staff respond to the alarm, the resident is already on the floor (Ward-Smith, Barrett, Rayson, & Govro, 2014). Despite the utilization of these technological devices, the rate of falls remains unabated among older adults.

Use of Restraints.

The use of restraints to prevent fall is an unpopular clinical approach that continues to be an option for SNFs and hospitals in their efforts to keep older adults safe from harm. Restraints include any manual method, mechanical device, or chemical substance that is attached or instilled to the body or equipment to restrict freedom of movement (Enns, Rhemtulla, Ewa, Fruetel, & Holroyd-Leduc, 2014). Most common types of physical restraint used in SNFs include bed side rails and seat belts. Whereas,

chemical restraints involve the unnecessary use of medications such as antipsychotics and sedative agents to restricts residents' functional ability (Möhler, & Meyer, 2015).

In a review study exploring the relationship between nursing home staffing and antipsychotic medication use, Mattingly, (2015) found that approximately 83% of SNF residents receiving antipsychotic drugs do not have appropriate diagnoses, resulting in unnecessary drug use or chemical restraint. Though restraints are occasionally applied in SNFs to reduce falls, there is no evidence to prove that the use of restraints reduces falls and maintain residents' safety. Instead, the use of restraints is found to be associated with adverse outcomes including increased agitation, decrease in activities, pressure ulcers, strangulations, increased falls and cardiac arrest (Enns et al., 2014). The use of restraints also contributes to a decline in resident physiological and psychological condition. Consequently, worsening residents' quality of life (Hofmann, Schorro, Haastert, & Meyer, 2015). Finding the least restrictive strategies to prevent falls is essential.

Staff and Resident Education.

The use of comprehensive fall assessment tools for all new admissions in preventing falls is standard practice for most SNFs. Additional fall risk assessments are completed quarterly and with changes in resident's health status (Jung, Shin, & Kim, 2014). Fall assessment tools may be useful in preventing falls when completed, to reflect residents falls risk factors. However, risk-assessment tools have not accurately identified high- or low-risk residents and have shown variation in sensitivity and specificity in pinpointing those at risk of falling (Evans et al., 2014; Hill & Fauerbach, 2014). The education of nursing staff on the correct ways to complete fall risk assessment tools is

essential. Thus, would increase nursing staff knowledge to implement appropriate fall prevention intervention necessary to reduce fall rates (Aiken, Sloane, Bruyneel, Griffiths, & Sermeus, 2014; Fariña-López et al., 2014). Equally, nursing staff needs to communicate and educate residents of their fall risk assessment scores to help them take precautions to minimize the potential for falls.

Reducing falls and falls-related injuries among older adults requires the implementation of different falls prevention strategies. Researchers (Payne, Abel, Simpson, & Maxwell, 2013), found that reducing the use of antipsychotic medications are safer for gait stability. SNFs efforts in assessing residents for antipsychotic medication reduction is a standard practice that has helped to decrease falls rates among older adults.

Older adults, those 65 and over, are more susceptible to vitamin D deficiency for many reasons. Kalyani et al., (2010), found an association between vitamin D and falls because vitamin D uptakes improve muscle function and strength. Adults 65 years and older, with vitamin D deficiency may develop atrophy of type 11 fibers making them vulnerable to falls and other comorbidities (Hill & Fauerbach, 2014). To decrease falls rates in SNF residents, Wijnen, Salemink, Roovers, Taekema, & de Boer, (2015) recommended that older adults take a loading dose of vitamin D to assist in the absorption of calcium and improve cardiovascular benefits, muscular function, and bone strength.

Injury Prevention.

Fall related injuries is a risk factor for future falls. Healthcare organizations have implemented several injury prevention tools to minimize fall-related injuries, such as low beds and hip protectors, which are often utilized in SNFs for residents who experience repeat falls. Evans et al. (2014), conducted a study on the effectiveness of hip protectors in preventing fall-related injuries. Their study showed mixed findings. Although they were effective in preventing hip fractures inside SNFs, they failed to show effectiveness in preventing fractures in older adults living out in the community (Evans et al., 2014). The mixed findings could be attributed to the staff's ability to intervene in making sure that residents comply with wearing hip protectors (Clancy, Balteskard, Perander, & Mahler, 2015). Low beds are additional unique tools that SNFs staff uses to prevent injuries resulting from repeat falls. Low beds come in three settings; high, medium and low which provides staff the flexibility to provide care, while the bed is at a comfortable height to maintain appropriate body posture (Evans et al., 2014). Conversely, low bed contributes to fall-related injuries when staff leave resident in bed at a high position after providing care. Therefore, staff education on the need to place the bed at the lowest position when the resident is in bed is essential in preventing fall-related injuries.

Other Fall Prevention Strategies.

Finally, the use of ambulation exercises and environmental modification of the care setting is vital to fall prevention. Whereas ambulation exercise helps with gait stability and increased activities of daily living, care facilities that are free of environmental hazards have been found to reduce the incidences of falls within SNFs

(Hill & Fauerbach, 2014; Zeng, & Yin, 2015). Although much research has focused on falls with many proposed interventions to reduce falls, most of these studies failed to include the role of nursing staff in preventing falls. The reduction of fall rates among older adults remains a public health concern, which cannot be resolved by one particular intervention. The interaction between fall risk factors and interventions to reduce falls among older adults remains unclear. Nonetheless, a successful falls prevention program involves proper utilization of a standardized fall risk assessment tools and implementing individualized interventions that target the identified risk factors. My study may provide insight into the importance of investing resources in interventions within SNFs, specifically in nursing staffing.

The Role of Nurses in Preventing Falls in Skilled Nursing Facilities

Nurses are known as the first line of defense against adverse events in SNFs. Nurses are also the largest group of healthcare professional in the U.S., making up 60% of total SNF staff and providing approximately 78% of direct care to SNF residents (Shin & Bae, 2012). The nurses' roles in the delivery of care and services in SNFs are multifaceted. Nurses use their skills to monitor and assess residents in SNF. Nurses' responsibilities have a significant impact on resident outcomes and perceptions of care and include evaluating residents fall risks and implementing strategies to prevent fall (Lake & Cheung, 2008).

SNFs have different types of nurse staffing, including registered nurses (RNs), licensed practical nurses (LPNs) and nursing assistants (NAs). Each group is deeply involved in ensuring resident safety, including preventing falls and fall complications.

RNs make up 11% of direct care nurse in SNFs while LPNs and NAs constitute 88% (Mueller, Anderson, McConnell, & Corazzini, 2012). RNs have more clinical education and utilize more clinical judgment than LPNs. RNs in SNFs usually supervise LPNs, NAs, and other unlicensed staff,conduct comprehensive clinical assessments and administer medication. RNs communicate with physicians, families and other interested parties on the resident's condition, develops resident plans of care, and coordinate overall resident care (Mueller, Anderson, McConnell, & Corazzini, 2012). LPNs attend about 1.5 years in a licensed state approved educational program. They work under the supervision of RNs in the areas of distributing and evaluating resident medication, data collection for RNs, monitoring the NAs' work activities, and documentation. LPNs are task oriented, whereas RNs apply clinical judgment and practice to ensure resident safety (Mueller, Anderson, McConnell, & Corazzini, 2012).

NAs provide the majority of the direct resident care, especially activities of daily living which include bathing, dressing, feeding, incontinence care, and ambulation (Backhaus, Verbeek, van Rossum, Capezuti, & Hamers, 2014; Zhang, Jackie, Unruh, & Wan, 2013). However, any one group of staffing cannot by itself adequately prevent falls. The identification of at-risk residents and prevention of falls requires a balance of staffing needs and the involvement of all nursing staff irrespective of their rankings.

Limitation of Previous Studies

Although there have been a growing number of evidence-based studies that examined how nursing staff affects patients falls, the studies have not yet reached a definitive conclusion. These inconsistencies may be related to differences in the data

source, variations in methodological design, differences in the calculation of nursing staff variables, and lack of a theoretical framework to guide the study. Researchers (Shin, Juh Hyun, & Bae, Sung-Heui, 2012; Spilsbury, Hewitt, Stirk, & Bowman, 2011) conducted two systematic literature reviews on the correlation between nursing staff and patient outcomes between 1980 and 2011, in nursing home settings. They found inconsistent and contradictory results and therefore did not find sufficient evidence to support the association between nursing staff and patient outcomes. Additionally, a systematic literature review conducted by Kane et al. (2007) was not able to identify sufficient evidence to support the relationship between nursing staff and patient falls in hospital settings (Kane et al., 2007). This study may help to fill the gap.

Differences in Data Sources

Studies on staffing and patient falls have had different findings. The contradictory findings may be a result of variations in data sources and study designs. Some studies conducted on staffing and patients' outcomes have used cross-sectional data sources (Castle & Anderson, 2011; Lee, Blegen, & Harrington, 2014; Leland et al., 2012; Lin, 2014). Consequently, limiting their ability to make an inference on cause and effects, due to the myopic nature of cross-sectional studies, which do not account for pre or post-study data (Institute for Work & Health, 2015; Lake & Cheung, 2006). On the other hand, other studies have used longitudinal data (Backhaus et al., 2013; Duffield et al., 2010; Staggs, Knight, & Dunton, 2012; Tyler et al., 2013). Notwithstanding mixed results between these studies, longitudinal data allow researchers to establish the temporal order

of events and make casual inferences about relationships between the impacts of nursing staff ratios and patient outcomes.

Numerous published articles on staffing and patient fall used data from data sources that may not be generalizable to other population due to non-representative study groups and small sample size. For example, (Cho et al., 2001; Donaldson, 2005) used data from California, Unruh (2003) from Pennsylvania, Duffield et al., (2011) from Canada, and Patrician et al., (2011) Missouri. Although results from these studies provided knowledge about the impact of nursing staff ratios on patient outcomes, the findings can only be generalized within certain hospitals in certain geographical areas. Therefore, a national dataset of MDS and CASPER were the data source for this study. CMS mandates all SNFs in the U.S. that are Medicare/ Medicaid certified to use MDS as a standardized tool to assess patients based on their physical, psychological, and psychosocial functioning. MDS is a nationwide database that can provide findings that are generalizable to a larger population. Such as those used by Hyun (2013) in a systemic review of the relationship between nursing staff and quality of life in SNFs, were inconsistent and had contradictory findings for the link between nursing staff and quality of care in SNFs. Leland, Gozalo, Teno, & Mor (2012) also used MDS to collect data on falls in Newly Admitted Nursing Home Residents which found that nursing home with higher CNA staffing have lower fall rate.

In their study, Zhang and Grabowski (2004), found that nursing home staffing and quality under nursing home reform used data from MDS and concluded that the relationship between quality improvement and nursing staff only increased in the lowest

staffed SNFs. Data for staffing measures come from CASPER, which is imputed annually from staffing schedules collected by the Department of Health during annual surveys. Staffing measures are case-mix adjusted based on SNFs MDS assessments depending on the number of registered nurses, licensed nurses, and certified nursing assistants.

Measurement and Operational Definitions of Nurse Staffing.

Despite limitations in data sources, over the years' variation in approaches used to measure nursing staff presents some difficulties (Lake & Cheung, 2006). These discrepancies may be due to lack of established conceptual measurement of nursing staff in the literature (Mark, Hughes, & Jones, 2004). In the study of multisite nursing staff and patients' adverse events occurrence, Blegen, and Vaughn, (1998), collected data from 39 units from 11 hospitals and calculated RN proportion, by dividing their hours of care with total hours for all nursing care. They found that the rate of adverse events declined when the percentage of RN increased from 50% to 85%. However, when the ratio of RN rose from 85% to 100%, the rate of adverse events increased. Similarly, Cho (2001), examined the relationship between nursing staff and patients' outcomes related to falls/injuries, pressure ulcers, adverse drug events, pneumonia, urinary tract infections, wound infections, and sepsis in 232 acute care hospitals. Using RN proportion to measure nursing staff ratios, Cho (2001) concluded that nurse staffing had a significant inverse relationship only with pneumonia with a 10% increase in RN proportion resulting in a 9.5% decrease in the odds of pneumonia.

In the same way, Duffield, et al. (2011), used RN proportion to measure nursing staff ratios to investigate the link between the nursing staffing workloads, unit

environment, and patients' outcomes including falls and medication errors. They (Duffield, et al., 2011), concluded that RN proportion is linked to higher medication errors, but could not find a correlation between RN ratio and falls rates. Although the authors used RN proportion in measuring nursing staff, their findings were different.

Other researchers used proportions of different nursing categories to measure nursing staff ratios. For example, Unruh (2003) used the ratio of licensed nurse hours (RNs and LPNs), to total nursing hours in their study of Licensed nurse staffing and adverse events in hospitals. Lake, Shang, Klaus, and Dunton (2010) applied the proportion of unlicensed nurses' hours to total nursing hours per patient day in their study of patient falls association with magnet hospital status and nursing unit staffing. Donaldson et al. (2005) used the proportion of contract nurses' hours to total nurses' hours in their study of the impact of California's licensed nurse-patient ratios on unit-level nurse staffing and patient outcomes.

Following these further, other researchers used a variety of methods to measure nurse staffing to patients' adverse event occurrences. Patrician et al. (2011), applied total nursing hours per patients/ resident day in the study of the relationship between the shift-level nurse staffing and adverse patient outcomes. Shin (2013) used RN hours per resident's days' approach to calculating staffing ratios in their study of collaboration between nursing staffing and quality of life in nursing homes. Dent (2015) utilized patient-to-nurse ratios in the study to identify the nine principles to improve nurse staffing. Given the extent the researchers have applied different calculation methods to

measure staffing ratios to patients' outcomes; it is clear that coming to consensus findings is challenging.

Even with all the inadequacies of these studies, the results of these earlier studies shows a trend toward supporting the hypothesis that higher nursing staff to patient ratios lead to better outcome. Additional measurement concerns arise from the calculation of nursing staff hours that incorporates indirect and aggregated measures. For example, Whitman and Colleagues (2001) combined indirect nursing care provider's hours from unit secretaries and nurse managers to nursing staff hours which can result in overestimating coefficients and bias the study result. Previous studies have used quarterly or yearly aggregated nursing staff variable over time (Unruh, 2003; Patrician et al., 2011), and failed to consider variability in nursing staff over a shorter period. This measure can result in measurement error and underestimate the impact of staffing on adverse patient outcomes. Patrician et al., (2011) noted that aggregated data may mask study outcome as it occurs as discrete events on specific units.

Therefore, to address the limitations in measurement and operationalization of nursing staff variables, my study applied evidence-based nursing staff measures used in the literature of experienced researchers (Lake & Cheung, 2006). A systematic literature review of staffing and patient falls by Lake, and Cheung (2006) found that skilled nursing hours and skilled mix (RNs, LPNs, and CNAs) signifies most broadly supported measures in the literature. The definition of nursing staff hours in this study is guided by the National Quality Forum National Quality Forum, 2004) operational definitions for nursing care hours per patient day (p. 673). Following this further, a panel of

international experts (Van den Heed, Clarke, Sermeus, Vleugels, & Aikens, 2007) found that measures for nursing hours per patient day (HPPD) /hours per residents per day (HPRD) are most accepted and useful for nurse staffing. In their study of missed nursing care, staffing and patients fall, Kalisch, Tschannen, and Lee, (2012) used HPPD to measure nursing hours and found that higher staffing level leads to fewer patient falls. In the Patient Protection Affordable Care Act (PPACA) of 2010, CMS used hours per resident per day to address staffing hours needed by SNFs to provide quality care to residents. The use of recommended standardized metrics from the international panel of nursing staff experts NQF and ACA is appropriate to address these gaps.

Summary

Chapter 2 presented an understanding of the issues surrounding nursing staff ratios, and patients fall rates. Previous studies of nursing staff and patient falls found inconsistent and contradictory results that could be attributed mostly to lack of a theoretical framework to guide the study, the difference in the data sources, variation in methodology, and changes in the calculation of nursing staff variables. In this study of the impacts of nursing staff ratio on patient falls, I addressed the gap in literature by applying the theoretical framework of Donabedian's SPO to examine changes in skilled nursing facility characteristics that will impact nurse staffing, and patient falls over time. Next is Chapter 3, which describes the study design, the rationale, procedures, participants, research questions, ethical concerns, data collection, and analysis.

Chapter 3: Research Method

Introduction

The objective of this research study was to discover if a correlation exists between nursing staff ratios and fall rates among older adults living in SNFs. Study findings could contribute to new information about ways to decrease preventable fall incidences among residents of SNFs. Chapter 3 offers details on the study methodology, design, rationale, researcher biases, the role of researcher, data sources, variables, sample population; instrumentation, data analysis, and ethical considerations.

This retrospective, correlational, longitudinal study was designed to assess the impact of nursing staff ratios on the frequency of falls among older adults in four SNFs. An IOM publication indicated that nursing staff is vital to providing quality care (CMS, 2015). Dissemination of study results of this current study may contribute to the literature in the context of how nursing staffing ratios may impact the incidences of resident falls in SNFs. The findings can potentially be used by SNF administrators and directors of nurses to target and tailor interventions to reduce patient falls. Furthermore, minimizing falls and fall-related complications in SNFs will enable staff to provide better quality care and maintain the safety of this population.

Research Design and Rationale

In this quantitative study, I used secondary data to complete correlational analysis of data obtained from a longitudinal study of SNFs. Variables from MDS version 3.0 were analyzed. Additional staffing data collected from CASPER included the number of staff on duty on each unit of the four SNFs. The fall event data was used to calculate

number of falls per resident that is equivalent to total number of falls each resident experienced within 6 months.

A longitudinal design was appropriate for this study because it improves the understanding of the complexity of the phenomenon of falls. A longitudinal design also helps the researcher to gain insights that may be impossible with other research methods (Gasper, Bautch, Caritas, & Strodthoff, 2015). Longitudinal design allowed me to establish temporal order of fall event and make causal inferences about the impact of nursing staff ratios on patient falls. Furthermore, several researchers have used longitudinal designs in the study of staffing and patient outcome in different settings including SNFs and Hospitals. For instance, unit-level staffing was examined by Breckenridge-Sproat, Johantgen, and Patrician (2012) to determine the association between nursing staff and the effects of adverse events such as falls in a military hospital. They used longitudinal secondary data from 23 Army inpatients hospitals to measure outcomes of falls and medication errors.

Similarly, Tyler et al., (2013) used a longitudinal design to track annual changes in nursing staff and unit-level characteristics in postacute care in U.S. nursing homes. Backhaus, Verbeek, van Rossum, Capezuti, and Hamers (2014) conducted a systematic review of a longitudinal study of nursing staff impacts on quality of care in nursing homes. Because my study of the impact of nursing staff ratios on falls rates aligns with these studies, a longitudinal design was best suited for my research.

Research Questions

RQ1: Is there a correlation between nursing staff ratios and the number of reported resident falls in four SNFs in each shift during the study period?

$H_0$1: There is not a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities in each shift during the study period.

H_a1: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities in each shift during the study period.

RQ2: Is there a significant correlation between the nursing staff ratios and the number of reported falls for the day shift during the study period?

$H_0$2: There is not a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for day shift during the study period.

H_a2: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the day shift during the study period.

RQ3: Is there a correlation between the nursing staff ratios and the number of reported falls for the evening shift during the study period?

$H_0$3: There is no statistically significant correlation between the nursing staff ratios and the number of reported falls for the evening shift during the study period.

H_a3: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the evening shift during the study period.

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RQ4: Is there a significant correlation between the nursing staff ratios and the number of reported falls for the night shift during the study period?

$H_0 4$: There is no statistically significant correlation between the nursing staff ratios and the number of reported falls for the night shift during the study period.

$H_a 4$: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the night shift during the study period.

Methodology

The data used in this quantitative study of the impact of nursing staff ratios on fall rates among older adults 65 years and older living in SNFs came from a prospective, longitudinal cohort study of four skilled nursing facilities owned and operated by a for-profit company in Hartford, Connecticut. The facilities had a capacity of at least 120 beds each. Study data came from CASPER, which included facility bed capacity, ownership, and nurse staffing. I collected fall information from MDS 3.0 database and fall event report logs that identified the number of falls per unit per shift over a 6-month period.

Sampling and Sampling Procedure

I obtained permission to conduct the study, from the Walden University Institution Review Board (IRB)(IRB Approval Number: 07-28-16-0409876) and the

owner of the four facilities. Once I received approval from the dissertation committee, I asked the directors of nurses for the de-identified SNFs' fall event logs and access to archival data. The inclusion criteria at the resident level were residents who were 65 years and older, with a completed MDS baseline assessment that indicated fall outcome data within the study period. At the facility level, staffing inclusion criteria was that they had complete CASPER data. These criteria was applied to the four selected SNFs to generate appropriate sample size.

Instrumentation.

In SNFs, MDS 3.0 is a comprehensive assessment tool that is used to improve the reliability and accuracy of residents' functional abilities (Center for Medicare Medicaid; MS, 2015). It uses the standardized protocol in different settings to perform assessments of resident status by multiple caregivers. MDS tools are made to enhance the accuracy of documentations, improve clinical evaluations, and support the reliability of programs that rely on MDS (Center for Medicare Medicaid; MS, 2015). CASPER is a comprehensive database of regulatory reviews of SNFs where all CMS- certified SNFs are mandated to report facility censuses and staffing information as part of their annual recertification review process, which occurs every 9-15 months. Data are validated during this on-site survey completed by a state surveyor operating under the oversight of CMS (CMS, 2004). Many researchers (Bowblis, 2011; Ybarra, Kross, & Sanchez-Burks, 2014) have found that CASPER measures are appropriate for research and have used it in their studies.

Data Analysis

Latent growth curve model (LGCM) of SPSS was used in my study to analyze the association between nursing staff ratios and patient fall rates in SNF settings. LGCM is a statistical model that can assess changes over time. A study by Unruh and Zhang (2012) used LGCM to analyze the association between changes in nursing staff and patient safety events in hospital. Similarly, a study conducted by Boyle, Cramer, Potter and Staggs (2015) used LGCM to determine the relationship between changes in registered nurse national nursing specialty certification and patients fall rates in the hospital. Another study by Everhart et al., (2014) used LGCM to analyze the relationship between nurse staffing ratios and hospital characteristics associated with patient fall rate trajectory groups. In my study, LGCM was used to determine the correlation between changes in nurse staffing ratios and fall rates in SNF's, within a 6-month period. Therefore, the use of LGCM was appropriate to analyze the study of the impact of nursing staff ratios on fall rates among older adults living in SNFs.

Threats to Validity and Reliability

After the development and validation of revision of MDS 3.0, the final reliability and validity were tested in 71 community nursing homes in 8 states and in 19 VA nursing homes in order to include well-developed and tested items (Center for Medicare Medicaid; MS, 2015). The national test directly examined: agreement between assessors (reliability); validity of new cognitive, depression and behavior's items; response rate for interview items; user's satisfaction and feedback of change; and time to complete assessment (Center for Medicare Medicaid; MS, 2015). In addition, the national test

design allowed comparison of item distribution between MDS 3.0 and MDS 2.0 and thus facilitated mapping into the payment cell.

The national trial of MDS 3.0 showed a high degree of validity and reliability. Accuracy: MDS 3.0 revealed that items showed either excellent or very good reliability even when comparing research nurse's assessment to facility nurse's assessment. Items used in other clinical settings showed either excellent or very good reliability with a low rate of missing responses (Center for Medicare Medicaid Services, 2015). Additionally, CASPER was tested for validity and reliability.

In a recent study of CASPER for validity and reliability, Center for Medicare and Medicaid (CMS) evaluated the concurrent validity for RN, LPN and nurses' aides staffing variables in 98 SNFs in Ohio by Center for Medicare and Medicaid (2001). CMS compared CASPER data from 1998-1999 to the facility's payroll data for the corresponding period. The Spearman correlation coefficient was $r = 0.59$ for RN hours per resident day, which was considered to be moderately strong (Munro, 1990). The CMS study supported the validity of the variables from the CASPER database. Similarly, LPN hours per resident per day had a Spearman correlation coefficient $r = 0.71$, which was considered a high correlation (Munroe, 1990). Thus, the Spearman correlation coefficient for nurse's aides was $r = 0.46$ which is a low to moderate correlation.

In summary, there was a strong support for the concurrent validity of the CASPER nursing staff variables. Because statistical methods are applied in quantitative research to establish reliability that is necessary for validity (Noble, & Smith, 2015), it is essential that the nursing staff variables were reliable. Therefore, I collected data from

CASPER database, as it was an appropriate data source for SNFs characteristic data, specifically staffing data.

Falls were recorded in the fall event report data when established that the falls occurred based on the facility's established standards, policy, and procedures. The entry of a fall occurs when the resident is observed on the floor by staff, family members or visitors, or the fall is self-reported by a resident. The falls data for this study contained the number of falls from the unit where the falls occurred, and in their shift for 6 months' period. Residents' personal information was not used for this study. Quantitative values were only requested from the directors of nurses. Permission from the owner of the four SNFs allowed me to evaluate validity by comparing fall incident report numbers with MDS falls numbers.

Ethical Procedures

The study of the impact of nursing staff ratios on fall rates did not involve human participants, but rather analyzed de-identified secondary data from MDS, CASPER, and fall event records. Although MDS and CASPER are public records, I obtained permission to access these records from the owner of the facilities. Therefore, this study did not pose any ethical concern for human participants or the facilities involved. Fall events numbers from all shifts from the four SNFs assisted with comparative purposes. In addition, Walden University's Institution Review Board (IRB) reviewed and approved the dissertation proposal (Approval Number: 07-28-16-0409876), prior to my collection of data.

Summary

The study of the impact of nursing staff ratios on falls rates among older adults living in SNFs used a qualitative design to collect data from four SNFs in Hartford, CT privately owned by one individual. The data from MDS 3.0, CASPER, and resident event reports only identified the number, date, and shift of falls. Latent Growth Curve Model (LGCM) was used in SPSS to analyze the association between nursing staff ratios and patient fall rates in SNF. Chapter 4 offers detailed information and discussion of data collection, and results, and summarize the research questions.

Chapter 4: Statistical Analysis

Introduction

Falls among older adults are public health issues, particularly falls in skilled nursing facilities (SNFs). There are many reasons why falls occur in SNFs. The issue examined in this study was whether falls were related to the nursing hours that exist on each shift. The hours worked is known as a staffing ratio. In this chapter, the data collection process is discussed and the findings presented. Descriptive statistics will address the number of days analyzed by site, how many nurses were on staff, and the number of falls by site by shift. Comparisons by site for the number of falls were analyzed using ANOVA tests. Correlations between the variables were examined, too. Hypothesis testing was conducted using latent growth curve modeling to examine whether there is an association between nursing staff hours per shift and falls in four nursing home facilities.

Data Collection

The data used in these analyses were collected between July 19, 2016 and August 9, 2016. The original intent was to collect data staffing hours from the Payroll Base Journal (PBJ), a dataset that each nursing home facility is required to submit their weekly staffing hours to the Department of Public Health (DPH). There was insufficient data in the payroll journal system, necessitating collecting the staffing hours worked directly from the individual SNFs payroll systems.

The required number of samples for this study was determined by power analysis conducted through G*Power software. The sample size computation was based on

various factors that included: the Cohen's effect size, the level of significance, and the statistical power or the probability of rejecting a false null hypothesis. An *a priori* power analysis was conducted with the following factors: (a) statistical test of repeated measures ANOVA; (b) statistical power of 0.80; which is normally used in quantitative studies (Faul, Erdfelder, & Buchner & Lang, 2009); (c) medium effect size of 0.25 for repeated measures ANOVA, with two independent variables (PPD by shift and total PPD), four dependent variables (falls by shift in day, evening, night; and total falls); (d) level of significance of 0.05. This yielded a minimum sample size of 82 samples of fall incident (See Appendix D). In addition, a power analysis involving a correlation analysis with a medium effect size of 0.30, a level of significance of 0.05, and a power of 80% was also conducted. The computed sample size consists of 82 samples (See Appendix E). Therefore, there should be at least 82 sets of fall data of the different study variables from the samples included in the study to achieve the required statistical power for a quantitative study of 80%.

Four facilities used in the study are for-profit SNFs owned by one individual. The data gathered for this study included the payroll information along with de-identified data for residents 65 years of age and older who lived at one of the four SNFs who experienced falls. The facilities have different units that provide various types of care that include: pulmonary care, dementia, rehabilitation, hospice care and regular geriatric custodial care. The protocol for the SNFs is that during each shift, the nurse supervisors and the out-going shift staff (including supervisors, charge nurses and the certified

nursing assistants) exchange reports that updates one and other on resident status from the previous shift.

The SNFs follow a similar protocol to nursing home standards, where there are administrators, staff coordinators, nurse supervisors, charge nurses, and nursing assistants all with particular duties. In addition to the staff, there are several departments in these SNFs, compatible with nursing home norms. The departments include administration, recreation, food services, education, housekeeping, recreation, and social services.

Descriptive Statistics

The analyses consisted of the number of falls per shift by SNF. ANOVAs were performed to examine whether there were mean differences between nursing home for number of falls by shift and whether there were differences in the nursing staff ratios. Correlations between the variables in the latent growth curve models were examined. Finally, hypothesis testing was performed using latent growth curve models.

Four SNFs data was examined for falls over 6 months from December 1, 2015 to May 30, 2016. Falls were divided into three shifts, day, evening, and night. For each day of the 6 months, the number of patients (census), the nursing staff, and number of falls were recorded. From these data, the hours per period of nursing time was calculated (number of nurses*7.5) as was the hours per patient (PPD; calculated as hours/census for day, evening, night and daily total). Table 1 shows the descriptive statistics by nursing home. For three of the four SNFs, there were more falls during the day, with nighttime falls showing the lowest number.

Table 1

Descriptive statistics by Skilled Nursing Facility Site #1

	#days	Minimum	Maximum	Mean	SD	Number falls
Facility #1						
Falls day	183	0.00	2.00	0.23	0.47	41
Nurse Staffing day	183	17.00	27.00	21.53	2.15	
Hours_day	183	127.50	202.50	161.48	16.13	
PPD_day	183	1.20	1.80	1.45	0.13	
Census	183	102.00	119.00	111.57	4.00	
Falls eve	183	0.00	1.00	0.12	0.32	21
Nurse Staffing eve	183	15.00	22.00	18.69	1.65	
Hours eve	183	112.50	165.00	140.21	12.34	
PPD_eve	183	1.00	1.40	1.26	0.08	
Falls night	183	0.00	2.00	0.04	0.23	8
Nurse Staffing night	183	10.00	15.00	11.75	1.37	
Hours night	183	75.00	112.50	88.12	10.26	
PPD_night	183	0.70	1.00	0.79	0.08	
Total Nurse Staffing	183	42.00	60.00	51.97	4.34	
Total Hours Worked	183	315.00	450.00	389.80	32.58	
PPD	183	2.90	4.00	3.49	0.22	
Total falls	183	0.00	3.00	0.38	0.59	70

An ANOVA using a Bonferonni correction was performed to examine whether there were difference in the number of falls between SNFs and whether there was a difference between the PPD between SNFs (Table 2). There were statistically significant mean differences for falls at all times of day and for PPD at all time of day between the four SNFs. In particular, a post-hoc Bonferonni test showed that the PPD variables were significantly different for all SNFs when compared to each other separately.

Table 2

Descriptive statistics by Skilled Nursing Facility Site #2

	#days	Minimum	Maximum	Mean	SD	Number falls
Facility #2						
Falls day	183	0.00	3.00	0.36	0.58	66
Nurse Staffing day	183	28.00	47.00	39.35	3.40	
Hours_day	183	210.00	352.50	295.12	25.50	
PPD_day	183	1.00	1.70	1.39	0.13	
Census	183	205.00	224.00	213.28	5.04	
Falls eve	183	0.00	2.00	0.30	0.52	54
Nurse Staffing eve	183	22.00	45.00	34.25	1.82	
Hours eve	183	165.00	337.50	256.84	13.68	
PPD_eve	183	0.80	1.60	1.21	0.07	
Falls night	183	0.00	2.00	0.16	0.44	30
Nurse Staffing night	183	19.00	28.00	23.32	1.16	
Hours night	183	142.50	210.00	174.88	8.71	
PPD_night	183	0.60	1.00	0.82	0.05	
Total Nurse Staffing	183	82.00	113.00	96.91	4.38	
Total Hours Worked	183	615.00	847.50	726.84	32.85	
PPD	183	2.90	4.10	3.41	0.18	
Total falls	183	0.00	4.00	0.82	0.89	150

Correlations are shown in Table 3. There was a small, but significant positive correlation between falls and PPD for day (r=0.08, p<0.05).

Table 3

Descriptive statistics by Skilled Nursing Facility Site #3

	#days	Minimum	Maximum	Mean	SD	Number falls
Facility #3						
Falls day	183	0.00	2.00	0.31	0.54	56
Nurse Staffing day	183	3.00	14.00	13.30	1.10	
Hours_day	183	24.00	112.00	106.40	8.77	
PPD_day	183	0.30	1.50	1.34	0.11	
Census	183	71.00	85.00	79.54	3.17	
Falls eve	183	0.00	2.00	0.17	0.40	31
Nurse Staffing eve	183	10.00	14.00	11.78	0.61	
Hours eve	183	80.00	112.00	94.21	4.88	
PPD_eve	183	1.00	1.50	1.19	0.07	
Falls night	183	0.00	1.00	0.10	0.31	19
Nurse Staffing night	183	6.00	8.00	7.53	0.54	
Hours night	183	48.00	64.00	60.24	4.34	
PPD_night	183	0.60	0.90	0.76	0.05	
Total Nurse Staffing	183	23.00	35.00	32.61	1.54	
Total Hours Worked	183	184.00	280.00	260.85	12.35	
PPD	183	2.20	3.60	3.28	0.17	
Total falls	183	0.00	4.00	0.58	0.81	106

Hypothesis testing was conducted using latent growth curve models in SPSS. The data was arranged by month, so that month was the grouping variable, thereby there were 24 groups (i.e. four sites with 6 months of data each). Furthermore, a time variable was created which was measured in weeks and centered so that the midpoint of the months was time=0 (31 day months: day-16/7; 30 day months: day-15.5/7; 29-day month: day-15/7). The outcomes were falls by shift (i.e. day, evening, night) and total falls and the independent variables were PPD by shift and total PPD. An interaction terms between the time variable and PPD was also included in the model to account for potential changes in PPD over time. The SNFs were used as a control variable given the significant mean

differences in falls and PPD between the SNFs. The intercept predicts falls at the midpoint of each month (*time=0*). The random effects were also examined. Variance 1 is the variance in the intercepts and variance 2 is the variance in the slopes. The variance in the intercepts measures how much falls vary at the midpoint of each month and the variance in slopes measures the rate of change in PPD.

Research Question 1

RQ1: Is there a correlation between nursing staffing ratios and the number of reported resident falls in four SNFs in each shift?

$H_0$1: There is not statistically significant correlation between higher nursing staffing and fewer falls in SNFs for the morning shift.

H_a1: There is a statistically significant correlation between higher nursing staffing and fewer falls in SNFs for the morning shift

RQ1 queried whether there was a relationship between nursing staff and falls encompassing all three shifts combined (Table 4). The estimate for the predictor of PPD was 0.15 *(p>0.05*) meaning that nursing staff hours were not associated with falls; however, the estimate was positive indicating that higher PPD showed more falls. The time variables also did not show a significant association (*estimate=0.21, p>0.05*), meaning that falls did significantly vary over time. The interaction of time and PPD was also not significant (*estimate=-0.04, p>0.05*) meaning time did not moderate the relationship between PPD and falls. Nursing home did show a significant association with falls (*estimate=0.11, p<0.05),* meaning that falls varied between SNFs. The random effects were not significant, indicating that falls did not vary at the midpoint of the month

(*estimate=0.02, p>0.05*) and the rate of change of PPD was not significant (*estimate=0.01, p>0.05*). Hypothesis 1 was not supported.

Table 4

Descriptive statistics by Skilled Nursing Facility Site #4

	#days	Minimum	Maximum	Mean	SD	Number falls
Facility #4						
Falls day	184	0.00	2.00	0.16	0.39	29
Nurse Staffing day	184	19.00	27.00	21.94	0.91	
Hours_day	184	142.50	202.50	164.55	6.80	
PPD_day	184	1.10	1.40	1.17	0.05	
Census	184	130.00	149.00	141.13	3.78	
Falls eve	184	0.00	3.00	0.19	0.48	35
Nurse Staffing eve	184	2.00	22.00	20.09	1.50	
Hours eve	184	15.00	165.00	150.69	11.25	
PPD_eve	184	0.10	1.20	1.07	0.08	
Falls night	184	0.00	2.00	0.10	0.34	19
Nurse Staffing night	184	11.00	15.00	12.89	0.45	
Hours night	184	82.50	112.50	96.64	3.35	
PPD_night	184	0.60	0.80	0.69	0.03	
Total Nurse Staffing	184	37.00	61.00	54.92	1.94	
Total Hours Worked	184	277.50	457.50	411.89	14.56	
PPD	184	1.90	3.30	2.92	0.12	
Total falls	184	0.00	4.00	0.45	0.73	83

Research Question 2

RQ2: Is there a significant correlation between the nursing staff ratios and the number of reported falls for the day shift?

$H_0$2: There is no statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the day shift.

H_a2: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for day shift.

RQ2 asked whether higher nursing staffing would result in fewer daytime falls (Table 5). The estimate for the time variable was not significant (*estimate= -0.01, p>0.05*), meaning that there was no increase in falls over time. There was also not a significant interaction between time and PPD (*estimate=0.02, p>0.05*); time did not moderate the relationship between PPD and falls. There was a significant association between PPD day and number of falls (*estimate=0.29, p<0.05*), indicating that higher levels of PPD were associated with higher number of falls. In addition, nursing home was also associated with number of falls (*p<0.001*). Neither random effect was significant (variance 1: estimate=*0.0003, p>0.05*; variance 2: estimate=*0.002, p>0.05*). Hypothesis 2 was not supported since an increase in PPD did not reduce falls, but rather higher levels of PPD during the day was associated with an increase in falls.

Table 5

ANOVA comparing mean differences between SNFs

		Sum of Squares	df	Mean Square	F	Sig.
Falls day	Between Groups	4.35	3	1.45	5.75	0.00
	Within Groups	183.15	726	0.25		
	Total	187.50	729			
PPD_day	Between Groups	7.97	3	2.66	222.81	0.00
	Within Groups	8.69	729	0.01		
	Total	16.67	732			
Falls eve	Between Groups	3.11	3	1.04	5.36	0.00
	Within Groups	140.73	728	0.19		
	Total	143.84	731			
PPD_eve	Between Groups	3.43	3	1.14	195.30	0.00
	Within Groups	4.27	729	0.01		
	Total	7.70	732			
Falls night	Between Groups	1.31	3	0.44	3.85	0.01
	Within Groups	82.80	728	0.11		
	Total	84.11	731			
PPD_night	Between Groups	1.84	3	0.61	212.49	0.00
	Within Groups	2.11	729	0.00		
	Total	3.95	732			
Total falls	Between Groups	20.35	3	6.78	11.71	0.00
	Within Groups	422.43	729	0.58		
	Total	442.79	732			
PPD total	Between Groups	34.99	3	11.66	379.73	0.00
	Within Groups	22.39	729	0.03		
	Total	57.38	732			

Research Question 3

RQ3: Is there a correlation between the nursing staff ratios and the number of reported falls for the evening shift during the study period?

$H_0$3: There is no statistically significant correlation between the nursing staff ratios and the number of reported falls for the evening shift during the study period.

H_a3: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the evening shift.

The third research question asked whether there was an association between falls and PPD during the evening shift (Table 6). There was not a significant association between Time (estimate= *-0.06, p>0.05*), PPD (estimate= *-0.18, p>0.05*), or the interaction between time and PPD (estimate=*0.04, p>0.05*) and number of falls during the evening shift. In contrast to the day shift where the estimate for PPD was positive, during the evening shift the estimate was negative, meaning there was a non-significant negative effect of PPD on falls (i.e. higher PPD and fewer falls). There was, however, a significant association between evening falls and nursing home (estimate=*0.03, p<0.05*). This means that the falls varied between SNFs at the evening shift. The random effects were not significant (estimates for variance 1 and 2 were *0, p>0.05*). Hypothesis 3 was not supported due to the non-significance of the estimate of PPD on falls.

Table 6

Correlations

		1	2	3	4	5	6	7	8
1	Falls day	1							
2	PPD_day	0.078*	1						
3	Falls eve	0.019	-0.001	1					
4	PPD_eve	0.054	0.603**	-0.055	1				
5	Falls night	0.065	-0.005	0.021	-0.042	1			
6	PPD_night	0.102**	0.535**	-0.010	0.609**	0.003	1		
7	PPD_total	0.089*	0.900**	-0.023	0.851**	-0.017	0.774**	1	
8	Total falls	0.689**	0.048	0.592**	-0.015	0.491**	0.063	0.037	1

*p<0.05; **p<0.01

Table 7

Parameter estimates for RQ1

Parameter	Estimate	95% Confidence Interval		Std. Error	Sig.
Fixed effects					
Intercept	-0.21	-1.11	0.69	0.45	0.65
PPD	0.15	-0.11	0.42	0.13	0.26
Nursing home	0.11	0.03	0.18	0.04	0.01
Time	0.12	-0.50	0.75	0.31	0.69
PPD *Time	-0.04	-0.23	0.15	0.09	0.69
Random effects					
Variance 1	0.02	0.01	0.07	0.01	0.07
Variance 2	0.01	0.00	0.03	0.01	0.23

Table 8

Parameter estimates for RQ2

Parameter	Estimate	95% Confidence Interval		Std. Error	Sig.
Fixed effects					
Intercept	-0.25	-0.60	0.10	0.18	0.16
PPD_day	0.29	0.05	0.54	0.13	0.02
Nursing home	0.05	0.02	0.08	0.02	0.00
Time	-0.01	-0.38	0.35	0.15	0.94
PPD_day * Time	0.02	-0.25	0.29	0.11	0.89
Random effects					
Variance 1	0.0003	2.38E-7	0.50	0.001	0.79
Variance 2	0.0020	0.00	0.02	0.002	0.39

Table 9

Parameter estimates for RQ3

Parameter	Estimate	95% Confidence Interval		Std. Error	Sig.
Fixed effects					
Intercept	0.34	-0.12	0.80	0.23	0.14
PPD_eve	-0.18	-0.55	0.19	0.19	0.34
Nursing home	0.03	-0.01	0.06	0.02	0.18
Time	-0.06	-0.35	0.22	0.15	0.67
PPD_eve * Time	0.04	-0.20	0.28	0.12	0.76
Random effects					
Variance 1	0.00	0.00	0.02	0.00	0.24
Variance 2	0.00	0.00	865.33	0.00	0.91

Research Question 4

RQ4: Is there a significant correlation between the nursing staff ratios and the number of reported falls for the night shift?

$H_0$4*:* There is no statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the night shift.

H_a4: There is a statistically significant correlation between higher nursing staffing and fewer falls in skilled nursing facilities for the night shift.

Finally, RQ4 queried whether falls and nursing staff ratios during the night shift are associated. The variable PPD showed a non-significant negative estimate *(-0.05, p>0.05*), while time showed a non-significant positive estimate *(0.14, p>0.05*). In addition, the interaction terms between PPD and time was not significant *(-0.18, p>0.05*). Finally, there was not a significant association between nursing home and falls during the night shift (*0.03, p>0.05*). Variance 1, the variance at intercepts, was marginally significant (*estimate=0.01, p=0.05*) indicating that falls vary at the midpoint of the month.

Table 10

Parameter estimates for RQ4

Parameter	Estimate	95% Confidence Interval		Std. Error	Sig.
Fixed effects					
Intercept	0.08	-0.25	0.41	0.17	0.63
PPD_night	-0.05	-0.47	0.37	0.21	0.80
Nursing home	0.03	-0.01	0.06	0.02	0.13
Time	0.14	-0.08	0.37	0.11	0.20
PPD_night * Time	-0.18	-0.47	0.11	0.15	0.23
Random effects					
Variance 1	0.01	0.00	0.00	0.01	0.05
Variance 2	0.00	0.00	-0.54	0.01	0.91

Summary

The purpose of this study was to determine whether nursing patient hours (PPD) are associated with falls separated by three shifts: day, night, and evening. Latent growth curve models were used to assess possible associations. Four hypotheses were examined, including whether or not there were associations between nursing patient hours and three time shifts (day, evening, nigh) and all shifts combined. For daytime and evening shifts, the nursing home was associated with falls, indicating that some SNFs have more falls than others. Higher PPD was associated with more falls during the daytime shift, the opposite of what hypothesis 2 predicted. The other three hypotheses were rejected due to non-significant associations.

The findings will be discussed in more detail in Chapter 5. The results will be placed in the context of the current literature and future directions for research will be explored.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this retrospective longitudinal quantitative study was to assess SNF factors that may influence residents' fall rates over time in four SNFs.The study was designed to examine if there was a statistically significant between nurse staffing hours and fall rates among residents in SNFs in four SNFs in Connecticut. It is necessary to understand the relationship between nurse staffing ratios and fall rates in order to guide policy interventions to prevent falls among older adults. This chapter presents the findings of the study, the positive social change that may be derived from this work, and provides recommendations for future research.

I conducted this study to address falls and fall-related issues among SNF residents in Connecticut and to examine if nursing staffing ratios have statistically significant impact on fall rates. This study may increase the knowledge base on the relationship between nurse staffing ratios and fall rates among older adults specifically, those residing in SNFs in Connecticut. This study may decrease falls and fall-related injuries, improve quality of life and decrease health care cost. Consequently, these findings may create positive social change for the vulnerable population.

The study findings showed that there was no significant correlation between higher nurse staffing ratios and fewer falls. Falls occurred more on day shifts and evening shifts when there was more nursing staff on duty. Falls vary significantly among facilities in that some facilities have more fall than others. The study used secondary data from four SNFs located in Connecticut. The secondary data used in the study was collected

from MDS 3.0, which is part of the process mandated by the federal government to assess patients in SNFs that are certified by Centers for Medicare and Medicaid Services (CMS). The process in question offers a complete evaluation of every patient's functional capabilities that assist the staff in SNFs to identify health issues. Care Area Assessments make up a portion of this practice.

The Care Area Assessments provide the foundation to develop health care plans for each resident in the facility. SNF staff completes MDS appraisals for every patient in Medicare and Medicaid certified nursing facilities (Hyun, 2013). Further, SNF transmits this information electronically to the national MDS database located at the Center for Medicare Services. I collected additional data from CASPER, and residents' event reports (collected from four SNFs for the duration of the 6-month data gathering period). Hours PPD were used as the measurement.

The impact that nursing staff ratios have on the incidence of falls in SNFs is not clear. Insufficient information regarding the effect of nursing staff ratios existed to help alleviate the impact of the negative outcomes that result from falls. Data from four SNFs was collected over a 6-month period, from December 2015 to May 2016. The data collected included the incidence of falls in the aggregate, during each shift for each SNF during the 6-months. Reports of falls were divided into three shifts: day, evening, and night. For each day of the 6 months, the number of patients (census), the nursing staff, and number of falls was collected and analyzed.

Statistical analysis included a Bonferonni correction (a simple method for correcting multiple comparisons) that was performed to examine whether there were

variations in the number of falls amongst the four SNFs. In addition, Bonferonni was used to determine any divergence between the PPD among these facilities. Latent growth curve models, which are a longitudinal analysis technique to estimate growth over a period of time, were used for hypothesis testing.

The Donabedian model for evaluating quality, which served as a guide for this study, used a three-pronged approach: structure, process, and outcomes (Salzer, Nixon, Schut, & Karver., 1996). This model propositions that each section has a direct influence on the next, as structure (organizational characteristics), affects process (patient care), and process affects outcomes (results of patient care) (Salzer, Nixon, Schut, & Karver., 1996). The conceptual framework is beneficial to understanding the connection between how healthcare providers deliver services to patients and the resultant quality of care the patients receive.

Interpretation of the Findings

In this section, I present the interpretation of the findings based on the following four research questions.

The first research question asked: Is there a correlation between nursing staff hours per shift and rates of falls in all four SNFs? In my study there was a notable variation of the number of falls between the SNFs, in that some SNFs had higher fall rates than others. However, there was no significant correlation between higher ratios of nursing staff and fewer falls. My study findings contradict a study conducted by Patrician et al., (2011), in which she studied the relationship between shift level nursing PPD and adverse patient outcomes, including falls. The contradiction exists in that there was a

significant inverse relationship between nursing PPD and falls, in that higher nursing PPD per shift were related to lower fall outcomes, whereas my study showed no significant correlation. However, it is noted that the study of Patrician et al, was conducted in a hospital environment. This association confirms the Donabedian (1968), framework that states that structure (including environment and location), impacts the ability to provide care to patients and influence potential outcomes.

The second research question asked: Is there a significant correlation between the nursing staff ratios and the number of reported falls for the day shift? The results indicated that the increase in PPD had no effect on reducing the number of falls. However, it found a small, yet significant positive correlation between daytime PPD and the number of falls. Furthermore, hypothesis 2 was not supported because an increase in PPD did not reduce the number of falls; instead, higher levels of PPD increased the number of falls reported. The third research question asked if a correlation exists between the nursing staff ratios and the number of reported falls for the evening shift during the study period. The study observed that there was not a meaningful association between time and PPD and the number of falls throughout the evening shift. The hypothesis that a statistically meaningful correlation between greater nursing staffing ratios and fewer falls was not supported.

The fourth research question queried: is there a significant correlation between the nursing staff ratios and the number of reported falls for the night shift? This query was intended to determine if nursing staff levels and the number of falls during the night shift had an association. The interaction between time and PPD was deemed not significant,

which indicates the no significant correlation exists between falls and nursing home during the night shift.

Past studies that measured the correlation between nursing staff ratios and patient outcomes in SNFs found inconsistent results that do not give adequate evidence to support the association between nursing staff and patient outcomes (Shin, Juh Hyun, Bae, & Sung-Heui, 2012; Spilsbury, Hewitt, Stirk, & Bowman, 2011). The absence of correlation between staffing ratios and fall outcomes in my study confirms the inconsistency found in previous studies.

Based on the study findings, I could not determine if or how nurse staffing levels affected the number of falls in nursing homes due to the results being statistically insignificant, making it uncertain if nursing levels provided a significant impact. It was found that during the daytime and evening shifts, some nursing home facilities have more falls than others. The cumulative total showed that some nursing homes have more falls than others, and three of the hypotheses were rejected because they rendered no significant associations. Further, the hours PPD was connected to the daytime shift having a greater number of falls, which contradicted the expectation of the second hypothesis posed. Two other studies (Castal, Engberg, & Men, 2007; Kalisch et al., 2012), indicated that the totality of care, in association with nurse staffing hours may affect the number of patient falls.

Older studies discovered negative effects on patients due to higher nursing staff ratios (Fine, 1959); while recent studies found the opposite, positive outcomes (Aiken et al., 2011; Needleman et al., 2011). Further analysis indicated that studies conducted

before the advent of efficient technology lacked the ability to accurately trace and compute the number of variables involved leading to the question of using them for any viable analysis. Additionally, many of these previous studies were cross-sectional (observational studies that analyses data at one particular point in time), which decreases the ability to make causal extrapolations from their results.

The IOM initially proposed to study the impact of staffing levels on patient care and patient safety. In 1999, the IOM organized a committee to investigate the issues (IOM et al., 1996), noting that the highest staffed nursing homes reported considerably lower resident care loads and provided higher quality care than all other facilities in the study. Nevertheless, this is an early study, which may have limited benefits to current finding conducted with more modern technology. As a result, there were no precisely measured specific care procedures, which might explain the impact on patient outcomes.

Containing the rising costs of health care is an imperative, and the cost of falls among older adults is extraordinary, not only in terms of dollars spent but also as related to the devastating and incapacitating bearing on nursing home residents (Li & Ali, 2015; Quigley et al., 2012). Pohl et al. (2014) estimated that 30% of elderly adults fall at least once per year, and once they fall, they are prone to experience another fall. Two-thirds of this segment of the elderly population prone to fall is admitted to SNFs because of the attendant complications (Pohl et al., 2014). These individuals rely on the nursing staff to ensure their health, well-being, and safety. Emotional, psychological, physical, and financial consequences result (Li & Ali, 2015). A recent study (Burns, 2016) reported that the average hospital treatment and cost per fall injury is over $30,000, and further

that in 2015, costs for falls to Medicare only equaled more than $31 billion for the US overall. Other costs include morbidity associated with decline in mobility and self-care abilities. In 2011, 21,649 deaths were attributed to falls (Quigley et al., 2012). Further, the price of treating such falls increases with age, highlighting the critical necessity to identify strategies that prevent falls among older adults.

The United States is not the only country experiencing difficulty creating studies that effectively determine causal relationships regarding patient falls by the older adults. Nurses in Turkey conducted a nurse-led study consisting of 46 older patients who were over the age of 60 (Uymaz & Nahcivan, 2015). None of the patients had cognitive impairments, and they were not bedridden (Uymaz & Nahcivan, 2015). In general, they had the ability to live an independent life. The researchers found that the nurse-led falls prevention programs affected knowledge about prescriptions and creating behaviors to prevent falls (Uymaz & Nahcivan, 2015). No impact was discovered that led to a reduction in the number of falls or lessening the fear of falling that existed in the nursing home patients (Uymaz & Nahcivan, 2015).

Limitations of the Study

Even though the statistics met rigorous standards, there was only 6 months data available due to change in SNF's ownership. Therefore, this study was limited to a 6-month time frame. In addition, it was limited to four nursing homes in one geographical location: the state of Connecticut. As a result, these factors can skew the data due to sample size. Furthermore, the study was conducted using secondary data which have the potential for measurement errors as well as systematic reporting bias (Castle, 2008) by

making an assumption that owners of nursing homes, administrators, nursing staff and directors of nursing would have a keen interest in strategies to prevent falls because this would involve a change at every level: administration, nursing staff, policies, and procedures.

Differences in nurse staffing calculation methods, have resulted in conceptual and methodological issues that reduce their effectiveness (Castle, 2008). It is possible that the study could have yielded a different result if I had collected primary data directly from the residents, nursing staff, and family members. Due to these factors, the study might lack external validity. Other nursing homes in the state, the nation, or the world may have different patients, diverse nursing staffs, or different administrators with unique ideas, education, and training. Donabedian (1988) posited that several issues affect outcome, however, it is challenging to know precisely the extent to which the process of care affects the observed outcome.

Other issues that may have affected the result of the study include extraneous factors. In this study, I did not consider the employee turnover rates, nurses educational level and years of experience, retention rate, employee's morale acuity level and consistent assignment (Arling & Mueller, 2014). Future research may consider these factors as they may have significant implications.

Recommendations

Nursing homes owners, nurses, patients, administrators; nurses' aides, healthcare providers, policymakers, and more can benefit from future studies on issues involving patient falls and other adverse occurrences. My study suggested that some SNFs have

more falls than others, and that most of these falls occur during day shift when there is more nursing staff on duty. Therefore, there is a need to explore if this result is related to factors such as staff attitude towards patients, the level of education among nursing staff, the differences between the resident's activities on day shift and night shift. This study was conducted in four nursing home in the same geographical area in Connecticut. It may be advisable to conduct a similar study in larger number of SNFs in different geographical location and different states.

My study used a quantitative approach which was an appropriate method. However, future research may use mixed method to assess the impact of nursing staff ratios on falls rates among SNF residents in the state of Connecticut to see if the study will yield a different result. This method will allow the researcher to interview nursing staff, residents, and their families, and to collect data directly from these individual, which may provide more insight as to the reason why resident falls and possibly provide appropriate intervention to minimize falls and fall-related adverse outcome. Working theories need to be developed or improved to assist in designing policies and procedures including proper staffing level to achieve optimum care for residents at SNFs. Borrowing from organizational and management psychology may provide a mechanism to assist in this endeavor.

Due to rising costs of healthcare, determining how registered nurses and knowledge resources influence the quality of patient care is essential. There is a need to increase the empirical evidence regarding the effects of nursing experience, staffing, and education on patient outcomes. The nursing intellectual capital, collective knowledge and

expertise of employees in an establishment as defined by Stewart (2001), may be a means to provide a wide-ranging conceptualization of nursing knowledge that is available within healthcare institutions.

Kalisch et al. (2012) noted that delivering patient care in totality had a positive impact on patient falls by reducing the frequency of falls. Castal et al. (2007) made a similar finding in their study, which stressed that staff turnover, staffing levels, worker stability, and agency employee are best attended to concurrently to address the issue of improving the standard of quality at SNFs. Therefore, seeking policies, strategies, methods, and procedures to benefit the residents at SNFs may be an interdisciplinary effort that requires the input of organizational behavior theory and management practices. The study of fall prevention is not the sole responsibility of nursing; it is a multidisciplinary effort.

Patient falls in SNFs are debilitating occurrences that affect patients, family, and nurses. It may be possible to mitigate these disabling events by studies that take organizational and managerial psychology into consideration (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002). In a study on nurse staffing levels and patient safety determined that the risk of patient mortality due to adverse occurrences such as falls increased by 7% for every additional patient that's added to a nurse's workload (Aiken et al., 2002). This finding regarding staffing levels merely notes an issue that might be critical in the quest for patient safety, and more investigation could produce significant results.

Implications of the Findings

This study confirmed conclusions from previous studies, and several inferences stem from this study, one of which is that not enough information is known about falls for residents in SNFs. In this respect, I advocate for more investigations regarding patient falls and their prevention among this resident population to maintain a healthy patient populace, reduce morbidity, and contain escalating costs. There is insufficient concrete and applicable data to design policies and procedures (including training) that can assist in mitigating this problem. Furthermore, this lack of information creates uncertainty regarding the elements of proper staffing levels and their impact on preventing falls in older adults.

Another way to perceive this issue is the concept of environmental uncertainty, which is the degree to which a SNF lacks complete, factual or expert information regarding the internal and external operating environment for the institution. Uncertainty may create a situation in which administrators' and the director of nursing may be unsure of which actions to take. It may affect their understanding of how the unit is functioning and the relationship between the various constituents. Even if this uncertainty is merely perceived, it impacts the structure in relation to the planning staffing hours. Further, this has an adverse impact on patient well-being and the cost structure.

To help solve this aspect of the problem of environmental uncertainty, we might borrow learnings from other forms of dynamic, complex organizations, such as businesses, that have dealt with and overcome similar obstacles via a strategic management method. Environmental uncertainty creates the inability to predict the

probability of future events, a deficit of information regarding the cause and effect relationships, or to estimate the implications of choices made. This lack of ability is an absence of relevant and adequate data about the situation is the question.

Raynor (2007) recommended a four-step approach that has the potential to be useful in studying and enhancing health care issues such as older adults falls: (1) Anticipate to create a more sophisticated comprehension of possible future events (scenario analysis); (2) Devise a strategy for each scenario and evaluate strategies among them; (3) Gather main components of the strategies to recognize viable options with the factors such as staffing levels, PPD, and shifts; (4) Evaluate the environment to determine which scenario is nearer to the desired future.

Information from the earlier studies may not make a meaningful contribution to contemporary studies because they lacked the appropriate technologies to massage the data, however well designed and intended they were. Another factor, as noted, the CMS (2015) experienced difficulty obtaining accurate information regarding staffing levels that could accurately estimate staffing levels' impact on quality care administered to the SNF resident population. To correct this, all Medicare and Medicaid nursing homes must submit payroll reports electronically to CMS. This submission strategy will bolster the knowledge of staffing on patient outcomes and provide greater tools to improve outcomes.

An important lesson from this study, and other studies alike, is that our society with medicine at forefront need to embark on developing appropriate clinical strategies to reduce the number of fall incidences. Healthcare organizations need to develop programs

that will provide training regarding fall prevention strategies to reduce falls, fall-related injuries and associated costs on individual, family and societal levels. These strategies might imply setting universal standards for elder care at SNFs, which include appropriate staffing levels, mandatory fall prevention in-services, and methods for recognizing potential fall victims. Healthcare providers can also provide education to patients and family members on identified fall risk factors to help in the early detection of the warning signs in potential fall risk patients.

The current plethora of risk factors as identified by Williams et al. (2015) regarding falls involving older adults needs to be addressed. The overprescribing of medication (polypharmacy), chronic illness, mental health, and urinary incontinence present identifiable and treatable issues. A more comprehensive risk factor assessment might be a useful tool to uncover some of these problems in the elderly. It appears from the studies that more information, in greater detail, is required.

Polypharmacy (five or more prescription medicines), and using more medications than needed in nursing homes, has been a concern of the CMS since the 1990's. One 2004 study from the 2004 United States Nursing Home Survey discovered that 39.7 percent had polypharmacy. Regrettably, this consumption of many medicines increases costs and the risk of adverse drug events (ADEs). Nevertheless, practice medical procedures usually necessitate multiple medications for the treatment of chronic diseases, making this a unique problem with now apparent solution (Maher, 2013).

One challenge in the study of falls and developing theories to put into practice to prevent them is that, theories must be based on an understanding of how nurse staffing

levels impact the adverse events that patients experience. Currently, multiple definitions of nurse staffing are considered; (1) nursing hours, which refers to the actual hours; (2) RN hour, or hours as a percent of all hour spent on nursing care; (3) percent of entire staff who are RNs. These different measurements reduce clarity, and thus a clear understanding of the problem (Mark, Hughes, & Jones, 2004).

Mark et al. (2004) suggested organizational industrial psychology may help provide solutions. One theory under investigation is leader-member-exchange (LMX), which can be used to clarify employees' motivational processes that yield voluntary behaviors. The underlying principle is that positive actions performed by managers toward employees will generate desires in the employees to respond with positive reactions. Moreover, organization leaders affirmed that LMX theory applies to areas involving risk management and safety because employees view safety-related conduct as voluntary.

Unfortunately, untoward events are a frequent occurrence in health-related institutions. This study, albeit inconclusive, suggests that more research is required to solve the dilemma of patient falls and their attendant issues on society. Certainly, the need for a universal measurement(s) seems essential.

Healthcare administrators will find this study useful, not only to reinforce their understanding of the safety problem as it currently exists but also as an impetus to expand research toward a more comprehensive understanding of nurse staffing issue. The knowledge that healthcare administrators will gain from this study could assist them to

resolve patient care concerns, enhance employee morale, and decrease the economic problems that accompany adverse patient safety outcomes.

Conclusion

In this chapter, I reviewed the data associated with the relationship between nursing staff and patient outcomes and SNFs as related to resident falls. The findings were inconclusive, as other studies have been in finding a direct correlation with nurse staffing and patient falls; however, the study provided many great ideas to consider. As previous literature suggested, a significant number of inconsistencies impede the investigation into nurse staffing levels, and universal measurements offer a benefit to future studies, and the resolution of problems associated with resident falls at nursing homes and nurse staffing levels. It suggests that we find a common conceptual framework.

In this study, I could not determine if or how nurse staffing levels affected the number of falls in SNF due to the results being statistically insignificant, making it uncertain if nursing staff levels provided a significant impact. However, it was found that during the daytime and evening shifts, some SNFs had more falls than others. The cumulative total showed that some SNFs had more falls than others, and three of the hypotheses were rejected because they rendered no significant associations. The hours per patient (PPD) was connected to the daytime shift having a greater number of falls, which contradicted the expectation of the second hypothesis posed.

The findings from this study will contribute to fill the gap in knowledge about falls and nursing staff in SNF's.The study findings provide implications for social change

in SNFs located in Connecticut. This information may be vital to inform and direct SNF administrators, owners and policymakers to develop and implement policies to support programs that will assist in falls prevention among older adults living in SNFs. In my study, falls occurred more during the day and evening shifts when there were more nursing staff on duty. Therefore, SNF staff can benefit from continuing education on falls and fall-related consequences.

Connecticut policymakers should mandate annual fall educational programs for all SNF employees, and issue continuing education units and certification of completion for attendees, as an incentive to improve their knowledge on falls. This approach could minimize falls and fall-related injuries among SNF residents, thus improve health outcomes of the studied population by decreasing frequent hospitalization due to falls, allowing residents to live a healthy, happy, longer life.

Social change implications in health services from this study, enhance the knowledge that Administrators, Directors of nurses and policymakers use to inform their decisions when creating and implementing policies and programs for falls and fall-related consequences. In addition, study findings, when disseminated, could assist Medicare and Medicaid Services improve SNF staff rating systems.

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Appendix A: National Institutes of Health Training Certification

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **AKudo Okeorji** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 06/28/2016.

Certification Number: 2088867.

Appendix B: Data Access Request (Email)

Dear Mr. Stern:

My name is Akudo Okeorji, a doctoral student in the College of Health Science Department at Walden University. I am also the VP of Clinical Operations for a Healthcare Organization in Hartford. This email is a follow-up to our phone conversation regarding my proposed study of falls among older adults living in skilled nursing. I am formally requesting your permission to gain access to the four SNFs secondary data that includes: data from Minimum Data Set (MDS 3.0), certification and survey providers enhanced reporting (CASPER), Area resource file (ARF), reportable event log, and facility time log for nurse and nurses' aides.

As previously discussed, I will need only the number of falls for each facility and the facility time log to identify hours worked. This secondary data will exclude residents' names and other demographic information. to ensure their confidentiality. Should you require additional information regarding this matter, do not hesitate to contact me. Thank you in advance for considering my request.

Akudo Okeorji

Appendix C: Data Collection Agreement

DATA USE AGREEMENT

This Data Use Agreement ("Agreement"), effective as of 6/17/16, is entered into by and between Akudo Okeorji ("Data Recipient") and Autumn Lake Healthcare Inc ("Data Provider"). The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in scholarship/research **in accord with laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.** In the case of a discrepancy among laws, the agreement shall follow whichever law is more strict.

1. Definitions. Due to the project's affiliation with Laureate, a USA-based company, unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the USA "HIPAA Regulations" and/or "FERPA Regulations" codified in the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.

3. Data Fields in the LDS. **No direct identifiers such as names may be included in the Limited Data Set (LDS).** In preparing the LDS, Data Provider shall include the **data fields specified as follows**, which are the minimum necessary to accomplish the project: Number of fall from Minimum Data Set (MDS 3.0), Enhancement Reporting (CASPER): staffing and falls. Area Resource File (ARF): Quarterly Nurse staffing hours. Reportable event log: Shift that falls occurred. Facility time log: Number of staff that worked and number of hours worked.

4. Responsibilities of Data Recipient. Data Recipient agrees to:

   a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

   b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

   c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

   d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and

   e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

5.Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS **for the present project's activities only.**

6. Term and Termination.

   a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

   b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

   c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

   d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

   e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

7. Miscellaneous.

   a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.

b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

DATA PROVIDER

Signed: [signature]

Print Name: [illegible]

Print Title: [illegible]

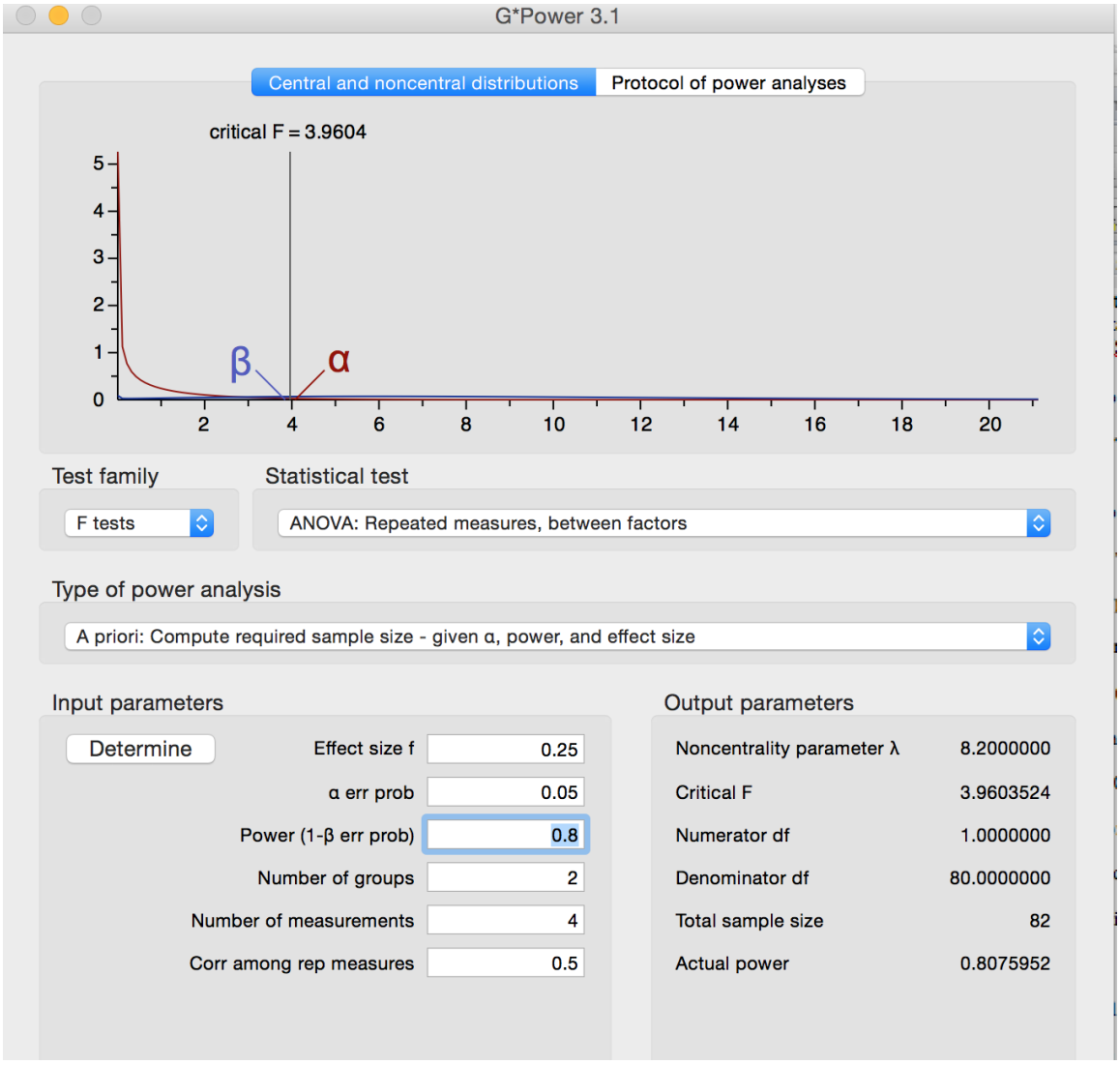
DATA RECIPIENT

Signed: Akudo Okeoji

Print Name: Akudo Okeoji

Print Title: Student.

Appendix D: G*Power Sample Size Computation involving Repeated Measure ANOVA



Appendix E: G*Power Sample Size Computation involving Correlational Analysis