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The Relationship Between Nurse Staffing and Quality Outcomes in Georgia Nursing Homes

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This is to certify that the doctoral dissertation by

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Walden University
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Abstract

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MSN, Walden University, 2012

ASN, Georgia Perimeter College, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The quality of care in United States' nursing homes has been of concern to consumers, government agencies, and researchers for several decades. Nurse staffing has been identified as a key factor influencing the quality of care in nursing homes. The purpose of this quantitative, correlational research was to determine if relationships existed between nurse staffing levels and three quality care outcomes in the state of Georgia. Donabedian's quality conceptual framework guided the study. The framework encompasses three interrelated dimensions of quality including structure, process, and outcomes. Nurse staffing levels and facility bed size represented the structure of nursing homes and pressure ulcers, falls with major injury, and urinary tract infections each represented facility outcomes. The sample included 348 nursing homes in Georgia. Data was collected from the Nursing Home Compare website. The predictor variables in this study were nurse staffing levels of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing levels. The outcome variables were pressure ulcers, urinary tract infections, and falls with major injury. A cross sectional design and multiple regressions were used to analyze the relationship between nurse staffing and quality of care outcomes. While the results of the study did not reveal significant relationships between variables, the study nonetheless offers useful insight on how future studies can be enhanced. These findings have implications for social changes as they may help to inform Georgia policy makers in decisions regarding regulations that mandate minimum nurse staffing standards.

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Dedication

To my grandmother Julia Mae Hayes, while she is no longer with us in the physical form, I know without doubt that her strength is the strength that keeps me going. I love and miss you, Grandma.

Acknowledgments

I've used thousands of words throughout this document to explain my study; it would take thousands more to fully express my gratitude for my committee chair, Dr. Leslie Hussey. She did not forget me and for that I am eternally grateful. Dr. Hussey's concise and quick feedback, along with her dedication to student progression and success provided me with the exact guidance and direction I needed to complete this academic journey. I also would like to acknowledge and express gratitude for my committee member, Dr. Debra Sullivan whose kindness, timeliness, and clear communication also helped me keep moving forward.

Also to my husband, Andre and sons Khigh, Tahj, and Shai I would not have been successful without the love, patience, and support you each provided to me. I'm not sure how many dinners went uncooked because I needed to "do school work", but thank you for not ever complaining and allowing me to take all the time I needed. I will always be convinced that I have the best family ever. Last but not least, to my parents whose unique ways of loving me was everything I needed to strive for greatness.

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Chapter 1: Introduction to the Study

Introduction

Nursing homes are a major component of the United States' growing health care system. The Centers for Disease Control and Prevention (CDC, 2016) reported that during the year 2014 there were an estimated 15,600 nursing homes serving approximately 1.4 million people. The same report showed that between $210.9 billion and $317.1 billion are spent annually on long-term care services. Nursing homes are the second largest sector of long-term care, with residential care communities comprising the largest sector (CDC, 2016).

Consumers, government agencies, and researchers have scrutinized the quality of care provided in nursing homes for several decades (Alexander, 2008; Castle & Ferguson, 2010). Research and quality initiatives aimed at understanding and improving quality of care in nursing homes has been well documented in literature (Lerner, Trinkoff, Storr, Johantgen, Han, & Gartell, 2014; Shin, 2013). In this research, nurse staffing has emerged as a key factor associated with quality care in nursing homes. In order to address concerns related to nurse staffing and care outcomes, the Omnibus Budget Reconciliation Act of 1987 (OBRA) included a Nursing Home Reform Act. The Nursing Home Reform Act (NHRA) marked a turning point in nursing homes as it shifted the focus to care outcomes and resident rights (Wunderlich, Sloan, & Davis, 1996). The NHRA also included minimum nurse staffing levels for nursing homes that receive funds from Medicare and/or Medicaid (Harrington, Schnelle, McGregor, & Simmons, 2016; Zhang & Grabowski, 2004).

The Centers for Medicare and Medicaid Services (CMS) is a federal agency that plays an integral role in the delivery of healthcare in the United States. A division of CMS is dedicated to nursing homes and the establishment and enforcement of nursing home regulations. The agency is also a primary payer for all U.S. nursing homes that are certified for Medicare and/or Medicaid. CMS has mandated the reporting on 15 quality measures for nursing homes, including the percent of long-stay residents with falls resulting in major injury, urinary tract infections (UTIs), self-reported pain, pressure ulcers, loss of bowel and bladder control, catheters inserted and left in bladder, physical restraints, ability to move independently worsened, need for help with activities of daily living increased, too much weight loss, depressive symptoms, received anti-anxiety or hypnotic medications, received anti-psychotic medications, appropriately received influenza vaccines, and appropriately received pneumococcal vaccines. Several of these measures are also considered to be nurse sensitive quality indicators, as they are directly impacted by the quality of nursing care (Mueller & Karon, 2004; Heslop & Lu, 2014). In this study, I examined three of these quality indicators, pressure ulcers, falls with major injury, and UTIs, which are outcomes linked to the quality of care provided by nurses (Heslop & Lu, 2014).

In addition to federal regulations, state-specific departments of health also have a vital role in establishing regulations for nursing homes. Nurse staffing levels are a common state regulation, but they vary by state. Forty-one states have legislation that exceeds the minimum nurse staffing levels outlined in the federal NHRA (Harrington, Schnelle, McGregor, & Simmons, 2016). Although the majority of states exceed the

NHRA requirement, there is wide variability in actual and mandated staffing levels across the U.S. California, Florida, and New Jersey represent a few states that have been the focus of studies examining the relationship between quality of care and nurse staffing in the last 7 years (Harrington, Ross, & Kang, 2015; Hyer et al., 2011; Flynn, Liang, Dickson, & Aiken, 2010; Lee, Blegen, & Harrington, 2014).

In this study, I focused on nursing homes in the state of Georgia. While Georgia is among states that exceed federally mandated nurse staffing levels, the state remains in the lower percentile of staffing. Georgia also ranks low compared to other states in regard to overall quality of care in nursing homes (Families for better care, 2014). After a comprehensive review of the literature, I found no studies on the relationship between nurse staffing and quality care outcomes in Georgia. As state officials engage in decision making and enact legislation related to nurse staffing, it is imperative that decisions are made based on state specific, current, and empirical data. Therefore, state specific research marks an essential contribution to the decision-making processes involved in enacting state specific legislation and regulations.

The nation's population of individuals older than 65 years is rapidly increasing. A 2014 census report estimated that by the year 2025, the number of people older than 65 years will rise by approximately 10 million (Ortman, Velkoff, & Hogan, 2014). While many of these people will remain at home cared for by family caregivers, there is no doubt many others will become residents of nursing homes. The number of people residing in nursing homes by the year 2025 is anticipated to increase by 20% (Mandelbaum, 2016). It is important that research examining the quality of care in the

nation's nursing homes continues. This study may lead to positive social change by adding to the scholarly knowledge related to the quality of care received by current and future residents of nursing homes.

In this chapter, I offer a comprehensive introduction to the background of nursing homes, nurse staffing, and quality care outcomes. I highlight the gap in knowledge that the study addressed, noting its significance. Sections on the problem statement, purpose of the study, research questions, conceptual framework, and research methods follow. I then provide definitions of key concepts, followed by an explanation of critical assumptions that are meaningful to the study. The scope, delimitations, and limitations of the study are outlined, and the chapter concluded with a synopsis of the potential of the study to (a) advance understanding of the relationship of nurse staffing and quality outcomes, (b) inform legislation and regulations, and (c) influence positive social change.

Background

Nursing homes serve as residential communities where residents also receive skilled and non-skilled nursing services. Residents of nursing homes are typically individuals 65 years or older and/or experiencing some type of physical or cognitive disability (Alexander, 2008; Briesacher, Field, Baril, & Gurwitz, 2009). Each of these characteristics renders the nursing home population one of America's most vulnerable (Shivayogi, 2013). Residents often require significant assistance with activities of daily living (ADLs; i.e., bathing, eating, toileting, and dressing). Skilled nursing services include but are not limited to medication administration, urinary catheter care, and tube

feedings (Hughes & Goldie, 2009; Gould, Gaze, Drey, & Cooper, 2017; Mitchell, Mor, & Gozalo, 2016).

Nursing home residents have long been identified as high-risk victims of neglect and deficient care, both of which are considered types of abuse (Johnson, Dobalian, Burkhand, Hedgecock, & Harman, 2004). After an intensive research endeavor, the Institute of Medicine (IOM, 1986) determined that nursing homes residents were at risk for "neglect and abuse leading to premature death, permanent injury, increased disability, and unnecessary fear and suffering" (p. 3). The NHRA was passed as an initial attempt to protect and manage the care of residents. It also established general laws related to nurse staffing and resident rights that are enforced by federal and state agents (Morford, 1988).

An important component of the NHRA directly addresses nurse staffing. The law established the expectation that nursing homes would have sufficient staff necessary to meet the needs of their residents (Harrington et al., 2016). The law requires that each nursing home must have at least one registered nurse (RN) 8 consecutive hours per day for 7 days per week and a licensed nurse, either RN or licensed practical nurse (LPN) for 24 hours per day (Harrington, C. 2010). Moreover, the director of nursing must be a RN working full time. Experts have used words such as vague, ambiguous, and inadequate to describe federal staffing regulations (Harrington et al., 2016; "Consumer Voice," n.d.). The regulation lacks specificity regarding number of hours per resident day required for each level of nurse (RN or LPN) and it does not set a required number of hours per resident day for certified nursing assistants (CNA).

Nursing homes typically employ both professional and non-professional nursing staff. RNs, LPNs, CNAs historically represent nursing home nurse staffing (Bowblis, 2011). The most common nurse staffing structure places RNs in administrative and supervisory roles, LPNs provide the majority of direct nursing care, and CNAs assist with ADLs (Corazzini, et al., 2010). Consumers and researchers have concerns related to the structure of nurse staffing because RNs represent only 14% of total nursing staff in long-term care and normally serve in administrative roles. This places LPNs and CNAs as primary direct care providers, often with little RN guidance (Corazzini et al., 2010). Consumers and researchers also have concerns regarding the levels of nurse staffing, which are commonly measured by the number of nursing hours per resident day (HPRD) (Park & Stearns, 2009).

Another major component of the NHRA was an outline of specific measures for quality of care. To augment quality improvement efforts and to promote public awareness, in 2002 CMS launched the release of the Nursing home Compare (NHC) website (Zhang & Grabowski, 2004; Werner & Konetzka, 2010). CMS publically reports data on quality measures, staffing, and state inspections from every Medicare/Medicaid certified nursing home. These data are available from two online databases, the Certification and Survey Provider Enhanced Reports (CASPER) and the Minimum Data Set 3.0 (MDS).

CASPER provides information related to inspection surveys, deficiencies, and staffing. MDS provides information related to resident outcomes. These data are self-reported and submitted by nursing home personnel to CMS on a quarterly basis. This

information is publicly available and accessible on the NHC. NHC also provides a five-star rating system, in which each nursing home is rated based on quality of care, survey results, and nurse staffing (CMS, 2017). The website enables consumers to make informed decisions when choosing a Medicare/Medicaid certified nursing home. To date the site list 15 quality measures for long-stay residents and nine for short-stay residents.

Incidences such as pressure ulcers, UTIs, and falls are common adverse events that are considered preventable (Shin & Hyun, 2015). These events are also known to contribute to declines in physical function, increased pain, hospitalization, and mortality (Johnson, Dobalian, Burkhand, Hedgecock, & Harman, 2004; McDonald, Wagner, & Castle, 2013). In 2004, approximately 11% (159,000) of nursing home residents had a pressure ulcer (Park-Lee & Caffrey, 2004). UTIs are the second most common infections in nursing homes, with a prevalence ranging from 0.6% to 21.8% (Genao & Buhr, 2012). Falls have been estimated to occur in up to 39% of nursing home residents (Leland, Gozalo, Teno, & Mor, 2012).

Problem Statement

Despite the vast amount of time, effort, research, and initiatives aimed at improving care in nursing homes, serious problems still exist (Collier & Harrington, 2008; Flynn et al., 2010; Werner & Konetzka, 2010). Although there are inconsistencies in research findings, the majority of evidence has shown and experts agree that levels of nurse staffing are a predicator of quality (Collier & Harrington, 2008). Thirty years after the enactment of the NHRA, nurse staffing as it relates to quality care outcomes continue to be the center of much debate. In the absence of staffing requirements that consider

census, acuity, or required CNA HPRD staffing, nursing homes leaders are left to make staffing decisions that may be of determent to their resident population.

Of the 50 states in the U.S, 41 states have established minimum staffing levels that exceed those of the federal government (Harrington et al., 2016; Tilly, Black, Ormond, & Harvell, 2003). Additionally, state-initiated staffing requirements are more specific, and most include minimum hours per resident day for CNAs. States differ in minimum nurse staffing levels and in how staffing levels are described. For example, some states describe staffing levels in HPRD, others by staff-to-resident ratio, still others use both methods (Tilly et al., 2003).

The state of Georgia has a staffing standard for nursing homes, which exceeds federal laws by adding a staff-to-resident ratio of 1:7 for total nursing personnel and 2.0 HPRD for direct care staff (Georgia Secretary of State [SOS], n.d.; Harrington, 2010). While the state did indeed raise staffing requirements, it still ranks low compared to other states that exceed federal standards. For example, neighboring state Florida has exceeded federal standards by adding the requirement that when the director of nursing has other duties, the facility must employ a full time RN as the assistant director of nursing, a 1.0 HPRD for licensed nurses, and 2.9 HPRD for direct care staff (Harrington, 2010).

Families for Better Care (2014) is a non-profit advocacy group that grades the quality of nursing homes at the state level on their website. States are graded based on data collected from the Kaiser Family Foundation (KFF), NHC, and offices of state long-term care ombudsman complaint reports. On this site, Georgia received a grade of F, which places the state among the worst states in which to receive quality nursing home

care. The site also reports Georgia as having one of the biggest declines in quality from the year 2013 when the state was downgraded from a D to the grade of F rating in 2014.

The fact that individual state legislators have the autonomy to establish staffing regulations necessitates state-specific examinations of the relationship between staffing and quality of care (Harrington et al., 2012; Tilly et al., 2003). As noted in the introduction, there is currently a gap in knowledge regarding the relationship of nursing staffing and quality of care in Georgia's nursing homes. This study was be the first to examine the relationship between nurse staffing levels and resident care outcomes in Georgia. The study enhances the existing body of knowledge related to nurse staffing and the quality of care in individual states.

In 2015 there were an estimated 33,000 residents living in Georgia's nursing homes (KFF, 2015). In 2013, Georgia nursing homes were below average when compared to other states in 13 of the 20 areas measured (Agency for Healthcare Research and Quality [AHRQ], 2013). The number of residents with pressure ulcers, falls with major injury, and UTIs were among those measures in which Georgia fell below the national average (AHRQ, 2013). As I previously noted in this subsection, Georgia's nursing staffing levels are also in the lower percentile compared to other states.

Since Georgia is below the national average on the majority of resident outcomes, there is a clear need for improvement in the delivery of quality care in Georgia nursing homes. Research has historically guided decision-making processes in healthcare. The results of this study have the potential to directly inform state and national nurse staffing legislation.

Purpose of the Study

The purpose of this retrospective quantitative study was to examine the relationship between nurse staffing and quality care outcomes in Georgia's nursing homes. I used a cross sectional, correlational design to explore whether relationships exist between independent and dependent variables. Nurse staffing levels were the independent variable and were measured in terms of hours per resident per day for RNs, LPNs, and CNAs. The dependent variables were quality measures and included the percent of residents who developed pressure ulcers and UTIs, and those who experienced falls with major injuries.

Research Questions and Hypotheses

I developed three research questions to guide this study:

RQ1: What is the relationship between occurrence of pressure ulcers and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

$H_0$1: There is no relationship between pressure ulcers and nurse staffing levels in Georgia's nursing homes.

H_a1: There is a relationship between pressure ulcers and nurse staffing levels in Georgia's nursing homes.

RQ2: What is the relationship between occurrence of urinary tract infections and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

$H_0$2: There is no relationship between urinary tract infections and nurse staffing levels in Georgia nursing homes.

H_a2: There is a relationship between urinary tract infections and nurse staffing levels in Georgia nursing homes.

RQ3: What is the relationship between occurrence of falls with major injury and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

$H_0$3: There is no relationship between percent of residents with falls with major injury and nurse staffing levels in Georgia's nursing homes.

H_a3: There is a relationship between percent of residents with falls with major injury and nurse staffing levels in Georgia's nursing homes.

I obtained archived data from the NHC website and used SPSS software to determine whether relationships existed between the independent variables (nurse staffing levels) and the dependent variables (pressure ulcers, UTIs, and falls with major injury). Results of the data analysis are described in chapter 4.

Conceptual Framework

Donabedian's quality model served as the conceptual framework for this study. The model was designed to provide a means for measuring healthcare quality by examining three domains: structure, process, and outcome (SPO). Structure includes both internal and external factors associated with a facility (Dyck, 2007). More specifically, structural characteristics of a healthcare facility include its physical plant, equipment, financial resources, and numbers and qualifications of staff (Donabedian, 1997). The

process domain of quality signifies the actions taken by the organization and/or member of the organization to provide care (Donabedian, 1997). Finally, outcome is related the change in health status of an individual receiving care.

Donabedian (1997) proposed that the SPO approach is appropriate for assessing quality because each domain is linked to the other. Good structure contributes to good process; good process contributes to desirable outcome (Donabedian, 1997). In order to assess quality, the researcher must have a prior understanding of the relationship between SPO and any combination of the three domains. Donbedian (1992) asserted that structure, process, and outcome are not attributes of quality of care; instead, they are kinds of information in which inferences can be made about the quality of care. I used the structure and outcome domains of Donabedian's model to guide this study. Nurse staffing levels represented the structure domain of quality. Pressure ulcers, UTIs, and falls with major injury represented the outcome domain.

Numerous researchers have used Donabedian's model when investigating the relationship between nurse staffing and quality of care in nursing homes. Dyck (2007) used the model to describe factors that contributed to weight loss and dehydration of nursing home residents. Lee, Blegen, and Harrington (2014) used the process and outcome components of the model to describe measures that were used to assess the impact of RN staffing on quality. In Chapter 2, I present a more comprehensive description of how researchers have used the SPO model in similar studies in Chapter 2.

Donabedian's model aligned with my approach to determining if a relationship existed between the structural characteristics of nurse staffing levels and resident

outcomes. My use of Donabedian's model as the conceptual framework in this study was consistent with national approaches to measuring quality of care in nursing home. The American Nurses Association (ANA) uses SPO as it outlines nursing quality indicators (NQI). Nursing HPRD are outlined as structure measures; falls with major injury, pressure ulcers prevalence, and UTIs represent outcome measures (Montalvo, 2007).

Nature of Study

I used a quantitative, retrospective correlation study design to examine the relationship between nurse staffing levels and quality outcomes in Georgia nursing homes. A correlational study was appropriate to investigate the relationship between two or more variables (see Frankfort-Nachmias & Nachmias, 2008). The study results were drawn from an analysis of secondary data from a public database on CMS' NHC website, thus the retrospective design. In this study the independent variables were measures of nurse staffing levels, which include HPRD for RNs, LPNs, CNAs, and total nurse staffing. The dependent variables were measures of quality, specifically the percent of pressure ulcers, UTIs, and falls with major injuries in Georgia nursing homes.

Definition of Terms

I used the following operational definitions in this research. These definitions are consistent with common usage in the area of study.

Falls with major injury: An unintentional and uncontrolled decent resulting in a bone fracture, joint dislocation, closed-head injury with altered consciousness, or subdural hematoma (Abt associates, 2016).

Long-stay residents: A person that live in a nursing home for 101 or greater cumulative days in a nursing home (RTI International [RTI], 2016).

Nurse staffing levels: Hours per resident day of RNs, LPNs, and CNAs (Tilly et. al., 2003).

Nursing home: Residential facilities where residents receive skilled and non-skilled nursing services (Alexander, 2008).

Pressure ulcers: Stages of II-IV wounds caused by unrelieved pressure on the skin (Park-Lee & Caffrey, 2004).

Nursing home resident: A person who lives in and receives services in a nursing home (Alexander, 2008).

Total nurse staffing: The combined total of RNs, LPNs, and CNAs working in a nursing home (Harrington et al., 2016).

Urinary tract infections: An infection of the genitourinary tract, measured when diagnosed within last 30 days (Nicolle, 2000).

Assumptions

Assumptions are "statements taken for granted or considered true, even though they have not been scientifically tested" (Grove, Burns, & Gray, 2013, p. 41). I obtained secondary data from the NHC website for this study. Required CMS data from nursing homes is self-reported and entered into the MDS 3.0 by nursing home personnel. CMS uploads this data to the NHC site on a quarterly basis. Therefore, several critical assumptions were inherent to this research. I assumed that qualified nursing personnel performed resident assessments, that data obtained during resident assessments were

correctly and accurately input into MDS 3.0, and that CMS uploaded nursing home data correctly. A major assumption of the study was that self-reported data are valid measures of the study variables.

CMS is the agency responsible for assuring that information presented on NHC is both reliable and accurate. As such, the agency has incorporated instructions on how data is to be collected and submitted into MDS 3.0. CMS also uses MDS 3.0 to guide nursing home surveys. Although surveyors review data from MDS 3.0, they do not formally check for accuracy (Nursing home compare, n.d.). My assumptions in this study were necessary given the exclusive use of NHC as the source for data collection. CMS and prior research on staffing levels and outcomes in nursing homes use this dataset and accept the data as valid measures of quality outcomes and nurse staffing.

Scope and Delimitations

In this study, I explore relationships between nurse staffing and quality care in Georgia nursing homes. Pressure ulcers, UTIs, and falls with major injury were the outcome measures, which were examined in the study. As noted, these variables are associated with having significant declines in overall resident health and well-being. Furthermore, pressure ulcers, UTIs, and falls are also listed as nurse quality indicators (Montalvo, 2007). I focused solely on outcomes impacting the long-stay resident population in Georgia nursing homes. Long-stay residents are those who have resided in a nursing home for greater than 101 days. Long-stay residents have a tendency to be more dependent on nursing care. A large majority of long-stay residents have some degree of cognitive impairment and are frail and disabled (Stevenson, 2006). Short-stay residents

were excluded from this study. Short-stay residents are usually post-acute care and/or participating in a rehabilitation program (Stevenson, 2006). Therefore, short-stay residents are less likely to depend heavily on nursing care, and their care needs are for shorter durations.

I examined data from 364 Georgia nursing homes represented on the NHC website, which lists nursing homes with greater than 30 Medicare/Medicaid certified beds. I assumed that this sample captured data from all Georgia nursing homes, as no data were found that described the number of nursing homes that were not Medicare/Medicaid certified or those with 30 or less certified beds.

Donbedian's quality model served as the conceptual model I used for this study. Since its introduction, Donbedian's (1988, 1992) model has offered a comprehensive method for evaluating health care quality and has been widely used by many researchers. Other researchers have used the contingency theory of organization to examine different aspects of quality in nursing homes (Castle & Ferguson, 2010). Lawerence and Lorsch's (1967) contingency theory holds that successful organizations are those that meet the needs of their clients while being able and willing to modify work structure in response to external environment changes (Thomas, Hyer, Andel, & Weech-Maldonado, 2010). The Contingency theory was not chosen because it focuses on responses to external environment changes, which was not aligned with the purpose of this study.

A final delimitation to the study was the focus on one state, which restricts the external validity of the study. I selected the state of Georgia because of its relatively low nurse staffing standards and because it falls below national average on multiple quality

care outcomes. Since nurse staffing standards vary from state to state, the study results cannot be accurately generalized to states with vastly different staffing standards. Yet the results have the potential to impact positive social change on a local level, which is where change, begins. The study also holds some significance in states with similar staffing standards.

Limitations

Limitations of a study are those factors that restrict the generalizability of study results. Limitations can be related to the theoretical framework, the methodology, or both. There are significant threats to construct validity, internal validity, and external validity in this study. Construct validity was a concern as the data contained on the NHC website are self-reported and entered by nursing home personnel. MDS 3.0 data may be deliberately or accidently inaccurate (Castle & Ferguson, 2010). Inaccuracies during data input have the potential to impact the internal validity of the study.

Selection can be considered a threat to both internal and external validity. Since I focused exclusively on nursing homes in Georgia, study findings are limited to that state. Similar studies in other states may yield different results. As my intent was to examine nursing homes in the state of Georgia and the sample included all recognized nursing homes in the state, I deemed selection an acceptable threat in the study.

Instrumentation also represents a threat to internal validity and was a limitation in this study. Secondary data from the NHC were analyzed for this study. I uploaded the NHC data from CASPER and MDS 3.0. CASPER provides information regarding a nursing home's annual surveys and staffing data. MDS 3.0 is the assessment tool used by

nursing home personnel. MDS 3.0 data may be deliberately or accidentally inaccurate (Castle & Ferguson, 2010). Inaccuracies during data input had the potential to impact the internal validity of the study.

<div align="center">**Significance**</div>

The quality of care residents receive in nursing homes is closely associated with resident quality of life (Castle & Ferguson, 2010; Shin, 2013). Although improvements in quality of care in nursing homes have been made since the enactment of the NHRA, there is still much work to be done. As the United States moves into an era in which more people will require placement in nursing homes, it is imperative that national and state-specific research continues to guide policies and laws that will improve quality of care in these facilities. The health and wellbeing of the nation's elderly and disabled residing in nursing homes depends on continued efforts to examine quality and improve care (Alexander, 2008; Konetzka, Stearns, & Park, 2008; Lin, 2014).

This study may impact positive social change by providing an expanded level of understanding regarding the relationship between nurse staffing levels and quality of care in nursing homes. Findings from this study may be used in future decisions, policies, and laws related to nurse staffing. Experts have challenged the staffing standards minimums established by the government for several years, arguing that standards are vague and insufficient to meet the needs of residents and require further study (Harrington et al, 2016). This study adds to current literature by providing data on an individual state that exceeds federal minimums. Though the study was limited to a focus on Georgia nursing homes, the local results may have significant impact on positive social change at a local

level. Georgia currently has over 300 Medicaid/Medicare certified nursing homes serving over 30,000 residents (Kaiser Foundation, 2015)

Summary

As the nation's aged population continues to grow, so too will the need for quality nursing home services. Although a great deal of work has been done on federal and state legislative levels, quality care in nursing home continues to be of concern to consumers, government agencies, and researchers (Castle & Ferguson, 2010; Lee et al., 2014; Li, Harrington, Mukamel, & Cai, 2015; Harrington et al., 2016). Though various studies have yielded contradicting results, researchers have consistently found a linked between nurse staffing levels and quality of care. In order to gain more comprehensive understanding of the relationship between nurse staffing levels and quality of care, it is necessary that researchers continue to explore the topic.

My focus in this study was on nursing homes in the state of Georgia. I analyzed the relationship between nurse staffing levels and quality care outcomes. Although Georgia legislators have employed nurse staffing standards that exceed federal standards, the state still ranks low in nurse staffing levels in nursing homes. Georgia also ranks below national averages in multiple quality measures. My aim in this study was to identify and describe a relationship between nurse staffing levels and the quality care outcomes for pressure ulcers, UTIs, and falls in Georgia nursing homes.

In Chapter 2, I discuss my comprehensive review of literature related to nursing home care, quality of care in nursing homes, and nursing home nurse staffing. In the next

chapter, I also discuss the conceptual framework how this study fills a gap in the

literature.

Chapter 2: Literature Review

Introduction

The quality of care for residents living in nursing homes has been of concern for consumers, policy makers, stakeholders, and researchers for several decades (Alexander, 2008; Castle & Ferguson, 2010). The purpose of this quantitative correlational study was to examine the relationship between nurse staffing levels and quality care outcomes in Georgia nursing homes. Although Georgia is among 41 states that have established nurse staffing standards higher than those set forth by the federal government, the state's nurse staffing standards still remain in the lower percentile (KFF, 2015). Nursing homes in Georgia also have a history of being below average in various quality care outcome measures including the three outcomes of focus in this study: pressure ulcers, UTIs, and falls (AHRQ, 2013).

Researchers have characterized the NHRA of 1987 as a turning point in nursing home quality (Wunderlich et al., 1996). While the initiatives in the NHRA did indeed stimulate positive change, concerns with quality of care and nurse staffing levels in nursing homes still exist with consumers and researchers (Werner & Konetzka, 2010; McDonald et al., 2013; Shin, 2013; Levinson, 2014; Harrington et al., 2016). Researchers have explored topics related to the quality of care provided in nursing homes and nurse staffing for many years. Various states have been the focus of studies aimed at exploring the relationship between nurse staffing and quality outcomes. Although the results of such studies have varied, there is a consensus amongst experts and researchers that nurse

staffing is linked to quality of care (Abt Associates, 2001; Harrington et al., 2016). After an exhaustive review of literature, I found no studies focused on Georgia nursing homes.

In this chapter, I reviewed the literature that served as the underpinning for the study. Chapter 2 included the search strategies that I used to gather the literature. The chapter also includes a comprehensive review of the conceptual framework, including how researchers have used it to guide similar studies, and how I used it to guide this study. I then reviewed literature related to key variables in this study and concluded with a summary and an introduction to Chapter 3.

Literature Search Strategy

I used several academic databases to search for peer-reviewed journals, books, and dissertations, including: ProQuest, Medline, CINAHL Plus, Ovid, and PubMed. Google and Google Scholar were also used. I used several combined keywords for this study, including: *nursing homes* and *staffing and quality care outcomes, nursing homes* and *staffing* and *resident care outcomes*, *nursing homes* and *nurse staffing* and *falls*, *nurse homes* and *staffing* and *pressure ulcers, nurse homes* and *staffing* and *urinary tract infections*, *nursing homes* and *nurse staffing* and *staffing standards, Georgia* and *nursing homes* and *quality care outcomes, Georgia* and *nursing homes* and *falls, Georgia* and *nursing homes* and *pressure ulcers*, and *Georgia* and *nursing homes* and *urinary tract infections*.

I searched for literature published between the years 2012 and 2017, which yielded hundreds of articles. Because a number of these publications referred to earlier research on nurse staffing and the outcomes of interest in this study, I completed a hand

search of seminal articles in order to obtain both depth and breadth of research literature related to the study variables. Unsurprisingly, I found no articles specifically examining Georgia nursing homes in regard to staffing, pressure ulcers, UTIs, or falls. All data directly related to Georgia were obtained via government or advocacy group reports in which all states were represented. The articles that I selected for review in this study were those that specifically examined or discussed nursing homes in the United States, matters of nursing staffing, and/or the impact of staffing on the quality of care.

Conceptual Framework

Donabedian's (1988) quality model served as the conceptual framework for this study. The model was designed to provide conceptual guidance to those assessing the quality of care in healthcare organizations. The model is grounded in a systems perspective and encompasses three interrelated dimensions of quality including the three SPO dimensions. Donabedian posed that structural characteristics influence care processes, which in turn influence the outcomes of care (see Figure 1). Donabedian (1992) noted that SPOs are not direct attributes of quality but instead "only kinds of information from which inferences can be made about the quality of care" (Donabedian, 1992, p. 357). Although the wording in the original article detailing the model was more closely aligned with acute care settings, researchers have consistently and extensively used the model to evaluate the quality of care in nursing homes and other healthcare settings (Ayanian & Markel, 2016; Donabedian, 1997).
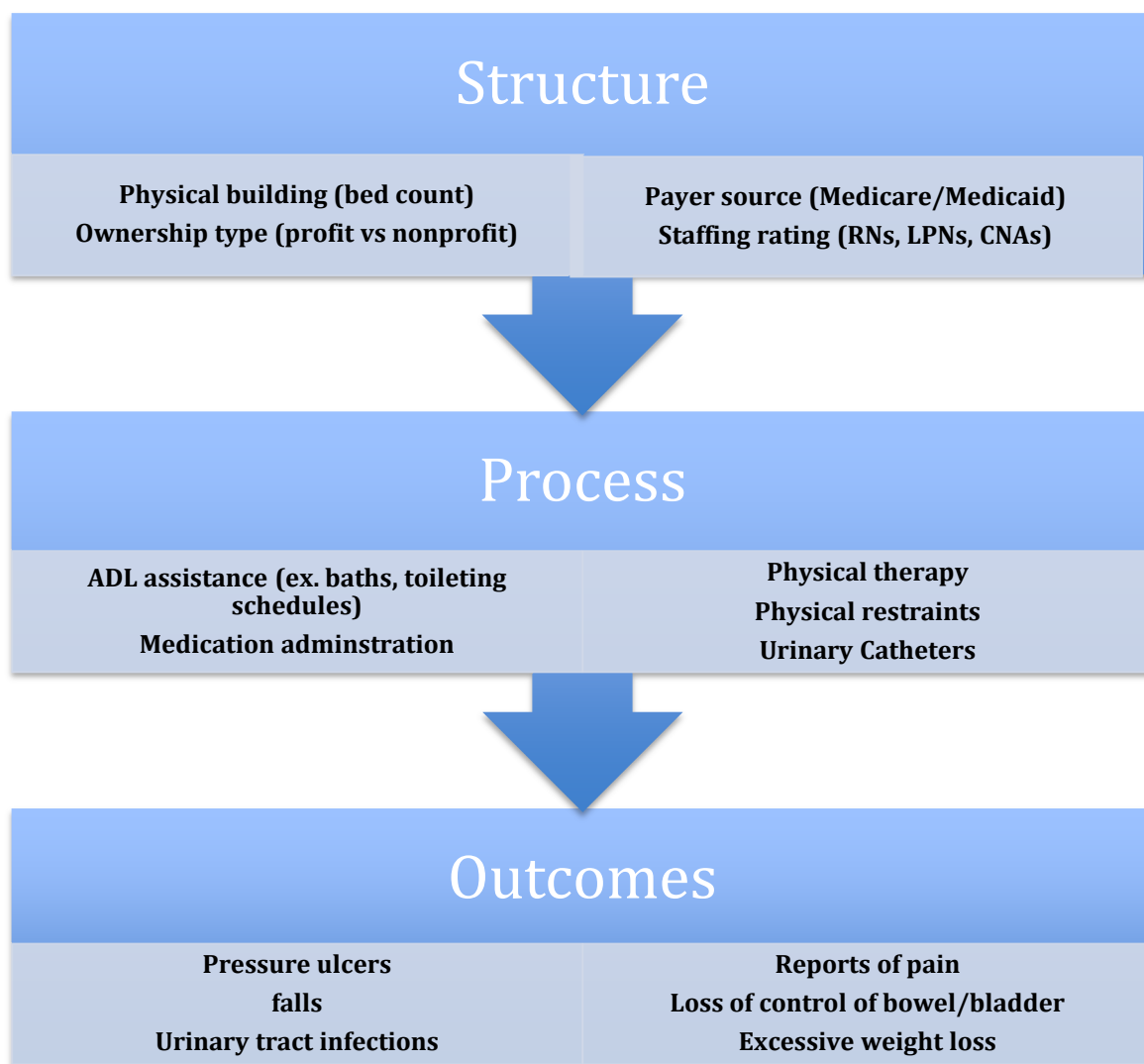
Figure 1. Donabedian's model.

The first component of Donabedian's model, structure, includes both the external

and internal environmental characteristics of a healthcare organization. External

characteristics include the physical plant of a facility and its financial resources. Internal

characteristics include the organization's staff mix, staffing levels, and equipment. The

structural characteristics of nursing homes include their staffing levels (nursing and non-

nursing), number of beds, primary payers (Medicare/Medicaid), ownership type (chain or

non-chain), and business model (profit or not-for-profit; Hakkarainen, Ayoung-Chee, Alfonso, Arbabi, & Flum, 2015).

The second component of Donabedian's model, process, is how an organization and/or its staff deliver health care services. The implementations of policies and/or procedures that are supported by evidence-based practice (EBP) guidelines are part of an organization's processes that guide care. The processes used in an organization can be adjusted as part of quality improvement initiatives when unintended variations in care are prevalent. Examples of processes in a nursing home include care delivery related to ADL assistance, medication administration, and physical therapy (Hakkarainen et al., 2015). Indicators of quality directly linked to the process of a nursing home include the use of physical restraints and urinary catheters, timely vaccine administration, and the percent of residents with bladder/bowel incontinence (Castle & Ferguson, 2010).

The third and final component of the model, outcomes, is the change in a client's health status. An organization's structure and processes influence outcomes. According to Donabedian (1992), outcomes are not to be considered as an assessment of quality of performance, but instead as information about the quality of the structure and process of care. Examples of outcomes most frequently evaluated in nursing homes include percent of residents with pressure ulcers, urinary tract infections, falls, and unintended weight loss (Castle & Ferguson, 2010; Dyck, 2007).

As noted, the SPO model is widely used to assess healthcare quality in a variety of settings. The National Database of Nursing Quality Indicators (NDNQI) outlines 15 indicators of nursing quality and categorizes each using the SPO model (Montalvo,

2007). Of the 15 nursing quality indicators, 5 directly correlate with CMS' nursing home quality measures including nursing hours per patient day (structure), patient falls with injury (process & outcome), pressure ulcer prevalence (process & outcome), restraint alignment prevalence (outcome), and urinary tract infections (outcome).

Similarly to the NDNQI, the data displayed on CMS' NHC website is grounded in the SPO model. CMS reports on each element of the model for every Medicare/Medicaid nursing home in the United States. Accordingly, the majority of researchers examining the quality of care in nursing homes have either directly or indirectly used Donabedian's quality model to describe their study variables (Castle & Ferguson, 2010). Since 2012, six studies examining nursing home quality and nurse staffing explicitly named the SPO model or its elements individually to define and categorize study variables (Backhaus, Verbeek, Rossum, Capezuti, & Hamers, 2014; Dellefield, Castle, McGilton, & Spilsbury, 2015; Dyck, 2014; Kehinde, Amella, Pepper, Mueller, Kelechi, & Edlund, 2012; Lee et al., 2014; Shin & Bae, 2012). In the same time period, six other studies appeared to use the model without distinctly naming the model or its elements (Leland et al., 2012; Lerner, 2013; Lin, 2014; McCloskey, Donovan, Stewart, & Donovan, 2015; McDonald et al., 2013; Zhang, Unruh, & Wan, 2013).

Additionally and most noteworthy, the authors of two seminal reports drew extensively from Donabedian's model (IOM, 1986; Wunderlich et al., 1996). The 1986 IOM report was instrumental in the development of the 1987 NHRA; it provided guidance to the legislators regarding the areas that needed to be addressed. The 1996 IOM report provided an update on the status of staffing and quality of care following the

NHRA. In addition to serving as guidelines for nursing home quality improvement, each of these IOM reports have also been repeatedly referred to in studies on the subject.

Given that the quality of care in nursing homes and nursing quality indicators are based on Donabedian's model, my use of this model as the conceptual framework in this study was well aligned with national approaches to measuring the quality of care in nursing homes.

<div align="center">**Literature Review Related to Key Variables**</div>

Nursing Home Nurse Staffing

Nurse staffing in nursing homes is largely influenced by both federal and state regulations. The NHRA of 1987 set forth staffing standards for all U.S. nursing homes certified for Medicare and/or Medicaid. Subsequently, 41 states have implemented staffing standards that exceed federal standards (Harrington et al., 2016). The nurse staffing in nursing homes is significantly different from nurse staffing in acute care settings where RNs are the majority and provide direct care. RNs working in nursing homes tend to serve in more administrative roles and have minimal direct care contact. Paraprofessionals (CNAs and LPNs) make up the bulk of the nurse staffing in nursing homes and provide the majority of direct care to residents (Dellefield et al., 2015; Dyck, 2014; Lerner, 2013).

The NHRA requires that a RN must be on duty at least 8 hours a day, 7 days per week (Harrington, 2010). As it is stated, the requirement does not address facility size or resident acuity. If individual states do not more specifically address RN staffing in regards to facility size and/or resident acuity, then nursing home administrators are left to

make these decisions (Lin, 2014). Although the education and skills of RNs may have the greatest impact on improving quality of care, they are more costly to employ (Dellefield et al., 2015; Lin, 2014). Experts and researchers have argued that regulations should more specifically mandate RN staffing in nursing homes (Dellefield et al., 2015; Hardin & Burger, 2015; Harrington et al., 2016; Lin, 2014; McDonald et al., 2013).

Registered nurses. In the past 5 years, several researchers have explicitly examined the impact of RN staffing on quality of care in nursing homes. They have found that an increase in RN staffing hours is associated with either fewer deficiency citations or fewer severe deficiencies (Lerner, 2013; McDonald et al., 2013). Contrary to the findings in these most current studies, Backhaus et. al. (2014) found little to no association between increased RN staffing and quality of care in their systematic review of older longitudinal studies. The authors explained that most studies in this area use a cross-sectional methodology, which is more likely to result in positive findings (Backhaus et al., 2014).

Licensed practical nurses. Although LPNs play a key role in the delivery of care in nursing homes, the NHRA does not specify any required staffing hours for LPNs. Instead, the regulation mandates that a licensed nurse must be on duty for the evening and night shifts (*Omnibus budget reconciliation act, 1987*). A licensed nurse is either a RN or LPN. The role of the LPN in nursing homes may vary, but often includes medication administration, skilled nursing services such as urinary catheter insertion and maintenance, and supervision of CNAs (Zhang et al., 2013). Shin and Bae (2012) found that increased staffing hours of LPNs were associated with positive nursing home

outcomes. The findings were inconsistent with those of Mcdonald et al. (2013) who reported that an increase in LPN staffing hours was associated with an increase in facility citations. Facilities that have increased LPN staffing hours may decrease RN staffing hours (Mcdonald et al., 2013). In a study focused on the impact of RNs and CNAs staffing on quality of care, Lin (2014) suggested that due to the LPNs' narrow range of duties in the nursing home, they might not have a significant influence on quality of care.

Certified nursing assistants. Requirements for CNA staffing are also not addressed in the NHRA. Nonetheless, CNAs are considered an integral part of nurse staffing in nursing homes as they provide 80 -90% of direct care to residents (Lin, 2014). Similarly to literature regarding RN and LPN impact on quality of care, inconsistencies exist related to the impact of CNAs on quality of care. Two studies in the past 5 years reported that an increase in CNA staffing hours had no impact on improved outcomes (Lin, 2014; Matsudaira, 2014). Four studies within the same period reported, higher CNA hours were associated with positive outcomes (Harrington et al., 2016; Lerner, 2013; McDonald et al., 2013; Shin & Bae, 2012).

Nursing home nurse staffing is linked to the quality of resident care. The enactment of the 1987 NHRA generated much attention to the linkage through research aimed at examining the relationship between nurse staffing and quality of care. Study results have been largely inconsistent primarily due to methodology, samples, and study variables. However, researchers do agree that continued research in this area is warranted.

Nursing Home Quality Measures

Nursing home quality is a complex matter, influenced and measured by a variety of factors. Each factor impacting the quality of a nursing home can be categorized in the areas of structure, process, or outcome (Wunderlich et al., 1996). Areas directly related to quality of care are categorized as either process or outcomes. Quality of care of nursing homes is measured with the use of the MDS 3.0, a tool used to guide and upload resident assessments. CMS requires an assessment on each long-stay resident within 14 days of admission, whenever a significant change in health status has occurred, and annually (Clauser & Fries, 1992). The assessments are uploaded to CMS' database, where they are calculated and displayed on the NHC website on a quarterly basis.

CMS currently measures and makes available for public view fifteen areas of quality of care specific to long-stay residents, those residing in a nursing home greater than or equal to 101 days. These measures include the percent of residents in a facility with, pressure ulcers (who were at high risk), physical restraints, catheters inserted and left in the bladder, self-reported moderate to severe pain, appropriately administered pneumococcal vaccines, appropriately administered influenza vaccines, urinary tract infections, lose of control of bowels or bladder, increased need for help with activities of daily living, decreased ability to move independently, symptoms of depression, falls resulting in major injury, too much weight lose, antipsychotic medication administration, and antianxiety medication administration. Nursing home data pertaining to quality of care measures are captured via resident assessments (Wunderlich et al., 1996).

Quality of care measures that will be focused upon in this study are pressure ulcers, falls with major injury, and UTIs. Pressure ulcers have long been a major national health concern for providers and residents of nursing homes. Furthermore, injuries resulting from falls may have major impact on a resident's quality of life, and are linked to disability and mortality (Leland et al., 2012). Finally, residents experiencing UTIs have increased episodes of confusion and higher incidence of falls (Leland et al., 2012). Pressure ulcers, falls, and UTIs are each considered largely preventable and have been widely linked to the quality of care within a facility (Kehinde et al., 2012; Konetzka, Park, Ellis, & Abbo, 2013; Leland et al., 2012; Wunderlich et al., 1996).

Pressure ulcers. Pressure ulcers are defined as "localized damage to skin and underlying tissue caused by prolonged pressure, shear and friction or a combination of these" (Bangova, 2013, p. 54). Stages of a pressure ulcer range from stage I to stage IV. Stage I is described as intact skin with nonblanchable redness, stage II is partial thickness loss of skin with a shallow ulcer, stage III is full thickness tissue loss, and stage IV is full thickness tissue loss with exposed bone, tendon, and/or muscle (Taylor, Lillis, & LeMone, 2001). Complications from pressure ulcers vary and can include pain and suffering, decrease in mobility, infection, and death (Sullivan, 2013). Additionally and secondary to pain and suffering pressure ulcers are associated with emotional and psychological trauma, thus also reducing a resident's overall quality of life (Bangova, 2013; Shannon, Brown, & Chakravarthy, 2012).

In addition to the significant negative impact on resident health status, pressure ulcers are also costly. Treatment of a single pressure ulcer can range from $500-&90,000,

the estimated national annual cost of treatment is $11 billion (Shannon et al., 2012;

Sullivan, 2013). Furthermore, there are large costs associated with lawsuits related to

pressure ulcers. Nursing home lawsuits are growing, Shannon et al. (2012) reported

17,000 claims are filed annually related to pressure ulcers. Implementing strategies of

prevention is less costly than treatment (Shannon et al., 2012; Sullivan, 2013).

     Two factors must be present in order for residents to be included in a facilities

percent of residents with pressure ulcers. First the resident must be considered high risk

for pressure ulcer development. Residents at high risk are those who have one or more of

the following: impaired mobility, comatose, malnutrition or is at risk for malnutrition

(Agency for Healthcare Research and Quality [AHRQ], 2015). Secondly, only pressure

ulcer stages II- IV are included in the calculations. There is currently no evidence to

support the inclusion of stage I pressure ulcers in the calculation (AHRQ, 2015).

     Falls with major injury. Falls are one of the most frequently reported resident

accidents in nursing homes. Approximately 75% of nursing home residents experience a

fall at least once per year, twice the number of elderly individuals living in the

community (RTI International [RTI], 2015). Residents experiencing falls are prone to

permanent disability and functional decline, fear of falling, and decrease in quality of life

(Kehinde et al., 2012). Falls are also associated with greater mortality in the elderly

population (Leland et al., 2012). Additionally, major injuries that occur as a result of falls

are costly to treat (Leland et al., 2012).

     Due to the adverse consequences of falls and its association to care deliver, it is

included among the quality measures for nursing homes. The qualifying factor for a

resident fall to be included in a nursing homes' percent of residents with falls measure, is whether the fall resulted in a major injury. Major injury is considered a bone fracture, joint dislocation, closed head injury with altered consciousness or subdural hematoma (RTI, 2015). Falls resulting in no injury, skin tears, lacerations, or superficial bruises are not included in the quality measure.

Urinary tract infections. UTIs are the most common infection among nursing home residents. Though many residents with UTI are asymptomatic, those who do have symptoms tend to have greater morbidity (Nicolle, 2000). Symptoms of UTIs in the elderly population are wide varying and may include, fever, pain, frequent or urgent urination, blood in the urine, increased confusion, and an increase in falls. Residents experiencing UTIs are also at increased risk for sepsis which can lead to death (Saint et al., 2006).

The quality measure, percent of residents with UTIs is related to long-stay residents. Long-stay residents are typically more dependent on nursing staff for ADL assistance, including perineal care. UTIs are currently the only infection that is used as a measure of nursing home quality of care. Therefore, the percent of residents with UTIs is in fact, the primary indicator of how facilities manage infection control (Agency for Healthcare Research and quality [AHRQ], 2015).

Quality Measures and Nurse Staffing

Pressure ulcers and nurse staffing. The association between pressure ulcers and nursing care has been widely studied by various researchers. Pressure ulcers are outcomes that are generally preventable and fundamentally linked to nursing care

(Bangova, 2013; Konetzka et al., 2013; Shannon et al., 2012; Sullivan, 2013). Although the prevention of pressure ulcers is an evolving science, the hallmarks of prevention include; risk assessment, management of incontinence, frequent redistribution of pressure (changing of body position), adequate nutrition, and nurse and resident education (Bangova, 2013; Konetzka et al., 2013). Accordingly and as previously noted, the NDNQI includes pressure ulcer prevalence as an indicator of the quality of nursing care (Montalvo, 2007; Mueller & Karon, 2004).

The linkage between pressure ulcers and nursing care has inspired researchers to study the relationship between pressure ulcer prevalence and HPRD of RNs, LPNs, and/or CNAs. The most consistent finding in recent studies is the association between higher RN staffing hours and decreased pressure ulcers prevalence (Dellefield et al., 2015; Hardin & Burger, 2015; Lee et al., 2014;Lin, 2014). Lee et al. (2014) reported higher RN staffing hours were significantly associated with an 11.3% lower rate of pressure ulcers. More historical studies have also found that higher RN HPRD is associated with lower pressure ulcer prevalence (Bostick, 2004; Castle & Anderson, 2011; Horn, Bergstrom, & Smout, 2005; Konetzka, Stearns, & Park, 2008). Though RNs typically spend less time engaged in direct care of residents, when RN HPRD is increased it is more likely that they will spend more time in direct care (Horn et al., 2005). Increased RN hours allow more time for clinical leadership for LPNs and CNAs (Lin, 2014).

There is little current literature (within the past 5 years) on the direct relationship between pressure ulcer prevalence and CNA HPRD. Researchers that have examined this

relationship have had mixed results. Some researchers found that increased CNA HPRD was associated with a decrease in pressure ulcers (Shin & Bae, 2012; Zhang et al., 2013). Meanwhile other researchers have found that increased CNA hours had no significant impact on overall quality of care, including pressure ulcer prevalence (Lin, 2014; Park & Stearns, 2009).

Falls with major injury and nurse staffing. Like pressure ulcer prevalence, falls with major injury are also listed as indicators of the quality of nursing care. Fall prevention is a multidiscipline responsibility, yet interventions and strategies to prevent falls are often nurse driven. Four key interventions are known to have positive impact on fall prevention; fall-risk assessments, exercise, regular review of medication, and environmental safety (Huntzinger, 2010).

Unlike pressure ulcer prevalence and although fall prevention is linked to nursing care, falls have not been an outcome widely studied as it relates to nurse staffing in nursing homes. A comprehensive review of the literature resulted in only one study in which falls were one of the nursing home quality measures examined. One current study was found that examined the relationship between falls and nurse staffing in acute care settings. However, these studies have produced contradicting findings.

Leland et al. (2012) found that a 1-hour increase in CNA HPRD was significantly associated with a 3% decrease in resident falls but no significant decrease occurred with increased RN or LPN staffing hours. Of all nursing staff, CNAs spend the greatest amount of time with residents, particularly during times when falls are likely to occur. Contrary to Leland's et al. findings, Staggs and Dunton (2013) found that only an

increase in RN staffing hours were associated with a decrease in patient falls. Staggs and Dunton also reported that the impact of RNs on decreasing falls was also specific to the type of inpatient unit. The differences in the results of the two studies are likely due to the significant different in staffing trends between nursing homes and hospitals.

Falls among the elderly living in nursing homes is significantly higher than those who reside in the community. Falls with major injury have grave impacts on the overall health and quality of life for elderly. CMS has implemented methods in which fall rates in nursing homes can be monitored. The incorporation of falls with major injuries as a variable in this study, adds to a body of knowledge that currently lacks extensive research that examines the relationship between falls and nurse staffing.

Urinary tract infections and nurse staffing. UTIs are another outcome in which prevention is linked to nursing care. The rate of UTIs in a healthcare setting is also listed by the NDNQI as a indicator of the quality of nursing care (Montalvo, 2007; Mueller & Karon, 2004). The basic elements of UTI prevention are infection control practices, which include frequent and proper hand washing, proper perineal care, and frequent management of bowel and bladder incontinence (Bergman, Schjott, & Blix, 2011). Though infection control practices apply to all disciplines in a healthcare, nurses spend more time in direct contact with residents. Although they are guided and directed by RNs and LPNs, CNAs are typically primarily responsible for providing perineal care and managing episodes of incontinence.

Research examining the relationship between nurse staffing and UTI prevalence is scant and inconsistent. Researchers have found an increased in RN staffing hours is

associated with a decrease in resident UTIs (Dellefield et al., 2015; Horn et al., 2005; Konetzka et al., 2008). Horn (2005) also found that increased LPN or CNA staffing hours did not have a significant impact on the rate of UTIs. However, CNAs are primarily responsible for care needs associated with UTI prevention, CNA staffing hours may not have as much impact as the having the leadership of a RN to guide and direct these practices. The most current study examining the relationship between nurse staffing and UTIs found that RN staffing was not significantly associated with UTIs. (Lee et al., 2014).

Summary

This goal of this chapter was to provide an exhaustive review of current literature regarding nurse staffing and quality care outcomes in nursing homes. The chapter provides a detailed review of Donabedian's conceptual framework and its use in the study field. The chapter also provide a detailed review of the various study variables including nurse staffing in nursing homes, pressure ulcers, falls with major injury, and UTIs. Additionally a literature review is provided for each quality measure and its relationship to nurse staffing. The chapter concludes with a brief review of the research design. Chapter 3 provides a more explicit explanation of the research design as well as a detailed review of exactly how the study was be conducted using the chosen methodology.

Chapter 3: Research Method

Introduction

The purpose of this quantitative, correlational study was to examine the relationship between nurse staffing levels and quality care outcomes in Georgia nursing homes. In Chapter 3, I described the various components of this study's methodology, design, and data analysis. The first section of the chapter includes a description of the study's research design and rationale. Next, I discussed the methodology, including the population, sampling, and sampling procedures. Details about the instrumentation and the data analysis plan are also included in the methodology section. Following the methodology section, I discuss threats to validity and conclude with a summary of the chapter. I completed the research plan described in this chapter after receiving approval by Walden University's IRB committee, approval number 02-22-18-0190857.

Research Design and Rationale

This study was a retrospective, quantitative correlational study of secondary data. I used the correlational design to explore whether relationships exist between independent and dependent variables. Secondary data are data that have been collected in the past by someone other than the researcher (Grove et al., 2013). In the case of this study, the data were collected by CMS, an agency of the government. The data were state- and nursing-home-specific, but were not specific to individual residents living in a nursing home.

The independent variable for this study was total nurse staffing, which was measured in terms of HPRD for RNs, LPNs, CNAs and total nurse staffing. The

dependent variables were measures of quality, specifically the percent of occurrences of pressure ulcers, falls with major injury, and UTIs. All data are available on the public website, Nursing Home Compare, which was initiated and is maintained by CMS.

The quantitative methodology was appropriate for this study because the data evaluated is numeric (HPRD, percent of residents with pressure ulcers, percent of residents with falls with major injuries, and percent of residents UTIs). The qualitative method is not designed to effectively evaluate numeric data (Creswell, 2013; Leedy & Omrod, 2013) Additionally, since the quantitative design uses quantitative data as inputs, it provides researchers the ability to determine, through the sampling and acquisition of numerous data points, if it is likely that there is a relationship between variables, or if differences between variables is likely to exist in the real world (Frankfort-Nachmias & Nachmias, 2008). Quantitative researchers use statistical tools to evaluate if the numerical relationships between variables are statistically significant (Creswell, 2013; Field, 2013; Leedy & Omrod, 2013).

The cross sectional methodology was appropriate for this study because I examined variables based on naturally occurring events and there was no manipulation of variables or assignment to groups. The research questions addressed the relationship between nurse staffing levels and quality care outcomes. Additionally, quantitative methodology and cross-sectional designs have been used in various other studies examining the relationship between nurse staffing and care outcomes (Harrington et. al., 2016; Hyer et. al., 2011; Lee, Blegen, & Harrington, 2014; Lerner, 2013; Lin, 2014; McDonald, Wagner, & Castle, 2013; Shin 2013; Shin & Hyun, 2015; Zhang, Unruh, &

Wan, 2013). Therefore, there was precedent in the field for my use of both the methodology and the design. The chosen research design for this study was appropriate based on the objectives of the study and the nature of the research questions, which I designed to examine the statistical linear relationships between nurse staffing levels and resident care outcomes in Georgia nursing homes.

The experimental (random groups assignment) and quasi-experimental (non-random groups assignment) designs were not appropriate for this study. First, the research questions did not necessitate the random assignment of nursing homes to a control and experimental groups, as there were no experimental comparisons to be made. Second, since this was a correlational study examining the relationships between variables, the quasi-experimental design was not appropriate either, as a quasi-experimental study is designed to also evaluate differences between groups, but without random assignment to groups like the experimental design.

The NHC database is located on the CMS website and is publicly accessible. Though the website was initially created with the purpose of providing information for consumers, the website has also been widely used for research purposes. The website contains a message that explicitly grants permission for use (see Appendix A).

Methodology

Population

The target population is defined as the subset of the entire population from which the sample is recruited. The target population in this study consisted of the 364 Medicare and/or Medicaid (CMS) certified nursing homes in the state of Georgia. The target

population, study population, and study sample are similar in this study because the

sample included all Medicare/Medicaid certified nursing homes in Georgia, which is

inclusive of the target population.

Sampling and Sampling Procedures

The sample of Georgia nursing homes was obtained from the NHC database

located on the CMS website. Since the study population and sample are the same,

sampling procedures were not necessary. The NHC database is a national database that

contains information for all certified nursing homes, including facility bed capacity,

ownership, nurse staffing, and resident care outcomes. I chose this data sampling

approach for two reasons. First, and most importantly, all of the information is already

obtained from all states and displayed on the website. Second, the frequency of the data

on NHC is mandated by CMS.

Inclusion criteria included Georgia nursing homes that were represented on NHC.

Nursing homes that did not have a population of long-stay residents during the review

period and facilities for which data were missing were exclude.

Power Analysis

Power analyses are conducted to ensure that study results can be inferred with

statistical confidence of 95%. In this study, the target and study population were the same

as the sample population, which ensured an adequate power. A power analysis using

GPower can be used to determine the needed sample size to adequately perform a

correlation analysis (Erdfelder & Buchner, 1996). To calculate the sample size for a

bivariate correlation containing 2, I used a medium effect size (.4), an error probability of

.05, and a statistical power value of .8. These are the standard values that are used for social scientific research (Field, 2013; Leedy & Ormrod, 2013; Tabachnick & Fidell, 2013). Results of the power analysis using GPower indicated that a total of 84 respondents were needed for the study. NHC contains 364 nursing homes, so the minimum sample required was exceeded as all nursing homes with complete data on the key variables were included in the study.

Procedures for Recruitment, Participation, and Data Collection

The CMS' data set located at NursingHomeCompare.com is aggregated into yearly quarters. Sample data were taken across four quarters, starting with the second quarter of 2016 thru the first quarter of 2017. Nursing homes that did not have long-stay residents were excluded from the study analysis. Additionally, I excluded nursing homes that did not have complete data for the variables in question, including nurse staffing levels (HPRD of RNs, LPNs, CNAs, and total nurse staffing) and resident outcomes (i.e., pressure ulcers, falls, and UTIs).

The CMS database is updated regularly from data input into MDS 3.0 and from compliance surveys (CMS, 2017). The web site includes a function to filter the data by state and by data range. I used this function to limit the data to nursing homes located in the state of Georgia and from the second quarter of 2016 through the first quarter of 2017. The data were then be downloaded an Excel workbook. Because the data are available to the public, no permissions or fees were required. The specific steps I used for accessing the data are below.

- Step 1: Go to https://www.medicare.gov/nursinghomecompare/ (Nursing Home Compare).

- Step 2: Scroll to the bottom of the page and click on "downloadable databases."

- Step 3: In the database selection box, choose "nursing home compare," click "continue."

- Step 4: Scroll to the bottom of the page and go to page 2.

- Step 5: To access quality measures, click on "quality measures-long stay."

- Step 6: To access staffing data, click "staffing."

Instrumentation and Operationalization of Constructs

The CMS file is for public use and updated every 9-15 months from state survey results and licensure information on all nursing homes that accept Medicaid or Medicare patients (Kash et al., 2007; Zhang et al., 2010). Nursing home information is displayed on the Nursing Home Compare section of the medicare.com website for all Medicare and Medicaid nursing homes in the United States. The website includes rates for quality measures, Five-Star ratings, survey results, and selected organizational characteristics. The quality measures of interest in this study included percent of total nursing home residents who experienced pressure ulcers, falls and UTIs during the review period. Quality measures represent unwanted outcomes; therefore, lower percentage means better performance. The organizational characteristics that I used in this study were nurse staffing levels, which were measured in terms of HPRD for RNs, LPNs, CNAs, and total nursing staff. The quality measures reported on NHC have been tested extensively and

are derived from the MDS 3.0 assessments (Castle, 2009; Castle & Engberg, 2007, Chipantiza, 2014). In a formal validation, researchers at Abt Associates (2004) concluded the measures were reliable and valid.

Operationalization

In this study, the independent variable included nurse staffing levels which were measured in terms of hours per resident per day for RNs, LPNs, CNAs and total nurse staffing. The time was represented as a percentage of hours per day per nurse type. So, .30 for RN indicated that registered nurses work an average of .30 hours per day per 100 residents, 7 days a week. Percentage hours were provided for RN, LPNs, CNAs and total nursing staff. The dependent variables were measures of quality—specifically, the percent of pressure ulcers, UTI, and falls with major injury. These measures of quality are also measured in percentages, where the percent represent the percentage of residents who have experienced the outcome. For example, .10 for pressure ulcers means that 10% of nursing home residents experienced pressure ulcers during the quarter in question.

Data Analysis Plan

In order to address the research questions, I performed a multiple regression analysis of the study variables. There were three phases in the data analysis process. The first phase was the data preparation phase. The second phase was the preliminary analysis, and the final phase was the primary analysis phase. During data preparation phase, I entered the data into SPSS v23. Next, the data were checked for errors and missing values using the frequencies procedures (see Pallant, 2016). If data were found to be missing or containing errors, I attempted to find the missing data and correct the

errors. When missing values and data errors could not be fixed, then the nursing homes were removed from the analysis. The third step in this phase was to recode the data (see Pallant, 2016). In some cases, the data needed to be reverse coded or recoded into a new variable.

The second data analysis phase was preliminary analysis. The purpose of this phase was to check the reliability of the survey scales. Second, during this phase, I tested the assumptions of statistical tests. Specifically, for the multiple regression analysis, the assumptions were linearity, homoscedasticity, and normality (Field, 2013; Pallant, 2016; Tabachnick & Fidell, 2013). To assess the assumption of linearity, I constructed a scatterplot of the standardized predicted values and the standardized residual. If the results of the scatterplot were not curvilinear, then there was no violation of linearity (Field, 2013; Pallant, 2016; Tabachnick & Fidell, 2013). Additionally, I checked heteroscedasticity using the scatterplot of the standardized predicted values and the standardized residual. If the scatterplot was rectangular in shape, then there was no violation in the assumption of homoscedasticity (Field, 2013; Pallant, 2016; Tabachnick & Fidell, 2013). The test of normality was conducted using the Shapiro-Wilk/Kolmogorov-Smirnov test. If the p value is equal to or greater than .05, then there is no violation in the assumption of normality (Field, 2013; Pallant, 2016; Tabachnick & Fidell, 2013).

The third and final phase of the data analysis process was the primary analysis phase. In this phase, I performed the statistical tests used to answer the research

questions. In this study, I conducted multiple regression analyses to address the three research questions, which were as follows:

RQ1: What is the relationship between occurrence of pressure ulcers and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

RQ2: What is the relationship between occurrence of urinary tract infections and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

RQ3: What is the relationship between occurrence of falls and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

The correlation analyses were conducted, and if the p value was less than .05, the correlation analyses were significant. If the p value was significant, then I examined the correlation coefficient (r) to determine if the relationship was weak, medium, or strong. According to Cohen, correlations coefficients between .1 and .3 are weak (Cohen, 1988). Correlation coefficients between .3 and .5 are medium, and r values of .5 or greater indicate a strong relationship between variables (Cohen, 1988). I performed a total of three correlation analyses to address the three research questions.

Threats to Validity

Validity is the extent to which an instrument measures what it is supposed to measure (Kimberlin & Winterstein, 2008; Leedy & Ormrod, 2011; Neuman, 2011). There were a few threats to validity that related to the secondary data source. The most

significant threat to validity was the use of NHC data. The data are self-reported by nursing home staff. Though some of the information is validated at time of onsite surveys, surveys occur at a minimum of once per year. Therefore, some data may be intentionally or unintentionally incorrect. Staffing data are the best-standardized data source available for all nursing homes that are a part of the Medicare and Medicaid programs (CMS, 2011; Mor, 2007). NHC staffing data include the staffing count 2 weeks prior to the annual certification survey only (Kash, et. al., 2007). This is a short time span and opens the possibility that nursing homes may increase staffing when they believe a survey will take place. This possibility makes the validity and reliability of the NHC staffing data open to question (Kash et al., 2007; Zhang et al., 2011).

Summary

Chapter 3 consisted of a review of the research design, the methodology, and the threats to validity. The purpose of this study was to examine the relationship between nurse staffing levels and resident care outcomes in Georgia nursing homes. The target population was Medicare- or Medicaid-certified skilled nursing facilities in the state of Georgia. The study population included the 364 nursing homes in Georgia between quarter two of 2016 and quarter one of 2017. Chapter 3 also included discussions of my methods of data collection and analysis. I also demonstrated that CMS' NHC website is a validated instrument. Chapter 4 contains the statistical results of the study.

Chapter 4: Statistical Analysis

Introduction

The purpose of this quantitative study was to examine the relationship between nurse staffing and quality care outcomes in Georgia's nursing homes. I used a cross sectional, correlational design to explore whether relationships existed between predictor, control, and outcome variables. Nurse staffing levels were the predictor variable and were measured in terms of HPRD for RNs, LPNs, CNAs and total nursing. The control variable was number of Medicare/Medicaid certified beds at the facility. The outcome variables were quality measures and include the percent of residents who develop pressure ulcers and UTIs, and those who experience falls with major injuries.

This chapter consists of a description of the sample, a summary of the results, and detailed reporting of the results. The detailed results section includes descriptions of the three phases of the data analysis process: the data preparation phase, the preliminary analysis phase, and the primary analysis phase. Finally, this chapter concludes with a summary and an introduction to Chapter 5.

Data Collection

The sample of Georgia nursing homes was obtained from the NHC database located on the CMS website. Since the study population and sample are the same, sampling procedures were not necessary. The NHC database is a national database that contains information for all certified nursing homes, including facility bed capacity, ownership, nurse staffing, and resident care outcomes. I chose this data sampling approach for two reasons. First, and most importantly, all the information is already

obtained from all states and displayed on the website. Second, the frequency of the data on NHC is mandated by CMS (CMS, 2017). Inclusion criteria included Georgia nursing homes that are represented on NHC. I excluded nursing homes that did not have a population of long-stay residents during the review period and facilities for which data were missing.

I followed the data collection plan described in Chapter 3 with the exception of the addition of a confounding variable, the number of beds in a facility. The number of beds is equivalent to the number of residents a nursing home can have during full census. The number of beds may influence how facility administrators determine nurse staffing levels. There is literature supporting the idea that the number or beds in a facility is associated with resident outcomes (Castle et al., 2011; Wagner et al. 2013). Therefore, number of beds was controlled for during the analysis.

After removing nursing homes with missing data there were a total of 348 Georgia nursing homes included in this analysis. The average number of staffing HPRD across all nursing homes for RNs, LPNs, and CNAs, the average number of residents in certified beds across all facilities, and the average percentage of residents who have experienced falls, pressure ulcers, and urinary tract infections is listed in Table 1.

Table 1.

Mean Number of Certified Beds and Mean Percentages of Residents who Have Experienced Falls, Pressure Ulcers, and Urinary Tract Infections

	M	SD
Number of Residents in Certified Beds	111.33	49.91
Four Quarter Average Score Pressure Ulcers	6.69	3.83
Four Quarter Average Score -UTI	4.56	3.22
Four Quarter Average Score - Falls	3.19	1.94

Results

Data Preparation Phase

There are three phases in quantitative data analysis: the data preparation phase, the preliminary analysis phase, and the primary analysis phase. During the data preparation phase, I entered secondary data into SPSS v22 and checked for errors and missing values using the frequencies procedure. There was a total of 364 nursing homes in the data file, of which 16 had missing data. After removing the 16 missing cases, the total sample size was 348.

Preliminary Analysis

During the preliminary analysis phase, I examined the parametric assumptions of the multiple regression. These assumptions include linearity, normality of the standardized residuals, homoscedasticity, and no multicollinearity. Linearity and homoscedasticity were examined using the plot of the standardized predicted values and the standardized residuals. If the plot pattern is not curvilinear, then there is no violation

in the assumption of linearity. If the plot pattern is rectangular in shape, then there is no

violation in the assumption of homoscedasticity. I measured multiple collinearity using

the variable inflation factor (VIF). If the VIF value is less than 10, then there is no

violation in the assumption of multicollinearity. Scatterplots of the standard residuals and

the standardized predicted values were generated for CNAs, LPNs, RNs, and total

nursing staff for falls, pressure ulcers, and urinary tract infections. The results of these

scatterplots revealed that there was no violation of linearity, as none of the plots were

curvilinear, and there was no violation of homoscedasticity, as the plots were relatively

rectangular in shape. See Figures 2 to 13.
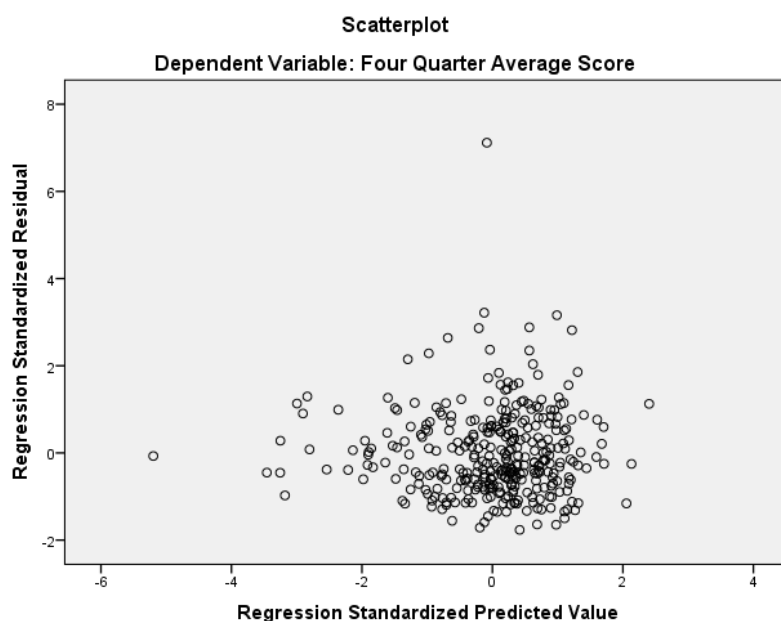
Figure 2. Scatterplot of average number of pressure ulcers regressed on CNA staffing
HPRD
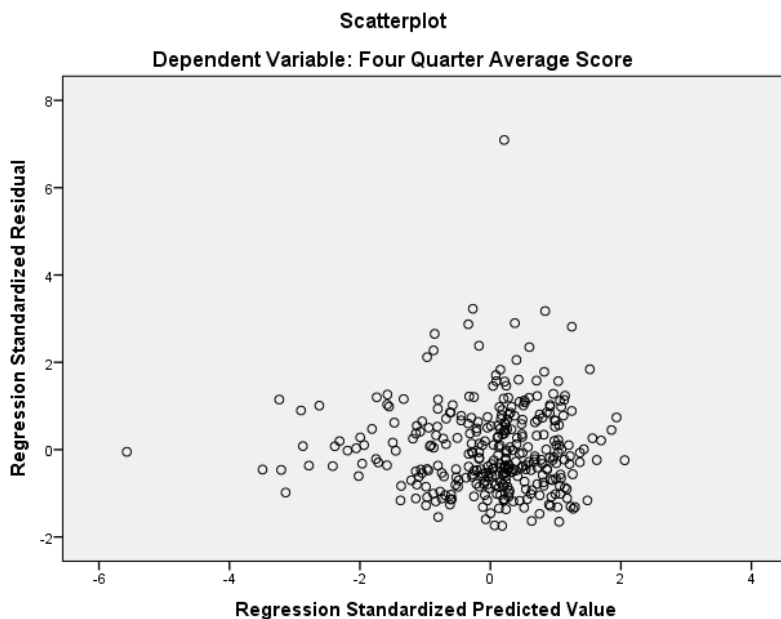
Figure 3. Scatterplot of average number of pressure ulcers regressed on LPN staffing HPRD
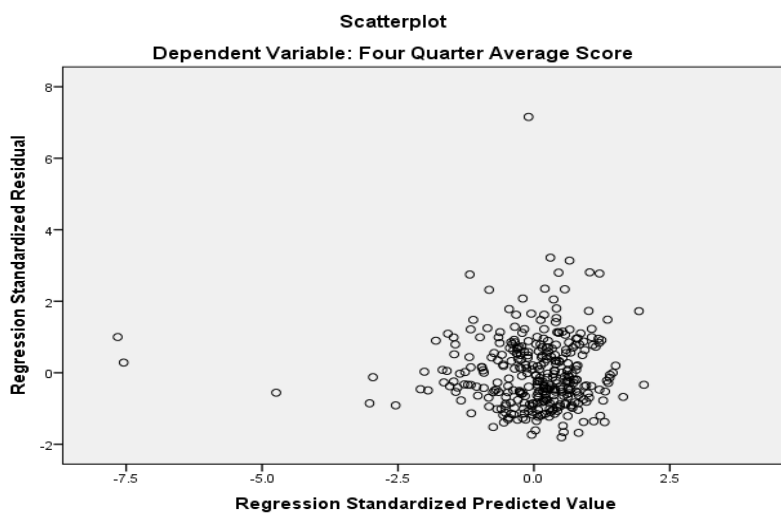
Figure 4. Scatterplot of average number of pressure ulcers regressed on RN staffing HPRD
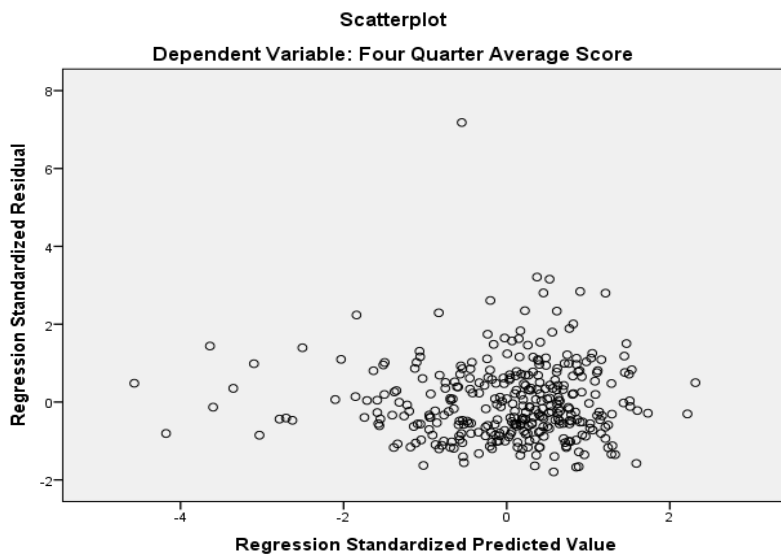
Figure 5. Scatterplot of average number of pressure ulcers regressed on total staffing HPRD
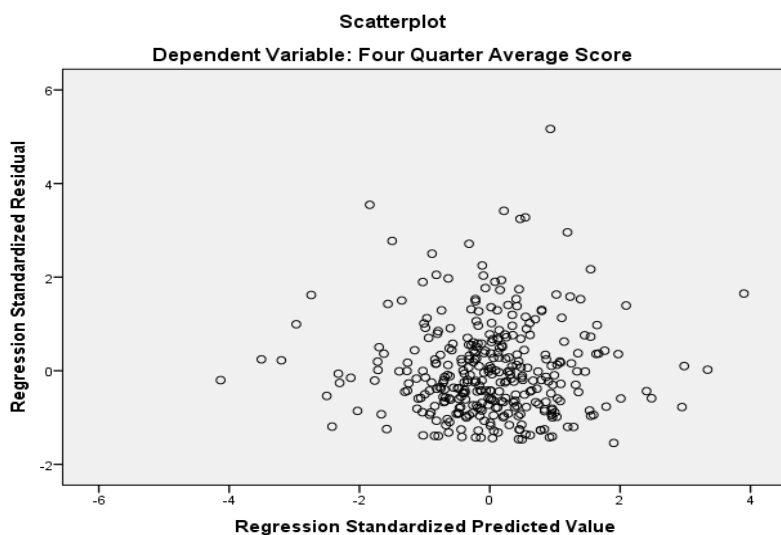
Figure 6. Scatterplot of standardized residuals for average number of urinary tract infections regressed on CNA staffing HPRD
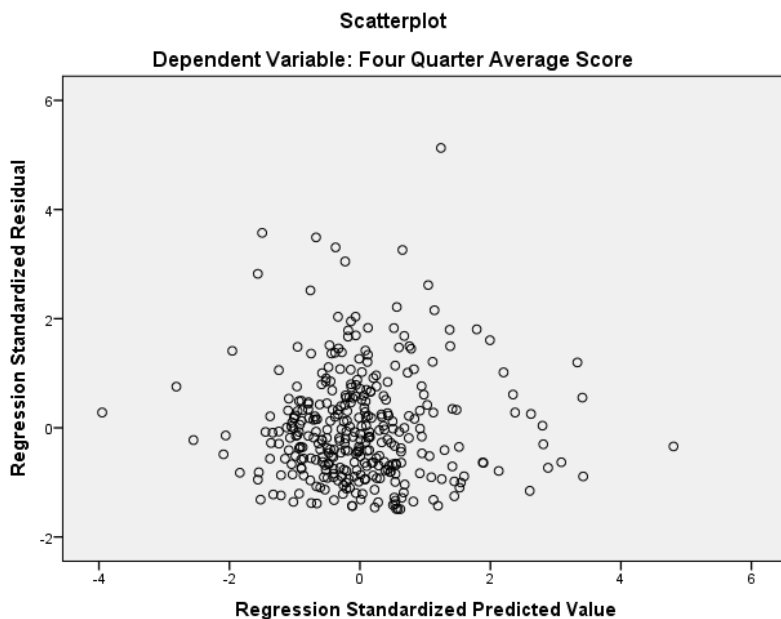
Figure 7. Scatterplot of standardized residuals for average number of urinary tract infections regressed on LPN staffing HPRD
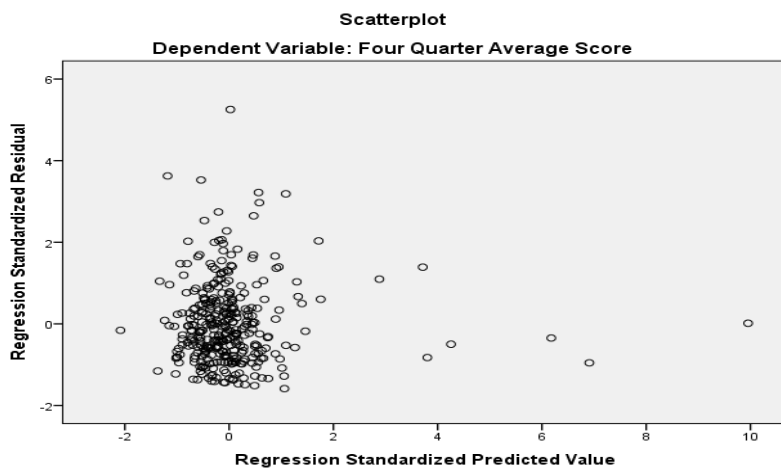
Figure 8. Scatterplot of standardized residuals for average number of urinary tract infections regressed on RN staffing HPRD
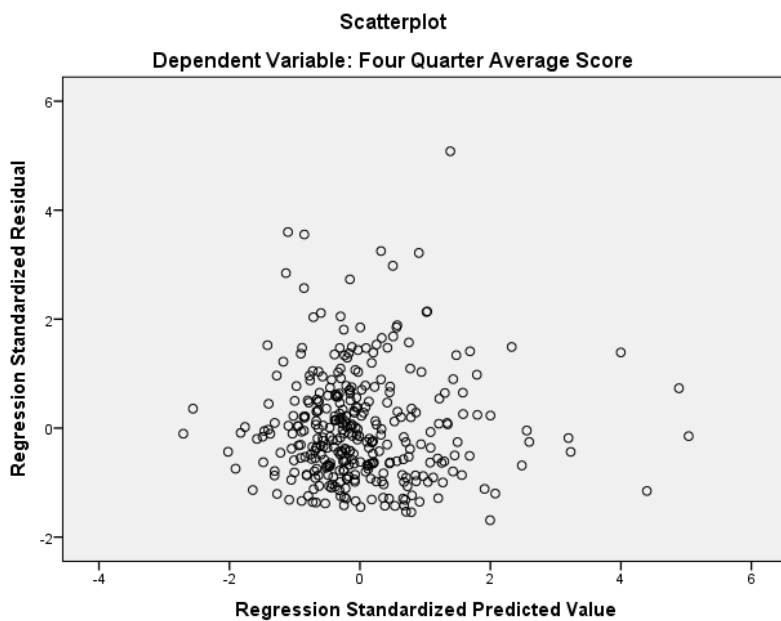
Figure 9. Scatterplot of standardized residuals for average number of urinary tract infections regressed on total staffing HPRD
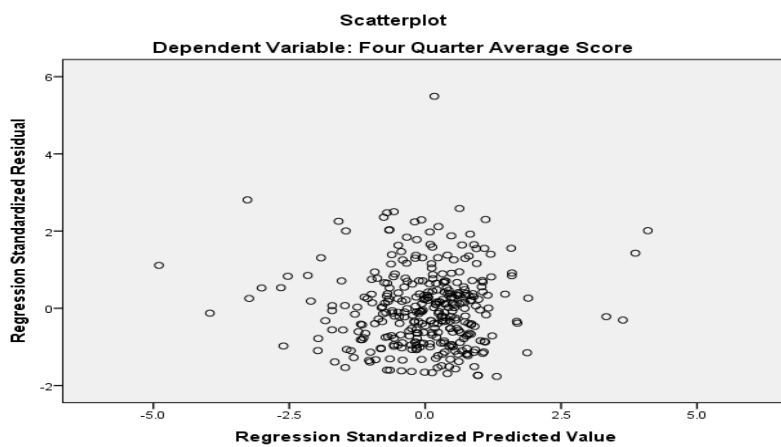
Figure 10. Scatterplot of standardized residuals for average number of falls regressed on CNA staffing HPRD
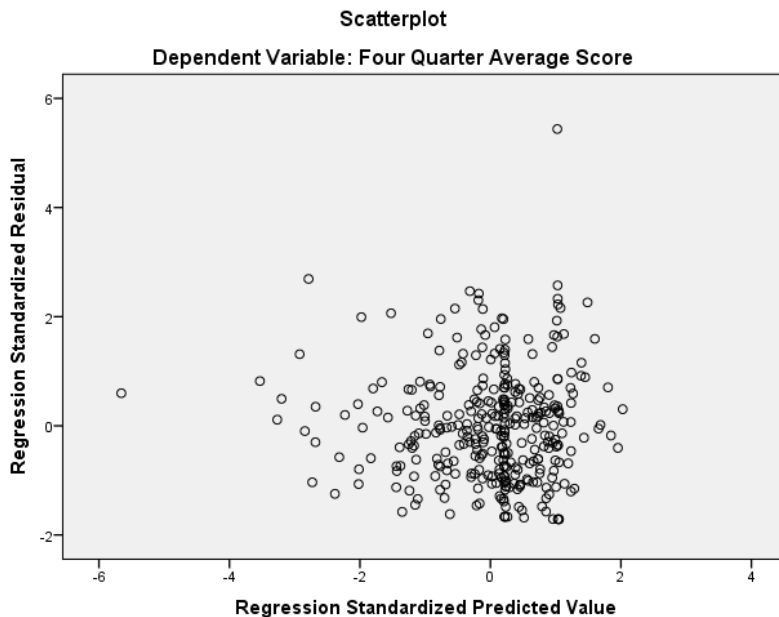
Figure 11. Scatterplot of standardized residuals for average number of falls regressed on LPN staffing HPRD
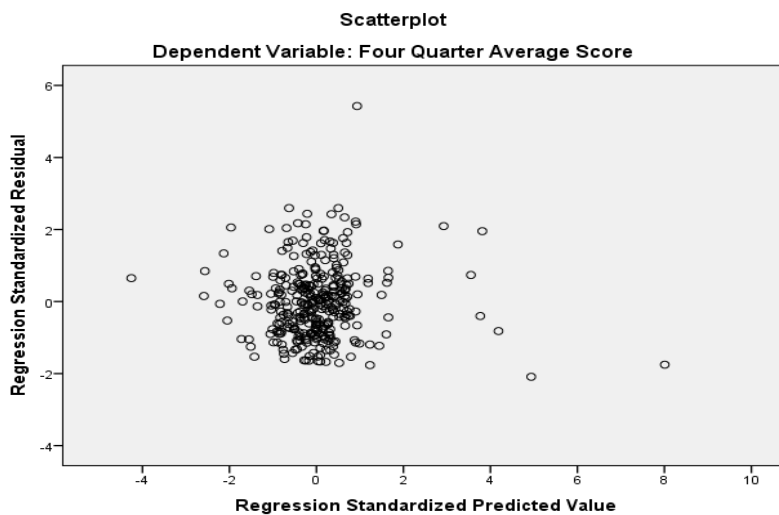
Figure 12. Scatterplot of standardized residuals for average number of falls regressed on RN staffing HPRD
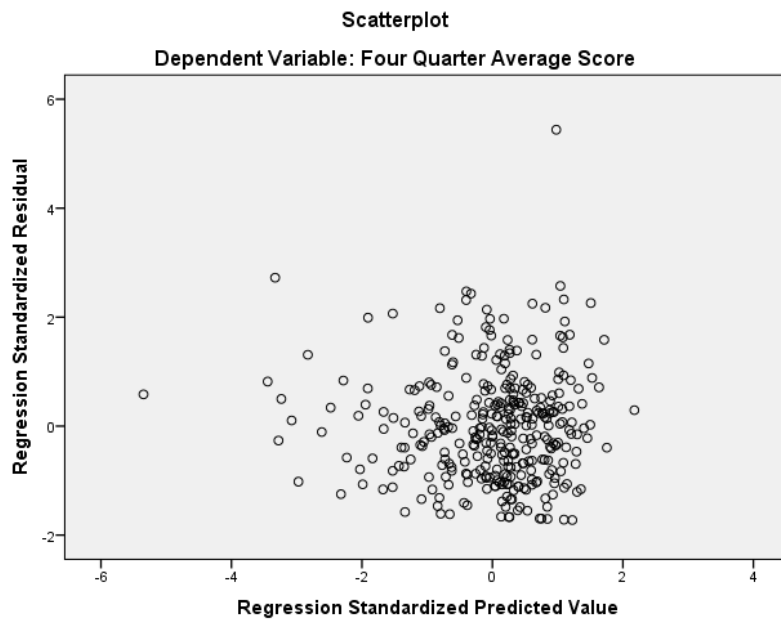
Figure 13. Scatterplot of standardized residuals for average number of falls regressed on Total staffing HPRD

Test of the normality of the standardized residuals for the RN, LPN, CNA, and total nursing staff for falls, urinary tract infections, and pressure ulcers revealed that all of the histograms had relatively normal distributions. See Figures 14 to 25.
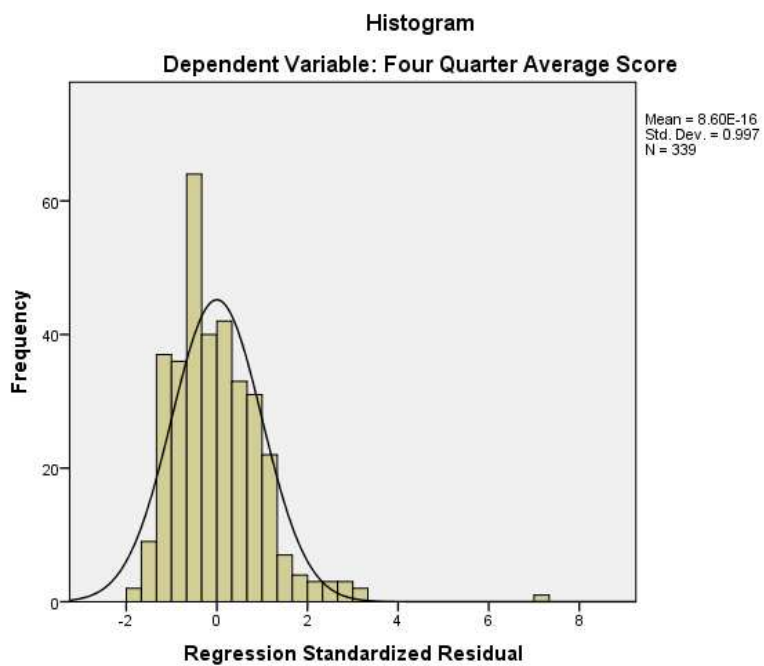
Figure 14. Histogram of standardized residuals for average number of pressure ulcers regressed on CNA staffing HPRD
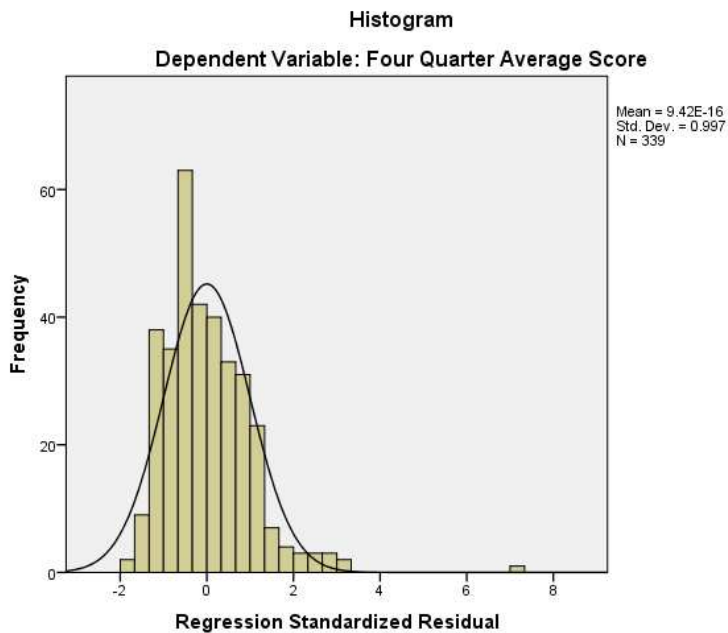
Figure 15. Histogram of standardized residuals for average number of pressure ulcers regressed on LPN staffing HPRD
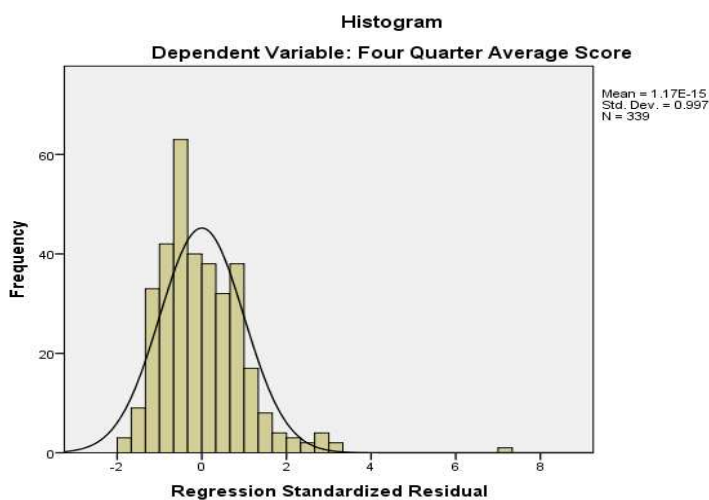
Figure 16. Histogram of standardized residuals for average number of pressure ulcers regressed on RN staffing HPRD
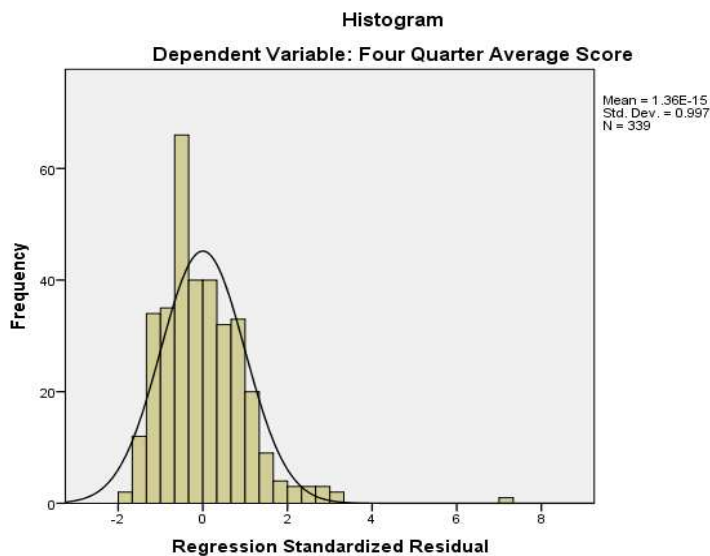
Figure 17. Histogram of standardized residuals for average number of pressure ulcers regressed on Total staffing HPRD
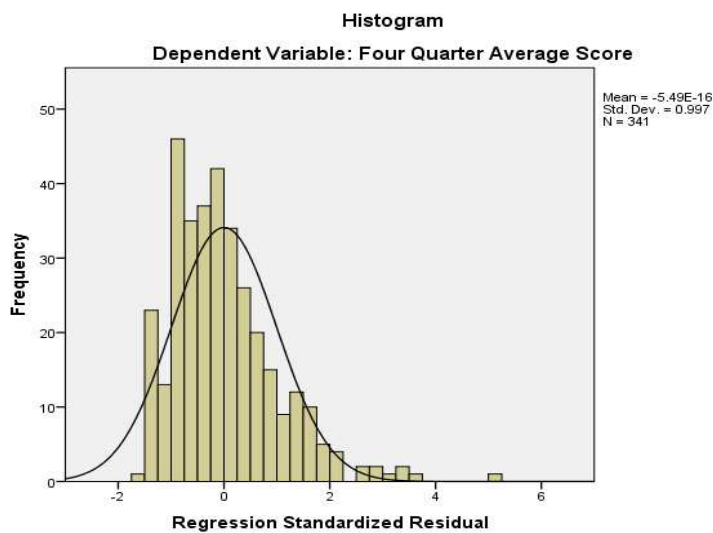
Figure 18. Histogram of standardized residuals for average number of urinary tract infections regressed on CNA staffing HPRD
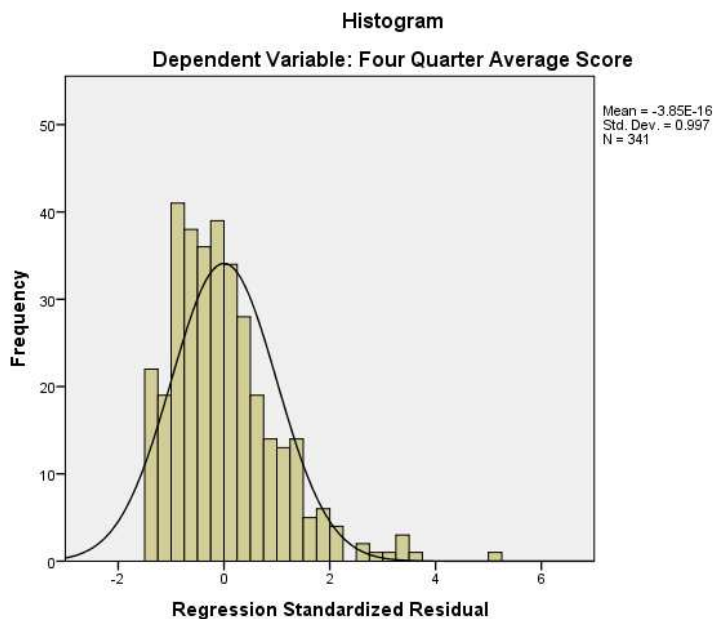
Figure 19. Histogram of standardized residuals for average number of urinary tract infections regressed on LPN staffing HPRD
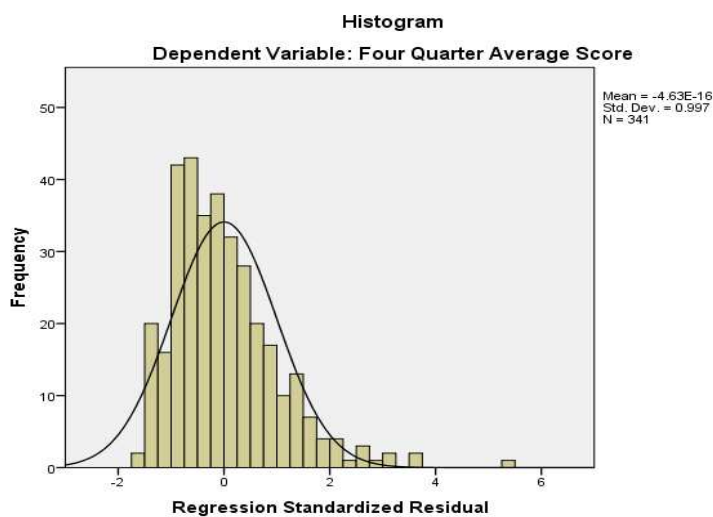
Figure 20. Histogram of standardized residuals for average number of urinary tract infections regressed on RN staffing HPRD
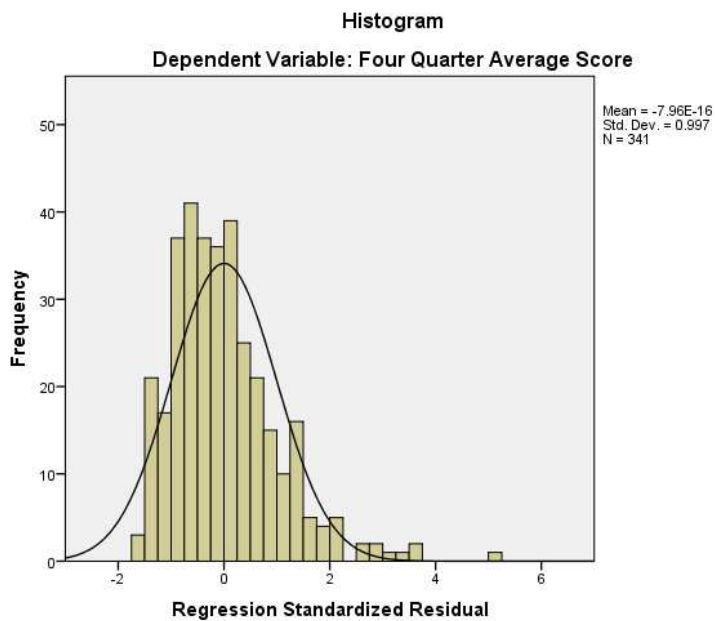
Figure 21. Histogram of standardized residuals for average number of urinary tract infections regressed on Total staffing HPRD
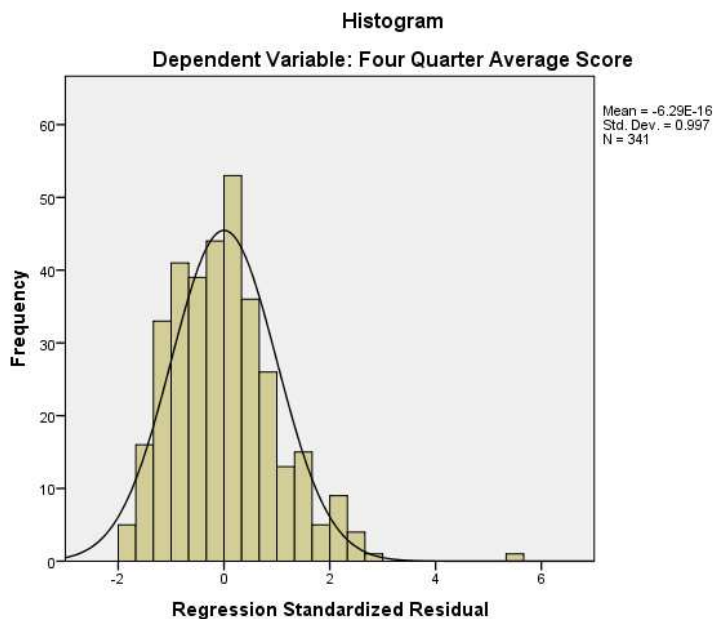
Figure 22. Histogram of standardized residuals for average number of falls regressed on CNA staffing HPRD
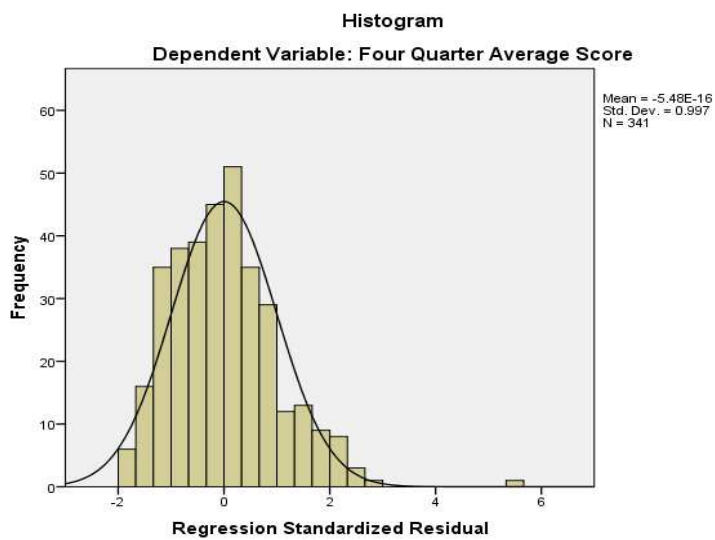
Figure 23. Histogram of standardized residuals for average number of falls regressed on LPN staffing HPRD
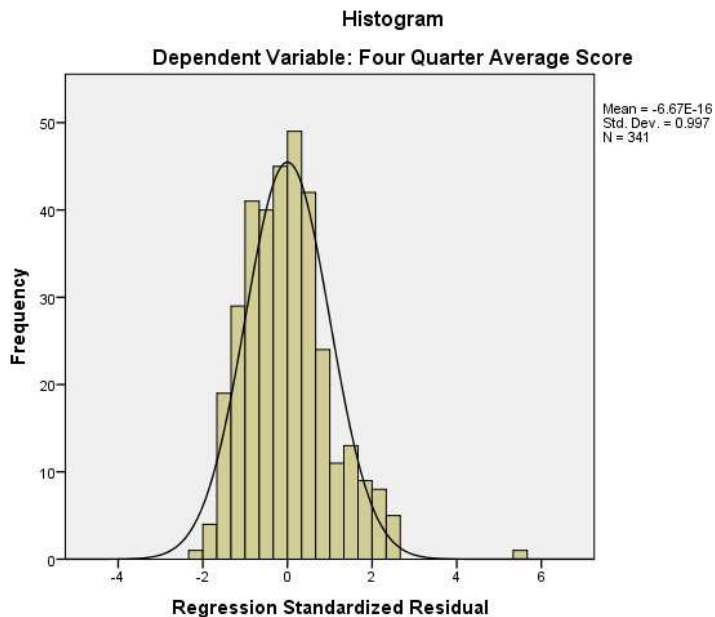
Figure 24. Histogram of standardized residuals for average number of falls regressed on RN staffing HPRD
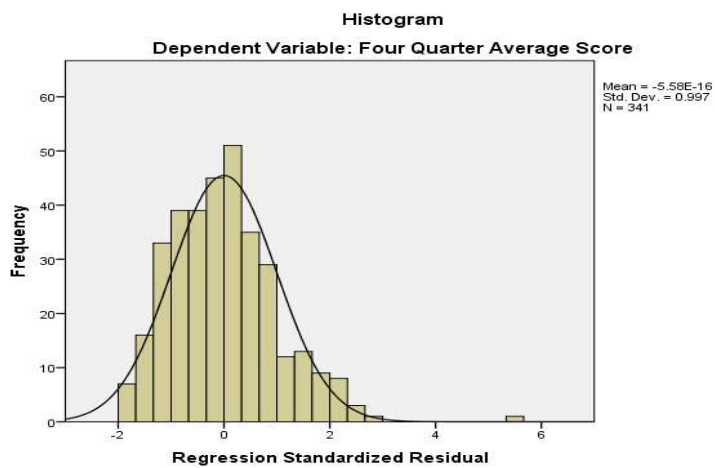
Figure 25. Histogram of standardized residuals for average number of falls regressed on Total staffing HPRD

Primary Analysis

RQ1: What is the relationship between occurrence of pressure ulcers and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

$H_0$1: There is no relationship between pressure ulcers and nurse staffing levels in Georgia nursing homes.

H_a1: There is a relationship between pressure ulcers and nurse staffing levels in Georgia nursing homes.

To address the research question, I conducted four stepwise multiple linear regressions. For the first regression, number of beds was entered first as the control variable, CNA staffing HPRD was entered next as the predictor variable, and the average percentage of residents experiencing pressure ulcers was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 336) = 1.186$, $p = .307$, $R^2 = .007$. Therefore, the null hypothesis was retained.

Table 2.

Model Summary Table – Average Number of Pressure Ulcers

R	R square	Adjusted R square	Std. error of the estimate
.081[a]	.007	.004	3.84102%
.084[b]	.007	.001	3.84598%

Note. Regressed on CNA staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted CNA staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 3.

ANOVA Table – Average Number of Pressure Ulcers was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	df	Mean square	F	p
1	Regression	33.145	1	33.145	2.247	.135[b]
	Residual	4971.907	337	14.753		
	Total	5005.052	338			
2	Regression	35.097	2	17.548	1.186	.307[c]
	Residual	4969.955	336	14.792		
	Total	5005.052	338			

Note. Regressed on CNA staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted CNA staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 4.

Coefficients Table – Average Number of Pressure Ulcers was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta		
Model					t	p
1	(Constant)	7.363	.514		14.314	.000
	Number of Residents in Certified Beds	-.006	.004	-.081	-1.499	.135
2	(Constant)	7.681	1.017		7.550	.000
	Number of Residents in Certified Beds	-.006	.004	-.080	-1.462	.145
	Adjusted CNA Staffing Hours per Resident per Day	-.156	.430	-.020	-.363	.717

Note. [a]Outcome Variable: Four Quarter Average Score

For the second regression for RQ1, I first entered the number of beds as the

control variable, I then entered LPN staffing HPRD as the predictor variable, and the

average percentage of residents experiencing pressure ulcers as the outcome variable.

Results of the regression indicated that the final model, controlling for number of beds,

was not statistically significant, $F(2, 336) = 1.130$, $p = .324$, $R^2 = .007$. Therefore, the null

hypothesis was retained.

Table 4.

Model Summary Table – Average Number of Pressure Ulcers was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.081[a]	.007	.004	3.84102%
2	.082[b]	.007	.001	3.84661%

Note. Regressed on LPN staffing HPRD, controlling for number of beds. [a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 5.

ANOVA Table – Average Number of Pressure Ulcers was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	*df*	Mean square	*F*	*p*
1	Regression	33.145	1	33.145	2.247	.135[b]
	Residual	4971.907	337	14.753		
	Total	5005.052	338			
2	Regression	33.449	2	16.725	1.130	.324[c]
	Residual	4971.603	336	14.796		
	Total	5005.052	338			

Note. Regressed on LPN staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

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Table 6.

Coefficients Table – Average Number of Pressure Ulcers was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

		Unstandardized coefficients		Standardized coefficients		
Model		B	Std. error	Beta	t	p
1	(Constant)	7.363	.514		14.314	.000
	Number of Residents in Certified Beds	-.006	.004	-.081	-1.499	.135
2	(Constant)	7.466	.884		8.442	.000
	Number of Residents in Certified Beds	-.006	.004	-.082	-1.502	.134
	Adjusted LPN Staffing Hours per Resident per Day	-.078	.543	-.008	-.143	.886

Note. [a]Outcome Variable: Four Quarter Average Score

For the third regression for RQ1, number of beds was entered first as the control variable, RN staffing HPRD was entered next as the predictor variable, and the average percentage of residents experiencing pressure ulcers was the control variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 336) = 2.842$, $p = .060$, $R^2 = .017$. Therefore, the null hypothesis was retained.

Table 7.

Model Summary Table – Average Number of Pressure Ulcers was Regressed on RN Staffing HPRD, Controlling for Number of Beds

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.081[a]	.007	.004	3.84102%
2	.129[b]	.017	.011	3.82730%

Note. Regressed on RN staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted RN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 8.

ANOVA Table – Average Number of Pressure Ulcers was Regressed on RN Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	df	Mean square	F	p
1	Regression	33.145	1	33.145	2.247	.135[b]
	Residual	4971.907	337	14.753		
	Total	5005.052	338			
2	Regression	83.247	2	41.623	2.842	.060[c]
	Residual	4921.805	336	14.648		
	Total	5005.052	338			

Note. Regressed on LPN staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 9.

Coefficients Table – Average Number of Pressure Ulcers was Regressed on RN Staffing HPRD, Controlling for Number of Beds

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta	t	p
1	(Constant)	7.363	.514		14.314	.000
	Number of Residents in Certified Beds	-.006	.004	-.081	-1.499	.135
2	(Constant)	8.001	.618		12.950	.000
	Number of Residents in Certified Beds	-.007	.004	-.084	-1.552	.122
	Adjusted RN Staffing Hours per Resident per Day	-1.582	.855	-.100	-1.849	.065

Note. ªOutcome Variable: Four Quarter Average Score

For the fourth and final regression for RQ1, I first entered the number of beds as the control variable, total staffing HPRD was entered next as the predictor variable, and the average percentage of residents experiencing pressure ulcers was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 336) = 1.834$, $p = .161$, $R^2 = .011$. Therefore, the null hypothesis was retained.

Table 10.

Model Summary Table – Average Number of Pressure Ulcers was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.081[a]	.007	.004	3.84102%
2	.104[b]	.011	.005	3.83863%

Note. Regressed on total staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted total staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 11.

ANOVA Table – Average Number of Pressure Ulcers was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	df	Mean square	F	p
1	Regression	33.145	1	33.145	2.247	.135[b]
	Residual	4971.907	337	14.753		
	Total	5005.052	338			
2	Regression	54.057	2	27.028	1.834	.161[c]
	Residual	4950.995	336	14.735		
	Total	5005.052	338			

Note. Regressed on total staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted total staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 12.

Coefficients Table – Average Number of Pressure Ulcers was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model		Unstandardized coefficients B	Std. error	Standardized coefficients Beta	t	p
1	(Constant)	7.363	.514		14.314	.000
	Number of residents in certified beds	-.006	.004	-.081	-1.499	.135
2	(Constant)	8.565	1.133		7.562	.000
	Number of residents in certified beds	-.006	.004	-.080	-1.476	.141
	Adjusted total nurse Staffing hours per resident per day	-.340	.285	-.065	-1.191	.234

Note. [a]Outcome Variable: Four Quarter Average Score

RQ2: What is the relationship between occurrence of urinary tract infections and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

$H_0 2$: There is no relationship between urinary tract infections and nurse staffing levels in Georgia nursing homes.

$H_a 2$: There is a relationship between urinary tract infections and nurse staffing levels in Georgia nursing homes.

To address the research question, four stepwise multiple linear regressions were conducted. For the first regression, number of beds was entered first as the control variable, CNA staffing HPRD was entered next as the predictor variable, and the average percentage of residents experiencing urinary tract infections was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 338) = .527$, $p = .591$, $R^2 = .003$. Therefore, the null hypothesis was retained.

Table 13.

Model Summary Table – Average Number of Urinary Tract Infections was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.031[a]	.001	-.002	3.15019%
2	.056[b]	.003	-.003	3.15146%

Note. Regressed on CNA staffing HPRD, controlling for number of beds. [a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted CNA staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 14.

ANOVA Table – Average Number of Urinary Tract Infections was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	*df*	Mean square	*F*	*p*
1	Regression	3.241	1	3.241	.327	.568[b]
	Residual	3364.130	339	9.924		
	Total	3367.371	340			
2	Regression	10.461	2	5.231	.527	.591[c]
	Residual	3356.910	338	9.932		
	Total	3367.371	340			

Note. Regressed on CNA staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors:
(Constant), number of residents in certified beds, adjusted CNA staffing hours
per resident per day. [c]Outcome variable: Four quarter average score.

Table 15.

Coefficients Table – Average Number of Urinary Tract Infections was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta	t	p
1	(Constant)	4.753	.422		11.267	.000
	Number of Residents in Certified Beds	-.002	.003	-.031	-.571	.568
2	(Constant)	4.141	.832		4.974	.000
	Number of Residents in Certified Beds	-.002	.003	-.035	-.639	.523
	Adjusted CNA Staffing Hours per Resident per Day	.300	.351	.046	.853	.394

Note. [a]Outcome Variable: Four Quarter Average Score

For the second regression for RQ2, I first entered the number of beds as the control variable, LPN staffing hours per resident was entered next as the predictor variable, and the average percentage of residents experiencing urinary tract infections was the outcome variable. Results of the regression indicated that the final model,

controlling for number of beds, was not statistically significant, $F(2, 338) = 1.122$, $p =$

.327, $R^2 = .007$. Therefore, the null hypothesis was not rejected.

Table 16.

Model Table – Average Number of Urinary Tract Infections was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.031[a]	.001	-.002	3.15019%
2	.081[b]	.007	.001	3.14594%

Note. Regressed on LPN staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 17.

Model Summary Table – Average Number of Urinary Tract Infections was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	df	Mean square	F	p
1	Regression	3.241	1	3.241	.327	.568[b]
	Residual	3364.130	339	9.924		
	Total	3367.371	340			
2	Regression	22.201	2	11.100	1.122	.327[c]
	Residual	3345.170	338	9.897		
	Total	3367.371	340			

Note. Regressed on LPN staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 18.

Coefficients Table – Average Number of Urinary Tract Infections was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta	t	p
1	(Constant)	4.753	.422		11.267	.000
	Number of residents in certified beds	-.002	.003	-.031	-.571	.568
2	(Constant)	3.943	.721		5.467	.000
	Number of residents in certified beds	-.002	.003	-.027	-.502	.616
	Adjusted LPN staffing hours per resident per Day	.612	.442	.075	1.384	.167

Note. [a]Outcome Variable: Four Quarter Average Score

For the third regression for RQ2, I first entered the number of beds as the control variable, RN staffing HPRD was entered next as the predictor variable, and the average percentage of residents experiencing urinary tract infections was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 338) = 2.973$, $p = .053$, $R^2 = .017$. Therefore, the null hypothesis was retained.

Table 19.

Model Summary Table – Average Number of Urinary Tract Infections was Regressed on RN Staffing HPRD, Controlling for Number of Beds

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.031[a]	.001	-.002	3.15019%
2	.131[b]	.017	.011	3.12897%

Note. Regressed on RN staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted RN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 20.

ANOVA Table – Average Number of Urinary Tract Infections was Regressed on RN Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	df	Mean square	F	p
1	Regression	3.241	1	3.241	.327	.568[b]
	Residual	3364.130	339	9.924		
	Total	3367.371	340			
2	Regression	58.208	2	29.104	2.973	.053[c]
	Residual	3309.163	338	9.790		
	Total	3367.371	340			

Note. Regressed on RN staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted RN staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 21.

Coefficients Table – Average Number of Urinary Tract Infections was Regressed on RN Staffing HPRD, Controlling for Number of Beds

		Unstandardized coefficients		Standardized coefficients		
Model		B	Std. error	Beta	*t*	*p*
1	(Constant)	4.753	.422		11.267	.000
	Number of residents in certified beds	-.002	.003	-.031	-.571	.568
2	(Constant)	4.085	.505		8.087	.000
	Number of residents in certified beds	-.002	.003	-.028	-.514	.608
	Adjusted RN staffing hours per resident per day	1.657	.699	.128	2.369	.018

Note. [a]Outcome Variable: Four Quarter Average Score

For the fourth regression for RQ2, I first entered the number of beds as the control variable, total staffing hours per resident was entered next as the predictor variable, and the average percentage of residents experiencing urinary tract infections was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 338) = 2.534$, $p = .081$, $R^2 = .015$. Therefore, the null hypothesis retained.

Table 22.

Coefficients Table – Average Number of Urinary Tract Infections was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.031[a]	.001	-.002	3.15019%
2	.122[b]	.015	.009	3.13296%

Note. Regressed on total staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted total staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 23.

ANOVA Table – Average Number of Urinary Tract Infections was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	df	Mean square	F	p
1	Regression	3.241	1	3.241	.327	.568[b]
	Residual	3364.130	339	9.924		
	Total	3367.371	340			
2	Regression	49.747	2	24.873	2.534	.081[c]
	Residual	3317.624	338	9.815		
	Total	3367.371	340			

Note. Regressed on total staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted total staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 24.

Coefficients Table – Average Number of Urinary Tract Infections was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta	*t*	*p*
1	(Constant)	4.753	.422		11.267	.000
	Number of residents in certified beds	-.002	.003	-.031	-.571	.568
2	(Constant)	2.964	.923		3.211	.001
	Number of residents in certified beds	-.002	.003	-.033	-.616	.539
	Adjusted total nurse staffing hours per resident per day	.506	.232	.118	2.177	.030

Note. [a]Outcome Variable: Four Quarter Average Score

RQ3: What is the relationship between occurrence of falls with major injury and nurse staffing levels (hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing) in Georgia nursing homes?

$H_0 3$: There is no relationship between percent of residents with falls with major injury and nurse staffing levels in Georgia's nursing homes.

$H_a 3$: There is a relationship between percent of residents with falls with major injury and nurse staffing levels in Georgia's nursing homes.

To address the research question, four stepwise multiple linear regressions were conducted. For the first regression, number of beds was entered first as the control variable, CNA staffing hours per resident was entered next as the predictor variable, and the average percentage of residents experiencing falls was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 338) = 1.164$, $p = .314$, $R^2 = .007$. Therefore, the null hypothesis was retained.

Table 25.

Model Summary Table – Average Number of Falls was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.057[a]	.003	.000	1.93359%
2	.083[b]	.007	.001	1.93292%

Note. Regressed on CNA staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted CNA staffing hours per resident per day. [c]Outcome variable: Four quarter average score.

Table 26.

ANOVA Table – Average Number of Falls was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	*df*	Mean Square	*F*	*p*
1	Regression	4.083	1	4.083	1.092	.297[b]
	Residual	1267.439	339	3.739		
	Total	1271.522	340			
2	Regression	8.697	2	4.348	1.164	.314[c]
	Residual	1262.825	338	3.736		
	Total	1271.522	340			

Note. Regressed on CNA staffing HPRD, controlling for number of beds.
[a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted CNA staffing hours per resident per day. [c]Outcome variable: Four quarter average score

Table 27.

Coefficients Table – Average Number of Falls was Regressed on CNA Staffing HPRD, Controlling for Number of Beds

		Unstandardized coefficients		Standardized coefficients		
Model		B	Std. error	Beta	t	*p*
1	(Constant)	3.450	.259		13.324	.000
	Number of residents in certified beds	-.002	.002	-.057	-1.045	.297
2	(Constant)	3.939	.511		7.714	.000
	Number of residents in certified beds	-.002	.002	-.052	-.951	.342

Adjusted CNA staffing hours per resident per day	-.239	.215	-.060	-1.111	.267

Note. ªOutcome Variable: Four Quarter Average Score

For the second regression for RQ3, I first entered the number of beds as the control variable, LPN staffing hours per resident was entered next as the predictor variable, and the average percentage of residents experiencing falls was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 338) = .544$, $p = .581$, $R^2 = .003$. Therefore, the null hypothesis was retained.

Table 28.

Model Summary Table – Average Number of Falls was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.057ª	.003	.000	1.93359%
2	.057ᵇ	.003	-.003	1.93644%

Note. Regressed on LPN staffing HPRD, controlling for number of beds.
ªPredictors: (Constant), number of residents in certified beds. ᵇPredictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. ᶜOutcome variable: Four quarter average score

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Table 29.

ANOVA Table – Average Number of Falls was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	df	Mean square	F	p
1	Regression	4.083	1	4.083	1.092	.297[b]
	Residual	1267.439	339	3.739		
	Total	1271.522	340			
2	Regression	4.083	2	2.042	.544	.581[c]
	Residual	1267.438	338	3.750		
	Total	1271.522	340			

Note. Regressed on LPN staffing HPRD, controlling for number of beds. [a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. [c]Outcome variable: Four quarter average score

Table 30.

Coefficients Table – Average Number of Falls was Regressed on LPN Staffing HPRD, Controlling for Number of Beds

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta	t	p
1	(Constant)	3.450	.259		13.324	.000
	Number of Residents in certified beds	-.002	.002	-.057	-1.045	.297
2	(Constant)	3.444	.444		7.759	.000
	Number of residents in certified beds	-.002	.002	-.057	-1.041	.298

Adjusted LPN staffing hours per resident per day	.004	.272	.001	.016	.987

Note. [a]Outcome Variable: Four Quarter Average Score

For the third regression for RQ3, I first entered the number of beds as the control variable, RN staffing hours per resident was entered next as the predictor variable, and the average percentage of residents experiencing falls was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 338) = 1.298$, $p = .275$, $R^2 = .008$. Therefore, the null hypothesis was retained.

Table 31.

Model Summary Table – Average Number of Falls was Regressed on RN Staffing HPRD, Controlling for Number of Beds

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.057[a]	.003	.000	1.93359%
2	.087[b]	.008	.002	1.93216%

Note. Regressed on RN staffing HPRD, controlling for number of beds. [a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted RN staffing hours per resident per day. [c]Outcome variable: Four quarter average score

Table 32.

ANOVA Table – Average Number of Falls was Regressed on RN Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	*df*	Mean square	*F*	*p*
1	Regression	4.083	1	4.083	1.092	.297[b]
	Residual	1267.439	339	3.739		
	Total	1271.522	340			
2	Regression	9.689	2	4.845	1.298	.275[c]
	Residual	1261.833	338	3.733		
	Total	1271.522	340			

Note. Regressed on RN staffing HPRD, controlling for number of beds. [a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted RN staffing hours per resident per day. [c]Outcome variable: Four quarter average score

Table 33.

Coefficients Table – Average Number of Falls was Regressed on RN Staffing HPRD, Controlling for Number of Beds

		Unstandardized coefficients		Standardized coefficients		
Model		B	Std. error	Beta	*t*	*p*
1	(Constant)	3.450	.259		13.324	.000
	Number of residents in certified beds	-.002	.002	-.057	-1.045	.297
2	(Constant)	3.236	.312		10.377	.000
	Number of residents in certified beds	-.002	.002	-.055	-1.014	.311

| Adjusted RN staffing hours per resident per day | .529 | .432 | .066 | 1.225 | .221 |

Note. ᵃOutcome Variable: Four Quarter Average Score

The final regression for RQ3, I first entered the number of beds as the control variable, total staffing hours per resident was entered next as the predictor variable, and the average percentage of residents experiencing falls was the outcome variable. Results of the regression indicated that the final model, controlling for number of beds, was not statistically significant, $F(2, 338) = .560$, $p = .571$, $R^2 = .003$. Therefore, the null hypothesis was retained.

Table 34.

Model Summary Table – Average Number of Falls was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.057ᵃ	.003	.000	1.93359%
2	.057ᵇ	.003	-.003	1.93635%

Note. Regressed on total staffing HPRD, controlling for number of beds.
ᵃPredictors: (Constant), number of residents in certified beds. ᵇPredictors: (Constant), number of residents in certified beds, adjusted total staffing hours per resident per day. ᶜOutcome variable: Four quarter average score

Table 35.

ANOVA Table – Average Number of Falls was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model		Sum of squares	*df*	Mean square	*F*	*p*
1	Regression	4.083	1	4.083	1.092	.297[b]
	Residual	1267.439	339	3.739		
	Total	1271.522	340			
2	Regression	4.203	2	2.101	.560	.571[c]
	Residual	1267.319	338	3.749		
	Total	1271.522	340			

Note. Regressed on LPN staffing HPRD, controlling for number of beds. [a]Predictors: (Constant), number of residents in certified beds. [b]Predictors: (Constant), number of residents in certified beds, adjusted LPN staffing hours per resident per day. [c]Outcome variable: Four quarter average score

Table 37.

Coefficients Table – Average Number of Falls was Regressed on Total Staffing HPRD, Controlling for Number of Beds

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. Error	Beta	*t*	*p*
1	(Constant)	3.450	.259		13.324	.000
	Number of residents in certified beds	-.002	.002	-.057	-1.045	.297
2	(Constant)	3.541	.570		6.207	.000
	Number of residents in certified beds	-.002	.002	-.056	-1.040	.299
	Adjusted total nurse staffing hours per resident per day	-.026	.144	-.010	-.179	.858

Note. [a]Outcome Variable: Four Quarter Average Score

Summary

There was a total of 348 Georgia nursing homes that were included in this analysis. There were three research questions addresses in this study. Research question one asked, what is the relationship between occurrence of pressure ulcers and nurse staffing levels, as measured by hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing, after controlling for number of beds, in Georgia nursing homes. The results indicated that there was no significant relationship between the staffing hours of CNAs, LPN, RNs, or Total nurses

and the percentage of residents experiencing pressure ulcers. Therefore, the null hypothesis for research question one was retained.

Research question two asked, what is the relationship between occurrence of urinary tract infections and nurse staffing levels, as measured by hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing, after controlling for number of beds, in Georgia nursing homes. The results indicated that there was no significant relationship between the staffing hours of CNAs, LPN, RNs, or Total nurses and the percentage of residents experiencing urinary tract infections. Therefore, the null hypothesis was retained.

Research question three asked, what is the relationship between occurrence of falls and nurse staffing levels, as measured by hours per resident per day of registered nurses, licensed practical nurses, certified nursing assistants, and total nurse staffing, after controlling for number of beds, in Georgia nursing homes. The results indicated that there was no significant relationship between the staffing hours of CNAs, LPN, RNs, or Total nurses and the percentage of residents experiencing falls. Therefore, the null hypothesis was retained.

Chapter 5 is a summary of this study. It will include the interpretation of the findings discussed in chapter 4, the limitations of the study and recommendations for future research in this area. Chapter 5 will also include the implications of the study and a final conclusion.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this quantitative study was to examine the relationship between nurse staffing and quality care outcomes in Georgia nursing homes. I used a cross sectional, correlational design to examine whether relationships existed between predictor and outcome variables. The predictor variables were nurse staffing levels as measured by the HPRD of RNs, LPNs, CNAs, and total nursing staffing. The outcome variables were quality measures and included the percent of residents with pressure ulcers, UTIs, and falls with major injury. Additionally, a control variable, number of beds in a facility, was included in the study.

I conducted this study to add to the current scholarly knowledge regarding the relationship between nurse staffing and quality of care in United States' nursing homes. The quality of care received by nursing home residents has been of concern to consumers, government agencies, and researchers for many decades (Alexander, 2008: Castle & Ferguson, 2010; Spilsbury, Hewitt, Stirk, & Bowman, 2011). Numerous researchers have conducted studies in various states aimed at understanding and improving the quality of care in nursing homes. While results have been inconsistent, each study lends to the overall understanding of the challenges and possible solutions to improved quality of care. This study focused solely on nursing homes in the state of Georgia. Georgia has not been the focus of any studies examining the relationship between nurse staffing and quality of care. Georgia nursing homes also fall below average in nurse staffing standards and quality of care measures (AHRQ, 2013).

The key findings of this study, as detailed in Chapter 4, indicated that there are no statistically significant relationships between nursing staffing levels and the quality care outcomes represented in the study. In this chapter, I offer an interpretation of the findings and discuss the study's limitations. Chapter 5 also includes recommendations for future studies with similar goals and the implications of this study for positive social change.

Interpretation of Findings

Current literature related to the relationship between nursing staffing and quality of care in nursing homes is largely inconsistent. The results of my study confirm findings in several studies, while disconfirming findings in others. An overview of the correlations and differences between the findings in my study and others are presented in the following sections.

Pressure Ulcers and Nurse Staffing

The findings of my study revealed there was no statistically significant relationship between nurse staffing (RNs, LPNs, CNAs, and total nurse staffing) and the occurrence of pressure ulcers in Georgia nursing homes. This finding does not support the findings of Lee et al. (2014) that higher RN staffing HPRD were significantly associated with lower rates of pressure ulcers. Zhang et al. (2013) reported that an increase in CNA HPRD was associated with a deceased rate of pressure ulcers, which were not supported by the results of my study. Lin (2014) found that increased CNA HPRD had no significant association with the occurrence of pressure ulcers, which is supported by the results in my study.

Falls with Major Injury and Nurse Staffing

The findings of my study showed no significant relationships between falls with major injury and nurse staffing levels. Current literature regarding the relationship between falls and nursing staffing has mainly been focused on acute care settings. Although there are few recent studies examining the relationship between falls and nursing staff in nursing homes, the findings of my study do not support the results from studies conducted in acute care settings. Leland et al. (2012) found that an increase in CNA HPRD was significantly associated with a decrease in falls, while Staggs and Dunton (2013) found that an increase in RN HPRD was associated with a decrease in falls. In accordance with my findings, Leland et al. (2012) also found that there was no significant association between increased RN or LPN HPRD and falls.

Urinary Tract Infections and Nurse Staffing

My results show that there was no statistically significant relationship between nurse staffing and UTIs, which did not support results by Dellefield et al. (2015) who found that an increase in RN staffing HPRD was associated with a decrease in resident UTIs. Lee et al. (2014), however, found that RN staffing was not associated with UTIs, which concurred with the results of my study and those presented by Horn et al. (2005).

Donabedian's Quality Model

Donabedian's (1988) quality model was the conceptual framework that guided my study. The model encompasses three interrelated dimensions of quality including structure, process, and outcome. I examined two parts of the model: nurse staffing levels and facility bed size, which represented the structure of the nursing homes. Pressure

ulcers, falls with major injury, and UTIs each represented facility outcomes. Donabedian argued that each dimension of the model ultimately influences the other. The results of my study did not support Donabedian's model since the elements of structure represented in the study were not found to be associated with the outcomes.

Limitations of the Study

There were two primary limitations of my study. First, the research design itself presented limitations. A cross-sectional design was used which limits the data collection to one point in time. I examined data from the second quarter of 2016 and the first quarter of 2017. Therefore, the results of my study cannot be generalized for any time period outside of these dates. Further, the results are not generalizable to other populations of nursing homes in the United States.

The second limitation of my study was the use secondary data. The data obtained for the research were collected and maintained via electronic software by CMS. Nursing home staff upload the data that are eventually made accessible to the public on the NHC website. Although each nursing home routinely has onsite surveys where much of the data on NHC can be verified, there is not currently a system in place to consistently monitor the accuracy of data (Nursing Home Compare website, n.d.). Therefore, it is impossible to know if the data is indeed an accurate representation of nursing home status.

Though not a study limitation, there was an inconsistency with one of the key terms in the study. In 2016, the National Pressure Ulcer Advisory Panel, modified the

term pressure ulcer to pressure injury. The panel also redefined the definition. The current definition of pressure injury as defined by the panel is as follows:

> A pressure injury is localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other devices. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue." (The National Pressure Ulcer Advisory Panel, 2016, para. 3).

The term and definition used throughout this study was consistent with the literature and the data source.

Recommendations

My study results show that there were no relationships between the predictor variables, nurse staffing levels, and the outcome variables of pressure ulcers, UTIs, and falls. Yet, a major limitation to the study was the use of a cross-sectional design. Cross-sectional designs bond results to a particular point in time, thus limiting results to a relatively small sample of an ongoing and dynamic environment of the nursing home. My study focused on four quarters or a 1-year sample of time in Georgia nursing home history. Future researchers should use a longitudinal design, thus extending the period of time focused upon. A longitudinal analysis may more accurately show the status of relationships between study variables over time.

Furthermore, another limitation of my study was the use of secondary data. Although the use of secondary data for this study was easily accessible and allowed me to explore a large sample, nearly the entire sample of Georgia nursing homes secondary data may not represent the most accurate facility data. Future research in this area should focus on a smaller sample of nursing homes from a more internal approach. A mixed study using a quantitative and a qualitative approach might enhance study results. Future researchers could use the secondary data reports on the NHC website but could also collect qualitative data from direct observation in nursing homes.

Implications

Although my results showed that there were no relationships between nurse staffing levels and the quality care outcomes of falls, occurrence of UTIs, and pressure ulcers, there is still much to be considered. The focus of my study was solely on Georgia nursing homes within a specific time frame, and included only one confounding variable of facility bed size. While similar studies have reported inconsistent results regarding the relationship between nursing staffing and quality of care, there is evidence that poor quality care is associated with nursing staffing level (Spilsbury, et al., 2011). Because of the conflicting results, there is a need for further research using a different study design.

My study adds to the current literature and provides grounds for enhancing and expanding future research. Walden University's definition of positive social change is "a deliberating process of creating and applying ideas, strategies, and actions to promote the worth, dignity, and development of individuals, communities, organizations, institutions, cultures, and societies" (Laureate Education, 2015, para. 5). Results that are not

significant do affect positive social change because these data can prove to be useful for administrators of nursing homes and policy makers of local and state agencies to show that current levels of staffing and practice are effective. Results that are not significant can also be useful to other researchers who seek to contribute to the improved quality of care of elderly and disabled individuals residing in nursing home institutions.

Conclusion

In this study, I examined relationships between nursing staffing levels (RNs, LPNs, CNAs, and total nursing staff) and quality care outcomes (pressure ulcers, UTIs, and falls with major injury) in Georgia nursing homes. A quantitative methodology with a cross-sectional design was used to analyze the relationship between variables. The analysis showed that during the 1-year review period between the second quarter of 2016 and the first quarter of 2017, there were no relationships between the predictor variables and the outcome variables.

Residents of nursing homes are typically individuals older than 65 years and living with mental and/or physical disabilities or illnesses. This population has a high dependence on staff—particularly nursing staff—for activities of daily living, including dressing, eating, toileting, and in some cases mobility. Research aimed at understanding and improving the quality of care in nursing homes dates back several decades. Regulations regarding nurse staffing in nursing homes have been imposed with the goal of improving quality care.

This study was important because it focused solely on Georgia nursing homes. Georgia currently has 364 Medicaid/Medicare certified nursing homes serving a

population of approximately 33,000 residents. When compared to other states, Georgia has low nurse staffing standards and ranks low in several quality of care outcome measures. Although studies examining similar variables have been done, I found no studies focused specifically on Georgia. While the results of this study did not reveal significant relationships between variables, they offer useful insight on how future studies can be enhanced.

As the nation's elderly population continues to grow, it is inevitable that many elders will require the 24-hour care that nursing homes provide. Therefore, it is imperative that work aimed at improving the quality of care in nursing homes continues to be done. This study offered a small glimpse into the status of Georgia nursing homes. It provides a foundation to future study with recommendations on how to enhance and expand going forward.

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Appendix A: CMS Statement/Permission to use Data

Using government data

Works of the U.S. government are in the public domain, and permission isn't required to use them. An attribution to the Centers for Medicare and Medicaid Services as the source is appreciated. However, Nursing Home Compare data, including star ratings, should not be construed as an endorsement by the U.S. Department of Health and Human Services of any health care provider's products or services. Conveying a false impression of government approval, endorsement or authorization of products or services is forbidden. See 42 U.S.C. 1320b-10.

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