

ASSESSING THE ASSOCIATION BETWEEN NURSING STAFFING AND NURSING
HOME RESIDENT QUALITY MEASURES
IN RURAL WASHINGTON

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Abstract

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Objective: The objective of this retrospective study is to assess the association between nurse staffing (RN, LPN, LVN, and CNA) hours per resident per day in rural Washington nursing homes and certain nursing home resident quality measures available at the Department of Health and Human Services website, Nursing Home Compare database.

Methods: The Pearson's correlation is used to determine the relationship between each quality measure and nurse staffing (RN, LPN, and LVN or CNA) hours per resident per day for all nursing homes located within rural counties in Washington State. The independent samples t-test is used to compare the differences in mean scores of each quality measure and different levels of nursing staffing.

Results: The Pearson's correlation tests reveal no linear relationships between RN, LPN, LVN, and CNA staffing hours and nursing home quality measures. The results of the t-tests also indicate no statistically significant differences between the means scores of quality measures and different levels of nursing staffing.

Conclusion: Although the results of the statistical tests performed in this research did not support the main study hypothesis, the potential association between nursing staffing hours and nursing home quality measures cannot be ruled out because of the established empirical evidence supporting it. Further replication research is needed in other rural counties of the United States to validate the study hypothesis.

This preliminary research is informative because it documents that most nursing homes in rural Washington are allocating more than the minimum licensed (RN, LVN, and LPN) nursing hours, but not certified nursing assistant hours per resident per day. Maintaining these levels of licensed nursing hours is found beneficial for improving quality measures by other researchers.

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DEDICATION

To my beloved children Mackenzie Kaye, Bailey Scot, Jacob Bruce and Payton James who give me hope for the future, and my love for whom knows no bounds.

CHAPTER ONE

INTRODUCTION AND SIGNIFICANCE OF THE STUDY

This chapter provides a short introduction to the importance of nursing home quality and the reason why the topic is chosen. The purpose of the study and the variables examined in the research are described next. The research problem, the significance of the research, the key research question, and hypothesis are also included in this chapter.

Introduction and purpose of the study

It is estimated that 43% of Americans who turned 65 in 1990 will spend some time in a nursing home during their lifetime (Shipmen & Hooten, 2007). Research shows that nursing home staffing levels are associated with specific health care quality indicators with regards to nursing home residents (Bostick, 2003, Davis, 1991, Dyck, 2007). Concern about the quality of care in nursing homes has aroused a significant amount of research and policy debate (Schnelle, Simmons, Harrington, Cadogan, Garcia, & Bates-Jensen, 2004).

The purpose of this study is to examine the association between nursing staffing and seven nursing home resident quality measures reported to the Center for Medicare and Medicaid Services and available in a national database called Nursing Home Compare in the rural counties of the state of Washington.

In the United States, one in four senior citizens resides in a rural setting (Morgan, Stewart, D'Arcy, & Werezak, 2004). Due to the desire of senior citizens to stay in their perspective rural communities, it is estimated that at least one fourth of the forecasted growth in the prevalence of geriatric-related diseases such as dementia will occur in rural areas (Morgan et al, 2004). Because of this growth in the number of seniors living in rural settings, it is important

to gather information regarding nursing homes in the rural environment. Coward, Duncan, and Uttaro (1996) have identified a deficiency in the amount of information regarding the unique characteristics of rural nursing homes, affirming the crucial need for additional and higher quality descriptive data on rural nursing homes.

The seven quality measures are chosen based on previous empirical evidence indicating that nurse staffing has a direct influence on the quality of these specific resident outcomes (Bostick, 2003). The objective of the research is to examine the association between nurse staffing hours and nursing home quality measures in order to provide further evidence regarding the significance of staffing levels when caring for nursing home residents in rural Washington. The seven quality measures are included in Table 1.

Table 1. Nursing home quality measures

Quality measures	MDS Observation time frame
Percent of residents whose need for help with daily activities has increased	Looks back 7 days
Percent of high-risk residents who have pressure sores	Looks back 7 days
Percent of low-risk residents who have pressure sores	Looks back 7 days
Percent of residents who were physically restrained	Looks back 7 days
Percent of low-risk residents who lose control of their bowels or bladder	Looks back 14 days
Percent of residents who lose too much weight	Looks back 30 days
Percent of short-stay residents with pressure sores	Looks back 7 days

Source: “Collecting and Updating Nursing Home Data.” Copyright 2008 by the Centers for Medicare & Medicaid Services.

Significance of the study

Nursing homes have become an integral part of society as a result of the constantly expanding elderly population. The ability to assess the quality of care in the nation's nursing homes is of vital importance with the oldest of the "baby boomer" generation approaching age 65 in the year 2011 (Rothberg, Abraham, Lindenauer, & Rose, 2005).

Schnelle and colleagues (2004) show that staffing levels in nursing homes are the best indicator of quality of care. Nursing homes with high staffing levels achieve better outcomes regarding patient care on 13 of 16 quality measures (Schnelle et al., 2004). A recent study by Kramer and Fish (2001), conducted for the Centers for Medicare and Medicaid Services examining nurse staffing levels and the association of nurse staffing levels with the probability of poor resident outcomes, found that 1.15 licensed nurse hours per resident per day and 2.4 certified nursing assistant hours per resident per day were the minimum staffing levels that correlated to a decreased probability of poor resident outcomes. This is supported by the Harrington study regarding the impact of minimum staffing levels and their association with a lower probability of poor resident outcomes, including weight loss, pressure ulcers and urinary tract infections (Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000).

Measurement of nursing home quality data enables consumers to see how well nursing homes are caring for their residents. It also allows nursing home administrators to realize and accept new policies and procedures when operating their homes so as to improve the quality of care offered to residents. For instance, nursing home leaders can further support nursing staff with the proper training and access to evidence-based practices so as to provide a higher quality of care for their residents.

Limited research exists regarding rural counties in the state of Washington examining nurse staffing levels and their association with *all of these* seven quality measures reported to CMS.

Key research question

Is there a positive association between nursing staff (RN/LPN/LVN) and CNA hours per resident per day and seven specific quality measures within nursing homes in rural Washington?

Hypothesis

The staffing levels of nursing homes located in rural Washington counties are positively associated with seven specific quality measures reported to CMS.

CHAPTER TWO

THEORETICAL BASIS/ LITERATURE REVIEW

This chapter describes the theoretical framework utilized in this research along with the literature review methodology used to conduct the literature search. The methodology is comprised of the time period covered, the criteria of relevance along with the inclusion and exclusion criteria, the names of the databases used in the search as well as the search terms used, the total number of citations identified and the total number of relevant citations ultimately used in the review. This chapter also summarizes the key findings of the literature along with recommendations for future research, gaps in the existing literature, and the unique contribution of this study.

Theoretical framework

Health services research examining the association of nurse staffing with the quality of patient care outcomes has primarily used Donabedian's structure, process, outcome quality framework (Maldondo, Hanke, Neff & Mor, 2004). A vast array of empirical studies regarding quality of care in nursing homes and its association with nursing staff hours are conducted using the Donabedian framework (Bowers, Esmond, & Jacobson, 2000; Davis, 1991; Dellefield, 2000; Zinn & Mor, 1998).

The structure of care includes information on the facilities and people caring for patients (Donabedian, 2005). Information on the facilities may include bed size, type of ownership, or occupancy rates (Dyck, 2007). Community characteristics such as insurance coverage, the number of hospital beds per capita, or the staffing characteristics of facilities are also examples of structural characteristics (Maldondo et al, 2004). Processes of care relate to the interaction

between patient and provider, such as diagnostic tests or procedures (Donabedian, 2005). Technical and interpersonal excellence is also a process measure (Maldonado et al, 2004). An outcome is the result of the care or intervention provided to patients (Donabedian, 2005). Examples of an outcome measure include measurements like the five year mortality rate from breast cancer or the percentage of patients who lose too much weight within a specific amount of time in a nursing home (Maldonado et al, 2004). Additional measures of outcomes are functional status and patient satisfaction.

The underlying premise of the structure, process, and outcome theoretical framework is that both structure and process improvements lead to better health outcomes (Donabedian, 2005). For example, when a facility employs the recommended staffing levels (such as the number of nurses working at specific times, or the recommended number of nursing hours per resident per day) and implements correct process measures (such as appropriateness of the intervention) that are empirically proven beneficial for a given population, then health outcomes should improve (Donabedian, 2005). However, the Donabedian framework is not without its limitations. The framework implies a very linear thinking and evidence linking structure and improvements of health outcomes is limited, likewise, the association between structure and process is not well ascertained (Donabedian, 2005).

Methodology of literature search

The time period incorporated in the literature search is from the years 1998 to 2009. This allows for a comprehensive review of the most recent literature and provides a large base of potential articles on the subject. The articles were searched primarily through the use of the PubMed, Medline, Ebsco Host, Ovid, and the American Medical Association databases in order to limit the scope of the search and include only peer reviewed articles. The key terms used in

the search inquiry were: “staffing”, “quality”, and “outcomes” in combination with “long term care”. Staffing, quality, and long-term care were used together in the search inquiry followed by the combination of staffing, quality, outcomes, and long-term care.

The search produced a grand total of 137 articles for potential review. Of the 118 articles, 39 were found relevant and examined entirely. Ultimately 31 of the 35 articles are cited in the study. The excluded articles focused on quality measures in a dissimilar setting such as hospitals, prisons, and home health which did not relate directly with nursing staffing and quality of care experienced in relation to nursing home residents.

Exclusion and inclusion criteria

This analytic review is limited to articles that are peer reviewed and published in English. The study must also take place within the United States. Exclusion criteria are studies that are not published in English, studies that are not peer reviewed, studies that take place outside the United States and articles outside the confines of the literature search (i.e. not related to the key constructs of interest specified above).

Summary of key findings

The results of the studies examined in the literature reveal a common theme. Nursing staff hours per resident per day has a positive effect on specific quality indicators, namely, pressure ulcers, ADL decline, cognitive functioning, the use of restraints, the use of urinary catheters, the prevalence of urinary tract infections, weight loss and dehydration.

While this underlying theme is evident in most of the studies examined, the results go both ways and may seem counterintuitive. For example in a study by Bostick (2003), a statistically significant negative association was found between RN hours and the prevalence of

pressure ulcers ($p=.03$). More specifically, in comparable nursing homes, a 6-minute increase in RN time was associated with a 3% reduction in the chance of one resident developing a pressure ulcer. This study found that a 6-minute increase in LPN staffing hours is associated with a 3% greater chance ($OR=1.03$) of one resident developing a pressure ulcer and a 2% greater chance ($OR=1.02$) of a resident developing late loss ADL decline (Bostick, 2003). This portion of the results seems counterintuitive and requires additional investigation before any generalization is made. A feasible explanation for this finding is that registered nurses perform many other tasks in the nursing home setting, for instance as the nursing home director or multiple data set coordinator the RN may have limited direct care responsibilities (Bostick, 2003). The low numbers of RN staff working in nursing homes as direct care faculty may provide a reason for contradictory or insignificant results (Bostick, 2003).

Research by Harrington and colleagues analyzing Online Survey, Certification and Reporting (OSCAR) data and staffing levels from state surveys revealed that the 2001 average total nurse staffing level was 3.5 hours of care per resident per day (Harrington, Carrillo, Wellin & Shemirani, 2002). This average of 3.5 hours of nurse staffing care per resident per day is shown to fall well below the 4.1 hours recommended by Health and Human Services as essential to avoid detriment to nursing home residents (Centers for Medicare and Medicaid Services, Appropriateness of minimum nurse staffing ratios in nursing homes, 2001). A study utilizing OSCAR data in 2000 found a direct negative correlation between the numbers of cited deficiencies in long-term care facilities and registered nursing hours (Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000). Specifically, the findings of the Harrington study indicate that fewer NA hours were associated with both quality of care and quality of life deficiencies while RN hours were associated with more quality of care deficiencies (Harrington et al., 2000).

A study of homes in Minnesota found that licensed nurse staffing levels significantly impacted the well-being of first year residents (Bleismer, Smayling, Kayne, & Shannon, 1998). The Bleismer study found that a higher level of licensed staffing is associated with improved functioning and an increased probability of rehabilitation to the point of discharge from the facility (Bleismer et al., 1998). This is further supported through research by Diane Jette and colleagues (2004) who examined the nurse staffing level of skilled nursing facilities and its association with length of stay and efficiency of discharge to the community. The study found that higher nursing staffing levels are associated with an increased likelihood of patient's discharged to the community.

A study of nurse staffing patterns and quality of care in nursing homes done by Robert Weech-Maldonado and colleagues (2004), found that higher RN staffing mix is associated with better outcomes in terms of both pressure ulcers and cognitive functioning. This coincides with the findings of a national pressure ulcer study by Horn and colleagues (2004) that found staffing patterns are associated with the prevention of pressure ulcers. The study also found that nursing homes with a higher proportion of full-time RNs, compared with part-time and contract RN's have lower use of restraints (Maldonado et al., 2004). This is further supported by the findings of the Castle study examining structural characteristics of nursing homes associated with persistent poor quality in the use of physical restraints (Castle, 2002). The Castle study examined data from the 1996, 1997, 1998, and 1999 OSCAR system (Castle, 2002). The results of the study suggested facilities with lower numbers of FTE RNs are more likely to have persistent poor quality in the use of physical restraints (Castle, 2002).

A study examining the influence of staffing characteristics on quality of care in nursing homes by Castle and Engberg (2007) found that high RN levels are associated with higher

overall quality. Research suggests that an increased nurse-to-patient ratio (meaning more nurses responsible for fewer patients) is associated with reductions in deficiency citations in general (Harrington & Carrillo, 1999).

A study conducted by Zhang and Grabowski (2004) examining the impact of the Nursing Home Reform Act which requires, amongst other things, a minimum standard of nursing staff hours and its association with the quality of care nursing home residents receive further solidify the association between nurse staffing hours and quality of patient outcomes. The results of the study include a statistically significant decrease in the proportion of residents with urinary catheters from 10% to 8%, and the proportion of residents with physical restraints declined from 39% to 23%, a decrease of almost 41% as a function of increased nursing staff hours (Zhang & Grabowski, 2004). However, the proportion of nursing home residents with pressure ulcers increased 8% which was also statistically significant (Zhang & Grabowski, 2004).

A study on nurse staffing hours and quality deficiencies in nursing homes by Akinci & Krolikowski (2005) in northern Pennsylvania found that as nursing home facilities decreased the number of RN and CNA hours of care provided, the number of quality of care deficiency citations increased. Specifically, fewer RN hours per resident per day predicted an average of 8.58 ($p < .05$) more deficiencies for nursing homes (Akinci et al., 2005). Similar results are found in a study by Kim and colleagues (2009) looking at the relationship of nurse staffing levels and standards to regulatory deficiencies in California. It was found that nursing homes that met staffing standards received fewer quality deficiencies.

Studies on staffing and quality of care uphold the argument that both the level of staffing and the staffing mix are directly related to quality of care (Scott-Cawiezell, Pepper, Madsen, Petroski, Vogelsmeier, & Zellmer, 2007; Bostick, Rantz, Flesner, & Riggs, 2006). A study

looking at all Missouri nursing home facilities by Gregory Alexander (2008) found that care is proportionate to the percentage of CNA/LPN/RN staffing level mix for two long-stay quality measures (percentage of residents who lose bowel or bladder control and percentage of residents whose need for help with activities of daily living has increased) and two short-stay measures (percentage of residents who had moderate to severe pain and percentage of residents with pressure ulcers). For instance, the analysis shows that low risk residents who were incontinent indicates that when RN staffing is held constant and the number of CNA staff increases, the percentage of residents who were incontinent also increases (Alexander, 2008). Likewise, as LPN time is held constantly at the lower end and CNA hours per resident per day increases, the frequency of pressure ulcers increases by more than 6% for short-stay residents (Alexander, 2008). This is further supported by a study conducted by Tamara Konetzka and colleagues (2007) on all freestanding nursing homes in Ohio, Kansas, Maine, Mississippi and South Dakota. This study found that as the level of registered nursing hours increased, the rate of pressure sores decreased significantly. A study by Hickey and colleagues (2005) looking at pressure ulcer rates and staffing characteristics in veterans hospitals found that changes in nursing home staffing, including staffing mix as well as staffing levels, is associated with the prevalence of pressure ulcers. Specifically, as staffing levels increase, the prevalence of pressure ulcers decrease.

A study assessing weight loss and dehydration amongst nursing home residents by Mary Dyck (2007) found that nursing home facilities that provided their residents with at least 3 hours per day of nursing assistant care significantly decreased the likelihood that the residents would suffer from weight loss by 17%. Research suggests that inadequate nutrition intake, malnutrition, starvation, and dehydration are attributed to low staffing levels in nursing homes (Kayser-Jones, Schell, Porter, Barbaccia, & Shaw, 1999). Furthermore, a study done by Suzanne Horn and

colleagues indicates that more RN direct care time per resident per day is associated with fewer pressure ulcers, hospitalizations, and urinary tract infections; less weight loss, catheterization, and deterioration in the ability to perform ADLs; and greater use of oral standard medical nutrition supplements (Horn, Buerhaus, Bergstrom & Smout, 2005).

The key findings of the peer-reviewed literature indicate that an increase in nurse staffing hours in nursing homes is positively associated with specific quality indicators. These quality indicators include pressure ulcers, cognitive functioning, the use of restraints, the use of urinary catheters, weight loss and dehydration specifically. For example, the likelihood of pressure ulcers is reduced with an increase in nurse staffing hours. Higher RN staffing is associated with better outcomes in terms of pressure ulcers and cognitive functioning as well as a lower use of restraints. The studies also indicate a decrease in the proportion of residents with urinary catheters, weight loss, and urinary tract infections.

Gaps in the literature and main contribution

Current gaps in the literature include the absence of empirical studies analyzing the impact of nurse turnover and its effect on the quality of patient care. Additional studies focusing on data from rural settings using the OSCAR and MDS databases are also needed along with studies that look at structural characteristics and their association with health care outcomes in long-term care facilities in order to fill the gaps in the literature.

The proposed research addresses some of the gaps in the existing literature. The research provides detailed information on the relationship of staffing patterns and patient quality measures. This research proposal contributes to the current body of knowledge by examining seven specific quality measures and how they are associated with the nursing staff hours provided by 93 nursing homes in 31 counties located within rural counties in Washington state.

This research represents the first study to examine the hypothesized associations between nursing staffing and quality measures in rural Washington.

CHAPTER THREE

METHODS

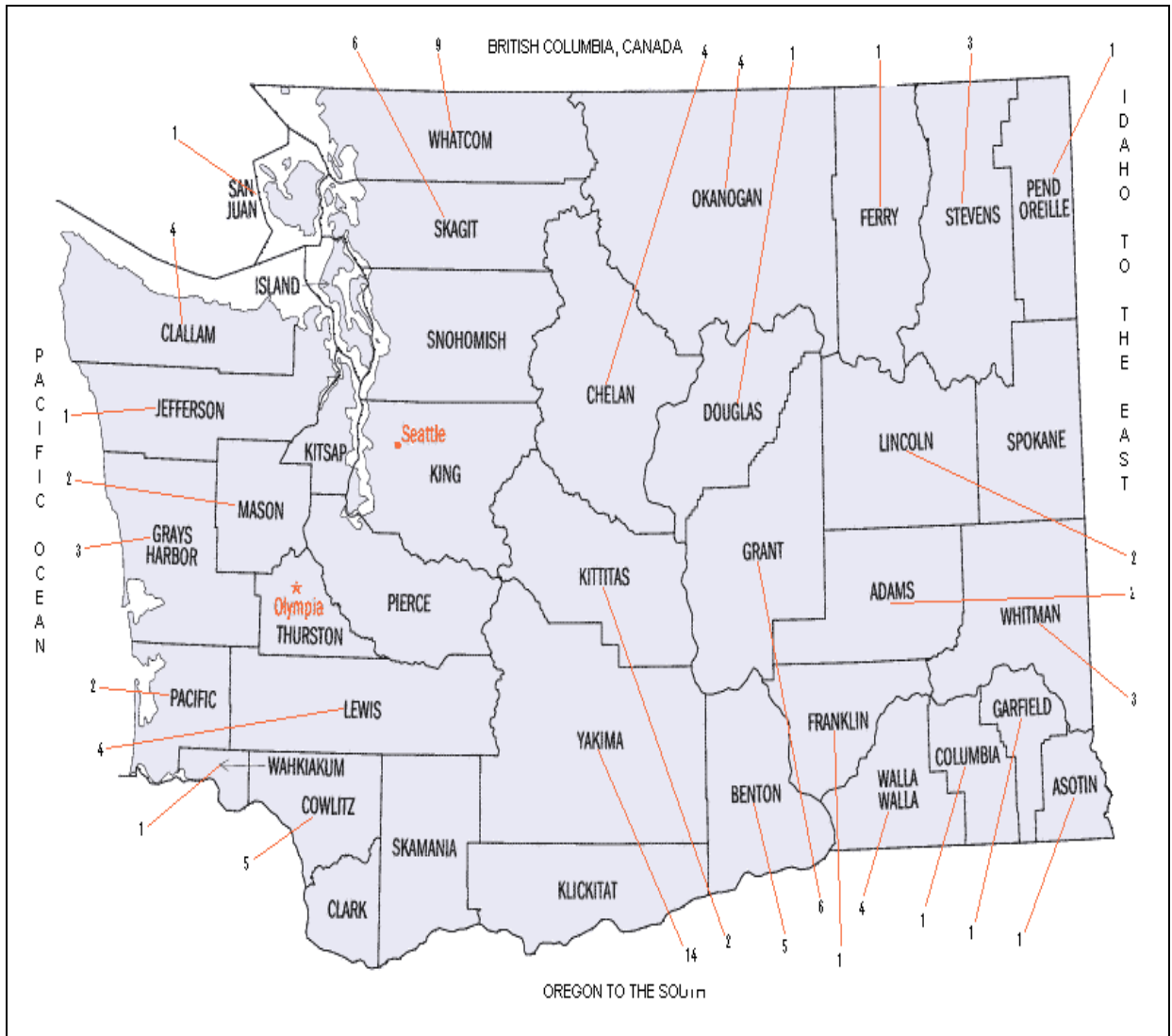
This chapter describes the study sample along with the names of the Washington counties the sample is drawn from. The criteria for inclusion in the sample are also described. The study design is recounted as well as the data source and methods of data collection. This chapter also describes the study variables and their operational definitions as well as the analytic method used in the statistical analysis.

Sample

The study sample includes all licensed nursing homes located in 31 rural Washington counties (exactly 93 facilities). A rural county has a population density of less than 100 persons per square mile as defined in RCW 43 160020 section 12 (Revised Code of Washington). The 31 rural counties the sample is drawn from consist of Clallam, Jefferson, Mason, Grays Harbor, Pacific, Lewis, Wahkiakum, Cowlitz, Skamania, Klickitat, Yakima, Kittitas, Chelan, Okanogan, Skagit, Whatcom, San Juan, Douglas, Grant, Benton, Walla Walla, Columbia, Garfield, Asotin, Whitman, Adams, Franklin, Lincoln, Ferry, Stevens, and Pend Oreille. The number of nursing homes existing in each county is diverse and ranges from 6 registered nursing homes in Grant County to 0 registered nursing homes in Ferry, Klickitat, and Skamania counties. The individual nursing homes are Medicare or Medicaid certified as a pre-requisite for inclusion in the sample. Each nursing home must possess the necessary licensure in the state of Washington, and Department of Health inspections are performed in order to assess the quality of care to individuals residing therein. In order for inclusion in the sample, each nursing home is required to participate in at least one Medicare inspection during the period of April 2007- April 2008.

Figure 1 represents the number of nursing homes in each of the rural counties within the state of Washington. Table 2 indicates the number of nursing home responses to each of the quality measures. For example, the number of nursing homes responding to the first quality measure (the percent of long-stay residents whose need for help with daily activities has increased) is 72 out of a total of 93 nursing homes. Table 3 represents the percentage of small, medium, and large nursing home responses to each individual quality measure. For instance the number of small nursing homes (those with less than 60 beds) responding to the first quality measure (the percent of long-stay residents whose need for help with daily activities has increased) is 14 out of a total of 33 small rural Washington nursing homes, which incorporates a 42.4% response rate to that measure. Table 3 also calculates the same measures for medium and large size nursing homes.

Figure 1- Quantity of nursing homes within rural Washington counties



Source: U.S. Census Bureau. [Map illustration Washington county selection map]. Retrieved from http://quickfacts.census.gov/qfd/maps/washington_map.html

Table 2. Quantity of rural Washington nursing home responses by quality measure

Quality measure	Number of Responders	Number of Non-Responders
Percent of long-stay residents whose need for help with daily activities has increased.	72	21
Percent of high-risk long-stay residents who have pressure sores.	63	30
Percent of low-risk long-stay residents who have pressure sores.	5	88
Percent of long-stay residents who were physically restrained.	78	15
Percent of low-risk long-stay residents who lose control of their bowels or bladder.	55	38
Percent of long-stay residents who lose too much weight.	77	16
Percent of short-stay residents with pressure sores.	57	36

Source: Department of Health and Human Services, Nov. 2008

Table 3. Percent of rural Washington nursing home responses by home size

Dependent variables	No. of small NH¹ (<60 beds) responses	Percent responses	No. of medium NH (60-120 beds) responses	Percent responses	No. of large NH (>120 beds) responses	Percent responses
Percent of long-stay residents whose need for help with daily activities has increased	14	42.4%	46	95.8%	12	100%
Percent of high-risk long-stay residents who have pressure sores	7	21.2%	44	91.7%	12	100%
Percent of low-risk long-stay residents who have pressure sores	0	0%	2	4.2%	3	25%
Percent of long-stay residents who were physically restrained	19	57.6%	47	97.9%	12	100%
Percent of low-risk long-stay residents who lose control of their bowels or bladder	4	12.1%	40	83.33%	11	91.7%
Percent of long-stay residents who lose too much weight	17	51.5%	47	97.9%	12	100%
Percent of short-stay residents with pressure sores	8	24.2%	38	79.2%	11	91.7%

Note: ¹ NH = Nursing Home

Source: Department of Health and Human Services, Nov. 2008

Study design

This is a cross-sectional survey research using the 2007-2008 secondary data from the Centers for Medicare Medicaid System reported on the Nursing Home Compare website. As in all cross-sectional studies where data on a sample of respondents are collected within a short period of time, the ability to adequately show the direction of causal relationships or rule out alternative rival explanations is limited (Shi, 2008).

The use of secondary data in any analysis has its strengths and weaknesses. The generalizability of the conclusions to a larger population (external validity) as well as internal validity, the ability to rule out extraneous variables responsible for the observed outcome of the study, are strengths of secondary data analysis (Shi, 2008). The principal weakness of secondary data analysis is the extent of compatibility between the available data and the research question (Shi, 2008). The value of available data depends largely upon the degree of match between the research question addressed within a study and the available data (Shi, 2008). The database available through the Nursing Home Compare website is extremely valuable for the research question and the hypothesis because it contains the necessary measures for both nursing staffing hours and selected nursing home quality indicators.

Data sources and methods of data collection

“The data for the quality measures contained in the CMS website come from the Minimum Data Set (MDS) repository and is collected regularly for every resident in a Medicare or Medicaid certified nursing home” (Medicare Collecting and Updating Nursing Home Data, 2009, para. 1).

“In addition to the quarterly and annual assessments, regulations also require that assessments are performed on the 5th, 14th, 30th, 60th, and 90th day of admission or whenever a

resident experiences a significant change in status. All of the data are collected by the nursing homes themselves and reviewed by nursing home inspectors” (Medicare Collecting and Updating Nursing Home Data, 2009, para. 2). The data used in this study were extrapolated from the Nursing Home Compare website in November 2008.

Research methods and data collected for the conduction of this research has received institutional review board approval. This research is approved by the institutional review board of Washington State University on February 26, 2009.

Table 4. Operational definition of study variables

Study Variable	Variable Type	Definition
Nursing staff hours	Independent	Incorporate both licensed RN hours per resident per day and licensed LPN/LVN hours per resident per day.
CNA hours	Independent	The number of certified nursing assistant hours per resident per day.
Percent of residents whose need for help with daily activities has increased	Dependent	Examines the percent of long-stay residents whose need for help doing basic daily tasks has increased from the last time it was checked. The daily activities this measure counts include: 1- feeding oneself 2- moving from one chair to another 3- changing positions while in bed and 4- going to the bathroom alone.
Percent of high-risk and low-risk, short and long-stay residents who have pressure sores	Dependent	<p>“High-risk” resident means the resident is in a coma, does not get the nutrients they need (like water, vitamins and minerals), or can’t move or change position on their own. “Low-risk” residents are active, change positions and are getting the nutrients they need</p> <p>“Short-stay” residents are individuals who were recently admitted to the nursing home following a hospital stay.</p> <p>This measure looks at those short-stay residents who have developed pressure sores, or who had pressure sores that did not get better between their 5-day and 14-day assessments in the nursing home.</p> <p>A pressure sore is a skin wound. Pressure sores usually develop on bony parts of the body such as the tailbone, hip, ankle, or heel. They are usually caused by constant pressure on one part of the skin. These sores are caused from the pressure on the skin from chairs, wheelchairs, or beds.</p>

Source: “Medicare Nursing Home Compare Fact Sheet.” Copyright 2008 by the Centers for Medicare & Medicaid services.

Table 4. Operational definition of study variables (continued)

Study Variable	Variable Type	Definition
Percent of long-stay residents who were physically restrained	Dependent	The percent of residents in the nursing home who are physically restrained during the 7-day assessment period. A physical restraint is any device, material, or equipment attached or adjacent to a resident's body, that the individual cannot remove easily, which keeps a resident from moving freely or prevents them normal access to their body. Examples of physical restraints include special types of vests, chairs with lap trays, lap belts, or enclosed walkers.
Percent of low-risk, long stay residents who lose control of their bowels or bladder	Dependent	Low-risk is defined as those residents who do not have dementia (memory loss) or if they do not have very limited ability to move on their own. Loss of bowel and bladder control is not a normal sign of aging and is often treated successfully.
Percent of long-stay residents who lose too much weight	Dependent	A loss of 5% or more of body weight in one month is usually considered unhealthy (for example, a 150 pound person should not lose more than 7 1/2 pounds in a month).

Source: "Medicare Nursing Home Compare Fact Sheet." Copyright 2008 by the Centers for

Medicare & Medicaid services.

Analytic methods

Originally, all seven quality measures were evaluated in order to determine descriptive statistics such as the mean, median, variance, and the standard deviation. However, one of the dependent variables, the percent of low-risk, long-stay residents with pressure sores was omitted from the study due to missing data.

Staffing data characterized as hours per resident per day for professional or licensed nursing staff (RN, LPN, and LVN) along with certified nursing assistant (CNA) staffing hours were recoded by using cut points in order to develop two staffing levels for each of the two nursing disciplines. These cut points are determined by the findings of research by Kramer and Fish (2001) indicating that no quality improvements are observed above these thresholds for each of the two nursing disciplines. Table 5 lists the cut points for the two disciplines along with the codes for each.

Following the descriptive statistical analysis, bivariate analyses using the Pearson's correlation tests is conducted in order to determine correlations between nursing staffing levels and selected nursing home quality measures. An independent sample t-test is then used to compare the means of each nursing home quality measure between the two nursing staffing groups. In an example with the quality measure of the mean percent score of long-stay residents who were physically restrained, it is compared between two groups for each discipline of nursing staff (RN, LPN, LVN and CNA), using the cut points of 1.15 hours per resident per day for RN, LPN, LVN and 2.4 CNA hours per resident per day . These analyses are done in order to determine if there are statistically significant differences in mean scores of selected nursing home quality measures (outcome) between two nursing staffing levels for RN, LPN, LVN and CNAs.

Table 5. Cut points for RN, LPN, LVN, and CNA hours per resident per day

	Professional nursing staff (RN, LPN, LVN) hours per resident per day	Code	CNA hours per resident per day	Code
Cut-	< 1.15	0	< 2.4	0
points	\geq 1.15	1	\geq 2.4	1

CHAPTER FOUR

RESULTS

This chapter describes the distribution of staffing hours for nursing homes in rural Washington counties. The results of the analytical tests including the Pearson's correlation test along with the t-test results for each of the six quality measures is also included in this chapter.

Sample distributions and Pearson's correlation

Distribution of each quality measure is checked for normality and outliers. The quality measures associated with the percent of residents whose need for help with daily activities has increased, the percent of residents who were physically restrained, and the percent of residents who lose too much weight, each indicated a positive skew. The percent of high-risk long-stay residents with pressure sores, the percent of low-risk long-stay residents who lose control of their bowels or bladder, and the percent of short-stay residents with pressure sores indicate a normal distribution.

The total amount of nurse staffing hours (RN, LPN, LVN, and CNA hours combined) in rural Washington nursing homes ranged from a minimum of two hours per resident per day to a maximum of eleven hours per resident per day. The average for this category is 4.1 hours per resident per day (see Table 6). The average apportionment of certified nursing assistant hours is more than that of RN, LPN, and LVN hours per resident per day, 2.5 mean hours compared to 1.6 mean hours respectively (see Table 6). However, it is interesting to note the maximum hours for RN, LPN, and LVN hours per resident per day in rural Washington nursing homes is two hours more than the maximum amount of certified nursing assistant hours expended per resident per day (see Table 6). The mean total of 4.1 nursing hours per resident per day for nursing homes

in rural Washington is above the national average staffing level found by other researchers (Wells, 2004; Harrington, Carrillo, Wellin & Shemirani, 2002; Centers for Medicare and Medicaid Services, Appropriateness of minimum nurse staffing ratios in nursing homes, 2001) of 3.5 hours of care per resident per day in her analysis of OSCAR data and staffing levels reported to state survey agencies (see Table 6).

Table 6. Distribution and descriptive statistics for nurse staffing hours for rural Washington nursing homes

Staffing hours by group	Mean (SD)	Min	Max	Range
Total nursing hours per resident per day	4.1 hrs. (1.2)	2	11	9
RN, LPN, LVN hours per resident per day	1.6 hrs. (.8)	1	7	6
Certified nursing assistant hours per resident per day	2.5 hrs. (.6)	1	5	4

Source: Department of Health and Human Services, Nov. 2008

Four quality measures had mean scores above 10 (see Table 7). These included 3 long-stay quality measures and the short stay measure: (1) percentage of residents whose need for help with daily activities has increased, (2) percentage of high-risk residents who have pressure sores, (3) percentage of low-risk residents who lose control of their bowels or bladder, and (4) percentage of short-stay residents with pressure sores (see table 7). The highest mean score is the percentage of low risk residents who were incontinent (60.5%) followed by the percentage of high-risk, long stay residents who have pressure sores (13.9%) (see Table 7).

It is also discovered that most nursing homes located in rural Washington are for profit, not located in a hospital, and belong to or are a part of a multi-nursing home chain. For example,

73% of the nursing homes are for profit, 84% are not located in a hospital, and 60% are part of a multi-nursing home chain (see Table 7). More nursing home facilities in rural Washington are owned by the government than are not-for-profit, 15% and 12% respectively (see Table 7).

An analysis of RN, LPN, and LVN staffing hours and quality measures was performed next followed by the same analysis for certified nursing assistant hours per resident per day using Pearson's correlation test. The results of the licensed staff (RN, LPN, and LVN) test showed no statistical significance. The p value for the licensed staff group ranged from .8 to .1 for the percentage of residents whose need for help with daily activities has increased and the percentage of residents who lose control of their bowels or bladder respectively. The percentage of residents who lose too much weight for the licensed group also shows a p value of .1. The Pearson's correlation coefficient ranges from -.2 to .2 for the licensed staff group, indicating that a weak correlation exists between licensed staffing hours and the individual quality measures. The quality measures corresponding to these values are the percentage of residents who lose control of their bowels or bladder and the percentage of residents who lose too much weight, respectively (see Table 8).

Similar results were found when the Pearson's correlation test was performed on the certified nursing assistant (CNA) hours per resident per day with a p value range of .4 to 1, indicating no statistical significance. The quality measures that correspond to these results are the percentage of residents whose need for help with daily activities has increased and the percentage of residents who lose control of their bowels or bladder. The Pearson's correlation coefficient for this group ranges from -.1 to .1. This also indicates a very weak association between CNA hours and the individual quality measures. The quality measures with a resulting value of -.1 are the percentage of residents whose need for help with daily activities has

increased and the percentage of residents who lose too much weight. Both of the pressure sore measures (long-stay and short-stay) resulted in a correlation coefficient of .1 (see Table 8).

Table 7. Descriptive statistics for study variables in rural nursing homes in Washington state (n=93)

Dependent variables	n	Mean (SD) or %
Percent of long-stay residents whose need for help with daily activities has increased	72	13.4 (8.9)
Percent of high-risk, long-stay residents who have pressure sores	63	13.9 (6.1)
Percent of long-stay residents who were physically restrained	78	2.4 (5.6)
Percent of low-risk, long-stay residents who lose control of their bowels or bladder	55	60.5 (11.58)
Percent of long-stay residents who lose too much weight	77	9.0 (6.08)
Percent of short-stay residents with pressure sores	57	13.5 (5.94)
Independent variables		
Total nursing staff hours per resident per day	364.5	4.1 (1.2)
Total RN, LPN, LVN hours per resident per day	143.7	1.6 (.8)
Total certified nursing assistant hours per resident per day	220.8	2.5 (.6)
Control variables		
<i>Ownership type</i>		
For profit	68	73%
Not for profit	11	12%
Government	14	15%
<i>Hospital location</i>		
Located in a hospital	15	16%
Not located in a hospital	78	84%
<i>Chain membership</i>		
Part of a multi nursing home chain	56	60%
Not part of a multi nursing home chain	37	40%

Source: Department of Health and Human Services, Nov. 2008

Table 8. Association between quality measures and nurse staffing hours in rural

Washington nursing homes (n=93)

Quality measure	Pearson's Correlation Coefficient	p
RN, LPN, and LVN hours		
Percent of long-stay residents whose need for help with daily activities has increased.	-.0	.8
Percent of high-risk, long-stay residents who have pressure sores.	-.1	.5
Percent of long-stay residents who were physically restrained.	.1	.6
Percent of low-risk, long-stay residents who lose control of their bowels or bladder.	-.2	.1
Percent of long-stay residents who lose too much weight.	.2	.1
Percent of short-stay residents with pressure sores.	.1	.3
Certified nursing assistant hours		
Percent of long-stay residents whose need for help with daily activities has increased.	-.1	.4
Percent of high-risk, long-stay residents who have pressure sores.	.1	.5
Percent of long-stay residents who were physically restrained.	-.0	.8
Percent of low-risk, long-stay residents who lose control of their bowels or bladder.	-.0	1
Percent of long-stay residents who lose too much weight.	-.1	.5
Percent of short-stay residents with pressure sores.	.1	.7

Source: The data for nurse staffing hours are from the Department of Health and Human Services, Nov. 2008.

Independent-samples t-test and group statistics

Two categories were created within each of the two types of nurse staffing (RN, LVN, LPN, and CNA) based on the pre-determined cut points (nursing homes with staffing below 1.15 hours per resident per day for RN, LVN, and LPN and those below). The same two categories were created for nursing homes with CNA staffing below 2.4 hours per resident per day and those above (see Table 5 for the cut points). Independent samples t-test is run for each of the 6 quality measures to determine if there are statistically significant differences in mean scores of selected nursing home quality measures (outcome) between two nursing staffing levels specified (based on the cut points) for RN, LPN, LVN and CNAs. The results of the t-tests indicate no statistically significant differences in the mean scores of any of the quality measures between the two nursing staffing levels for RN, LPN, LVN, and CNAs. The *p* value for the t-test ranges from .1 to .8 for the RN, LPN, and LVN group. The results for the CNA group were similar with a *p* value range of .4 to .7, again indicating no statistically significant difference in mean scores of any of the quality measures between two nursing staffing levels (see Table 9).

Group statistics indicate that more rural Washington nursing homes are operating above the 1.15 hours per resident per day cut point for the RN, LVN, and LPN group as compared to the CNA group. For example, 63 nursing homes allocate at least 1.15 hours per resident per day for the quality measure percentage of long-stay residents whose need for help with daily activities has increased out of a total of 72 nursing homes responding to that measure. Contrast that with the same quality measure for the CNA group and it is found that only 41 out of 72 rural Washington nursing homes are operating above the cut point of 2.4 CNA hours per resident per day, this trend is apparent for all quality measures (see Table 9).

Table 9. T-test results for quality measures in rural Washington nursing homes (n=93)

Quality measure	Group Statistics		Independent samples test	
	< 1.15 hours per resident per day n, mean, (SD)	≥ 1.15 hours per resident per day n, mean, (SD)	t	p
Percent of long-stay residents whose need for help with daily activities has increased.	9, 14.7, (9.2)	63, 13.3, (9)	.4	.7
Percent of high-risk, long-stay residents who have pressure sores.	6, 12.7, (7.4)	57, 14, (6)	-.5	.6
Percent of long-stay residents who were physically restrained.	9, 1.7, (1.5)	69, 2.5, (6)	-.4	.7
Percent of low-risk, long-stay residents who lose control of their bowels or bladder.	7, 64, (12.3)	48, 60, (11.5)	.9	.4
Percent of long-stay residents who lose too much weight.	9, 5.6, (4.4)	68, 9.4, (6.1)	-1.8	.1
Percent of short-stay residents with pressure sores.	4, 12.8, (5.3)	53, 13.6, (6)	-.3	.8

Source: The data for nurse staffing hours are from the Department of Health and Human Services, Nov. 2008.

Table 9. T-test results for quality measures in rural Washington nursing homes (n=93)

(continued)

Quality measure	Group Statistics		Independent samples test	
	< 2.4 hours per resident per day n, mean, (SD)	≥ 2.4 hours per resident per day n, mean, (SD)	t	p
Percent of long-stay residents whose need for help with daily activities has increased.	31, 14.1, (8.4)	41, 12.9, (9.4)	.5	.6
Percent of high-risk, long-stay residents who have pressure sores.	25, 13.1, (5.8)	38, 14.4, (6.2)	-.8	.4
Percent of long-stay residents who were physically restrained.	34, 2.8, (6.9)	44, 2.1, (4.5)	.6	.6
Percent of low-risk, long-stay residents who lose control of their bowels or bladder.	24, 59.4, (11.8)	31, 61.3, (11.5)	-.6	.5
Percent of long-stay residents who lose too much weight.	34, 8.7, (6.2)	43, 9.2, (6.1)	-.4	.7
Percent of short-stay residents with pressure sores.	26, 12.9, (6.1)	31, 14.1, (5.8)	-.8	.4

Source: The data for nurse staffing hours are from the Department of Health and Human Services, Nov. 2008.

CHAPTER FIVE

CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS

This chapter includes a brief synopsis of the research purpose along with the highlights of the research findings. The limitations of the study and suggestions for future research are described in this chapter. Managerial and policy implications are also included.

Conclusions

The objective of this investigation is to assess the association between certain quality measures available in a national database and the number of nursing hours per resident per day in rural nursing homes located in the state of Washington. These quality measures are important to examine because of the empirical evidence indicating that nurse staffing has a direct influence on these specific quality measures. The database used in this research is called Nursing Home Compare and is available to all individuals through the World Wide Web.

Although the results of the statistical tests performed in this research did not support the main study hypothesis, the established empirical evidence supports the potential association between nurse staffing hours and nursing home quality measures. Research suggests that the level of training nursing staff receive impacts the quality of care given to nursing home residents (Dyck, 2007).

Managerial Implications

An important managerial implication suggested by other researchers and the current study is to provide ongoing training in current patient care methods in order to arm nursing home staff with the appropriate tools and knowledge for quick and thorough clinical solutions specifically for geriatrics (Alexander, 2008). Furthermore, requiring such training by the facility

will aid nursing staff in learning evidence-based care and improve resident outcomes (Dyck, 2007). A simple restructuring of funds can ensure that costs are not increased, but rather redistributed to reduce spending on capital, home operations, and administrative expenses and increase spending on clinical training and nursing care, as research suggests that such factors affect both the quality and cost of care (United States General Accounting Office, 2002).

In addition to providing nursing home staff with opportunities for growth in continued education, enhancing the overall work environment will, even beyond salary and benefit increase, enhance the likelihood of improving job satisfaction and reducing turnover (Akinci et al., 2005). The fore mentioned adjustments will aid in the achievement and retention of sufficient nurse staffing levels. Research suggests that skill mix, turnover, tenure and training affect the quality of care; such that managers that strive for low turnover rates and better trained staff will see a positive effect in the quality of care (United States General Accounting Office, 2002).

Policy Implications

Poor staff training is associated with low quality care and high employee turnover (Harrington, 2001). For certification, nursing assistants are only required to complete 75 hours of training which seems inadequate when compared to the certification requirements of manicurists and barbers (Harrington, 2001). Furthermore, for most licensed nurses working in nursing homes, including RN's and LVN's, no special training is given in geriatrics and rehabilitation (Harrington, 2001). Policy changes by the federal legislature have yet to recognize and address this problem (Harrington, 2001).

Accountability is a major policy issue facing nursing homes. Currently, the government does not require nursing homes to spend a set proportion of their funds on direct patient care even though the government pays more than half of the nation's nursing home revenues (62% in

1998) (Levit, Cowan, Lazenby, Sensenig, McDonnell, Stiller, et al. 2000). Possible policy change is for the federal government to require nursing homes to spend proportionately more on direct patient care while setting limits on profits and administrative costs (Levit et al., 2000). Proportional regulations will help to promote a well-trained workforce, and also enable clinicians to receive a living wage, thereby encouraging stable, highly trained, and satisfied nursing home employees (Harrington, 2001).

Evidence suggests that national staffing requirements would help ensure that nursing home residents receive adequate care resulting in increased quality outcomes (Shipmen & Hooten, 2007). However, current economic conditions make increasing staffing requirements a hard sale because of the increased costs that inevitably follow. Considerable public policy changes like these demand a massive amount of statistical data and research in order to persuade legislators and policy makers to pass regulations and provide funding for new long-term care policies.

This preliminary research is informative because it documents that most nursing homes in rural Washington are allocating more than the minimum licensed (RN, LVN, and LPN) nursing hours found beneficial for improving nursing home quality measures by other researchers, but not more than the minimum certified nursing assistant hours per resident per day. Further replication research is needed in other rural counties of the United States to validate the study hypothesis.

Limitations of the study

A possible explanation for the lack of support for the main study hypothesis is that licensed nurses are simply unaware of appropriate evidence-based care processes that constitute good quality. The underlying premise of the Donabedian model is that if the correct structure is

in place, the likelihood that the correct process is in place increases, leading to better outcomes. Nursing hours and quality outcomes, which is the focus of this research, are structure and outcome components of the Donabedian model and, unfortunately, empirical evidence from rural Washington counties showing that good structure, by itself, leads to good outcomes is lacking.

The nursing home environment is different from other health care environments and licensed nurses who practice in nursing homes need additional specialized training that centers specifically on the nursing home population (Schnelle et al, 2004). The direct care responsibilities of the licensed nursing staff may also play a part in a lack of ability to document the hypothesized association between nursing staff and quality measures in this research. Registered nurses have many responsibilities within the nursing facility other than the direct care of residents, making it difficult to assess the true impact of RN hours on nursing home quality measures.

Sample size is a limitation of this study. Although all nursing homes located within all rural counties in the state of Washington are included in the study, not all nursing homes reported data on all quality measures, decreasing the sample size for some quality measures and increasing the amount of missing data.

This study also relied on secondary data analysis which has limitations. Not all elements relating directly to nurse staffing hours and its effect on the quality measures are contained in the Nursing Home Compare database. For example, Nursing Home Compare does not take into account factors such as patient mix or whether or not the nursing hours are spent providing direct patient care. The possibility of the inaccuracy of the data is also elevated with secondary data analysis.

This study did not control for possible confounding variables such as nursing home size, ownership type, hospital based status, patient severity, or payor mix. Nursing homes with deficiency citations were also uncontrolled. It is logical to assume that homes with such citations would increase their nursing hours temporarily in order to remedy the deficiency. This study is limited in scope because it includes data that are gathered during one facility assessment and does not include longitudinal work over previous or subsequent assessments.

Recommendations

Future studies should include an expansion of the number of quality measures, control variables, and nursing homes in order to more effectively describe the association between nurse staffing hours and quality measures in rural nursing homes. The examination and use of data from multiple nursing home quality assessments will increase the scope of this research and allow for a more comprehensive analysis. The employment of stronger statistical tools, such as a multivariate analysis that controls for confounding factors, will help increase the robustness of research findings. Additional replication studies regarding rural nursing homes and the use of the Nursing Home Compare database are also imperative to determine whether or not the findings of this research are unique or representative of the other rural counties across the United States.

Quality transparency in the health care industry is becoming more prevalent and its necessity will only increase with the ever expanding knowledge of and demand for accountability by the public. Using data sets like Nursing Home Compare will assist in the development of future research and empirical evidence to aid us in developing better structures and processes of care in hopes of improving health outcomes for all nursing home residents.

REFERENCES

- Akinci, F., & Krolikowski, D. (2005). Nurse staffing levels and quality of care in northeastern Pennsylvania nursing homes. *Journal of Applied Nursing Research*, 18, 130-137.
- Alexander, G.L. (2008). An analysis of nursing home quality measures and staffing. *Quality Management in Health Care*, 17(3), 242-251.
- Bleismer, M.M., Smayling, M., Kayne, R., & Shannon, I. (1998). The relationship between nursing staffing levels and nursing home outcomes. *Journal of Aging and Health*, 10(3), 351-371.
- Bostick, J. E. (2003). Relationship of nursing personnel and nursing home care quality. *Journal of Nursing Care Quality*, 19(2), 130-136.
- Bostick, J.E., Rantz, M.J., Flesner, M.K., & Riggs, C.J. (2006). Systematic review of studies of staffing and quality in nursing homes. *Journal of the American Medical Directors Association*, 7(6), 366-376.
- Bowers, B.J., Esmond, S., and Jacobson, N. (2000). The relationship between staffing and quality in long-term care facilities: exploring the views of nurse aids. *Journal of Nursing Care and Quality*, 14(4), 55-64.
- Castle, N.G. (2002). Nursing homes with persistent deficiency citations for physical restraint use. *Medical Care*, 40(10), 868-878.
- Castle, N. G., & Engberg, J. (2007). The influence of staffing characteristics on quality of care in nursing homes. *Health Services Research*, 42(5), 1822-1847.
- Centers for Medicare and Medicaid Services. (2001). *Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes*. Report to Congress Phase II Final Report.
- Coward, R, Duncan, R, & Uttaro, R. (1996). The rural nursing home industry: a national

- description. *The Journal of Applied Gerontology*, 15(2), 153-171.
- Davis, M.A. (1991). On nursing home quality: a review and analysis. *Medical Care Review*, 48(2), 129-166.
- Dellefield, M.E. (2000). The relationship between nurse staffing in nursing homes and quality indicators: a literature review. *Journal of Gerontological Nursing*, 26(6), 14-28.
- Donabedian, A. (2005). Evaluating the quality of medical care. *The Milbank Quarterly*, 83(4), 691-729.
- Dyck, M. J. (2007). Nursing staffing and resident outcomes in nursing homes: weight loss and dehydration. *Journal of Nursing Care Quality*, 22(1), 59-65.
- Harrington, C. (2001). Nursing facility staffing policy: a case study for political change. *Policy, Politics, & Nursing Practice*, 2(2), 117-127.
- Harrington, C., & Carrillo, H. (1999). The regulation and enforcement of federal nursing home standards, 1991-1997. *Medical Care Research and Review*, 56, 471-494.
- Harrington, C., Carrillo, H., Wellin, V., & Shemirani, B.B. (1995-2001). *Nursing Facilities, Staffing, Residents, and Facility Deficiencies*, San Francisco: University of California, Department of Social and Behavioral Sciences; 2002.
- Harrington, C., Zimmerman, D., Karon, S. L., Robinson, J., & Beutel, P. (2000) Nursing home staffing and its relationship to deficiencies. *Journal of Gerontology: Social Sciences* 55B (5): S278-87.
- Hickey, E.C., Young, G.J., Parker, V.A., Czarnowski, E.J., Saliba, D., & Berlowitz, D.R. (2005). The effects of nursing home changes in nursing home staffing on pressure ulcer rates. *Journal of the American Medical Directors Association*, 6(1), 50-53.

Horn, S.D., Bender, S.A., Ferguson, M.L., Smout, R.J., Bergstrom, N., Taler, G. et al. (2004).

The national pressure ulcer long-term care study: pressure ulcer development in long term care residents. *Journal of the American Geriatrics Society*, 52(3), 359-367.

Horn, S. D., Buerhaus, P., Bergstrom, N., & Smout, R. J. (2005). RN staffing time and outcomes of long-stay nursing home residents. *American Journal of Nursing*, 105(11), 58-70.

Jette, D.U., Warren, R.L., & Wirtalla, C. (2004). Rehabilitation in skilled nursing facilities. Effect of nursing staff level and therapy intensity on outcomes. *American Journal of Physical Medicine & Rehabilitation*, 83(9), 704-712.

Kayser-Jones, J., Schell, E.S., Porter, C., Barbaccia, J.C., & Shaw, H. (1999). Factors contributing to dehydration in nursing homes: inadequate staffing and lack of professional supervision. *Journal of the American Geriatrics Society*, 47(10), 1187-1194.

Kim, H., Kovner, C., Harrington, C., Greene, W., & Meezey, M. (2009). A panel data analysis of the relationship of nursing home staffing levels and standards to regulatory deficiencies. *Journal of Gerontology, Series B, Psychological Sciences and Social Sciences*.

Konetzka, R.T., Stearns, S.C., & Park, J. (2007). The staffing-outcomes relationship in nursing homes. *Health Research and Education Trust*, 43(3), 1025-1042.

Kramer, A.M., & Fish, R. (2001). The relationship between nurse staffing levels and the quality of nursing home care. *Appropriateness of Nurse Staffing Ratios in Nursing Homes*. Report to Congress, Phase 2 final, chap.2, 1-26. Washington, DC: U.S. Department of Health and Human Services, Health Care Financing

Administration.

Levit, K.R., Cowan, C., Lazenby, H.C., Sensenig, A., McDonnell, P., Stiller, J., et al. (2000).

Health spending in 1998: signals of change. *Health Affairs*, 19(1), 124-132.

Maldonado, R. W., Hanke, L. M., Neff, M. C., & Mor. V. (2004). Nurse staffing patterns and quality of care in nursing homes. *Health Care Management Review*, 29(2), 107-116.

Medicare Collecting and Updating Nursing Home Data. (2009). *U.S. Department of Health and Human Services*. Retrieved January 26, 2009, from <http://www.medicare.gov/NHCompare/static/tabSI.asp?language=English&activeTab=3&subTab=0>

Medicare Nursing Home Compare fact sheet. (2008). *U.S. Department of Health and Human Services*. Retrieved April 7, 2008, from <http://www.medicare.gov/NHCompare/include/DataSection/Quality/QualityMeasuresResults.asp>

Morgan, D.G., Stewart, N.J., D'Arcy, K.C., & Werezak, L.J. (2004). Evaluating rural nursing home environments: dementia special care units versus integrated facilities. *Aging & Mental Health*, 8(3), 256-265.

Rothberg, M.B., Abraham, I., Lindenauer, P.K., & Rose, D.N. (2005). Improving nurse-to-patient ratios as a cost-effective safety intervention. *Medical Care*, 43(8), 785-791.

Schnelle, J. F., Simmons, S. F., Harrington, C., Cadogan, M., Garcia, E., & Bates-Jensen, B. M. (2004). Relationship of nursing home staffing to quality of care. *Health Services Research*, 39(2), 225-250.

- Scott-Cawiezell, J., Pepper, G.A., Madsen, R.W., Petroski, G., Vogelsmeier, A., & Zellmer, D. (2007). Nursing home error and level of staff credentials. *Clinical Nursing Research*, 16(1), 72-78.
- Shi, L. (2008). Health services research (2nd ed.). Thomson Delmar.
- Shipman, D., & Hooten, J. (2007). Are nursing homes adequately staffed? The silent epidemic of malnutrition and dehydration in nursing home residents. *Journal of Gerontological Nursing*, 33(7), 15-18.
- United States General Accounting Office. (2002). *Nursing homes: quality of care more related to staffing than spending* (GAO Publication No. GAO-02-431R). Washington, DC: United States General Accounting Office.
- Wells, J. (2004). The case for minimum nurse staffing standards in nursing homes: a review of the literature. *Alzheimer's Care Quarterly*, 5(1), 39-51.
- Zhang, X., & Grabowski, D. C. (2004). Nursing home staffing and quality under the nursing home reform act. *The Gerontologist*, 44(1), 13-23.
- Zinn, J.S., & Mor, V. (1998). Organizational structure and the delivery of primary care to older Americans. *Health Services Research*, 33, 354-380.