2020

Impact of Registered Nurse Staffing Ratio on Nursing Home Operating Margins and Quality Measure Star Ratings

Douglas R. Whitman
University Of Alabama At Birmingham

IMPACT OF REGISTERED NURSE STAFFING RATIO ON NURSING HOME OPERATING MARGINS AND QUALITY MEASURE STAR RATINGS

Defended

by

Douglas R. Whitman

Robert Weech-Maldonado, Chair
Pia Bisakha Sen
Amy Landry
Nathaniel Carroll

A DISSERTATION

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

BIRMINGHAM, ALABAMA

2020

IMPACT OF REGISTERED NURSE STAFFING RATIO ON NURISING HOME OPERATING MARGINS AND QUALITY MEASURE STAR RATINGS

DOUGLAS R. WHITMAN

ABSTRACT

Today's nursing homes are under immense pressure from government regulators to improve quality while the government simultaneously tightens reimbursement rates. These two forces squeeze operating margins. The question facing nursing home operators is how to improve quality without breaking the bank. This study looks at the association of more registered nurses (RN) with quality and margins in U.S. nursing homes.

This research project fills literature gaps which previously found improved nursing home quality correlates with more RNs. However, prior studies used self-reported data and typically considered only two or three quality measures. This study uses recently released electronic payroll data to more accurately report nursing labor hours, and it utilizes the government standard of 17 quality measures that make up the star ratings.

This study uses the Resource-Based View of the Firm theory with the Donabedian structure/process/outcome framework to analyze the relationship of RN staffing mix with operating margins and quality measure star ratings. The methodology of this project used ordinary least squares regression for operating margins and ordered logit regression for quality measure star ratings. The sample of 12,862 nursing homes omitted those that were either extraordinary data outliers or did not file complete cost reports.

This study determined that a higher proportion of RNs was correlated with lower operating margins and improved quality measure star ratings. Nursing home operators could expect to improve quality measure star ratings when utilizing higher RN staffing mix.

Key words: Nursing homes, operating margins, quality measure star ratings, nurse staffing mix, payroll-based journal.

DEDICATION

I dedicate this dissertation to my mom. Elizabeth Louise Macke Whitman quietly encouraged and supported me to carry my education as far as I had a desire to do so. She was intelligent and capable and believed in education. After she graduated from nursing school, she went back to college and became an electronics/computer engineer. Not many women in her generation were a registered nurse and a chief engineer at the same time. Although she has passed away, I believe she is still cheering for me now.

ACKNOWLEDGMENTS

I would like to acknowledge the guidance of my mentor and committee chair Dr. Robert Weech-Maldonado. I have felt like a sponge since I first met him almost four years ago. He is one of the primary reasons I accepted admission to this program. I immediately recognized that he is a thought-leader in my professional field of long-term care. I sought to learn from him, and it has been my privilege to research under his direction. I hope to continue to research and publish with him in the future.

I also have great admiration for each member of my committee, Dr. Pia Sen, Dr. Amy Landry, and Dr. Nate Carroll, who are among the talented faculty members that taught my cohort. These professors influenced me personally in many ways beyond the lessons learned in the classroom. I value their support and encouragement throughout my UAB experience.

The leader of our program, Dr. Robert Hernandez, has been an inspiration to me. Although as a Duke alumnus, I have reluctantly attempted to overlook his light blue roots, I have a great deal of respect for him and the direction he has given me along the way. The faculty in the Doctor of Science program has provided a great learning experience for me as well. Gani Davlyatov was very helpful to me in data management and statistical analysis with this study. His knowledge and experience with nursing home data was invaluable. Moses Barker was also a patient guide on my statistical processes. I value the role that program director Leandra Celaya has played. She held my hand several times through some rough spots, including two direct-hit hurricanes on my hometown.

The members of my cohort have become my friends, almost family. I have such high regard for each of them. We have supported each other through good and hard times, and they have all contributed to my learning and my life experience.

Lastly, and perhaps most importantly, I acknowledge my family. When I was finishing my MBA at Duke University in 2002, I asked my wife, Pamela Whitman, how she might feel if I were to continue in school to get my doctorate degree. She said four words (I will leave you). So, I thought it would be a great time to go get a job! But 15 years later, she encouraged me to proceed on this monumental adventure. I could not have succeeded without her support. Our children Jessica W. Maloy and Andrew Whitman sometimes wondered why I was going back to school at an age some people retire, but they and my five granddaughters cheered me on anyway. My father-in-law, Kenneth Kohler, has been as excited about my dissertation completion as I have been. This has been an incredible journey!

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Figure *Page*

LIST OF ABREVIATIONS

CASPER = Certification and Survey Provider Enhanced Reporting

CMS = Centers for Medicare and Medicaid

HHI = Herfindahl- Hirschman Index

LPN = Licensed Practical Nurse

LTC = Long-Term Care

MDS = Minimum Data Set

PBJ = Payroll-Based Journal

RN = Registered Nurse

CHAPTER 1

Introduction

CHAPTER 1: Introduction

Problem and Contribution: This study examined the association between Registered Nurse (RN) staffing mix and (1) quality measure star ratings and (2) financial performance in U.S. nursing homes. This is significant to owners/managers of nursing homes who seek to improve quality measure star ratings and operating margins in an environment of increasing federal regulation and tighter controls on staffing, quality, and reimbursement rates. This research on the correlation of RN staffing with quality measure star ratings and/or operating margins contributes to literature and informs practice and policy.

Introduction: This research project studied the association of a higher proportion of RNs among nursing home nurses on the quality measure star ratings and on operating margins. The study utilized recently implemented government data on staffing documentation called Payroll Based Journal (PBJ).

Literature Gap: The study has identified gaps in the existing literature on this topic. First, current research relies on the accuracy of self-reported nurse staffing hours. This project will use PBJ electronic payroll records that is collected from nursing homes by the Centers for Medicare and Medicaid Services (CMS). Second, although existing literature does address the impact of nurse staffing on quality, this study will take it a step farther and report the effect of RN staffing on the quality measure star ratings that are published by CMS. In addition, this research will assess the influence of RN staffing on nursing home financial performance measured by operating margins.

Purpose and Implications: The purpose of this project is to determine with greater accuracy and with more current data than prior research if nursing home administrators may be able to improve quality measure star ratings and/or financial performance with a higher RN staffing mix.

Data Sources: This research used publicly available CMS staffing, quality, and financial data from LTC Focus, CMS Nursing Home Compare archives, CMS Medicare Cost Reports, and CMS Payroll-Based Journal (PBJ). Geographic/demographic data came from the Area Resource File. The sample was designed to be approximately 12,000 certified nursing homes measured from the beginning of the PBJ data collection by CMS in 2017.

Conceptual Framework: This study used the following conceptual framework and theory: Donabedian Structure/Process/Outcome framework (SPO) with the Resource-Based View of the Firm theory (RBVF).

Methodology: The statistical analysis methods includes the ordered logit model for star ratings, because there are five ordered response categories. The operating margins portion of the study used Ordinary Least Squares Regression modeling. The independent variable is the RN staffing mix. The two dependent variables are (1) quality measure star ratings and (2) operating margins. The control variables included the following: bed count, location, for-profit/non-profit, multi-facility, occupancy rate, average acuity, Medicare and Medicaid percentages, nurse staffing intensity, competition, and median income. The state code was used as fixed effects.

CHAPTER 2

Background

CHAPTER 2: Background

From the birth of Medicare and Medicaid in the mid-1960s through the early 1980s, U.S. government expenditures for healthcare services rose at an unprecedented pace. (Shi, 2015a) This was driven, in part, by two external forces: (1) the U.S. healthcare financial model, which utilized fee-for-service payment that was subject to inflationary tendencies; and (2) the independent American societal culture of individual determination to obtain the latest healthcare treatments with the newest healthcare technology regardless of costs. (Shi, 2015b)

By the 1980's, the U.S. government Medicare and Medicaid systems were experiencing unsustainable growth in healthcare costs. In response, Congress and federal agencies began 30 years of overhaul on the healthcare industry, including long-term care.

In 1987, Congress passed the Nursing Home Reform Act (NHRA), which affected many elements of long-term care including staffing and quality. The NHRA required nursing home managers to meet minimum staffing standards in order to maintain certification for reimbursement from Medicare and Medicaid. The law mandates sufficient staff to care for patients, and the presence of one 8-hour RN daily, licensed nurses 24 hours, and minimum training standards for Certified Nurse Aides (CNA). The law also established quality measures that included antipsychotic drugs, restraints, med errors, pressure ulcers, and incontinence (Zhang, 2004).

Ten years later, Congress created the new Prospective Reimbursement System as part of the Balanced Budget Act of 1997 (White, 2006). This changed the way the federal government paid providers for health care services. Previously, Medicare and Medicaid reimbursed providers on a Retrospective Reimbursement system, which is also referred to as cost-plus or fee-for-service. This Retrospective Reimbursement method had the tendency to reward providers for performing more tests and procedures, whether or not there was benefit to the patient (Park, 2007).

In 2002, CMS developed the Nursing Home Compare website (NHC) to provide information and comparative ratings on all nursing homes in regard to staffing levels, patient outcomes, and regulatory compliance (R. Konetzka, Grabowski, D., Perraillon, M., & Werner, R. , 2015).

In 2008, CMS enhanced the NHC website when it established the Star Rating system (Dulal, 2017). It took existing quality measures that were previously being tracked, and it created algorithms to calculate quality measure star ratings based on measurements of resident preference and outcomes. The quality measure star ratings became one of three elements of the overall star ratings published by CMS for nursing homes. The other two domains of the overall star ratings were (1) CMS annual recertification inspection results, and (2) self-reported staffing levels. The intent of the NHC website was to motivate providers to improve quality (R. Konetzka, Grabowski, D., Perraillon, M., & Werner, R. , 2015).

Nearly all the 15,000+ U.S. nursing homes are required to continuously report 26 quality measures to CMS, of which 17 form the basis of the quality measure star ratings published quarterly on the NHC website (CMS-NHCompareArchive, 2019). For each of the 17 quality

measures, CMS assigns point values between 100 and 150 points (higher scores are better). The total points from all 17 quality measures produce a star rating between one and five stars (again, higher is better). Of these 17 quality measures, 10 focus on long-stay patients (100+ days), and seven concentrate on short-stay patients (primarily people who receive intense physical therapy to recover from surgery or acute medical incidents). Quality measures include such items as pain management, catheters, antipsychotic drugs, hospital readmissions, and emergency room visits. CMS has revised the list of quality measures several times since 2008, most recently in 2019, when they introduced several new measures, algorithms, and weightings. In the U.S., nursing homes are required to report standardized nursing assessments, however some European countries have experimented with quality measure reporting on a voluntary basis allowing nursing homes to compare themselves against their peers without identifying individual nursing homes. (Mor, 2010)

In 2010, a portion of the Affordable Care Act (ACA) began establishing financial incentives and penalties for providers to motivate quality improvement efforts (CMS-FederalRegister, 2011). Within these initiatives, hospitals are financially incentivized to minimize readmission rates, and that has caused them to be more selective of the nursing homes to which they refer discharged patients. Many hospital systems have responded by designating "in-network nursing homes", often based upon the CMS quality measure star ratings and hospital readmission rates. If nursing homes achieve high quality measure star ratings, they will likely receive more desirable hospital referrals (compliant patients that have better pay sources). Therefore, one of the most pressing issues for nursing home managers today is to determine how to magnify the quality measure star

ratings, so they can (1) attract the better patients from hospital discharges and (2) maintain financial stability.

With slim to negative operating margins in most nursing homes, this study focuses on the challenge facing nursing home managers to balance costs and quality measure star ratings. There is a confluence of two powerful government-driven forces in the nursing home industry that make it difficult to achieve financial viability: (1) CMS regularly ratchets up pressure on nursing homes to improve quality, and (2) Congress pushes CMS to tighten Medicare and Medicaid reimbursement rates to nursing homes. While trying to improve quality, nursing home owners are left with operating budgets that are squeezed on both sides: decreased revenue and increased expenses, which strangle profits.

As reimbursement rates constrict, nursing home operating budgets shrink, and managers have sought ways to cut costs. Labor is the largest expense item, and RNs are the highest paid floor staff. Managers have looked for ways to reduce wage costs to make up for reduced revenue from Medicare and Medicaid rate cuts. So for decades, nursing home managers attempted to save their way into positive financial performance by replacing expensive RNs with less expensive Licensed Practical Nurses (LPNs) (White, 2006). This practice led to a 25% decrease in RN staffing levels in U.S. nursing homes between 1999-2003 (C. Harrington, 2005). Two important differences between RNs and LPNs are training levels and the ability to assess resident medical status (McCain, 1965). RNs receive more comprehensive education and training than LPNs, and RNs can assess patient conditions, which it is out of scope for LPNs. Also, LPNs work under the

supervision of RNs (Mueller, Anderson, McConnell, & Corazzini, 2012). As LPNs replaced RNs over the past 20 years, it has exacerbated public concerns about quality care.

The above economic and policy changes have presented difficult challenges to nursing home companies (Levins, 2017). In fact, this might be the hardest industry environment ever for skilled nursing managers, according to American Health Care Association (AHCA) CEO Mark Parkinson in his keynote address at the 2017 AHCA conference (Mullaney, 2017). The widespread cuts to government reimbursement rates led nursing home managers to cut costs, which has created concerns that care quality is being sacrificed. (R. Weech-Maldonado, Vince Mor, Adetokunbo Oluwole, 2004) Medicare and Medicaid rate cuts have a negative effect on nurse staffing in U.S. nursing homes (R. T. Konetzka, Yi, D., Norton, E. C., & Kilpatrick, K. E. , 2004). In addition to tighter reimbursement practices by Medicare and Medicaid, nursing homes already experience operating losses on average from Medicaid, which is the pay source for about two thirds of all nursing home patients. The per patient day (PPD) cost of care for each Medicaid patient is higher than the average Medicaid PPD reimbursement rate (Rau, 2017).

Medicaid reimbursement rates are positively associated with RN and total nursing hours. "Medicaid reimbursement rates would need to be substantially increased" to motivate nursing home managers to increase staffing levels. (C. Harrington, Swan, J., & Carrillo, H. , 2007) page 1105.

As nursing home managers look for the “success formula” to attain better quality measure star ratings and financial stability, one approach may be to reverse the trends of the past 20 years and hire a greater proportion of RNs for nurse positions.

CHAPTER 3

Literature Review

CHAPTER 3: Literature Review

a. Nurse Staffing vs. Quality in Nursing Homes

In reviewing the literature related to the effect of nurse staffing on nursing home quality, I found many studies that skirt the perimeter of my research questions. In this section, I will synthesize my key learnings from related articles under two sub-headings: staffing intensity and staffing mix.

Nurse Staffing Intensity in Nursing Homes

Staffing intensity in nursing homes refers to the number of nurse hours per patient day (HPPD), which is associated with the nurse/patient ratio.

Recent literature documents that higher RN staffing achieves high quality of care, and RNs clinical expertise and professional skills assist in maintaining better quality processes and outcomes. (R. Weech-Maldonado, Meret-Hanke, L, Neff, M, Mor, V, 2004) Also, staffing hours per patient day (HPPD) for RN, LPN, and CNA forms a basis for a relationship between quality and financial performance, along with RN skill mix and several quality measures of facility processes and patient outcomes. (R. Weech-Maldonado, Pradhan, R., Dayama, N., Lord, J., Gupta, S., 2019)

Large for-profit nursing home companies have lower nurse staffing and more serious deficiencies than other types of nursing home ownership. (Charlene Harrington, Olney, Carrillo, & Kang, 2012) In California, different quality measures have different relationships with cost

and efficiency. Quality of care and cost efficiency are more impacted by care process than by staffing ratios. (Dulal, 2017)

I also expanded the literature search to include the effect of non-RN staff positions on nursing home quality. Higher levels of caregiver staffing had a robust association with quality indicators (Castle, 2011), and increased CNA staffing predicted a lower number of inspection survey deficiencies demonstrating a positive relationship between CNA staffing and nursing home quality. (Hyer et al., 2011)

Nurse Staffing Intensity in Hospitals

I looked at several closely related studies in hospitals. It was learned that each additional patient per nurse correlates with a 7% higher mortality within 30 days of the hospital admission and a 23% increase in the odds of nurse burnout. (L. H. Aiken, Clarke, Sloane, Sochalski, & Silber, 2002) RN staffing changes are related to an increase in hospital deaths (Harless & Mark, 2010), and there is a negative relationship between RN staffing and patient safety indicators in hospitals. (Unruh & Zhang, 2012)

With the minimum nurse staffing mandate in California hospitals, nurses were assigned to one less patient than nurses in the other states that did not have minimum staffing mandates. When nurses in non-mandated states have similar workload to California's mandated staffing levels, nurse burnout and dissatisfaction are lower. (L. Aiken, Sloane, D., Cimiotti, J., Clarke, S., Flynn, L., Seago, J., Smith, H., 2010)

Discussion: We learn from existing literature that nursing home quality of care improves when there are higher RN staffing levels and better staffing generally in the nursing department (RN, LPN, and CNA). Also, quality is more affected by care process than by staffing intensity. Likewise, hospital patient care quality and safety improve when RN staffing is higher.

Nurse Staffing Mix

Nurse staffing mix in nursing homes refers to the proportion of nurses that have certain levels of licensing, training, experience, skills, etc. For purposes of this study, I will generally refer to staffing mix as the proportion of nurses that are Registered Nurses (RNs) vs the total of all RNs and Licensed Practical Nurses (LPNs).

One nursing home study showed that increased RN hours in direct patient care were associated with lower pressure ulcers, hospitalizations, urinary tract infections, weight-loss, and catheterizations. (Horn, Buerhaus, Bergstrom, & Smout, 2005) Another study also found increased RN hours were associated with a lower number of pressure ulcers but did not find a correlation with other quality indicators. (Lee, 2014) Poor quality of care is found to be related to low nurse staffing and a poor mix of nursing skills. (Spilsbury, Hewitt, Stirk, & Bowman, 2011)

When nursing homes have a higher level of RN staffing, they tend to deliver higher quality care, and the proportion of RNs is associated with better processes of care (such as lower use of restraints). (R. Weech-Maldonado, Meret-Hanke, L, Neff, M, Mor, V, 2004) Increased RN staffing levels are positive predictors of improved nursing home quality (Kim, 2009).

Some states allow nursing homes to use CNAs with a little extra training to pass medications after taking a test to become medication aides, and there are fewer deficiencies in nursing homes that use medication aides. (Walsh, Lane, & Troyer, 2013)

Discussion: we have learned from current literature that a higher proportion of RNs in the nurse staffing mix delivers better quality care to nursing home patients. Multiple studies found this to be the case as demonstrated by lower number of pressure ulcers. Also, increased RN staffing levels predict improved quality.

b. Nurse Staffing vs. Financial Performance

In my literature review on the effect of nurse staffing on nursing home financial performance, I found some very relevant research, In this section, I will summarize my key findings from related articles under two sub-headings: staffing intensity and staffing mix.

Nurse Staffing Intensity in Nursing Homes

Nursing homes that are managed by owners have higher nurse staffing levels than in nursing homes managed by hired administrators, but they both have similar quality and financial performance. (Huang & Bowblis, 2017) When Medicaid census increases, RN staffing levels decrease in both for-profit and non-profit nursing homes. (Decker, 2008)

Use of Donabedian's structure, process, and outcomes (SPO) framework in research on nursing homes demonstrates that improved process of care and outcomes were characterized by better

financial performance, which suggests there is a business case for quality. It has been suggested that RN staffing intensity in nursing homes might have an indirect positive impact on financial performance through these improvements in processes and outcomes. (R. Weech-Maldonado, 2016)

Nurse Staffing Intensity in Hospitals

I also expanded my research on nurse staffing effect on financial performance to include hospitals. Hospital nurse staffing is associated with financial performance in competitive hospital markets (Everhart, Neff, Al-Amin, Nogle, & Weech-Maldonado, 2013)

Discussion: existing literature about RN staffing and financial performance of nursing homes tells us that nursing home RN staffing levels decrease when Medicaid census is up, and higher nurse staffing in owner-managed nursing homes does not affect quality or financial performance compared to those managed by hired administrators. Literature on hospitals also supports the concept that nurse staffing is positively related to financial performance.

Nurse Staffing Mix

Literature shows a relationship between quality and financial performance, basing the independent variable (quality) on nursing home staffing hours per patient day (HPPD) for RN, LPN, and CNA, along with RN skill mix and several quality measures of facility processes and patient outcomes. It was determined that nursing homes perform better financially when they use better processes and outcomes of care, suggesting there could be a fiscal benefit from quality. (R. Weech-Maldonado, Pradhan, R., Dayama, N., Lord, J., Gupta, S., 2019)

In support of the expected outcome of this nursing home study, hospitals had higher operating costs when they increased RN staffing, but "found no statistically significant effect of RN staffing on profit margins." (McCue, Mark, & Harless, 2003) page 68. That is consistent with my expectations in this study and with a comment from the 2016 Weech-Maldonado study noted above (R. Weech-Maldonado, 2016) that although increased RN staffing will increase expenses, the hospital study did not find a negative effect on profit margins. (McCue et al., 2003)

Discussion: Although my study goes a step farther, current literature provides support for the expected outcome of my study. Existing literature suggests that increased RN staffing and the benefits of higher skills mix from RNs are positively related to financial performance. It also indicates that even though RN salaries will increase expenses, the associated advantage of having more RNs on staff has no negative affect on operating margins. In fact, I propose this study might find that increased RN staffing mix would have a positive impact on operating margins.

c. Gaps and Weaknesses in the Literature; Expected Contributions to Literature from this Study

I have identified two primary gaps in existing literature on this topic. First, the accuracy of current research on nursing home RN staffing has been based on self-reported staffing levels by nursing home administrators during the annual CMS recertification inspection. Many researchers criticize self-reported data as a limitation of research viability. This study will be the first to utilize the more precise PBJ reporting system, in which CMS pulls staffing data directly from the electronic payroll systems that nursing homes use to pay nursing employees. Second,

existing studies on nursing home staffing and quality tend to omit relevant reference to the quality measure star rating system, which has become the industry standard for nursing home evaluation by patient families and by medical professionals.

In my literature search, I found no existing research that addresses the association of RN proportion of nurse staffing with either quality measure star ratings or with financial performance using the new PBJ tool. Early research on the PBJ has demonstrated total nursing department staffing increases are associated with higher quality measure ratings (Williams, Zheng, & White, 2019), and has shown a greater difference in RN staffing hours between PBJ and prior self-reported data than CMS officials expected to see. (Geng, Stevenson, & Grabowski, 2019)

Some studies I reviewed were very close to my topic, but they were published several years prior to the creation of the CMS star rating system or PBJ staffing reports. Despite that, several of these articles do provide support to my question if a higher proportion of RNs will improve quality measure star ratings. Other studies supported my research questions, as several of the outcomes were among the quality measures now used to calculate the quality measure star ratings.

This study of the impact of RN staffing mix on quality measure star ratings and/or improved operating margins will not only contribute to knowledge and literature, but it could also inform nursing home managers as they develop strategies to create sustainable competitive advantages.

This study proposes that this is (1) a relationship between RN staffing mix and quality measure star ratings and (2) a relationship between RN staffing mix and operating margins. The results of this study will be important to nursing home managers as it will provide scientific evidence regarding the relationship of quality measure star ratings and/or fiscal performance with the proportion of RNs in nurse positions. The purpose of this project is to determine if nursing homes can expect to improve quality measure star ratings and/or financial performance with a larger proportion of RNs, as measured by PBJ.

There is significant need for this research. Some of the research in current literature is more than 10 years ago, and much has changed in healthcare regulation, nursing home operational practices, quality measure reporting, and reimbursement environment. This study should provide answers for nursing home administrators regarding the value of hiring RNs vs. LPNs to achieve higher quality measure star ratings and to drive positive operating margins.

Although some existing research parallels and conceptually supports many of the elements of my study, my project will fill literature gaps in two areas (1) by using recent PBJ data to more accurately measure nursing staff HPPD and (2) by utilizing quality measure star ratings in place of specific quality measures.

CHAPTER 4

Theory, Conceptual Framework, and Hypotheses

CHAPTER 4: Theory, Conceptual Framework, and Hypotheses

This study utilized Donabedian's "structure/process/outcome" (SPO) framework with the Resource-Based View of the Firm theory (RBVF) to analyze the relationship between RN staffing mix and quality measure star ratings (Quality Stars) and operating margins.

Resource-Based View of the Firm

The resource-based view of the firm theory best explains and clarifies my research questions and analyses. It proposes that a company is a collection of resources, capabilities, or processes that create value but that competitors cannot easily imitate. (Miller, 2019) The RBVF identifies and relies on both tangible and intangible resources that are diverse and immobile to create sustainable competitive advantage.

RN staffing is a unique resource in a nursing home and can affect quality and financial performance as demonstrated by numerous studies in the literature review. Further, the proportion of nurses that are RNs can contribute to better performance, and this could create competitive advantage. In competitive environments, a nursing home with a higher proportion of RNs could establish a reputation of actual or perceived high-quality care, which might develop not only a competitive advantage, but a "sustainable" competitive advantage. The Donabedian SPO framework and the Resource-Based View of the firm are exactly aligned with the premise in this study that explores the reason a higher proportion of RNs could build a sustainable competitive advantage.

The RBVF was developed by Jay Barney in the early 1990's. The four indicators that could create sustainable competitive advantages include resources that (1) have value, (2) are rare, (3) are difficult to imitate, and (4) do not have similar substitute resources available to competitors. (Barney, 1991)

The resource-based view of the firm is different from other theories, because it emphasizes the connection between strategy and the internal firm resources. It focuses on competitive advantage created by a firm's unique resources. (Wright, 1992)

The RBVF theory is becoming integrated into healthcare management research, particularly in large scale quality improvement efforts. Empirical studies can use the theory to explore if it is applicable or needs adjusting to the healthcare industry. This theory looks at organizational and system level competencies rather than a micro level view from other commonly used theories in healthcare management. (Ferlie et al., 2015)

The RBVF theory has three basic elements that are applicable to this study: (1) performance differs among companies based on each organization's resources; (2) companies develop and maintain unique and sustainable positions in competitive environments; and (3) firms compete on a basis of their unique resources. (Miles, 2012)

Donabedian's Structure-Process-Outcomes Framework

Donabedian's (1966) research developed the "structure-process-outcome" (SPO) framework. He created this framework when he was hired to look at the research on quality assessment related to

the roll-out of Medicare and Medicaid. (Ayanian & Markel, 2016) Before the Donabedian framework, there was little structure to the evaluation of healthcare process and outcome. (Ayanian & Markel, 2016)

The Donabedian "structure-process-outcome" framework is now used by many researchers to assist in evaluating healthcare quality issues. (Ulreich, 2015) The framework is simple, and it provides a solid foundation for this study.

Definition and Examples of Donabedian's SPO Framework in this Study

In this research project, Donabedian's "structure" would refer to RN staffing, specifically the proportion of RNs that work in nurse positions in a nursing home and encompasses the training and experience of the RNs. The "process" portion of the framework would represent the way RNs perform the nursing services (good or bad) that demonstrate the nursing approach to patient care (process-oriented quality measures, such as the use of catheters and the prevention of pressure ulcers). The final element of the framework, "outcome", would denote the actual effect of care given by the RNs to the patients. The focus of this study will be the relationship between "structure" (RN staffing levels) and "outcomes" (quality measure star ratings and operating margins).

Donabedian's SPO Framework used with RBVF Theory

In my review of literature on management theories and frameworks, I observed that two of the prominent papers I studied regarding the impact of nurse staffing on quality used both Donabedian's SPO framework and the resource-based view of the firm. The framework and

theory fit well together. Weech-Maldonado, et al. (2004) used them jointly to research the effect of RN staffing on the quality of care. Ulreich (2015) also used the framework and theory together in her dissertation that studied nurse staffing and patient falls. She used the Donabedian framework to define (a) "structure" as staffing levels by shift; (b) "process" as doing the right things to use proper protocols in reducing falls; and (c) "outcomes" as understaffing associated with the likelihood of falls. Ulreich used the resource-based view of the firm theory to develop her concept of tacit knowledge gained through exposure to certain experiences and outcomes. She concluded that tacit knowledge contributes to certain attributes of nurses, which create unique resources and a competitive advantage spoken of by this theory.

The Donabedian SPO framework formed the basis of another more recent paper by Weech-Maldonado, et al. (2019). He used the SPO to support the independent variable of quality. The "structure" was represented by HPPD for RN, LPN, and CNA, along with RN skill mix. The "process" was characterized by process-oriented quality measures such as facility-acquired catheters and restraints, pressure ulcer prevention, and restorative ambulation. The "outcomes" included facility-acquired contractures and pressure ulcers, hospitalizations, re-hospitalizations, and health deficiencies. Although my use of the SPO framework uses different characteristics, Weech-Maldonado's use of this model is consistent with my plan.

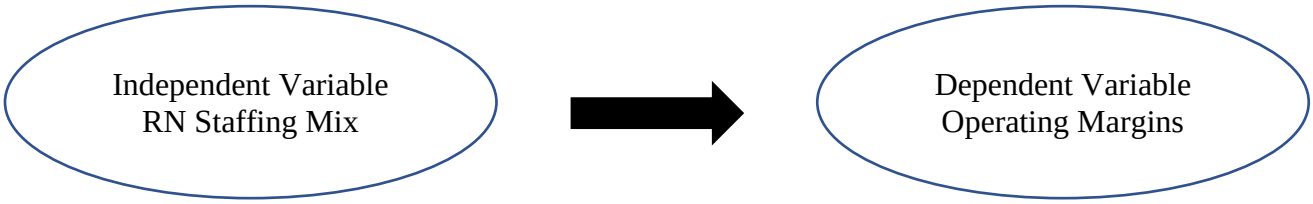
Hypothesis Development

Financial Performance vs. Nurse Staffing: major constructs

The basic constructs of the financial performance portion of this study is RN staffing mix and operating margins. The independent variable is RN staffing mix. The dependent variable of

interest is operating margins. The following diagram shows the relationship of these constructs, namely RN staffing mix with operating margins (Figure #2) in U.S. nursing homes.

Figure #1: How do changes in the proportion of RN staffing affect operating margins in U.S. nursing homes?



Control Variables

1. Bed count
2. Multi-facility
3. For profit/non-profit
4. Occupancy rate
5. Medicare percentage
6. Medicaid percentage
7. Acuity index
8. Staffing intensity (RN, LPN, and Medication Aid HPPD)
9. Location
10. Market competition
11. Median income

Financial Performance vs. Nurse Staffing: relations hypothesized

This portion of the study hypothesizes that a higher proportion of RNs among nurse staffing levels will produce better operating margins in nursing homes. There are clear relationships between higher RN staffing mix and operating margins.

As a nursing home increases the RN staffing mix, it puts better trained RNs on the floor to assess and treat complex and acute patients. That should earn greater trust among professional referral sources, such as physicians, hospital nurses, and discharge planners, which motivates them to refer the better patients to those nursing homes for two reasons: (1) hospitals are financially incentivized by the federal government to reduce readmissions from nursing homes, and many hospitals select "in-network" nursing homes based in part upon perceived quality of care, and (2) these professionals will more likely encourage the better patients (compliant patients with better pay sources) to choose nursing homes they believe have better quality of care.

The hospital discharge planners greatly influence patient selection of nursing homes for post-acute care. They will more likely refer patients to nursing homes that they perceive will provide better quality care. This study conjectures that discharge planners will refer the better patients to nursing homes with a higher proportion of RNs. There is a direct relationship between the referral of better patients and improved financial performance. As better paying patients are referred to a nursing home, greater revenue will follow, which will improve financial performance.

Financial Performance vs. Nurse Staffing: Hypothesis

The financial performance hypothesis for this study is as follows:

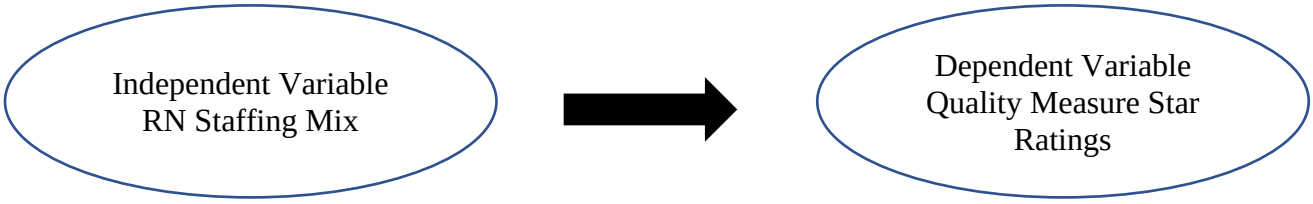
Hypothesis #1

Nursing homes with a greater proportion of RNs working in nurse positions have better operating margins than nursing homes with a lower proportion of RNs working in nurse positions.

Quality Stars vs. Nurse Staffing: major constructs

The basic constructs of the quality portion of this study were RN staffing mix and quality measure star ratings (quality stars). The independent variable is RN staffing mix. The dependent variable of interest is quality measure star rating. The following diagram shows the relationship of the constructs of this portion of the study, namely RN staffing mix with quality measure star ratings (Figure #1) in U.S. nursing homes.

Figure #2: How do changes in the proportion of RN staffing affect quality measure star ratings in U.S. nursing homes?



Control Variables

1. Bed count
2. Multi-facility
3. For profit/non-profit
4. Occupancy rate
5. Medicare percentage
6. Medicaid percentage
7. Acuity index
8. Staffing intensity (RN, LPN, and Medication Aid HPPD)
9. Location
10. Market competition
11. Median income

Quality Stars vs. Nurse Staffing: relations hypothesized

This portion of the study hypothesizes that a higher proportion of RNs among total nurse staffing would produce better quality measure star ratings in nursing homes. There are clear relationships among higher RN staffing mix and quality measure star ratings. Higher RN staffing mix puts better trained RNs on the floor assessing and treating complex and acute patients, which has a direct relationship with the quality measure star ratings.

Nursing homes have non-RN options to meet the required nurse staffing levels. Administrators can hire nursing personnel that accept lower salaries than RNs, such as LPNs, and in some states, Medication Aids (CNAs that take a brief course in passing pills). From a quality care standpoint, these RN alternates cannot provide all the needed care services that RNs can, including patient assessment, because it is out of scope of their licenses to do so. The inability to assess and perform certain other nursing treatments can negatively affect the quality of care and quality measure star ratings. RNs are better trained and have a broader scope of care services than non-RN nursing personnel.

Quality Stars vs. Nurse Staffing: Hypothesis

The quality hypothesis for this study is as follows:

> Hypothesis #2
>
> Nursing homes with a greater proportion of RNs working in nurse positions have higher quality measure star ratings than nursing homes with a lower proportion of RNs working in nurse positions.

Conceptual Framework Conclusion

At the start of this study, I believed we will find that RNs produce better patient outcomes than LPNs given at least two important differences: training and ability to assess. RNs receive more comprehensive education and training than LPNs, and RNs can assess patient conditions, which is out of scope for LPNs. Because of training and assessment, I thought we would find better patient outcomes, which could lead to improved CMS quality measure star ratings, because (a) long-term care patients typically have multiple chronic and complex conditions, any one of

which could cause immediate change of condition that needs an RN to assess; and (b) short-term rehab patients come straight from the hospital with acute conditions that often require immediate RN assessment. When LPNs are caring for these patients, the assessment process is slowed or even sometimes missed, diminishing the quality of care and potentially complicating or compromising the treatment needs of the patients. Consistent with the RBVF theory and the Donabedian SPO framework, if the hypotheses prove correct, a nursing home could create not only a competitive advantage, but a "sustainable" competitive advantage by having a company culture of higher quality care as the nursing home hires and maintains a greater proportion of RNs.

CHAPTER 5

Methodology

CHAPTER 5: Methodology

a. Data Sources

This study used publicly available data from these primary sources: LTC Focus, Area Resource File, CMS Medicare cost reports, CMS Payroll-Based Journal, and CMS Nursing Home Compare archives.

LTC Focus: LTC Focus is a research product of the "Shaping Long-Term Care in America Project" at the Brown University Center for Gerontology and Healthcare Research, which is supported, in part, by the National Institute on Aging. This research group assembles data collected from CMS and a variety of primary and secondary sources, including the CASPER databases, and calculations using the Herfindahl-Hirschman Index. Here is a brief explanation of the primary data that was provided for this study from LTC Focus:

- **CASPER Database**: Certification and Survey Provider Enhanced Reporting (CASPER) are administrative data collected by state survey agencies during the nursing home annual certification inspections and reported to CMS. These data provide information on patient characteristics, staffing, and quality deficiencies from the annual inspections. In 2012, CASPER replaced an earlier data collection system called Online Survey Certification and Reporting (OSCAR).

- **Herfindahl-Hirschman Index (HHI)**: LTC Focus calculates competitive analysis using the HHI. This was used in this study as the Market Competition variable.

Area Resource File (ARF): This database is prepared by the U.S. Department of Health and Human Services, Health Resources Service Administration, Bureau of Health Professions. It provides immense data on each of the nation's counties. It draws information from dozens of sources on over 6,000 variables at the county level. This study draws on data from the ARF for multiple variables including location and median income.

Centers for Medicare and Medicaid Services (CMS)

In addition to CMS data consolidated by LTC Focus above, this study used several databases provided directly by CMS, including (a) quality measure star ratings from Nursing Home Compare, which uses nursing home MDS data; (b) cost reports, and (c) payroll-based journal.

- **Nursing Home Compare**: CMS produces quarterly quality measure star ratings data in its Nursing Home Compare. CMS calculates the quality measure star ratings from nursing home data called Minimum Data Set (MDS).
    - **Minimum Data Set (MDS)** is a series of comprehensive multidisciplinary assessments of nursing home patients in areas such as falls, antipsychotic drugs, incontinence, pain, re-hospitalizations, pressure ulcers, etc. These data are collected by CMS in real time through near-daily submission from every nursing home that is certified for Medicare and Medicaid. Specially trained registered nurses at the nursing homes collect this data as they perform assessments of all patients upon admission and at certain other intervals. Additional assessments are conducted by other interdisciplinary professionals including nursing, rehab therapy, social services, recreational activities, and dietary. In October of 2019, CMS changed the assessment requirements for short-term care patients, but long-

term care patients will continue to receive MDS assessments at least quarterly. The MDS assessments provide a basis for Medicare and Medicaid reimbursement rates, and they offer rich data on most nursing homes in the United States. CMS consolidates the MDS data and provides comparison results of 17 quality measures that produce scoring points to determine the number of quality measure star ratings given to each nursing home for that quarter. The quality measure star ratings are one of several categories for which CMS posts quarterly star ratings on the CMS Nursing Home Compare website.

- **Cost Reports**: Nursing homes that accept Medicare reimbursements are obligated to submit annual cost reports through one of the regional Medicare contract administrators for CMS. These data are made available to researchers in the Healthcare Provider Cost Reporting Information System. The annual cost reports contain considerable information, including costs, charges by cost center, and financial statement data.

- **Payroll-Based Journal (PBJ):** payroll record documentation of nurse staffing hours are drawn from nursing home time clock and electronic payroll data from which nurses are paid. PBJ was developed in 2017 to improve the accuracy of reporting nurse hours and replaces the self-reported approach previously reported through CASPER during the annual CMS recertification inspection.

The data were fully available for this study. Except for quality measure star ratings, all data are from 2017, because it is the most recent year of data published by LTC Focus for many of the variables used in this study. Also, 2017 is the first year PBJ nurse staffing hours data were collected by CMS. Quality measure star rating data is from 2019, because (a) that is first year

CMS published it in the current format, and (b) because this study was designed to capture the longitudinal delay in the effect of the RN Ratio (from 2017) on quality measure star ratings (from 2019).

b. Operationalization of Variables

This section will describe the dependent, independent, and control variables used in this study. Also, please see Table #1 that contains a brief description and list of data sources for each variable.

Dependent Variables: The two dependent variables are (a) operating margin, and (b) quality measure star ratings of U.S. nursing homes. The data for operating margin was supplied by CMS cost reports, and the data for quality measure star ratings came from CMS Nursing Home Compare archives.

- **Operating Margin** is the percentage of operating income against operating revenue. It is calculated from cost report data by dividing the difference between operating revenue and operating expenses by operating revenue. In this study, the operating margin were compared to independent variable RN Ratio (described below) to determine the effect of RN Ratio on operating margin.
- **Quality Measure Star Ratings** was sourced from the CMS Nursing Home Compare archives. These data show between one and five stars, as published quarterly on the CMS Nursing Home Compare website. Every quarter, CMS consolidates MDS patient assessment quality data and assigns point values to each nursing home based on the performance in each of 17 different areas of quality measures. CMS then adds the points

from the 17 quality measures to determine the number of quality measure stars that will be given to each nursing home for that quarter. CMS also gives star ratings for two other areas, inspection results and staffing. In this study, the quality measure star rating variable was analyzed against the independent variable RN Ratio to determine the effect that RN Ratio had on quality measure star ratings. (see appendix for brief definitions of the 17 quality measures)

Independent Variable, RN Ratio

The independent variable is the proportion of RNs among all nurses working in each U.S. nursing homes in 2017. The data for this variable comes from the new Payroll-Based Journal (PBJ). In 2017, CMS began to collect nurse labor hours from the payroll software in each nursing home. This study defines nurse staffing to include RN's LPN's, and Medication Aids. This research project recognizes that in many states CNAs can be trained and certified by the state to pass medications, allowing them to work in place of nurse positions with certain restrictions. The RN Ratio is a percentage that is calculated from PBJ data as follows: total hours for RNs divided by the sum of total hours for RNs, LPNs, and Medication Aids and multiplied by 100 to show the percentage of total nurse hours that were registered nurses. This electronic data contains nurse hours every day in every nursing home, and it is collected quarterly by CMS. PBJ is more accurate than data used in existing literature, which is based on annual CASPER reports with self-reported nurse staffing hours.

Control Variables: This study used the following 11 control variables:

1. **Certified bed count**: Number of beds stated on the annual CASPER report. This control variable is relevant, because larger nursing homes might have economies of scale, which could affect financial ability to hire more expensive RNs.

2. **Multi-facility**: Indicates if a facility is part of a chain. Corporate owners often operate differently than small or single-building owners, and these differences could produce varying results in staffing, quality, and financial performance**.**

3. **For-profit vs. non-profit:** Indicates if the facility is for-profit. Since the funding sources differ, there could be variances in the ability or motivation to pay for the added cost of hiring a greater proportion of RNs.

4. **Occupancy**: Number of occupied beds in a facility divided by the total number of beds. The level of a nursing home occupancy affects the choices that administrators make regarding staffing and quality.

5. **Medicare Share:** Proportion of facility residents whose primary support is Medicare. Short-term rehab patients (often with Medicare pay source) are more acute and demand advanced services and require more frequent RN assessments, which is out of scope for LPNs. Nursing homes with higher proportions of short-term rehab patients could have different levels of RN staffing. These factors could affect the results of the study.

6. **Medicaid Share:** Proportion of facility residents whose primary support is Medicaid. LTC Focus provides CMS data showing the percentage of a nursing home population that has Medicaid as the primary pay source. Long-term care

patients (often with a Medicaid pay source) tend to have chronic conditions and place fewer demands on nursing services. These factors could affect the results of the study.

7. **Acuity Index**: is a measure of the care needed by a nursing home's residents. It is calculated based on the number of residents needing assistance with activities of daily living (bed mobility, transferring from bed to chair, eating, and toileting) or special treatment (such as physical therapy or tube feeding). Long-term care patients often present with multiple complex medical conditions. Short-term rehab patients often admit from severe medical procedures or incidents (i.e. joint replacements, stroke, etc.), and these acuity variations affect quality and staffing considerations.

8. **Staffing Intensity:** This is the hours per patient day (HPPD) of the nursing staff. Nurse Staffing Intensity is the sum of RN, LPN, and Medication Aid hours per day divided by the MDS Census, which represents average daily census. CMS provides PBJ data of actual hours per day of nurses that were recorded in the electronic payroll systems of all nursing homes. PBJ also provides MDS Census that is reported electronically every day by all nursing homes. Results of this study could vary among nursing homes that have varying levels of staffing intensity.

9. **Location**: The data for this variable comes from the Area Resource File, which distinguishes counties by the population and degree of urbanization and adjacency to a metropolitan area. Each county in the U.S. is designated as metropolitan, micropolitan, small town, or rural, and these differences could impact (a)

reimbursement rates that might affect the ability of nursing home managers to afford higher wage RNs, (b) competitive motivation to pay extra for RNs, and (c) availability of RNs. All of these factors could affect the meaning of the results.

10. **Market Competition**: This data is provided by LTC Focus using the Herfindahl-Hirschman Index (HHI) to measure nursing home concentration and competition in the county. The index ranges from zero to one, and the closer the index is to one, the closer the county is to having a monopoly in nursing home beds. The index is calculated as the sum of the squares of the market shares of nursing homes in a county to determine the level of competition. Varying levels of Market Competition could affect nursing home decisions regarding RN staffing intensity.

11. **Median Income**: The Area Resource File provides Median Household Income for each county in the U.S. This is relevant to this study because income variations could affect census mix (private pay vs. Medicaid, etc.). Income also impacts consumer expectations, which could affect operating strategies regarding quality and staffing.

State Fixed Effects include State Code of each nursing home. There could be regulatory or policy differences among states, which might affect operating practices and costs.

Table #1, Operationalization of Variables

Variable Names	Operationalization	Data Source
Dependent Variables		
Operating Margin	(operating revenue – operating expense) / operating revenue	CMS cost report
Quality Measure Star Ratings	Quality measure star rating (1-5) is a composite measure based on 17 different physical and clinical measures on nursing home residents, which offer information about how well nursing homes are caring for their residents' needs. (see appendix for brief definition of the 17 quality measures)	CMS Nursing Home Compare
Independent Variables		
RN ratio	Proportion of RNs to all nurses. Calculated by total RN hours divided by the sum of total hours for RN, LPN, and Medication Aids.	CMS PBJ data
Control Variables Organization-Level		
Certified Bed Count	Number of beds reported on the annual CASPER	LTC Focus
Multi-Facility	Indicates if the facility is part of a chain	LTC Focus
Profit Classification	Indicates if the facility is for-profit or non-profit	LTC Focus
Occupancy	Percentage of occupied beds in a facility	LTC Focus
Medicare Share	Proportion of facility residents whose primary pay source is Medicare	LTC Focus
Medicaid Share	Proportion of facility residents whose primary pay source is Medicaid	LTC Focus
Acuity Index	Acuity index is a measure of the care needed by a resident, calculated by the number of residents needing various levels of assistance with activities of daily living or special treatment (such as feeding tube or physical therapy)	LTC Focus
Staffing Intensity	Nursing staff (RN, LPN, and Medication Aid) hours per patient day, calculated with the sum of RN, LPN, and Medication Aid hours per day divided by MDS Census.	CMS PBJ
Control Variables Community-Level		
Location	Measures if the nursing home is in a metropolitan, micropolitan, small town, or rural population area	Area Resource File

Market Competition (HHI)	Measure of nursing home concentration or competition using the Herfindahl-Hirschman Index	LTC Focus
Median Income	Average household income in the county	Area Resource File
State Fixed Effects	Code for the home state of each nursing home	LTC Focus

CMS=Centers for Medicare and Medicaid, RN=Registered Nurse, LPN=Licensed Practical Nurse, PBJ=Payroll-Based Journal, CASPER=Certification and Survey Provider Enhanced Reporting, LTC=Long-Term Care, MDS=Minimum Data Set, HHI=Herfindahl- Hirschman Index

c. Sample

The sample size in this study was 12,862 U.S. nursing homes. There are approximately 15,483 licensed nursing homes in the United States. Facilities were omitted from the study if they did not file a Medicare cost report in 2017 or if the report had missing data. Also, cost report and PBJ outliers were omitted for research accuracy.

d. Statistical Analysis

This project utilized an observational design with a quantitative methodology. All data was from 2017 except for Quality Measure Star Ratings that used 2019 data. The reasons for the selection of years was explained in the Data Source section. This study used two methods of statistical analysis, one for each dependent variable. Operating Margin was evaluated using Ordinary Least Squares Regression, and Quality Measure Star Ratings used Ordered Logit Regression.

- **Ordinary Least Squares Regression**: The dependent variable operating margin used ordinary least squares regression modeling. This type of simple regression estimates the relationship between RN Ratio and Operating Margin in U.S. nursing homes.
- **Ordered Logit Regression**: The statistical analysis method chosen for the dependent variable quality measure star ratings was the ordered logit model. Also referred to as

proportional odds model, the ordered logit model can regress ordered categories of data. It is an appropriate model to determine the correlation between RN Ratio and the quality measure star ratings, because there are five ordered response categories in the ratings. Each quarter, CMS awards between one and five stars for quality measures in every nursing home. Consistent with this regression method, five stars is better than one star. As noted in the Results chapter under the heading “Note on Interpretation of Ordered Logit Regression with Quality Measure Star Ratings”, we also used multinomial logistic regression model and found similar results to the ordered logit regression approach.

CHAPTER 6

Results

CHAPTER 6: Results

a. Results Introduction

This study examined the association between registered nurse staffing mix (RN Ratio) and two dependent variables, (1) operating margin, and (2) quality measure star ratings in U.S. nursing homes. This chapter will describe the following aspects of this study: descriptive statistics and multivariable results.

b. Descriptive Statistics

This section will describe the statistics used in this study, including the sample, the two dependent variables, the independent variable, and the 11 control variables. Please see Table #2 below for more information.

Dependent Variables

In 2017, Operating Margin averaged 12% among nursing homes in the 2017 sample. Quality Measure Star Ratings 2019 data show that 34% of nursing homes received five stars for quality measures, 25% had four stars, 21% received three stars, 14% got two stars, and 6% had one star. CMS calculates and awards between one and five stars for quality measures for all nursing homes.

Independent Variable, Registered Nurse Ratio

This study recognizes that nurse staffing in nursing homes includes RNs, LPNs, and Medication Aids. The data show that in 2017, registered nurses worked 31% of all the nurse staffing hours in U.S. nursing homes.

Control Variables, Organization-Level

- **Certified Bed Count**: There was an average of 109 certified beds in this study's sample of nursing homes.
- **Multi-Facility**: This research project shows that 61% of the nursing home sample were part of a multi-facility chain.
- **Profit Classification**: The data demonstrates that 74% of nursing homes were owned or operated by for-profit organizations.
- **Occupancy**: The average occupancy of nursing homes in this study was 81%.
- **Medicare Share**: This study found that an average of 13% of nursing home residents used Medicare as their primary pay source.
- **Medicaid Share**: The primary pay source for 55% of residents in nursing homes was Medicaid.
- **Acuity Index**: The average acuity of nursing homes residents in the sample was 12. The index ranges between a low of zero and a high of 22.
- **Staffing Intensity**: The electronic payroll data in the study show average nurse staffing is 1.27 hours per patient day. This means that each nursing home resident receives an average of 1.27 hours of care every day by an RN, LPN, or Medication Aid.

Control Variables, Community-Level

- **Location**: This study identifies each county as one of four categories of location, which is determined by population and/or proximity to a metropolitan area. It shows that 70% of U.S. nursing homes are in metropolitan areas, 14% are in micropolitan areas, 10% are in small towns, and 6% are in rural areas.
- **Market Competition (HHI)**: With a Herfindahl-Hirschman Index (HHI) value of 0.20, the results of this study indicate nursing homes operate in a highly competitive environment. The HHI results are displayed with a number between zero and one. The closer the index is to zero indicates an extremely competitive market, and the closer the index is to one suggests it is approaching a monopolistic market environment.
- **Median Income**: The median annual household income in all U.S. counties is $59,436. It ranges between a low of about $10,554 and a high of approximately $237,454.

Please see Table #2 below

Table #2, Descriptive Statistics of the Sample (N = 12,862)

Variables	Mean/ Frequency	Standard Deviation / Percentage
Dependent Variables		
Operating Margin	12%	0.37
Quality Measure Star Rating		
*	760	5.91%
**	1,787	13.89%
***	2,676	20.81%
****	3,273	25.45%
*****	4,366	33.94%
Independent Variables		
RN Ratio	31%	0.19
Organization-Level Control Variables		
Certified Bed Count	109.26	52.53
Multi-Facility		
Yes	7,862	61.13%
No	5,000	38.87%
Profit Classification		
For-Profit	9,544	74.20%
Non-Profit	3,318	25.80%
Occupancy	80.79	14.20
Medicare Share	13.21	12.27
Medicaid Share	55.42	26.36
Acuity Index	12.22	1.24
Staffing Intensity	1.27	0.36
Community-Level Control Variables		
Location		
Metro	8,945	69.55%
Micro	1,788	13.90%
Small	1,327	10.32%
Rural	802	6.24%
Market Competition (HHI)	0.20	0.24
Median Income	59,436.05	23,090.06

RN=Registered Nurse, HHI=Herfindahl- Hirschman Index

c. Results of Statistical Analysis

This section will summarize the results of the statistical analysis as follows: (1) the results of the Ordinary Least Squares Regression for the dependent variable Operating Margin (see Table #3), and (2) the results of the Ordered Logit Regression model for the dependent variable Quality Measure Star Ratings (see Table #4).

Results of Ordinary Least Squares Regression of Operating Margin (see Table #3)

RN Ratio, Independent Variable

> Hypothesis #1 states: Nursing homes with a greater proportion of RNs working in nurse positions have better operating margin than nursing homes with a lower proportion of RNs working in nurse positions.

The results of this study do not support Hypothesis #1. The Ordinary Least Squares Regression model was used with the independent variable RN Ratio and the dependent variable operating margin. Contrary to our hypothesis, the study found that RN Ratio has a negative effect on operating margin such that every 1% increase in the proportion of RN Ratio produced a decrease of 4.5% in operating margin (P-value = 0.035).

Control Variables, Organization-Level

All the organizational level control variables are significantly related to operating margin. Bed count has a slim (0.1%) positive relationship with operating margin (P-value = 0.001). Chain affiliated nursing homes have a 7.2% better operating margin (P-value = 0.001). For-profit facilities have a 12.3% higher operating margin (P-value = 0.001). Nursing homes with an

increase in occupancy of 10 residents have a 3% higher operating margin (P-value = 0.001). Nursing homes with a 10% increase in Medicare share have 4% higher operating margin (P-value = 0.001). Nursing homes with a 10% increase in Medicaid share have 2% higher operating margin (P-value = 0.001). Nursing homes with one more unit of average acuity had 1.2% greater operating margin (P-value = 0.001). The study found that every 1% increase in nurse staffing intensity has 5.8% decrease in operating margin (P-value = 0.001).

Control Variables, Community-Level

The only community level control variable that is significantly related to operating margin is median income. As average market household income increases, operating margin decreases (P-value = 0.001). Neither location nor market competition were significantly associated with operating margin.

Table #3, Ordinary Least Squares Regression (N=12,862)

Operating Margin is the dependent variable

Variables	Coefficient	95% CI	
RN Ratio	-0.045*	-0.086	-0.003
Organization-Level Control Variables			
Certified Bed Count	0.001***	0.001	0.001
Multi-Facility	0.072***	0.058	0.085
For-Profit	0.123***	0.107	0.138
Occupancy	0.003***	0.003	0.003
Medicare Share	0.004***	0.003	0.004
Medicaid Share	0.002***	0.002	0.003
Acuity Index	0.012***	0.007	0.018
Staffing Intensity	-0.058***	-0.078	-0.038
Community-Level Control Variables			
Location			
Micro	0.020	-0.001	0.040
Small	0.019	-0.005	0.043
Rural	0.028	-0.002	0.058
Market Competition (HHI)	0.007	-0.029	0.042
Median Income	-0.001***	-0.001	-0.001

* p<0.05, ** p<0.01, *** p<0.001

RN=Registered Nurse, HHI=Herfindahl- Hirschman Index

Results of Ordered Logit Regression of Quality Measure Star Ratings (see Table #4)

RN Ratio, Independent Variable

Hypothesis #2 states: Nursing homes with a greater proportion of RNs working in nurse positions have higher quality measure star ratings than nursing homes with a lower proportion of RNs working in nurse positions.

The results of this study support Hypothesis #2. The Ordered Logit Regression model was used with the independent variable RN Ratio and the dependent variable quality measure star ratings. The study found that RN Ratio has a positive effect on quality measure star rating such that a 1% increase in RN Ratio is associated with a 2.54 higher odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001).

Control Variables, Organization-Level

The organizational level control variables that are significantly related to quality measure star rating include multi-facility, for-profit classification, occupancy, Medicare and Medicaid shares, acuity, and staffing intensity. Chain related nursing homes have 1.12 higher odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.002). For-profit nursing homes have 21% lower odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001). Nursing homes with 1% higher occupancy have 1.01 higher odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.002). Nursing homes with 1% higher Medicare share are associated with 1.01 higher odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001). Nursing homes with 1% higher Medicaid share have 1% lower odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001). Nursing homes with one unit higher acuity index have a 5% lower odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001). Nursing homes with 1% higher nurse staffing intensity have 1.35 higher odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001).

Control Variables, Community-Level

The community level control variables that are significantly related to quality measure star rating include location and market competition. Three categories of location based on population and proximity to large cities were compared to the effect of metropolitan areas on quality measure star rating. Micropolitan areas have 21% lower odds than metropolitan areas of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001). Likewise, small towns had 22% lower odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.001). Rural areas were not significantly related. Nursing homes with one-unit greater HHI market competition index resulted in 23% lower odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.006). Median income results show that it has 1.00 odds of having a 5-star quality measure rating compared to a 1-4 star rating (P-value = 0.005).

Note on Interpretation of Ordered Logit Regression with Quality Measure Star Ratings

In this study, the result of an ordered logit regression of a certain control variable produces odds of having a 5-star quality measure rating compared to a 1-4 star rating. However, the same odds would apply to each other combination, such the odds of having a 4-star rating compared to a 1-3 star rating, and so on. With ordered logit regression, the relationship between each pair is the same.

The UCLA Institute for Digitation Research and Education has a statistical consulting practice that clarifies the usage of this model with star ratings. It says that an assumption of ordered logit regression is the relationship between each pair of outcome groups is the same. So, it assumes

the coefficients that describe the relationship between a 5-star and 1-4 stars is the same as the relationship between a 4-star rating and 1-3 stars. They describe it as the proportional odds assumption. (UCLA, 2020)

Since the ordered logic regression model assumes proportional odds among each set of dependent variable outcomes, we also used the multinomial logistic regression modelling for the quality stars analysis. We found the multinomial logistic regression produced similar results to that of the ordered logit regression model.

Table #4, Ordered Logit Regression (N=12,862)

Quality Measure Star Rating is the dependent variable

Variables	Odds Ratio	95% CI	
RN Ratio	2.54***	2.03	3.17
Organization-Level Control Variables			
Certified Bed Count	1.00*	1.00	1.00
Multi-Facility	1.12**	1.04	1.20
For-Profit	0.79***	0.73	0.86
Occupancy	1.01***	1.01	1.02
Medicare Share	1.01***	1.01	1.01
Medicaid Share	0.99***	0.99	0.99
Acuity Index	0.95**	0.93	0.98
Staffing Intensity	1.35***	1.21	1.50
Community-Level Control Variables			
Location			
Micro	0.79***	0.72	0.88
Small	0.78***	0.68	0.88
Rural	0.86	0.73	1.01
Market Competition (HHI)	0.77**	0.65	0.93
Median Income	1.00**	1.00	1.00

* p<0.05, ** p<0.01, *** p<0.001

RN=Registered Nurse, HHI=Herfindahl- Hirschman Index

CHAPTER 7

Discussion

CHAPTER 7: Discussion

a. Major Findings

The major findings of this study produced mixed results on the two hypotheses. The independent variable RN Ratio is negatively correlated with operating margins and positively related to higher quality measure star ratings. So, nursing homes that have a higher proportion of RNs have lower operating margins and higher star ratings for quality measures.

This research contributes to literature, because it is the first study of its type. Prior research has skirted the perimeters of this project but has not addressed the impact of RN Ratio on operating margin or quality measure star rating, nor have other studies utilized electronic payroll records to more accurately document labor hours.

As described in Chapter 3, Literature Review, recent studies have established that nursing home quality of care improves with higher nursing department staffing levels. But, this study contributes to knowledge in three specific areas, (1) prior research utilized self-reported nursing hours data while this study improves accuracy of nursing hours by using recently released electronic payroll records (PBJ); (2) other literature focused more broadly on nursing department hours including non-nurse positions (such as CNAs), while this study narrows the focus to just nurse positions to provide more precise information on how management and policymakers can expect to improve quality, namely by increasing RN Ratio; (3) existing literature often selected a few individual quality measures to represent quality of care. This research project utilized the officially defined 17 quality measures that CMS uses in awarding star ratings. Since CMS

publishes the star ratings quarterly on the Nursing Home Compare website, the quality measure star ratings also have special meaning to policymakers and nursing home management, because it is the single most visible representative of quality used by the general public in defining quality of care.

As noted above, contrary to the hypothesized relationship, this study found that RN Ratio was negatively related to operating margin. It is intuitive that a higher RN Ratio would have the effect of driving costs up and operating margins down, because RN salaries are higher than the other nurse position categories (LPNs or Medication Aids). This study's direct negative correlation between RN Ratio and operating margin could also be affected by the one-year window in which this research project was conducted. It is possible that, over time, the RN Ratio could have an indirect positive relationship with operating margin through improved quality and or higher revenue.

Current literature has mixed results on the impact of RN staffing and operating margin. A 2003 study by Weech-Maldonado inferred that RN staffing was positively associated with operating margin and that it was more positively related to revenue than costs. In that same study, higher RN staffing had an indirect inverse impact on costs through a positive effect on quality outcomes of care. (R. Weech-Maldonado, Neff, & Mor, 2003) A follow-up study by the same author in 2019 found evidence of a positive relationship between quality and financial performance. (R. Weech-Maldonado, Pradhan, R., Dayama, N., Lord, J., Gupta, S., 2019)

The organizational level control variables used in this study contribute additional perspective to existing literature. We learned that chain-affiliated nursing homes have 7% better operating margin, which compares with 2% lower operating margins in a 2003 study. (R. Weech-Maldonado et al., 2003) However, the 2003 study pre-dated the significant industry consolidation during which time chain-affiliation rose from 28% to 61%. It is plausible that the larger chains found economies of scale and practice standards that improved operating margins. In this study, for-profit nursing homes have 12% better operating margins, which is consistent with the 13% margin found in the 2003 study. (R. Weech-Maldonado et al., 2003) We learned in this research project that occupancy has a positive effect on operating margins and on quality measure star ratings, both of which are consistent with the 2003 Weech-Maldonado study. (R. Weech-Maldonado et al., 2003) We found that nursing homes with higher acuity have better operating margin and lower quality measure star ratings, and this contrasts with the 2019 Weech-Maldonado research that showed higher acuity had lower operating margins. (R. Weech-Maldonado, Pradhan, R., Dayama, N., Lord, J., Gupta, S., 2019) Both this study and the 2019 study noted that increased RN staffing mix and RN staffing hours had a negative effect on operating margins. (R. Weech-Maldonado, Pradhan, R., Dayama, N., Lord, J., Gupta, S., 2019)

Among the community level control variables, only median income had a significant relationship with operating margin. In this study, median income had a negative impact on operating margin. This is in contrast to the 2019 Weech-Maldonado study, which showed median income with a positive relationship with operating margin. (R. Weech-Maldonado, Pradhan, R., Dayama, N., Lord, J., Gupta, S., 2019)

b. Implications on Policy and Management

The results of this study provide strong implications for both policy and management.

Implications on Policy

As the independent variable RN Ratio increases, regulators now know that quality measure star ratings improve. It has been a major initiative of CMS to motivate nursing home companies to improve quality of care, and this study documents one approach to drive quality, namely increase RN staffing ratios. Lawmakers and policymakers can use the results of this study to support future efforts to refine and upgrade quality of care in U.S. nursing homes.

Since this study demonstrates that increased RN staffing improves quality and lowers financial performance, there are additional implications for policymakers. Perhaps the current incentives are not enough to compensate nursing homes for the increased costs associated with higher RN staffing. So, the results of this study imply that if policymakers really want to motivate nursing homes to improve quality, they could do so by developing a Medicare/Medicaid payment model that increases the reimbursement to nursing homes that have a higher proportion of RNs.

Implications on Management

With the independent variable RN Ratio findings of this research project, the leadership of nursing home companies now know they can expect to improve quality measure star ratings with higher proportions of RNs. They will also know that operating margins will likely decline, which could be a significant stumbling block to for-profit nursing home companies.

c. Limitations

There will be limitations to the accuracy of this study based upon the methodological approach. Problems could include the following (a) this study used cross-sectional data, so it cannot imply causality; (b) data accuracy from the various collection processes could affect data validity; (c) data entry could affect data validity; (d) some of the data is self-reported, such as occupancy, which could limit validity of the data; and (e) correlation does not prove causality.

d. Future Research

Many opportunities for future research exist. Since PBJ data is so recently available, any prior nursing home research that relied on self-reported labor hours is subject to updating with more accurate electronic payroll records. Specifically, there is a need to extend the time period of this same study through longitudinal research as data becomes available to determine the multi-year effect of increased RN ratio on operating margins and quality measure star ratings. There would also be value in expanding the scope of this same study to include control variables such as CNAs to determine the possible impact of various overall nursing department staffing levels on operating margins and quality measure star ratings.

This study examined the direct effect of nurse staffing on operating margin, but there might be indirect effect of nurse staffing on operating margin through better quality of care, which was thoroughly researched in 2003 using self-reported labor hours. (R. Weech-Maldonado et al., 2003) Further study is needed of this indirect effect using PBJ electronic payroll data.

Additional research could also be pursued to determine the possible correlation of nursing home quality measure star ratings with hospital referral practices.

e. Conclusions

The major finding of this study is that nursing homes experience higher quality measure star ratings and lower operating margins when they have either (1) a higher proportion of RNs among the total of all nurse staffing (RN, LPN, Medication Aid), or (2) a higher nurse staffing intensity (total of all RN, LPN, Medication Aid). This study provides is a significant contribution to prior literature since it uses more accurate electronic labor hour records and because it is more focused than other research on just nurse staffing and on quality measure star ratings.

LIST OF REFERENCES

REFERENCES

Aiken, L., Sloane, D., Cimiotti, J., Clarke, S., Flynn, L., Seago, J., Smith, H. (2010). Implications of the California Nurse Staffing Mandate for Other States. *Health Services Research, 45*(4), 904-921.

Aiken, L. H., Clarke, S. P., Sloane, D. M., Sochalski, J., & Silber, J. H. (2002). Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction. *JAMA, 288*(16), 1987-1993. doi:10.1001/jama.288.16.1987

Ayanian, J. Z., & Markel, H. (2016). Donabedian's Lasting Framework for Health Care Quality. *N Engl J Med, 375*(3), 205-207. doi:10.1056/NEJMp1605101

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management, 17*(1), 99-120. doi:10.1177/014920639101700108

Castle, N., & Anderson, R. . (2011). Caregiver staffing in nursing homes and their influence on quality of care, Using dynamic panel estimation methods. *Medical Care Research and Review, 49*(6), 545.

CMS-FederalRegister. (2011). Medicare program; hospital inpatient value-based purchasing program. Final rule. *Fed Regist, 76*(88), 26490-26547.

CMS-NHCompareArchive. (2019). Nursing Home Compare Website. Retrieved from https://data.medicare.gov/data/archives/nursing-home-compare

Decker, F. H. (2008). Nursing Home Performance in Resident Care in the United States: Is it Only a Matter of for-Profit Versus Not-for-Profit? *Health Economics, Policy and Law, 3*(2), 115-140.

Dulal, R. (2017). Cost efficiency of nursing homes: Do five-star quality ratings matter? . *Health Care Management Science, 20*(3), 316-325.

Everhart, D., Neff, D., Al-Amin, M., Nogle, J., & Weech-Maldonado, R. (2013). The effects of nurse staffing on hospital financial performance: competitive versus less competitive markets. *Health care management review, 38*(2), 146-155. doi:10.1097/HMR.0b013e318257292b

Ferlie, E., Crilly, T., Jashapara, A., Trenholm, S., Peckham, A., & Currie, G. (2015). Knowledge mobilization in healthcare organizations: a view from the resource-based view of the firm.(Perspective)(Viewpoint essay). *4*(3), 127. doi:10.15171/ijhpm.2015.35

Geng, F., Stevenson, D. G., & Grabowski, D. C. (2019). Daily Nursing Home Staffing Levels Highly Variable, Often Below CMS Expectations. *Health Aff (Millwood), 38*(7), 1095-1100. doi:10.1377/hlthaff.2018.05322

Harless, W. D., & Mark, A. B. (2010). Nurse Staffing and Quality of Care With Direct Measurement of Inpatient Staffing. *Medical Care, 48*(7), 659-663. doi:10.1097/MLR.0b013e3181dbe200

Harrington, C. (2005). Addressing the dramatic decline in RN staffing in nursing homes. *Am J Nurs, 105*(9), 25.

Harrington, C., Olney, B., Carrillo, H., & Kang, T. (2012). Nurse staffing and deficiencies in the largest for-profit nursing home chains and chains owned by private equity companies. *Health services research, 47*(1pt1), 106-128.

Harrington, C., Swan, J., & Carrillo, H. . (2007). Nurse Staffing Levels and Medicaid Reimbursement Rates in Nursing Facilities. *Health Services Research, 43*(3), 1105-1129.

Horn, D. S., Buerhaus, J. P., Bergstrom, J. N., & Smout, J. R. (2005). RN Staffing Time and Outcomes of Long-Stay Nursing Home Residents: Pressure ulcers and other adverse outcomes are less likely as RNs spend more time on direct patient care. *AJN, American Journal of Nursing, 105*(11), 58-70.

Huang, S. S., & Bowblis, J. R. (2017). Managerial Ownership in Nursing Homes: Staffing, Quality, and Financial Performance. *Gerontologist*. doi:10.1093/geront/gnx104

Hyer, K., Thomas, K. S., Branch, L. G., Harman, J. S., Johnson, C. E., & Weech-Maldonado, R. (2011). The Influence of Nurse Staffing Levels on Quality of Care in Nursing Homes. *The Gerontologist, 51*(5), 610-616. doi:10.1093/geront/gnr050

Kim, H., et al. (2009). A Panel Data Analysis of the Relationships of Nursing Home Staffing Levels and Standards to Regulatory Deficiencies. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 64*(2), 269-278.

Konetzka, R., Grabowski, D., Perraillon, M., & Werner, R. . (2015). Nursing Home 5-Star Rating System Exacerbates Disparities In Quality, By Payer Source. *Health Affairs, 34*(5), 819-827.

Konetzka, R. T., Yi, D., Norton, E. C., & Kilpatrick, K. E. . (2004). Effects of Medicare payment changes on nursing home staffing and deficiencies. *Health services research, 39*(3), 463-488.

Lee, H. Y., Mary A. Blegen, and Charlene Harrington. (2014). The Effects of RN Staffing Hours on Nursing Home Quality: A Two-Stage Model. *International journal of nursing studies, 41*(3), 409-417.

Levins, H. (2017). U.S. Nursing Homes Struggle in Ever-Tougher Market. *University of Pennsylvania, Leonard Davis Institute of Health Economics*. Retrieved from https://ldi.upenn.edu/news/us-nursing-homes-struggle-ever-tougher-market

McCain, R. F. (1965). Nursing by Assessment -- Not Intuition. *The American Journal of Nursing, 65*(4), 82-84. doi:10.2307/3453219

McCue, M., Mark, B. A., & Harless, D. W. (2003). Nurse staffing, quality, and financial performance. *Journal of health care finance, 29*(4), 54-76.

Miles, J. A. (2012). *Management and organization theory: A Jossey-Bass reader* (Vol. 9): John Wiley & Sons.

Miller, D. (2019). The Resource-Based View of the Firm. *Oxford Research Encyclopedia, Business and Management, March 2019*.

Mor, V. (2010). Improving the quality of long-term care. *DICE Report, 8*(2), 35-39.

Mueller, C., Anderson, R. A., McConnell, E. S., & Corazzini, K. (2012). Licensed Nurse Responsibilities in Nursing Homes: A Scope-of-Practice Issue. *Journal of Nursing Regulation, 3*(1), 13-20. doi:https://doi.org/10.1016/S2155-8256(15)30229-5

Mullaney, T. (2017). AHCA CEO, Silled Nursing Providers Must Branch Out to Survive. *Skilled Nursing News*. Retrieved from https://skillednursingnews.com/2017/10/ahca-ceo-skilled-nursing-providers-must-branch-survive/

Park, J. (2007). The Effects of State Minimum Staffing Standards on Staffing, Quality of Care, and Financial Performance in Nursing Homes. *The University of North Carolina at Chapel Hill, 3257464*

Rau, J. (2017). Why Glaring Quality Gaps Among Nursing Homes are Likely to Grow if Medicaid is Cut. *Kaiser Health News*. Retrieved from https://khn.org/news/why-glaring-quality-gaps-among-nursing-homes-are-likely-to-grow-if-medicaid-is-cut/view/republish/

Shi, L. a. S., D. (2015a). *Delivering Health Care in America, A Systems Approach, 6th Edition*.

Shi, L. a. S., D. (2015b). *Delivering Health Care in America, A Systems Approach, 6th Edition*.

Spilsbury, K., Hewitt, C., Stirk, L., & Bowman, C. (2011). The relationship between nurse staffing and quality of care in nursing homes: A systematic review. *International Journal of Nursing Studies, 48*(6), 732-750. doi:10.1016/j.ijnurstu.2011.02.014

UCLA. (2020). Ordered Logistic Regression. *Institute for Digital Research and Education*. Retrieved from https://stats.idre.ucla.edu/stata/dae/ordered-logistic-regression/

Ulreich, S. M. (2015). *Difference in recommended-to-actual nurse staffing and patient falls*: Birmingham, Alabama : University of Alabama at Birmingham, Graduate School.

Unruh, Y. L., & Zhang, J. N. (2012). Nurse Staffing and Patient Safety in Hospitals: New Variable and Longitudinal Approaches. *Nursing Research, 61*(1), 3-12. doi:10.1097/NNR.0b013e3182358968

Walsh, J. E., Lane, S. J., & Troyer, J. L. (2013). Impact of medication aide use on skilled nursing facility quality. *The Gerontologist, 54*(6), 976-988.

Weech-Maldonado, R. (2016). Nursing Home Quality and Financial Performance, Is There a Business Case for Quality? . *The Gerontologist, 56*(Suppl 3), 10-11. doi:10.1093/geront/gnw162.042

Weech-Maldonado, R., Meret-Hanke, L, Neff, M, Mor, V. (2004). Nurse Staffing Patterns and Quality of Care in Nursing Homes. *Health Care Management Review, 29*(2), 107-116. doi:10.1097/00004010-200404000-00004

Weech-Maldonado, R., Neff, G., & Mor, V. (2003). Does Quality of Care Lead to Better Financial Performance?: The Case of the Nursing Home Industry. *Health Care Management Review, 28*(3), 201-216. doi:10.1097/00004010-200307000-00002

Weech-Maldonado, R., Pradhan, R., Dayama, N., Lord, J., Gupta, S. (2019). Nursing Home Quality and Financial Performance: Is There a Business Case for Quality? *Inquiry, 56*, 46958018825191. doi:10.1177/0046958018825191

Weech-Maldonado, R., Vince Mor, Adetokunbo Oluwole. (2004). Nursing Home Costs and Quality of Care: Is There a Tradeoff. *Expert Review of Pharmacoeconomics & Outcomes Research 4*(1), 99-110.

White, C. (2006). Medicare's Prospective Payment System for Skilled Nursing Facilities: Effects on Staffing and Quality of Care. *Inquiry - Excellus Health Plan 42*(4), 351-366.

Williams, C., Zheng, Q., & White, A. (2019). PAYROLL-BASED STAFFING MEASURES FOR NURSING HOMES. *Innovation in Aging, 3*(Suppl 1), S62-S62. doi:10.1093/geroni/igz038.241

Wright, P. M., & McMahan, G. C. . (1992). Theoretical Perspectives for Strategic Human Resource Management. *Journal of Management, 18*(2), 295-320.

Zhang, X., and David C. Grabowski. (2004). Nursing Home Staffing and Quality Under the Nursing Home Reform Act. *The Gerontologist, 44*(1), 13-23.

APPENDIX A

QUALITY MEASURES INCLUDED IN THE STAR RATINGS

APPENDIX A: QUALITY MEASURES INCLUDED IN THE STAR RATINGS

Quality Measures: CMS currently monitors 26 quality measures of which 17 are scored with points that determine the number of quality measure star ratings each nursing home is awarded quarterly. Of the 17 measures, 10 monitor long-stay residents and seven focus on short-stay residents. Following is a brief description of each of the 17 quality measures:

Long-Stay Residents

Based on Nurse Assessments

1. ADL's: percent of residents whose need for help with Activities of Daily Living has increased.
2. Move independence: Percent of residents whose ability to move independently worsened.
3. Pressure ulcers: Percent of high-risk residents with pressure ulcers.
4. Catheters: Percent of residents who have/had a catheter inserted and left in their bladder
5. UTI: Percent of residents with a Urinary Tract Infection.
6. Pain: Precent of residents who self-report moderate to severe pain.
7. Falls: Percent of residents experiencing one or more falls with major injury.
8. Antipsych: Percent of residents who received an antipsychotic medication.

Based on Claims Filed

9. Hospitalizations: Number of hospitalizations per 1,000 long-stay resident days.
10. ER: Number of outpatient emergency department visits per 1,000 long-stay resident days.

Short-Stay Residents

Based on Nurse Assessments

11. Function: Percent of residents who made improvement in function.

12. Pressure Ulcer: Percent of residents with pressure ulcers that are new or worsened.
13. Pain: Percent of residents who self-report moderate to severe pain.
14. Antipsych: Percent of residents who newly received an antipsychotic medication.
15. Re-hospitalization: Percent of short-stay residents who were re-hospitalized after a nursing home admission.
16. ER: Percent of short-stay residents who have had an outpatient emergency department visit.
17. Home: Rate of success return to home and coimmunity from a nursing home.

APPENDIX B

IRB APPLICATION AND APPROVAL

APPENDIX B: IRB APPLICATION AND APPROVAL

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

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

NHSR DETERMINATION

TO: Whitman, Douglas R

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

DATE: 18-Dec-2019

RE: IRB-300004508
Effect of Nursing Home RN Staffing Mix on Quality Stars and Operating Margins

---

The Office of the IRB has reviewed your Application for Not Human Subjects Research Designation for the above referenced project.

The reviewer has determined this project is not subject to FDA regulations and is not Human Subjects Research. Note that any changes to the project should be resubmitted to the Office of the IRB for determination.

if you have questions or concerns, please contact the Office of the IRB at 205-934-3789.

Additional Comments:

- Publicly available data from CMS and LTC Focus databases.