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ALZHEIMER DISEASE SPECIAL CARE UNITS AND NURSING HOMES' ORGANIZATIONAL PERFORMANCE

by

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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 Philosophy

BIRMINGHAM, ALABAMA

2022

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ALZHEIMER'S DISEASE SPECIAL CARE UNITS AND NURSING HOMES' ORGANIZATIONAL PERFORMANCE

GIOVANNA PILONIETA

ADMINISTRATION/HEALTH SERVICES

ABSTRACT

Alzheimer's disease special care units (AD SCUs) have been adopted to provide specialized care for people with dementia in nursing homes. However, the effects of environmental and organizational factors on AD SCUs adoption by nursing homes and their influence on nursing homes' organizational performance remains unclear. Guided by Resource Dependence Theory, Donabedian's Structure-Process-Outcome (SPO) framework and the Resource-Based View of Firms perspective, the purpose of the three papers included in this dissertation was to provide empirical evidence of the contextual and organizational factors that influence AD SCUs adoption among nursing homes and how the adoption of AD SCUs impact nursing homes quality of care and financial performance. This study employed NH-level panel data from 2005 to 2019. The findings of this dissertation suggest that some measures of environmental munificence, complexity, and dynamism were associated with AD SCUs adoption. Specifically, nursing homes operating in more monopolistic markets were more likely to adopt AD SCUs. On the other hand, a higher concentration of minority populations and higher change in the Medicare Advantage penetration rate were negatively associated with AD SCUs adoption. In addition, organizational factors such as size, for-profit status, occupancy rate, and payer mix were significant predictors of AD SCUs adoption. Additionally, better processes and outcomes of care were associated with AD SCUs

adoption. Further, analysis of financial performance indicated that AD SCUs adoption was marginally significant associated with improved nursing homes' financial performance. Specifically, AD SCUs adoption was associated with higher operating margins among nursing homes. Organizational factors such as nursing home size, for-profit status, occupancy rate, dementia census, percentage of Hispanic residents, and Medicare and Medicaid census were predictors of financial performance. Further, market characteristics such as per capita income, market competition, and Medicare Advantage penetration were also associated with NHs' financial performance. These findings can be used by NHs administrators to make informed decisions when adopting specialized care for people with dementia. Additionally, these results will provide policymakers and nursing home administrators with a better understanding of the relationship between AD SCUs and NHs' quality of care and financial performance.

Keywords Special care unit, Alzheimer’s disease, nursing home, quality, financial performance

DEDICATION

This dissertation is dedicated to my parents, who have always believed in me, supported me and motivated me.

ACKNOWLEDGMENTS

The success of this dissertation depends mainly on the encouragement and support of my committee chair, Dr. Robert Weech-Maldonado. I cannot thank you enough for your guidance, and patience. You have been a role model for the type of researcher, mentor, and professor that I hope to be.

I would like to thank my committee members Dr. Amy Landry, Dr. Justin Lord, Dr. Rita A. Jablonski, and Dr. Ferhat Zengul. Their guidance, involvement, and willingness to help me improve my dissertation are much appreciated. My sincerely thank Dr. Holly Felix for allowing me to use CASPER/OSCAR data. I thank all my professors, fellow doctoral students, and friends who have supported and motivated me throughout the doctoral program.

I want to express my deepest appreciation to my work family at the UAB Division of Memory Disorders and Behavioral Neurology; they stepped in and helped me stay on track through these difficult years. Thank you, Dr. David S. Geldmacher, for your mentorship, patience, and guidance during this Ph. D process.

Finally, I thank my parents and family, who have given me the love and support to achieve my dreams.

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INTRODUCTION

As of 2021, nearly 6.5 million Americans were living with Alzheimer's disease and other related dementias (ADRD) (Alzheimer's Association, 2021). While AD progresses, patients require specialized care due to their functional and cognitive impairment and behavioral symptoms. The latter are the main drivers of caregivers' burden (Chiao et al., 2015). Dementia is the most common reason for nursing home placement (Zimmerman, Sloane, Heck, Maslow, & Schulz, 2005). The number of adults with dementia residing in US nursing homes increases as the population ages and the prevalence of the disease increases. According to the National Center for Health Statistics, in 2016, nearly 48% of nursing home residents were diagnosed with Alzheimer's disease or other dementias (Harris-Kojetin et al., 2019). Approximately 75 % of people with dementia aged 80 and older live in a nursing home compared with only 4 % of the general population (Arrighi HM, Neumann PJ, Lieberburg IM, 2010). Residents with dementia require specialized care due to their functional and cognitive impairment and behavioral symptoms. In 2014, 61% of residents of nursing homes with ADRD had moderate or severe cognitive impairment. Of them, 43 % had more than 3 activities of daily living (ADL) impairments (CMS, 2015).

Alzheimer's disease Special Care Units (AD SCUs) were developed by nursing homes to meet the highly specialized care needs for managing residents with Alzheimer's disease and other related dementias. AD SCUs consist of a specific number of beds

where the physical environment, staffing training, and care interventions are designed for cognitively impaired residents who may or may not have a definite diagnosis of Alzheimer's disease (Blackburn et al., 2018; Nazir, Arling, Perkins, & Boustani, 2011). Of the 15,600 nursing homes regulated by federal or state governments, approximately 14.9% had a unit or floor designated as dementia special care units, constituting 72 percent of all special care beds (Alzheimer's Association, 2021; Harris-Kojetin et al., 2019). Interestingly, only 1 % of nursing homes exclusively deliver care to people with dementia (Alzheimer's Association, 2021). People with dementia (PWD) have a higher risk of behavioral symptoms like depression, a higher decline in their activities of daily living, and hospitalization rate. Although some of these issues are part of the course of the disease and nursing homes might not be in control of them, these conditions indicate the complexity of caring for PWD (Nazir, Arling, Perkins, & Boustani, 2011).

In the next sections, first, we will summarize studies on Alzheimer's disease special care units' adoption and the role that environmental and organizational factors may play in their adoption by nursing homes. Then, the second section briefly reviews the literature that assesses the effects of Alzheimer's disease special care units' adoption on performance for nursing homes delivering AD specialized care. While these sections might highlight some of the issues, the following sections explore concerns and knowledge gaps that need to be addressed.

Nursing Special Care Units and Alzheimer's Disease Special Care Units

Special care units (SCUs) are "a specific number of beds identified and dedicated by the facility for residents with specific needs or diagnosis" (Castle, 2008). There are

several types of SCUs, such as Alzheimer's disease, head trauma, hospice, persons with a disability, ventilator care, AIDS/HIV, Huntington's disease, dialysis, and specialized rehabilitation (Castle, 2008). AD SCUs were adopted in the 1980s and 1990s as part of nursing homes' strategy to address changes in the payment system, medical and treatment advances, and new market opportunities (Blackburn et al., 2018; Zinn & Mor, 1994). AD SCUs aim to deliver a better quality of care, maintain market share, and enhance nursing homes 'profitability (Castle, 2008). AD SCUs attempt to optimize residents' quality of life by maintaining functional status and modifying environmental stressors that might cause behavioral problems (Mobley, Leigh, & Malinin, 2017).

Most of the AD SCUs are designated in traditional nursing homes settings but have been adapted to offer environmental design, interventions, and specially trained staff to meet the needs of people with dementia. Regarding the environmental design, some of the characteristics of AD SCU include private rooms, safe interior, and exterior resident space. In addition, AD SCUs might have quiet areas where residents can sit, appropriate signs and clues for activities of daily living (ADLs) and cognitive function, and controlled audible and visual stimuli (Mazzei, Gillan, & Cloutier, 2014). Generally, AD SCUs have appropriate staffing features and interventions to meet residents' needs and establish interventions and activity programs that prevent triggering negative behaviors such as psychosis, agitation and wandering. (e.g., sustained reduction in the noise level within the units, policies about family involvement) (Gilbert, Ward, & Gwinner, 2019; Grant, Kane, & Stark, 1995).

Prior research has ascertained the role of environmental and organizational factors in nursing homes' adoption of AD SCUs. Environmental factors such as a competitive market and geographical location have been associated with AD SCUs adoption (Banaszak-Holl, Zinn, & Mor, 1996; Park-Lee, Sengupta, & Harris-Kojetin, 2013; Zinn & Mor, 1994). Organizational factors such as chain affiliation, ownership, payer mix, and size have been found to be predictors of AD SCUs designation (Blackburn et al., 2018).

Alzheimer's Disease Special Care Units and Nursing Home Performance

The Institute of Medicine defined quality as "the degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge." (Institute of Medicine (US) Committee to Design a Strategy for Quality Review and Assurance in Medicare,& Lohr, 1990). Delivering optimal care for people with dementia involves person-centered care. This approach provides tailored care according to residents' preferences, abilities, and needs. Trained staff, regular assessments, adequate management of behavioral symptoms, and a proper physical environment are the main components of optimal care for PWD (Gaugler, Yu, Davila, & Shippee, 2014). These principles are congruent with the person-environment model applied to describe the role of the physical and social environment in dementia care settings (Morgan & Stewart, 1997). Earlier research described a positive effect of dementia tailored physical and social environment on residents' quality of care (Morgan, & Stewart, 1997). AD SCUs that align with these principles should provide appropriate care for nursing home residents with cognitive impairment (Blackburn et al., 2018). However, nursing home quality of care for people with dementia has been a consistent issue of interest for policymakers, researchers, and

consumers. Although AD SCUs are expected to provide a better quality of care to people with dementia compared to other nursing homes, previous studies have shown mixed results (Cadigan, Grabowski, Givens, & Mitchell, 2012) (Luo, Fang, Liao, Elliott, & Zhang, 2010). For example, Luo et al. (2010) found that AD SCU residence was associated with lower rate of pressure ulcers, hospitalizations, and weight loss compared to regular units; however, it was also associated with a higher probability of falling (Luo et al., 2010). On the other hand, Cadigan and colleagues found that residents diagnosed with advanced dementia in an AD SCU were more likely to have pressure ulcers and more frequent use of antipsychotic drugs.

Evaluating the influence of AD SCUs adoption on nursing homes' organizational financial performance is also an important topic for policymakers, researchers, and nursing home administrators. As evidenced in previous research, nursing homes' financial viability is affected by changes in the reimbursement system (Zinn et al., 2009), regulatory reforms (e.g., staffing requirements) (Bowblis, 2015), increasing competition from alternative providers (Lord et al., 2018), and changes in the payer mix (i.e., higher proportion of Medicaid residents) (Konetzka et al., 2015). As a response, nursing homes adopt strategies to respond to rapid changes in the environment they operate. One of these strategies has been the delivery of specialized care through the implementation of AD SCUs. Previous studies have found that organizations that provide value-added services are more attractive to the private pay market segment, have a higher occupancy rate (Castle, 2008), and experience a better financial performance (Weech-Maldonado, Pradhan, Dayama, Lord, & Gupta, 2019).

Statement of the Problem

Even though AD SCUs are the most common type of specialized care (Blackburn et al., 2018), several unanswered questions remain. First, there is a lack of a recent and comprehensive assessment of the environmental and organizational factors associated with the adoption of AD SCUs by nursing homes. Second, there are mixed results about the relationship between AD SCUs and the nursing home quality of care; further research is needed to ascertain AD SCUs' effects on nursing home processes and outcomes of care. Finally, few studies have documented how AD SCUs' designation is associated with financial performance. As such, using longitudinal data on a national sample of nursing homes, the goals of this dissertation are to: 1) examine the associations between organizational and environmental factors and nursing homes' adoption of AD SCUs; 2) explore the relationship between nursing homes 'adoption of AD SCUs and quality of care; and 3) ascertain the relationship between nursing homes 'adoption of AD SCUs and financial performance.

DISSERTATION PLAN

This dissertation utilized a three-paper format to study the relationship between the adoption of AD SCUs and nursing homes' organizational performance. The first paper examines the organizational and environmental predictors of AD SCUs adoption by nursing homes. The second paper evaluates the effect of AD SCUs adoption on nursing homes' quality of care, while the third paper explores the association between AD SCUs adoption and organizational financial performance. These three papers provide critical

insights to nursing home administrators and policymakers about the factors that might be associated with AD SCU adoption, the effect of SCUs on NHs' quality of care, and financial performance. Figure 1 illustrates the overall framework that depicts all three papers.

Paper 1: Organizational and Market Factors of Nursing Homes Adopting Alzheimer's Disease Special Care Units

This study attempts to fill the knowledge gap in understanding AD SCUs adoption among nursing homes. This paper uses resource dependence theory (RDT) as a framework to ascertain the organizational and environmental factors associated with the adoption of Alzheimer's Disease Special Care Units (ADSCUs). The study was a longitudinal analysis using a panel design of nursing homes from 2005 to 2019. The sample consists of approximately 193,652 nursing home-year observations (or an average of 12,900 facilities per year). Data was obtained from LTC-Focus and the Area Health Resource File. Multivariate relationships between AD SCUs adoption and nursing homes' organizational and environmental factors were evaluated using panel logistic regression with random effects and year and state effects. This study provides a new contribution to the healthcare literature by examining environmental and organizational factors that relate to nursing homes' adoption of AD SCUs using the RDT framework and longitudinal data.

Paper 2: Association Between the Adoption of AD SCUS and Quality of Care Provided by Nursing Homes

The purpose of this paper was to examine the relationship between the adoption of Alzheimer's Disease Special Care Units (ADSCUs) and the quality of care delivered

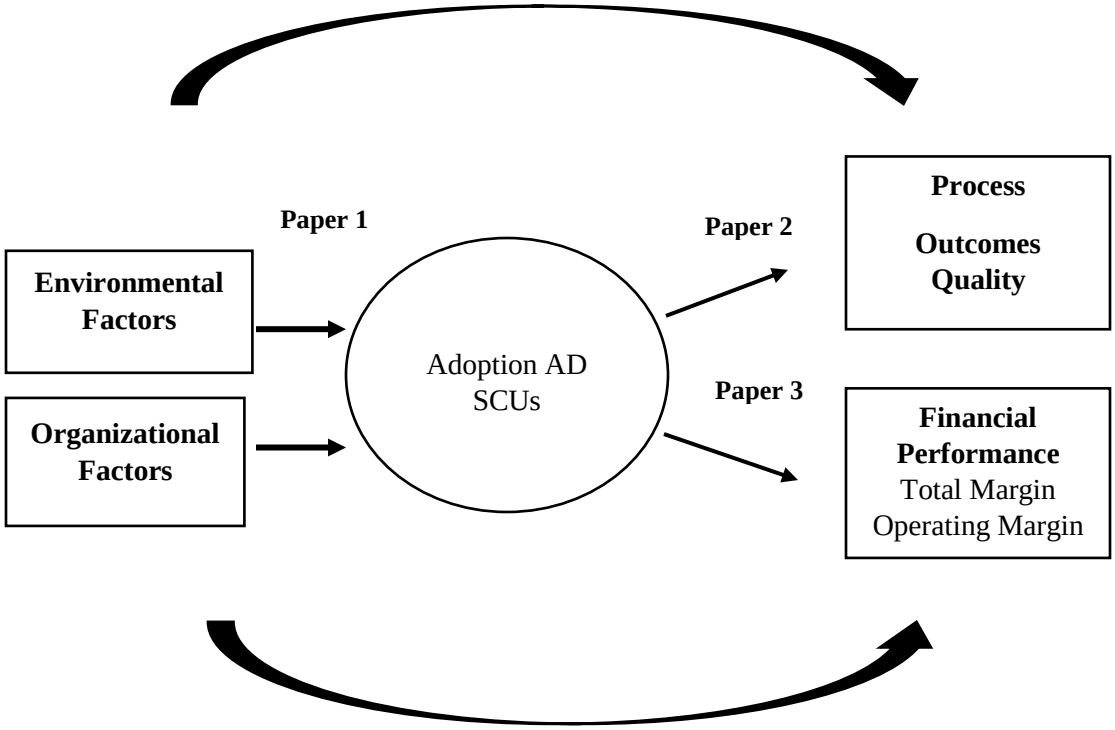
in nursing homes. This study used Donabedian's Structure-Process-Outcomes (SPO) quality framework. The data included longitudinal data for a national sample of nursing homes. Data were derived from three sources: 1) LTC-Focus, 2) Online Survey Certification and Reporting (OSCAR)/ Certification and Survey Provider Enhanced Reporting (CASPER), and 3) the Area Health Resource File (AHRF). The percentage of AD SCUs designated beds and the proportion of residents who were restrained, the proportion of residents who received antipsychotic medications, the proportion of facility tube placement, the proportion of long-stay residents who have fallen, the proportion of long-stay residents with pressure ulcers, hospitalization rate. Multivariate relationships between the independent and dependent variables were examined using separate panel data linear regression with facility and year fixed effects. Models were adjusted by organizational and market factors. This study contributes to the existing health services literature by providing a better understanding of quality nursing care and the relationship between AD SCUs and NHs' quality of care. This knowledge can provide further information to improve the quality of life for NHs residents living with dementia and nursing home care.

Paper 3: Association Between Nursing Home Financial Performance and Alzheimer's Disease Special Care Units Adoption

The objective of this paper was to test the relationship between AD SCUs adoption and financial performance using a resource-based view of the firm (RBV) as a conceptual framework. Specifically, it provides answers to whether there was an effect on nursing homes' total and operating margins. Our findings provide a better

understanding of attributes and performance differences across organizations in the nursing home industry and provide insights to managers into identifying the most performance-enhancing strategies in their market segments. This study utilized longitudinal data from a national sample of nursing homes. Data were obtained from three databases: Medicare Cost Reports, Brown University's LTCFocus, and the Area Health Resource File (AHRF) for the period of 2006 to 2018. Multivariate relationships between total and operating margin and the adoption of AD SCUs were examined using separated panel data linear regression with facility and year fixed effects. Models were adjusted by organizational and market factors.

Figure 1. Overall framework to study the relationship between the adoption of AD SCUs and nursing home organizational performance.



ORGANIZATIONAL AND MARKET FACTORS OF NURSING HOMES ADOPTING ALZHEIMER'S DISEASE SPECIAL CARE UNITS: A LONGITUDINAL ANALYSIS OF U.S NURSING HOMES (2005-2019)

by

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Format adapted for dissertation

ABSTRACT

Background: Alzheimer's disease special care units (AD SCUs) have been adopted to provide specialized care for people with dementia in nursing homes. However, little information is available on the effects of environmental and organizational factors on AD SCUs adoption by nursing homes.

Objective: To ascertain whether environmental and organizational characteristics predict the adoption of Alzheimer's disease special care units (AD SCUs) among nursing homes.

Methods: This study utilized data from two different sources: Brown University's LTCFocus data and the Area Health Resource File from 2005 to 2019. The sample consisted of approximately 193,652 nursing home-year observations (or an average of 12,900 facilities per year). Panel logistic regression with random effects and state and year fixed effects analysis was used to examine the relationship between nursing homes' adoption of AD SCUs and environmental and organizational characteristics.

Results: Bivariate analyses showed significant differences between AD SCUs adopters and non-adopters in all environmental and organizational characteristics except Medicare Advantage penetration rate. In regression analyses, nursing homes operating in a less munificent external environment and more dynamic environment were less likely to adopt AD SCUs. On the other hand, nursing homes operating in more monopolistic markets were more likely to adopt AD SCUs. In addition, organizational factors such as size, for-profit status, occupancy rate, payer mix, and nursing homes' location were significant predictors of AD SCUs adoption.

Conclusions: Among NHs, a context defined by the racial/ethnic composition of the population, lower level of market competition, and urban location affects the adoption of AD SCUs. Additionally, organizational factors such as size, for-profit status, occupancy rate, and payer mix were associated with AD SCUs adoption. These findings can be used by NHs administrators to make informed decisions when adopting specialized care for people with dementia.

Keywords: Alzheimer's disease, special care units, nursing homes, environment; market factors panel logistic regression.

INTRODUCTION

As of 2021, 6.5 million Americans were diagnosed with Alzheimer's dementia (Alzheimer's Association, 2021). Alzheimer's disease (AD) is a multi-faceted progressive disease, which causes cognitive and functional decline. Individuals gradually experience changes in their memory, behavior, ability to perform daily living activities (ADLs), and loss of their capabilities to manage personal affairs (Alzheimer's Association, 2021; Daviglus et al.,2010). As AD progresses, individuals require specialized care due to their functional and cognitive impairment and behavioral symptoms. The latter are the main drivers of caregivers' burden (Chiao et al., 2015). In addition, caring for individuals with dementia has tremendous financial implications. Alzheimer's and other related dementias (ADRD) cost of care is estimated at $355 billion, not counting the value of informal caregiving. Medicare and Medicaid are anticipated to pay for 67% of the health care and long-term care expenditures for people with Alzheimer's or other dementias. Out-of-pocket expenses are estimated to be 22% of total payments. Some of these can be attributed to a higher hospitalization rate for people with dementia than other older adults (Alzheimer's Association, 2021).

The number of adults with dementia residing in US nursing homes (NHs) increases as the population ages and the prevalence of the disease increases. Forty-eight percent of nursing home residents have Alzheimer's disease or other dementias (Harris-Kojetin et al., 2019), which indicates the need to develop strategies to deliver optimal

care. Several types of Special Care Units (SCUs) exist to deliver care to persons with a disability, AD, AIDS/HIV, Huntington's disease, dialysis, and specialized rehabilitation, among others (Castle, 2008). Of the 15,600 nursing homes regulated by federal or state governments, approximately 14.9% had a unit or floor designated as dementia special care units, constituting 72 % of all special care beds (Alzheimer's Association, 2021; Harris-Kojetin et al., 2019). AD special care units (AD SCUs) include some characteristics such as a modified environmental design (e.g., single rooms, house-like design) (Mazzei, Gillan, & Cloutier, 2014), specialized trained staff, and interventions to meet AD nursing home residents (Gilbert et al., 2019).

Prior research has explored the role of organizational and environmental factors and AD SCU designation by NHs. Studies exploring the role of external environmental factors have found that facilities located in more competitive markets were more likely to provide AD specialty care, while HMO penetration was not associated with having AD SCUs (Banaszak-Holl et al., 1996). Gruneir and colleagues (2007) reported that the adoption of AD SCUs was also influenced by the presence of another nursing home AD SCU in their market. In addition, other studies have found regional variations in AD SCUs distribution. Western states had a higher proportion of beds designated than southern states (Park-Lee, Sengupta, & Harris-Kojetin, 2013; Zinn & Mor, 1994).

Studies examining the role of organizational factors have found that for-profit chain-affiliated nursing homes are more likely to have a designation of beds for AD SCU (Blackburn et al., 2018). On the other hand, the percentage of residents paying with Medicare did not affect AD SCUs designation (Blackburn et al., 2018). Additionally, adopting AD SCUs has been considered as an organizational strategy to increase overall

occupancy. Castle and colleagues (2008) found a positive relationship between opening an AD SCU and increased overall occupancy, having a more significant impact on private-pay occupancy compared to Medicare occupancy (Castle, 2008).

While prior research has explored the association between nursing home AD SCU designation and environmental and organizational factors, recent studies have focused on organizational antecedents (Blackburn et al., 2018). The most comprehensive assessment of environmental factors associated with nursing homes' AD SCU was conducted by Banaszak-Holl et al. (1996); however, this research was limited to cross-sectional data from 1992. There have been many environmental changes affecting the nursing home industry since the 1990s. For instance, alternative home and community-based options to NHs have emerged over the past few decades (Clement & Khushalani, 2015). Assisting Living Facilities (ALFs) entered the market in the late1990s as alternatives to traditional NH care. The number of assisted living facilities (ALFs) has grown since the 1990s. As of 2019, there were around 28,900 ALFs with nearly 1 million licensed beds in the United States (National Center of Assisted Living, 2019). ALFs are a potential substitute of NHs for cognitively and functionally independent individuals (Clement & Khushalani, 2015) and private-pay residents (Bowblis, 2012). In addition, there has been increased regulation of AD SCUs, with several states requiring facilities with dementia special care units to meet certain physical safety features (e.g., doors with keypads), minimum staffing ratios, and staff specially trained to care for residents with dementia (National Center for Assisted Living, 2019). Lastly, Medicaid expenditures on community-based and home services grew between 2008 and 2018 from 43% to 56% of total long-term services and supports spending (Alzheimer Association, 2022). States have offered

services such as adult day care and respite care to seniors or people with dementia, which might delay care recipient institutionalization, in turn affecting AD SCUs demand. As such, this study seeks to build on the existing literature by using longitudinal data from 2005 through 2019 from a national sample of nursing homes and a resource dependence theory framework to explore the environmental and organizational characteristics associated with a nursing home's strategic decision to adopt AD SCU. Our results provide knowledge to elucidate factors associated with adopting AD SCUs, assisting policymakers and nursing home administrators in recognizing additional opportunities made possible from their adoption.

CONCEPTUAL FRAMEWORK

A growing body of literature in ascertaining factors associated with SCUs development has used a resource dependence theory (RDT) framework (Castle, 2008; Banaszak-Holl et al., 1996; Zinn & Mor, 1994). In this study, RDT will be used to assess the relationship between organizational and environmental factors and AD SCUs designation (Figure 1). RDT posits that, “the key to organizational survival is the ability to acquire and maintain resources” (Pfeffer & Salancik, 1978, p.2). RDT assesses the effects of environmental factors on organizations' strategic approaches (Hillman et al., 2009). Thus, organizations are not autonomous and depend on other organizations to acquire crucial resources for survival (Pfeffer, J., & Salancik, 1978). Even though limited by their environment, organizations respond according to their external context and resources to survive and succeed, reducing uncertainty and dependence on the

environment (Hillman et al., 2009). Organizational approaches may involve changes in the structure and behavior and establishing resource exchange networks to secure a stable flow of needed resources (Pfeffer, J., & Salancik, 1978). Likewise, differences in environmental and organizational characteristics (i.e., competitive markets and resource providers' demand) impact their response to changing environments (Yeager et al., 2014; Banaszak-Holl et al., 1996).

Nursing homes respond to their environment and available resources; however, the changing demographics (i.e., rapid growth of population sixty- five and older) (Feng et al., 2011), residents' special care needs (people with dementia) (Lai et al., 2009) and competition from alternative providers (e.g., assisted living facilities) (Lord et al., 2018) have required nursing homes to redirect their strategies to respond to rapid changes in resource providers' demands and in the environment in which they operate.

Nursing homes may adopt innovative services such as special care units to align the organization with changes in the payment structure and market segments. Medicaid payment reforms have established incentives to admit residents with complex care needs (i.e., behavioral symptoms) and dual-eligible (Medicare/Medicaid) beneficiaries with Alzheimer's. Under these systems, care delivered in special care units and to dual-eligible with AD diagnosis is reimbursed at higher rates (Thies , Bleiler & Alzheimer's Association, 2013). According to the Alzheimer's Association, the average annual Medicaid payments per Medicare beneficiary with ADRD ($6,478) were 22 times greater than average Medicaid payments for Medicare beneficiaries without ADRD ($291) in 2020 (Alzheimer Association, 2022). This effort to diversify services requires changes in the structure and processes of the organization. In addition, adopting AD SCUs might be

an organizational strategy to attract private pay residents having a better payer-mix (Zinn & Mor, 1994). This strategy would increase profitability through an increased census and market share of private-pay residents (Castle, 2008).

In previous studies exploring the role of environmental characteristics on strategic adoption, the environment has been examined as three constructs that involve the degree of uncertainty and resources: munificence, complexity, and dynamism. Munificence refers to "the availability and accessibility of resources to a particular organization" (Yeager et al., 2014, page 51). Past research has identified environmental munificence as a critical predictor of service innovation in nursing homes. For example, nursing homes located in more munificent environments, defined as higher Medicaid reimbursement, were more likely to adopt innovative approaches (Weech-Maldonado et al., 2009). Another example is that nursing homes that had a lower census of Medicare residents were more likely to establish AD SCUs (Banaszak-Holl et al., 1996).

In the context of nursing homes, environmental factors associated with munificence are the sociodemographic characteristics of the population in the nursing home's community. These factors measure the availability of resources, such as demographic characteristics of the population and economic resources. One of the reasons for nursing homes in developing AD SCUs has been the growing number of AD cases (Phillips et al., 1998). Age is the greatest risk factor for developing late-onset Alzheimer's, and AD is a major driver of nursing home placement (Zimmerman et al., 2005). The proportion of individuals with Alzheimer's dementia rises significantly with age to 5.3% among those aged 65 to 74, 13.8% among people aged 75 to 84, and 34.6% of those aged 85 or older develop AD (Alzheimer's Association, 2021). Given that AD is

a major predictor of institutionalization, this may be particularly relevant among Black/African Americans and Hispanics. Black/African Americans are about twice as likely to develop ADRD as Whites. Similarly, Hispanics are about 1.5 times more likely to develop ADRD than Whites. (Alzheimer's Association, 2021). In the last few decades, the proportion of racial/ethnic minority residents in nursing homes has grown, while that of White residents has decreased (Feng et al., 2011). The proportion of Hispanics and Asians NHs residents is rapidly growing amongst nursing homes residents followed by Blacks/African Americans (Feng et al., 2011). Despite the higher prevalence of ADRD among Black/African Americans and Hispanics and the increased utilization among minorities of nursing homes, little is known about the influence of the racial/ethnic composition of the communities in AD SCU designation. In addition, racial/ethnic disparities in NHs have been reported. Earlier research has shown that nursing homes located in areas with a higher proportion of Black/African Americans had limited resources (e.g., staffing ratios) and more health-related deficiencies (Mor et al, 2004).

As such, nursing homes might implement strategies based on the population's demographic characteristics of their market. For example, nursing homes located in markets with a higher percentage of individuals 65 years and older have access to a larger proportion of individuals at risk and with a greater demand for long-term care. Therefore, we could posit that these facilities are more likely to invest in adopting AD SCUs to attract potential private pay residents with AD from the community. On the other hand, nursing homes that operate in less munificent environments like communities with lower socioeconomic status (SES) or with a higher proportion of minorities will be less likely to secure the necessary resources to adopt AD SCUs. Higher proportion of minorities tends

to reside in areas with a lower SES and rely more on Medicaid due to lower incomes, poorer health, and greater need of long-term care services compared to non-Hispanic White population. (Meyer et al., 2013) For example, it was shown that nursing homes located in areas with higher unemployment rates had a lower likelihood of having AD SCU (Banaszak-Holl et al., 1996).

Based on this, the following hypotheses are proposed:

Hypothesis 1: Nursing homes located in areas with a higher proportion of the population 65 years and older will be more likely to develop AD SCUs.

Hypothesis 2: Nursing homes located in areas with a higher proportion of racial/ethnic minorities will be less likely to develop AD SCUs.

Hypothesis 3: Nursing homes located in communities with lower SES will be less likely to develop AD SCUs.

Complexity represents to the extent that information is available to administrators for strategic organizational decisions (Yeager et al., 2014). Rigorous regulations trigger complex environments; environments with more strict regulatory policies (i.e., Certificate of Need legislation) have been negatively associated with SCU development in nursing homes (Banaszak-Holl et al., 1996) and the adoption of innovative services (Castle, 2001). Also, complexity refers to the number of nursing homes operating within a given market and the allocation of resources among the competitors (Banaszak-Holl et al., 1996). In this study, we measure environmental complexity as the level of market competition. In a more competitive market, NHs might innovate, implementing specialized care to be more competitive and increase their share market. Special care

units have been considered a representation of nursing home care innovation (Banaszak-Holl et al., 1996).

Hypothesis 4: Nursing homes operating in more competitive markets will be more likely to adopt AD special care units.

Dynamism is related to the level of change in the environment, which results in an increased degree of uncertainty (Yeager et al., 2014; Menachemi, Mazurenko, Kazley, Mark, & Ford, 2012). Dynamic environments have been negatively associated with organizational innovations like Electronic Medical Records (EMR) adoption (Menachemi et al., 2012). Changes in the Medicare Advantage (MA) penetration rates may increase uncertainty in nursing homes markets. MA provides health coverage through preferred networks of care providers as well as has the potential to reduce costs by narrowing individuals' choice of providers exacerbating market segregation (Meyers et al., 2018). Nursing homes in more dynamic environments may experience higher uncertainty in the demand for long-term care services, such as AD care. As such, this may deter nursing homes from adopting SCUs. In our study, the dynamism will be evaluated by percent changes in the size of the population 65 years and older and percent changes in the Medicare Advantage penetration rate over time (2005-2019). We hypothesized that nursing homes operating in environments that are more dynamic will be less likely to adopt an AD SCU.

Hypothesis 5: Nursing homes located in areas with a higher rate of change in the population 65 years and older will be less likely to adopt AD SCUs

Hypothesis 6: Nursing homes located in areas with a higher rate of change in the Medicare Advantage penetration rate will be less likely to adopt AD SCU

Organizational characteristics may also drive strategic choices. Resource dependence theory postulates that organizations make strategic decisions based on their resources. Chain affiliation and size may act as indicators of resource availability (Davis et al., 2009). For example, both chain affiliation and organization size were linked to implementing cost control strategies and best practices across NHs (Zinn & Mor, 1994). Chain affiliation and larger size imply greater resource availability and flexibility to implement specialized care (Zinn & Mor, 1994). Delivering specialized care in a designated unit may enable chain-affiliated NHs to implement standardized practices and share costs across the NHs (Blackburn et al., 2018). Additionally, larger organizations have more internal resources, a larger staff, and standardized practices that allow them to adjust to environmental demands compared to smaller facilities (Banaszak-Holl et al., 1996). Given this, the following hypotheses are proposed:

Hypothesis 7: Nursing homes that are part of a chain will be more likely to adopt AD SCUs.

Hypothesis 8: Larger nursing homes will be more likely to adopt AD SCUs.

METHODS

Sample

The unit of analysis for this study was the facility-year, and the study used a national sample of freestanding nursing homes. Because of their different organizational practices, the analysis excluded hospital-based facilities and federal governmental facilities. The study was a longitudinal analysis using a panel design of nursing homes

from 2005 to 2019. The sample consists of approximately 193,652 nursing home-year observations (or an average of 12,900 facilities per year).

Data

In order to test the proposed hypotheses, data from LTC-Focus files for the years included in the study were merged with data from the Area Health Resource File (AHRF). LTC Focus files are part of the Shaping Long-Term Care in America Project at the Center for Gerontology and Healthcare Research at Brown University (Shaping Long Term Care in America Project at Brown University funded in part by the National Institute on Aging (1P01AG027296)). These files combine multiple data sources, including the Minimum Data Set, Online Survey Certification and Reporting System (OSCAR), state policy data, and the Area Resource File. The LTC-Focus dataset provides several nursing home-level characteristics, such as whether or not the nursing home adopted an AD SCU, the nursing home's size and ownership status, and whether or not the nursing home is chain affiliated. In addition, the LTC-Focus dataset provides market characteristics, such as the Herfindahl–Hirschman Index and Medicare Advantage penetration. The Area Health Resource Files (ARF) dataset provides environmental characteristics such as the percentage of the population 65 years and older, racial/ethnic composition, poverty level, and per capita income at the county level.

Variables

Table 1 shows definitions and data sources for all variables.

Dependent variable. The dependent variable in this analysis was the adoption of AD SCUs or not. This variable was obtained from the LTC Focus dataset and was coded

as a dichotomous variable (0,1) with a value of 1 if the facility has an AD SCU and 0 otherwise.

Independent variables. The independent variables included each of the environmental and organizational variables selected for the study. The environmental variables selected to measure munificence at the county-level included the percentage of the population 65 years and older (H_1), percentage of Black/African American, Hispanics, and other race population (H_2), and socioeconomic conditions as per capita income and poverty level (H_3). The percentage of the population 65 years and older was based on the population estimates 65+ from the ARF File. (Population Estimates 65+ are from the U.S. Census Bureau).

To measure environmental complexity, market competition (H_4) was operationalized in terms of the Herfindahl–Hirschman Index (HHI). HHI is a measure of the nursing home concentration/competition at the county level. It is defined as the sum of the squares of market shares (based on residents' days of care) for nursing homes in each county. Nursing home competition in the county ranges from 0 to 1. The closer to 1, the closer the county is of having a monopolistic market, while scores close to 0 indicate highly competitive markets.

Market dynamism was evaluated by the percent change in the population 65 years and older (H_5) (2005-2019) and the percent change in the Medicare Advantage penetration rate (H_6). The year-over-year change was calculated by subtracting the prior-year value from the current year value and dividing the result of this calculation by the prior-year value.

Organizational factors included chain affiliation (H_7) and nursing home size (H_8). Chain affiliation indicates whether or not a facility is part of a chain (0 = No, 1 = Yes). Nursing home size was operationalized as the total number of beds.

Control variables. We also controlled for other environmental and organizational factors that have been found to be predictors of SCUs adoption (Blackburn et al., 2018, Park-Lee et al., 2013, Castle, 2008, Gruneir, Lapane, Miller, & Mor, 2008). Environmental factors included the location of the nursing home. Location was defined as metro and urban areas (1) or rural areas (0) (based on the Urban Influence Code)(United States Department of Agriculture, n.d.). Metro and urban areas were defined as (Rural-Urban Continuum code-RUCC) codes 1-7, whereas rural areas included codes 8-9. Metropolitan and urban areas have greater availability of resources, like a higher concentration of population 65 years and older compared to rural areas. Studies have found that nursing homes located in urban areas are more likely to adopt AD SCUs (Park-Lee et al., 2013).

Organizational factors included ownership status, payer mix, and occupancy rate. Nursing home ownership (for-profit and not for profit) was represented as a dichotomous variable (0 = for-profit, 1 = not-for-profit). One study found that AD SCUs were more common among not-for-profit nursing homes (Blackburn et al., 2018). The payer mix was defined as the percentage of residents with Medicare and the percentage of residents with Medicaid. Residents in AD SCUs are more likely to be private pay (Gruneir et al., 2008). Occupancy rate was measured as the percentage of occupied nursing home beds. Castle (2001) found that average occupancy was associated with the odds of early

innovation adoption by nursing homes. Higher occupancy potentially leads to greater adoption due to possibly higher slack resources.

Analysis

Bivariate analyses were conducted to provide descriptive statistics of the data and to test the relationship between nursing homes that had adopted AD SCU and those that had not adopted it. Differences in the distribution of categorical and continuous variables were examined using chi-square and T-test, respectively. Multivariate relationships between AD SCU adoption (Yes or No) and nursing home organizational and market factors were ascertained using panel logistic regression with random effects, state and year fixed effects, and robust standard errors to address the correlation of repeated observations. Random effects assume that individual-specific effects are uncorrelated with the independent variables. State fixed effects controlled for interstate differences in regulations, policies, or other factors that may influence behavior in nursing homes. By including year-fixed effects, we controlled for time trends in the designation of SCUs. A one-year lag between organizational and market-level variables and AD SCU adoption was established. The one-year lag allowed some time variance to assess if the environment (organizational and market-level factors) were associated with AD SCU adoption). All analyses were conducted in SAS Version 9.4/ Stata 17. Statistical significance was considered at the p-value < 0.05.

The resulting equation used in the analysis is presented below. All the independent and control variables are represented. The general model specification for the “i”th is the nursing home, the “j”th is the state, and the “t” is the year.

Logit (AD SCUs adoption $_{i}$) = ß$_{0}$ + ß$_{1}$ (Percentage of the population 65 years and older $_{jt}$) + ß$_{2}$ (Percentage of the Black/African American population $_{jt}$)+ ß$_{3}$ (Percentage of the Hispanic population $_{jt}$)+ ß$_{4}$ (Percentage of the other race population $_{jt}$)+ ß$_{5}$(per capita income per 1,000 $_{jt}$) + ß$_{6}$(poverty level $_{jt}$) + ß$_{7}$(market competition $_{jt}$) + ß$_{8}$(Change in population $_{jt}$) + ß$_{8}$(Change in MA penetration rate $_{jt}$) + ß$_{10}$ (chain/ system affiliation $_{it}$) + ß$_{11}$(Size $_{it}$) + ß$_{12}$ (Rural / Metro & Urban areas $_{jt}$) + ß$_{13}$ (ownership $_{it}$) + ß$_{14}$(occupancy rate $_{it}$) + ß$_{15}$(Payer mix-Medicare $_{it}$) + ß$_{16}$(Payer mix-Medicaid $_{it}$) + ß$_{17}$(Payer mix-Private $_{it}$) + ß$_{18}$(Year Dummy variable $_{jt}$) + ß$_{19}$(State Dummy Variables $_{jt}$) + ų (Year $_{t}$) +

ų (State $_{j}$) +υ $_{i}$ + ϕ $_{i}$+ Ɛ$_{ijt}$

υ $_{i}$- Random effects -facility level

Ψ – robust cluster at the facility level

Ɛ-error term

RESULTS

Nursing home observations were classified into two groups: AD SCU adopters (n=31,370; 16.20%) and non-AD SCU adopters (n= 162,282; 83.80%). The descriptive statistics are presented in Table 2. The results indicated a statistically significant difference between NHs that adopt an AD SCU and those that do not. For the environmental variables, AD SCU adopters generally operated in more munificent markets, with slightly higher averages of percent population 65 years and older (15.41 vs. 15.17; p <0.001); higher averages percentage of White population (75.89 vs. 69.27; p <0.001); lower averages percentages of a minority populations, Black /African Americans (9.84 vs. 11.41; p <0.001), Hispanics (9.51 vs. 13.34; p <0.001), and other race (3.88 vs. 5.22; p <0.001); and a lower average level of per capita income (42,389.38

vs. 43,261.83; p <0.001) but lower averages percentage of persons below the poverty threshold (13.76 vs. 14.58; p <0.001). Regarding the complexity of the environment, nursing homes that adopted AD SCU operated in slightly more monopolistic markets (0.22±0.23 vs. 0.21± 0.24; p <0.05). Lastly, nursing homes that adopted an AD SCU operated in environment with mixed levels of dynamism. AD SCUs adopters were more likely to operate in environments with lower average change in percentages of the population older than 65 (0.018± 0.02 vs. 0.019± 0.02; p<0.001) compared to those that did not adopt an AD SCU. However, AD SCUs adopters operated in environments with high average percent change in MA penetration rate (0.52 ±4.02 vs. 0.49 ±4.14).

Concerning the organizational factors of AD SCU adoption, nursing homes that adopted an AD SCU were larger in size compared to nursing homes that did not adopt an AD SCU (133.43 ± 63.58 vs. 104 ±54.28; p<0.001) and more likely to be part of a chain (60.67 vs. 58.20; p<0.001). For the organizational control variables, nursing homes that adopted an AD SCU were less likely to be part of a for-profit organization (64.52 vs. 77.96; p<0.001); had a higher occupancy rate (84.06 ±13.42 vs. 82.38 ±14.82; p< 0.001); lower percentage of Medicare (12.10 vs. 14.65; p<0.001) and Medicaid residents (60.59 vs. 61.03; p<0.05), compared to nursing homes that did not adopt an AD SCU. For environmental control variables, nursing homes that adopted an AD SCU were more likely to be located in urban areas (97.05 vs. 96.03; p<0.001).

Multivariable results of AD SCUs adoption and environmental and organizational factors are presented in Table 3.

Environmental munificence

One of the three munificence hypotheses was supported by the data with H2 (percentage of racial/ethnic minority population). For Hypothesis 2, a 1% increase in the Black/African American population was associated with 2% lower odds of having an AD SCU (OR=0.98; p<0.001). For Hispanics, 1% increase in the Hispanic population was associated with 3% lower odds of having an AD SCU (OR=0.97; p<0.001). Then, for the other race population, a 1% increase in the other race population was associated with 7% lower odds of having an AD SCU (OR= 0.93; p<0.001). We found no support for Hypothesis 1 that nursing homes located in areas with a higher proportion of the population over 65 are more likely to develop AD SCUs (OR=0.99; p=0.28). For Hypothesis 3, we posited that nursing homes located in communities with lower SES are less likely to develop AD SCUs. There were no statistically significant associations between SES and AD SCUs adoption measured as the percentage of persons below the poverty threshold (OR= 1.00; p=0.76) and per capita income (OR=1.00; p=0.52).

Environmental complexity

We found no support for Hypothesis 4 that nursing homes operating in a more complex (competitive) environment are more likely to adopt AD SCUs (OR= 1.96; p= 0.001). Specifically, nursing homes operating in more monopolistic markets were three percentage points more likely to adopt AD SCUs.

Environmental dynamism

We found no support for Hypothesis 5 that nursing homes located in areas with a higher rate of change in the population 65 years and older are less likely to adopt AD SCUs. The relationship between the rate of change in the population 65 and older and the adoption of AD SCUs was not statistically significant. (OR =2.85; p=0.122). We found support for

Hypothesis 6, nursing homes located in areas with a higher rate of percent change in the Medicare Advantage penetration rate were less likely to adopt AD SCUs (OR=0.98; p=0.003).

Organizational characteristics

Regarding organizational factors, there was support for Hypothesis 7, with larger nursing homes being more likely to adopt AD SCUs (OR= 1.03; p<0.001). On the other hand, Hypothesis 8 was not supported; the relationship between chain affiliation and the adoption of AD SCU was not found to be statistically significant (OR= 1.07; p= 0.195).

In addition to these findings, organizational and environmental control variables were also associated with AD SCUs adoption. Organizational control variables, such as being for-profit (OR= 0.57; p <0.001) and higher percentage of residents with Medicaid (OR= 0.99; p<0.05) and Medicare as primary payer (OR= 0.98; p< 0.01) were negatively associated with AD SCUs adoption. Conversely, a higher occupancy rate was positively associated with the adoption of AD SCUs (OR=1.02; p<0.001). Lastly, nursing homes operating in urban areas were more likely to adopt AD SCUs (OR=2.11, p<0.05). Specifically, nursing homes operating in urban/metro areas were two percentage points more likely to adopt AD SCUs (ME=0.03).

DISCUSSION

Based on RDT, this study evaluated the environmental and organizational factors that may be associated with AD SCUs adoption among nursing homes. Our findings suggest an association between the environment in which a nursing home operates and its

decision to adopt an AD SCU. The results partially support the relationship between environmental munificence and AD SCUs adoption. Percentages of minority populations were negatively associated with AD SCUs adoption. This suggests that nursing homes located in high minority communities may rely more on Medicaid and may not have the resources to invest in AD SCUs.

Contrary to our expectations, we found that nursing homes located in more monopolistic environments were more likely to adopt AD SCUs. One would expect that NHs operating in competitive markets to innovate and implement specialized care that provides them with a competitive advantage. This finding contrasts with the study conducted by Banaszak et al. (1996) that found greater competition as a predictor of delivering specialty care. Our findings may be explained in that nursing homes in more competitive markets may experience higher operating costs, which may curtail their ability to dedicate resources towards specialized care.

Regarding environmental dynamism, the percent change in the Medicare Advantage penetration rate was significantly negatively associated with AD SCUs adoption. Specifically, nursing homes operating in areas with higher levels of MA penetration were two percentage points less likely to adopt AD SCUs. This may reflect NHs administrators implementing cost-containment strategies to cope with instability of resources due to environmental uncertainty. Earlier research did not find an association between HMO penetration and AD SCUs designation (Banaszak-Holl et al., 1996).

Among the organizational characteristics, larger nursing homes were more likely to adopt AD SCUs. Larger organizations may have greater access to resources to alter infrastructure and provide specialized staff training, among other specifications and

requirements, than smaller facilities. Our findings were consistent with those of prior studies showing size as a predictor for the designation of special care units (Banaszak-Holl et al., 1996; Zinn & Mor, 1994). On the other hand, contrary to the study by Blackburn et al. (2018), we did not find a significant association between chain affiliation and designating AD SCUs beds. One reason may be because this study evaluated not only organizational characteristics, but also environmental factors associated with AD SCUs adoption. Several organizational and market control variables were also associated with AD SCUs adoption. As hypothesized, organizational factors like for-profit status, occupancy rate, the proportion of Medicaid and Medicare payer mix, and location were predictors of AD SCUs adoption. First, for-profit status was negatively associated with AD SCUs adoption. This finding supports prior studies that found that not-for-profit NHs were more likely to have designated AD SCU beds (Blackburn et al., 2018; Zinn & Mor, 1994). In general, not-for-profit nursing homes tend to develop innovative services to compete with for-profit nursing homes (Davis et al., 2011). Second, nursing homes with higher occupancy rates were more likely to adopt ADSCUs. Establishing an AD SCU has been reported as an NHs approach to increase occupancy rates and private-pay census (Castle, 2007).

Third, we found a negative relationship between the proportion of Medicare and Medicaid payer mix and AD SCU adoption. These findings were consistent with earlier research on nursing homes' AD SCUs adoption (Blackburn et al., 2018; Banaszak-Holl et al., 1996). One study found that having a lower proportion of Medicare residents was associated with a higher likelihood of adopting an SCU (Banaszak-Holl et al., 1996). Similarly, Blackburn et al.(2018) found that the percentage of Medicaid and Medicare

payers was negatively associated with AD SCU beds designation (Blackburn et al., 2018). One potential explanation for this finding is that AD SCU adoption may be an organizational strategy of NHs to attract and retain private-pay residents (Castle, 2008). Finally, nursing homes located in urban areas were more likely to adopt AD SCUs. This was expected as facilities in rural areas may have limited resources to adopt specialized care. Nursing homes operating in rural areas have been less likely to have AD SCU (Orth & Cagle, 2022).

IMPLICATIONS

Several of our findings may be important to the nursing home industry, policymakers, and researchers. First, the study provides insights to nursing homes administrators on how organizational factors influence the adoption of AD SCUs. For example, factors such as size, occupancy rate, and urban location were important enabling factors influencing the tendency to adopt AD SCUs. This suggests that these attributes may be associated with higher financial resources available to NHs managers to invest in the adoption of specialized care. Second, our research informs policymakers and researchers about potential racial/ethnic disparities regarding access to AD SCUs. Despite the growing proportion of racial/ethnic minorities among nursing home residents (Feng et al., 2011), AD SCU adoption was negatively associated with the proportion of racial/ethnic minorities in the market in which NHs operate. Future studies should seek to better understand organizational (e.g., age of facility) and market factors (e.g., neighborhood deprivation) as potential contributors to disparities in access to specialized care.

LIMITATIONS

This study has a few limitations. First, the data used in the study were secondary and self-reported by the NH and could be conditional to inaccuracies and missing data. Because of the lack of standardization in the definition of an AD SCU, there can be differences in interpretation among nursing home administrators when reporting their presence. In our study, environmental factors were explored at the county level; demographics and socioeconomic characteristics may vary in the county.

CONCLUSIONS

Among NHs, a context defined by the racial/ethnic composition of the population, lower level of market competition, and urban location affects the adoption of AD SCUs. In addition, organizational factors such as size, for-profit status, occupancy rate, payer mix, and nursing home's location are significant predictors of AD SCUs adoption. Our study adds to the existing literature by using a longitudinal design to explore how AD SCUs adoption relates to the environmental and organizational characteristics of nursing homes. In addition, our results highlight the role of environmental factors as racial/ethnic composition of the NHs market on AD SCUs adoption. The influence of environmental and organizational factors on AD SCUs adoption needs further investigation. Future research assessing social deprivation may help to elucidate differences in access to specialized care for Alzheimer's disease in nursing homes. Additionally, because of the relationships between geographic location and concentration of ethnic minority populations and the adoption of AD SCUs, efforts to reduce differences in access should focus on communities with high concentrations of minority racial/ethnic groups. Lastly,

the findings can be used by NHs administrators to make informed decisions when adopting specialized care for people with dementia.

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Figure 1. Conceptual framework

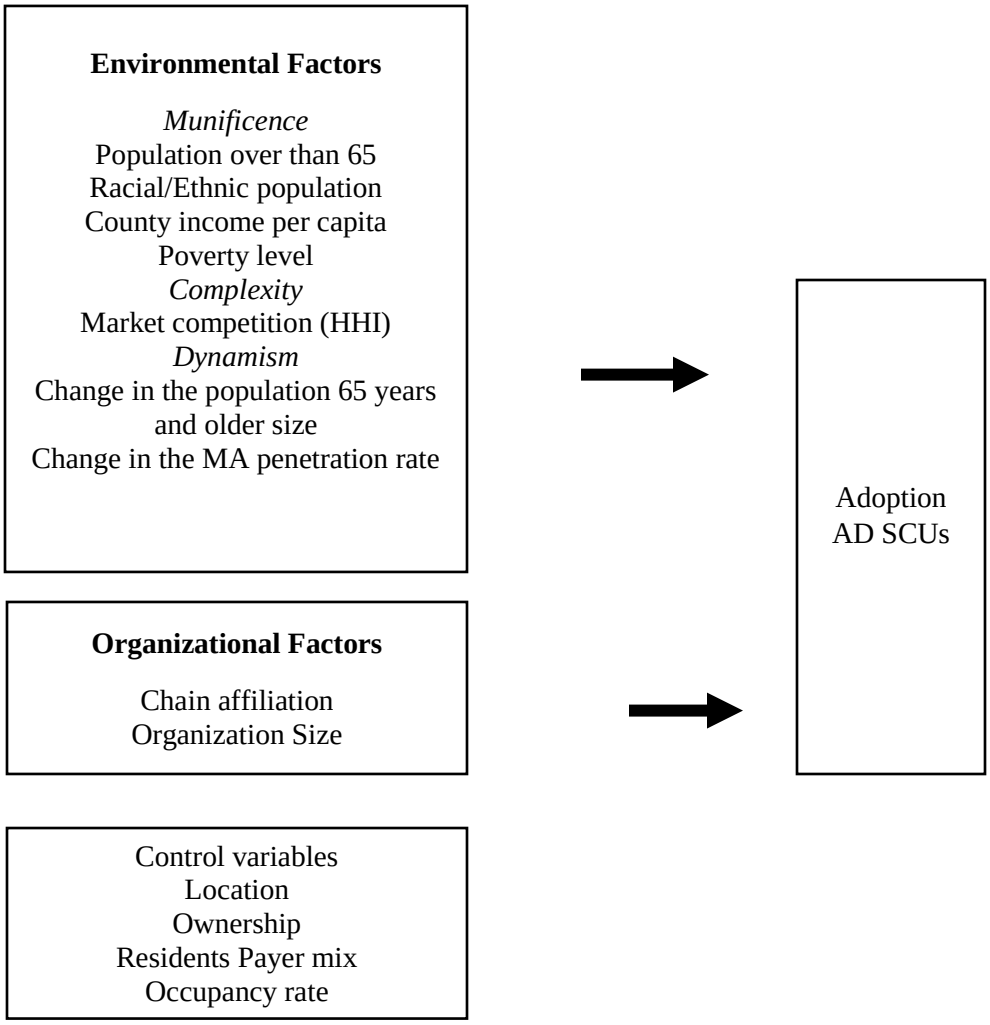

Table 1. Variables' definition and sources

Variable	Definition	Source
Dependent variables		
Has Alzheimer's dementia unit?	Indicates whether the facility has an Alzheimer's disease Special Care Unit (SCU) Yes =1 No=0	LTC FOCUS
Independent variables		
Percentage of population over 65 years	The percentage of the population over 65 years old at the county level	AHRF
Percentage of Black/African American population	The percentage of Black/African American population at the county level	AHRF
Percentage of Hispanic population	The percentage of Hispanic population at the county level	AHRF
Percentage of other race population	The percentage of other race population (include American Indian, Asian, Native Hawaiian due to small sizes) at the county level	AHRF
Change in the population 65 years and older	Relative changes in the percentage of the population 65 years and older	AHRF
Change in the Medicare Advantage penetration rate	Relative changes in the Medicare Advantage penetration rate	AHRF
Per capita income	Income level in the county per 1K	AHRF
Poverty Level	Poverty level will be defined as the percent of persons and families below poverty threshold in the county, as indicated by the Office of Management and Budget's Statistical Policy Directive 14	AHRF
Market characteristics		
Herfindahl–Hirschman Index	Nursing home competition in the county ranging from 0 to 1. The closer to 1, the closer the county is of having a monopoly in nursing home beds.	LTC FOCUS
Organizational Characteristics		
Size	Number of beds	LTC FOCUS
Multi-facility chain member	Indicates whether the facility is part of a chain	LTC FOCUS
Control variables		
Ownership	0 = for-profit, 1 = not-for-profit	LTC FOCUS
Occupancy	Percentage of NH beds occupied	LTC FOCUS
Payer mix		
% Medicare	The proportion of facility residents whose primary support is Medicare	LTC FOCUS
% Medicaid	The proportion of facility residents whose primary support is Medicaid	LTC FOCUS
Location	Metro and urban areas = 1 or rural areas =0	AHRF

AHRF=Area Health Resource File

Table 2

Descriptive Statistics of Variables (N = 193,652 nursing homes year observations)

	AD SCU YES 31,370 16.20%		AD SCU NO 162,282 83.80%		
	Mean (SD)/ Frequency (%)		Mean (SD)/ Frequency (%)		
Independent variables					
Environmental Factors					
Environmental munificence					
Percentage of the population 65 and older (%)	15.41	(4.02)	15.17	(4.04)	**
Percentage of White population (%)	75.89	(17.61)	69.27	(21.40)	**
Percentage of Black/African American population (%)	9.84	(11.82)	11.41	(12.72)	**
Percentage of Hispanic population (%)	9.51	(11.25)	13.34	(15.31)	**
Percentage of other race population (%)	3.88	(4.38)	5.22	(6.47)	**
Per capita income ($)	42,389.38	12,184	43,261.83	13,772	**
Persons below the poverty threshold (%)	13.76	(5.03)	14.58	(5.38)	**
Environmental complexity					
Market Competition (HHI)	0.22	(0.23)	0.21	(0.24)	*
Environmental dynamism					
Change 65+	0.018	(0.02)	0.019	(0.02)	**
Change MA penetration rate	0.52	(4.02)	0.49	(4.14)	
Organizational Factors					
Size (# Beds)	133.43	(63.58)	103.91	(54.28)	**
Chain affiliation %	19,031	(60.67%)	94,454	(58.20%)	**
Control variables					
Organizational Variables					
For-profit %	20,240	(64.52%)	126,51%	(77.96%)	**
Occupancy (%)	84.06	(13.42)	82.38	(14.82)	**
Medicare (%)	12.10	(9.61)	14.65	(13.21)	**
Medicaid (%)	60.59	(19.48)	61.03	(22.61)	*
Environmental variables					
Location (Urban)	30,444	(97.05%)	155,841	(96.03%)	**

* <0.05 ** <0.001

Table 3 Logistic Regression Analysis with AD SCU adoption as dependent variable

	Nursing Homes adopting AD SCU N = 193,652	
Variables	Odds Ratio	Margins
Environmental Factors		
Environmental munificence		
Percentage of the population over 65	0.99	-0.0006
Percentage of White population	Ref	
Percentage of Black/AA population	0.98**	0.0011** -0.00091**
Percentage of Hispanic population	0.97**	0.0014**
Percentage of other race population	0.93**	-.0028 **
Per capita income ($)	1.01	1.09e-07
Persons below the poverty threshold (%)	1.00	0.0001
Environmental complexity		
Market Competition (HHI)	1.96*	0.03*
Environmental dynamism		
Change 65+	2.85	0.043
Change Medicare Advantage Penetration rate	0.98*	-0.0005*
Organizational Factors		
Nursing Home Size	1.03**	0.001**
Chain affiliation	1.07	0.003
Control variables		
Organizational Variables		
For-profit	0.57**	-0.02**
Occupancy rate (%)	1.02**	0 .001**
Medicare payer mix (%)	0 .98 **	-.001**
Medicaid payer mix (%)	0.99*	-.0002*
Environmental variables		
Location Urban	2.11*	0.031*

* <0.05
** <0.001

THE ASSOCIATION BETWEEN THE ADOPTION OF ALZHEIMER DISEASE SPECIAL CARE UNITS AND THE QUALITY OF CARE PROVIDED BY NURSING HOMES

by

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Format adapted for dissertation

ABSTRACT

Objective: To evaluate the effects of adopting AD SCUs on nursing homes' processes (use of physical restraints, antipsychotic drugs, and use of feeding tubes) and residents' outcomes (proportion of long-stay residents with pressure ulcers, proportion of long-stay residents who have fallen, and hospitalization rate) measures of quality of care.

Data Sources/ Study Setting: This study utilized data from three different sources: Brown University's LTCFocus data, Online Survey, Certification, and Reporting (OSCAR) and Certification and Survey Provider Enhanced Reporting (CASPER), and the Area Health Resource File from 2006 to 2019. The sample consists of approximately 148,707 nursing home-year observations over the 14-year study period. This sample included a national population of Medicare and Medicaid-certified nursing homes that are categorized as nongovernment not-for-profit or investor-owned for-profit facilities.

Study Design: We performed panel data linear regressions with facility fixed effects and year fixed effects to estimate the effects of AD SCUs on each of the dependent variables controlling for a range of organizational and market covariates.

Principal Findings: Facilities that adopted AD SCUs had a lower prevalence of feeding tubes, pressure ulcers, and hospitalizations among nursing home residents. Furthermore, a higher percentage of AD SCU beds resulted in a marginal decrease in physical restraints.

Conclusions: Our findings suggest differences in care processes and outcomes associated with AD SCUs adoption, such as reducing physical restraints, feeding tubes, pressure ulcers, and hospitalization rates. These findings will provide policymakers and

nursing home administrators with a better understanding of quality nursing care and the relationship between AD SCUs and NHs' quality of care.

Key Words: Special care unit, Alzheimer’s disease, nursing home, quality

INTRODUCTION

The quality of care for residents with Alzheimer's and other related dementias (ADRD) in nursing homes has been a long-term area of interest for policymakers, researchers, and consumers. Dementia is the most common reason for nursing home placement (Zimmerman et al., 2005). According to the National Center for Health Statistics, in 2016, nearly 48% of nursing home residents were diagnosed with Alzheimer's disease or other dementias (Harris-Kojetin et al., 2019). Residents with ADRD have a higher risk of behavioral symptoms like care-resistance and are at risk for delirium, falls, and other adverse health outcomes (Cen et al., 2018; Espinoza, 2006; McCreedy et al., 2019). These conditions are associated with the neurodegenerative aspects of dementia and demonstrate the complexity of dementia care and its associated challenges for nursing homes.

Some nursing homes (NHs) have designated Special Care Units (SCUs) to address the needs and manage the care of residents with ADRD. Alzheimer's disease SCUs (AD SCUs) consist of a specific area or number of beds where the physical environment, staffing training, and care interventions are designed for cognitively impaired residents who may or may not have a definite diagnosis of Alzheimer's disease (Blackburn et al., 2018; Nazir et al., 2011).

AD SCUs are intended to optimize residents' quality of life by maintaining functional status and modifying environmental stressors that might cause behavioral

problems (Mobley et al., 2017). In terms of the environmental design, some of the characteristics of an AD SCU include private rooms, safe interior and exterior resident space for independent ambulation, and quiet areas. In addition, spaces should have appropriate signs and clues for activities of daily living (ADLs) and cognitive function and controlled audible and visual stimuli (Mazzei et al., 2014; Park-Lee et al., 2013). Regarding interventions and staffing, AD SCUs have appropriate staffing features (i.e., staffing ratio, training) to meet residents' needs and establish interventions and activity programs that prevent triggering negative behaviors such as psychosis, agitation, and wandering (e.g., sustained reduction in the noise level within the units, policies about family involvement) (Gilbert et al., 2019; Grant et al., 1995). Of the 15,600 nursing homes regulated by federal or state governments, as of 2016, approximately 15% had a unit or floor designated as dementia special care units, constituting 72 percent of all special care beds (Association., 2021; Harris-Kojetin et al., 2019).

Even though AD SCUs are the most common type of specialized care (Blackburn et al., 2018), and their designation might lead to a higher quality of care for residents with ADRD, prior studies examining their effectiveness have shown mixed results. There is evidence, although mixed, that the adoption of AD SCUs is associated with improved quality of care in NHs (Kok et al., 2013; Lai et al., 2009). Kok et al. (2013) identified thirty-two studies that explored the effects of AD SCUs on functional status, cognition, and quality of life. The authors found nineteen studies that measured ADL or functional ability. These studies showed that AD SCU residence was associated with better functional status. However, no significant difference in the quality of life or improvement in cognition was associated with AD SCU residence. In a systematic review by Lai et al.

(2009), the authors investigated the effects of SCUs on behavioral problems, mood, and use of physical and chemical restraints in residents with dementia. The study found lower use of physical restrains in SCUs, a slight improvement in neuropsychiatric symptoms, and SCUs' residents were less depressed than those in non- SCU. On the other hand, SCUs tended to have higher use of psychotropic medications.

This study aims to expand our knowledge regarding AD SCUs adoption as a nursing home strategy to improve the quality of care delivered to nursing home residents. While several studies have explored the association between AD SCUs designation and quality of care, most prior research either depended on cross-sectional data (Luo et al., 2010; Xing et al., 2013), or the study included nursing homes in a single city as its sample (Cadigan et al., 2012). This study used a longitudinal design and included a national sample of nursing homes. Using Donabedian's (1988) framework, this study considered the effects of adopting AD SCUs on nursing homes' processes (use of physical restraints, antipsychotic drugs, and use of feeding tubes) and residents' outcomes (proportion of long-stay residents with pressure ulcers, proportion of long-stay residents who have fallen, and hospitalization rate). Information obtained from this analysis can provide a better understanding of quality nursing care and the relationship between AD SCUs and NHs' quality of care. This knowledge can provide further information to improve the quality of life for NHs residents living with dementia and nursing home care. Further evaluations of quality-of-care processes and outcomes may also inform healthcare organizations and policymakers, facilitating the development of a standard definition of AD SCUs and evaluation of these units.

CONCEPTUAL FRAMEWORK

Donabedian's (1966) quality of care model consists of three constructs: structure, process, and outcome (SPO). In this framework, structure comprises the organizational and professional assets, such as facilities and staffing patterns used to deliver care. Process indicators are the actions involved in the delivery of care, such as the use of antipsychotic medications. Outcomes' indicators are the results of that delivery of care, such as the prevalence of pressure ulcers. These SPO indicators can impact the quality of care given that an appropriate structure can enable better processes of care and, as a result, better outcomes (Chisholm et al., 2013). Additionally, appropriate structures might have a direct effect on the outcomes (Weech-Maldonado et al., 2004).

Health services researchers have applied Donabedian's SPO approach to ascertaining the quality of nursing home care (Luo et al., 2010; Weech-Maldonado et al., 2004; Weech-Maldonado et al., 2019). For example, prior research has used this framework to compare the quality of care delivered for residents with dementia on AD SCUs with those on non-SCUs (Luo et al., 2010). Luo et al. (2010) reported that SCU residents were less likely to have pressure ulcers, hospitalizations, and weight loss than those in regular units; however, they had a higher probability of falling. Similarly, AD SCUs residence was positively associated with a decrease in inappropriate antipsychotic drugs, physical restraints, feeding tube use, and an increase in appropriate specialized care for behavioral symptoms management (Joyce et al., 2018; Luo et al., 2010). In another study by Cadigan et al. (2012), residents diagnosed with advanced dementia in an SCU had fewer hospitalizations and were less likely to be tube-fed, but they were more

likely to have pressure ulcers and more frequent use of antipsychotic drugs compared to non-SCU residents.

This study used Donabedian's framework to explore the associations between AD SCUs (a structure indicator), NHs' processes and nursing home residents' outcomes compared to other NHs. Processes of care included the proportion of residents who were restrained and the proportion of residents who received an antipsychotic medication, and the percentage of feeding tube use. The outcomes of residents included the proportion of long-stay residents with pressure ulcers, the proportion of residents in the facility who have fallen, and the hospitalization rate. This study hypothesizes that nursing homes' adoption of AD SCUs may be associated with better processes of care and residents' outcomes compared to other NHs.

Process measures of quality

Physical and chemical restraints. The use of restraints and antipsychotic drugs among nursing home residents has been reported in several studies and raised concerns (Castle et al., 2009; Joyce et al., 2018; Weech-Maldonado et al., 2004). Physical restraints have been associated with negative health outcomes such as a higher rate of falls, pressure ulcers, and contractures (Castle & Engberg, 2009). People with dementia have higher incidence rates of worsening behavioral and psychological symptoms compared to those who do not (Nazir et al., 2011). Between 48% to 82% of NHs residents with dementia exhibit neuropsychiatric symptoms such as aggression or agitation (Zuidema et al., 2007). Some psychological and behavioral symptoms are recognized as residents' attempts to communicate their unmet needs (Carson S et al., 2006), while others, such as hallucinations, are a result of neurodegeneration (Ballard et

al., 2013). Generally, AD SCUs have specially trained staff able to meet the needs of residents with ADRD and a safe environment to deliver appropriate management of behavioral and psychological symptoms (Chisholm et al., 2013; Lai et al., 2009; Orth et al., 2019), which may reduce the use of physical and chemical restrains.

Feeding tubes use. Tube placement in AD SCU has been considered a measure of the quality of end-of-life care in people with dementia (Cadigan et al., 2012). Residents with dementia are more likely to receive feeding tubes due to their inability to swallow in late-stages of the disease (Gruneir et al., 2008). However, past studies have found that AD SCUs residence was associated with a lower likelihood of being tube fed (Cadigan et al., 2012; Joyce et al., 2018). These findings may suggest that AD SCUs 'policies focus on meeting specific needs associated with dementia and have a stronger emphasis on the quality of life of their residents.

Therefore, we hypothesize that:

Hypothesis 1: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower proportion of long-stay residents who are physically restrained than other NHs.

Hypothesis 2: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower proportion of long-stay residents who receive an antipsychotic medication than other NHs.

Hypothesis 3: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower prevalence of use of feeding tubes than other NHs

Outcomes measures of quality

Pressure ulcers. Nursing home residents at a late stage of dementia are at higher risk of being bed-bound and functionally dependent (Reimer et al., 2004). Lower pressure ulcer prevalence has been considered a relevant indicator of high quality of care and end of life quality of life for residents with dementia (Cadigan et al., 2012; Weech-Maldonado et al., 2004). Past studies have found that AD SCU residents were less likely to develop pressure ulcers (Cadigan et al., 2012; Joyce et al., 2018; Luo et al., 2010). AD SCUs trained staff may implement programs to reduce the use of physical restraints and increase residents' mobility associated with a higher prevalence of pressure ulcers.

Hypothesis 4: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower prevalence of pressure ulcers than other NHs.

Falls. Residents with dementia have a higher risk of falling due to impaired visual-spatial perception, gait problems, medications, functional status, and behavioral symptoms (Fernando et al., 2017). Additionally, to these unmodifiable factors, the living environment has been related to the falls (i.e., wet floors, narrow doorways)(Datta et al., 2018). NHs are required to deliver best practices and provide environmental characteristics to reduce the prevalence of falls (Teresi et al., 2013). Some of these practices of care involve training programs to increase knowledge about visual impairment and behavioral management during activities of daily living (ADLs) (Teresi et al., 2013). Furthermore, AD SCUs are expected to offer the appropriate physical environment and programs to maintain psychosocial functioning and protocols for showering and bathing (Zimmerman et al., 2013). Therefore, we hypothesize that:

Hypothesis 5: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower proportion of long-stay residents who have fallen than other NHs.

Hospitalizations. Evidence also suggests that structural and organizational aspects are associated with AD NHs residents' rate of hospitalization (Porell & Carter, 2005). Cognitive decline associated with AD may hinder residents' ability to report early symptoms or adverse effects of medications (Porell & Carter, 2005). A higher prevalence of hospitalization risk factors may lead to a higher hospitalization rate. AD SCUs trained staffing can conduct regular and thorough evaluations to assess the stage of AD NH residents to prevent avoidable hospitalizations. The hospitalization rate is a frequently used indicator of the quality of care. Lower odds of hospitalization have been associated with SCU residence (Joyce et al., 2018; Luo et al., 2010).

Thus, we hypothesize that:

Hypothesis 6: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower number of hospitalizations per resident on 365 days than other NHs.

METHODS

Data

The study used a longitudinal design for the period 2006 to 2018. Analyses were conducted using multivariable analyses to ascertain the relationship between designating

an AD SCU and the prevalence of each long stay outcome. The data was obtained from three sources: 1) LTC-Focus, 2) Online Survey Certification and Reporting (OSCAR)/Certification and Survey Provider Enhanced Reporting (CASPER) and the 3) Area Health Resource File (AHRF). LTC Focus files are part of the Shaping Long-Term Care in America Project at the Center for Gerontology and Healthcare Research at Brown University (Shaping Long Term Care in America Project at Brown University, funded in part by the National Institute on Aging (1P01AG027296)). These files combine multiple data sources, including the Minimum Data Set, OSCAR, state policy data, and the Area Health Resource File.

The OSCAR system was an administrative database of the Centers for Medicare and Medicaid Services (CMS) until 2012. Since July 2012, the OSCAR System was replaced by the CASPER system. OSCAR and CASPER files provided information about the percentage of AD SCUs designated by the NHs, percentage of residents with dementia, percentage of feeding tube use, and percentage of residents who got antipsychotic medications. The Area Health Resource Files (ARF) dataset provides environmental characteristics such as per capita income at the county level and nursing home location.

Sample

The sample used in this study included a national population of Medicare and Medicaid-certified nursing homes that are categorized as a nongovernment not-for-profit or investor-owned for-profit facilities. The sample consists of approximately 148,707 nursing home-year observations over the 13-year study period (or an average of 10,622

facilities per year). Because of their varying organizational practices, the analysis excluded hospital-based and governmental facilities.

Variables

Table 1 shows definitions and data sources for all variables.

Dependent Variables

Dependent variables evaluated the quality of care through process and outcome measures relevant to residents with dementia. These variables include the use of physical restraints, feeding tubes, and antipsychotic medications; the proportion of residents with pressure ulcers; the proportion of residents who have fallen; and the hospitalization rate.

Process measures of quality

Physical and chemical restraints. The use of physical restraints is defined in LTC Focus as the proportion of facility residents who were restrained. Centers for Medicare & Medicaid Services (CMS) defines the use of antipsychotics as the percentage of long-stay residents who received an antipsychotic medication.

Feeding tubes. The prevalence of feeding tube use is measured by dividing the number of residents who received a feeding tube by all residents from Oscar & Casper's data files.

Outcomes measures of quality

Pressure ulcers. The presence of pressure ulcers is defined in LTC Focus as the proportion of long-stay residents with pressure ulcers.

Falls. Falls are defined in LTC Focus as the percentage of long-stay residents who have fallen.

Hospitalization rate. Hospitalizations are defined in LTC Focus as the number of hospitalizations during the calendar year for every 365 nursing home resident days.

Independent variable

The independent variable in the study is a continuous variable indicating the percentage of AD SCUs beds. It was calculated by dividing the number of AD SCUs beds by the number of NHs beds. We used lagged independent variable.

Control Variables

Included organizational and market characteristics that have been associated with nursing home quality of care (Grabowski et al., 2013; Hughes et al., 2000; Lapane & Hughes, 2004; O'Neill et al., 2003; Weech-Maldonado et al., 2004; You et al., 2016). Organizational characteristics like ownership, chain affiliation, size, nursing staff intensity, the presence of a nurse practitioner or physician assistant, occupancy rate, acuity index, the proportion of residents with a diagnosis of dementia, the percentage of racial/ethnic minorities, and payer mix were included. Ownership (for-profit and not for profit) was operationalized as a dichotomous variable (1= for-profit, 0 = not-for-profit). Ownership's influence on the quality of care has been evaluated (Grabowski et al., 2013; O'Neill et al., 2003). Grabowski and colleagues (2013) reported that nonprofit facilities had greater improvement in ADL functioning, mobility, and pain and had fewer 30-day hospitalizations. Chain affiliation indicated whether or not a facility is part of a chain (0 = No, 1 = Yes). Prior research has shown that facilities owned by larger chains are more likely to have lower rating scores of overall and specific areas of care (You et al., 2016).

Nursing home size was measured as the number of NH beds. Size of the facilities has been related to the use of antidepressants for the management of depression (Lapane & Hughes, 2004). Larger nursing homes were more likely to have a lower treatment rate. The nursing staffing ratio was measured as registered nurses (RN), licensed practical

nurses (LPN), and certified nurse aides (CNA) hours per resident day. RN staffing patterns (RNs, licensed practical nurses, and certified nurse aides) and nurse staff intensity (e.g., higher nurse staffing) have been associated with quality outcomes in nursing homes, such as lower rate of pressure ulcers (Weech-Maldonado et al., 2004) and fewer number of deficiencies (Xu et al., 2021). The presence of a nurse practitioner or physician assistant at the facility was ascertained as a binary variable (indicates whether or not the facility has a nurse practitioner or physician assistant). Nurse practitioners or physician assistants' presence on nursing homes' medical teams has been associated with fewer deficiencies (Xu et al., 2021). Occupancy rate was defined as the percentage of NH beds occupied. Lower antipsychotic drug use prevalence has been associated with higher occupancy rate (Hughes, Lapane, & Mor, 2000). The Average Acuity Index is an indicator of the care needed by a nursing home's residents at the facility level. It is ascertained based on the number of residents requiring different levels of activities of daily living (ADLs) assistance and the number of residents receiving special treatment. Facilities with higher proportions of residents with more complex medical conditions and behavioral symptoms more often prescribed antipsychotic medications (Hughes et al., 2000).

The percentage of residents with a diagnosis of dementia was included as an additional measure of nursing homes' case mix, which may be related to the quality of care. The percent of residents that are minorities (% non-Hispanic Blacks and % Hispanics) was included. Black and Hispanic older adults are more likely to reside in nursing homes with lower quality of care (Rivera-Hernandez et al., 2019). Payer mix involves the percentage of residents covered by Medicare, Medicaid, or private pay. The

payer mix has been associated with use of antipsychotic drugs. Nursing homes with a higher proportion of Medicaid residents were more likely to have higher use of antipsychotic drugs compared to those with higher percentage of Medicare residents (Hughes et al., 2000).

Environmental factors include market competition, Medicare Advantage (MA) (managed care) penetration, per capita income, and location. Herfindahl–Hirschman Index measures market competition (ranging from 0 to 1). The closer to 1, the closer the county is to have a monopoly in nursing home beds. Regarding market competition, one study found that not-for-profit nursing homes operating in the most competitive market have better outcomes of care (e.g., higher improvement in mobility and ADL functioning) (Grabowski et al., 2013). MA penetration is the proportion of all Medicare beneficiaries in the county who are enrolled in a Medicare managed care organization. The percentage of Medicare Advantage (MA) (managed care) enrollees in nursing homes have increased (Jung et al., 2018). However, a study found that MA enrollees were more likely to be admitted to lower-quality nursing homes compared to fee-for-service beneficiaries (Meyers et al., 2018). Per capita income was obtained from AHRF at the county level and is used to indicate the county wealth in which nursing homes operate. Prior research showed a positive association between median income and quality of care (Livingstone et al., 2019). Location was defined as metro/urban areas (1) or rural areas (0) (based on the Urban Influence Code)(United States Department of Agriculture, n.d.). Metro and urban areas were defined as (Rural-Urban Continuum code-RUCC) codes 1-7, whereas rural areas included codes 8-9. Nursing homes in rural areas have shown a lower

quality of care (i.e., higher contractures rates) than urban nursing homes (Bowblis et al., 2013).

Analysis

Analyses were conducted at the nursing home level. Descriptive analysis for the sample of nursing homes describing the characteristics and attributes of the dependent and control variables were performed for both the baseline year of 2006 and the final year of the study period, 2018. Panel data linear regressions with facility fixed effects (control for time-invariant unobserved characteristics) and year fixed effects (control for time trends) were performed to estimate the effects of AD SCUs for each of the dependent variables. Robust clusters at the facility level were used to address within-group correlation. The independent variable, the percentage of AD SCUs beds, was lagged for 1 year to evaluate the possible lagged effect of AD SCU on quality of care. Models were adjusted by organizational and market factors. All analyses were conducted in SAS Version 9.4/ Stata 17. Statistical significance was considered at $p < 0.05$.

The resulting equations are presented below. All the independent and control variables are represented. The general model specification for the "i"th is the nursing home, and the "t" is the year.

$$Y_{it}\,(\text{Quality}) = ß_0 + ß_1\,(\text{Percentage of AD SCUs beds}_{it-1}) + ß_2\,(\text{Ownership}_{it}) + ß_3\,(\text{Chain/ system affiliation}_{it}) + ß_4\,(\text{Size}_{it}) + ß_5\,(\text{Occupancy Rate}_{it}) + ß_6\,(\text{RN staffing intensity}_{it}) + ß_7\,(\text{CNA staffing intensity}_{it}) + ß_8\,(\text{LPN staffing intensity}_{it}) + ß_9\,(\text{Presence NP or PA}_{it}) + ß_{10}\,(\text{Acuity Index}_{it}) + ß_{11}\,(\text{Payer Mix-Medicare}_{it}) + ß_{12}\,(\text{Payer Mix- Medicaid}_{it}) + ß_{13}\,(\text{Percentage Black residents}_{it}) + ß_{14}\,(\text{Percentage Hispanics residents}_{it}) + ß_{15}\,(\text{Market Competition}_{it}) + ß_{16}\,(\text{MA penetration}_{it}) + ß_{17}\,(\text{Per capita income}_{it}) + ß_{18}\,(\text{Location}_{it}) + ß_{19}\,(\text{Year Dummy variable}_{it}) + ß_{20}\,(\text{Facility Dummy variable}_{it}) + ų\,(\text{Year}_t) + ų\,(\text{Facility}_i) + Ɛ_{it}$$

ε-error term

Whereas Y it (Quality of Care) =

Processes: (Percent of restraints, use of antipsychotic medications, feeding tubes)

Outcomes (Proportion of pressure ulcers, falls, and hospitalizations rate)

RESULTS

Descriptive analysis for the sample of nursing homes at the study baseline (2006) and the final study year (2018) is displayed in Table 2. There was no significant change in the percentage of AD SCUs designated beds during the study period (3.4 % vs. 3.7 %). In the study period, there was a reduction in the prevalence of physical restraints use (6.7 vs. 1), antipsychotic medications use (26.4 vs. 18.9), and feeding tube use (5.7 vs. 3.9) ($p<0.001$). On the other hand, the prevalence of pressure ulcers increased from 2.4 % to 7.6 %, the proportion of residents who have fallen from 16.03 % to 20.8 %, and the number of hospitalizations per resident from 0.9 vs. 1.1 ($P<0.001$). With respect to organizational characteristics, 63.3 % of participating nursing homes were chain affiliated in 2018, which had increased significantly from 57 % in 2006 ($p<0.001$), occupancy rate decreased from 85.3 % in 2006 to 79.5% in 2018 ($p<0.001$), and nurse staffing intensity decreased for RNs (0.3 vs. 0.2) ($p<0.001$), LPNs (0.8 vs. 0.4) and CNAs (2.2 vs. 1.1), from 2006 to 2018. The nursing home's acuity index increased from 11.1 in 2006 to 12.2 in 2018, as well as the proportion of Black residents increased from 9 % in 2006 to 10.2% in 2018 ($p<0.001$). In contrast, the percentage of residents with dementia decreased (46.3 vs. 45.4), as well as the percentage of residents with Medicaid as primary payer (62.6 vs. 60.03) ($p<0.001$). Market competition (HHI) decreased from 0.2 in 2006

to 0.4 in 2018 ($p < 0.001$). Additionally, Medicare Advantage penetration increased from 11.8 % to 31.7% ($p<0.001$). The mean per capita income was $35,992 in 2006 and had a significant increment to $50,656 in 2018. In the study's final year, most nursing homes were primarily in urban and metropolitan areas, 96.2 %.

Tables 3 and 4 present the results of the panel data linear regressions. Below we present the results for each tested hypothesis.

Hypothesis 1: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower proportion of long-stay residents who are physically restrained than other NHs. We found partial support for Hypothesis 1. Although there was a negative association between the percentage of AD SCUs designated beds and the prevalence of residents physically restrained, the relationship was only marginally statistically significant ($\beta = -0.47$, $p=0.076$).

Hypothesis 2: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower proportion of long-stay residents who receive an antipsychotic medication than other NHs. We found no support for Hypothesis 2. On the contrary, facilities with a higher percentage of AD SCU-designated beds were more likely to use antipsychotic medications ($\beta=1.24$, $p<0.005$).

Hypothesis 3: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower prevalence of use of feeding tubes than other NHs. We found support for Hypothesis3. Every 10 % increase of AD SCUs designated beds decreased the use of feeding tubes by 3% ($p<0.05$).

Hypothesis 4: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower prevalence of pressure ulcers than other NHs. We found support for Hypothesis 4. Every 10 % increase of AD SCUs designated beds decreased the prevalence of pressure ulcers by 5 % ($p<0.005$).

Hypothesis 5: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower proportion of long-stay residents who have fallen than other NHs. We found no support for Hypothesis 5. Facilities with a higher percentage of AD SCU designated beds had a higher proportion of residents who had fallen ($\beta=1.33$, $p<0.001$).

Hypothesis 6: NHs with a higher percentage of AD SCU designated beds will have, on average, a lower number of hospitalizations per resident on 365 days than other NHs. We found support for Hypothesis 6. Every 10% increase of AD SCUs designated beds decreased the number of hospitalizations per resident by 1 % ($p<0.001$).

With respect to the control variables, for-profit status was associated with a higher prevalence of antipsychotic medication use ($p<0.05$). Larger nursing homes had lower prevalence of feeding tube use and falls. Regarding nursing staffing intensity, each additional hour of RN ($\beta=-19.05$, $p<0.001$) per resident inpatient day was associated with lower prevalence of physical restraints use and lower prevalence of falls ($\beta=--89.61$, $p<0.001$). On the contrary, RN staffing intensity was associated with higher number of hospitalizations per resident per 365 days ($\beta=3.01$, $p<0.05$). Each additional hour of LPN

(β=-14.72, p <0.001) per resident inpatient day was associated with lower prevalence of physical restraints use. On the other hand, LPN staffing intensity was associated with a higher prevalence of pressure ulcers (β=14.82, p<0.05).and hospitalization per resident (β=2.51, p<0.05). Then, each additional hour of CNA per resident was associated with lower prevalence of pressure ulcers (β=-7.7, p<0.05) and hospitalizations per resident (β=-0.95, p<0.05). Higher occupancy rates were associated with lower prevalence of residents restrained, feeding tube use, pressure ulcers, falls, and hospitalizations.

Facilities with a higher percentage of residents with dementia had lower prevalence of feeding tube use, pressure ulcers, and hospitalizations (p<0,001). On the other hand, a higher percentage of residents with dementia had a higher prevalence of physical restraints use, antipsychotic medication use, and falls (p<0,001). Higher acuity index was associated with lower prevalence of falls (p<0.05) but higher prevalence of physical restraint use, feeding tube use, and pressure ulcers (p<0.001). Higher percentage of Black residents was associated with higher prevalence of feeding tube use and pressure ulcers but lower prevalence of falls (p<0.005). Higher proportion of Hispanic residents was associated with lower prevalence of physical restraints use and falls (p<0.005). Medicare as primary payer was associated with lower prevalence of physical restraints and antipsychotic medication use, pressure ulcers, and falls (p<0.005). However, nursing homes with higher percentage of Medicare residents had a higher prevalence of feeding tube use and hospitalizations (p<0.001). Medicaid as primary payer was associated with a lower prevalence of pressure ulcers, falls, and hospitalizations (p<0.05). Conversely, nursing homes with a higher proportion of Medicaid residents had a higher prevalence of restraint use (p<0.05), feeding tube use (p<0.001), and antipsychotic medications usage

($p<0.001$). Chain affiliation was not significantly associated with AD SCUs processes and outcome measures of quality of care. In terms of environmental control variables, we found mixed results. Less competitive markets were associated with higher prevalence of falls. Per capita income was positively related to physical restraints and antipsychotic medication use and negatively associated with the prevalence of pressure ulcers and falls ($p<0.05$). Medicare Advantage penetration was negatively associated with antipsychotic medications use and feeding tube use and positively associated with hospitalizations per residents ($p<0.05$). Urban location was associated with lower prevalence of antipsychotic medications use ($p<0.05$).

DISCUSSION

Using Donabedian's quality framework, this study postulated that adopting AD SCUs would improve the quality of care in nursing homes. As hypothesized, we found that a higher percentage of AD SCU designated beds resulted in a lower prevalence of feeding tubes, pressure ulcers, and hospitalizations among nursing home residents. Furthermore, a higher percentage of AD SCU beds resulted in a marginal decrease of physical restraints ($p=0.076$). Contrary to our hypotheses, nursing homes with a higher percentage of AD SCUs designated beds had a higher prevalence of antipsychotic medication use and in the percentage of residents who had fallen.

We found nursing homes with an AD SCU might provide better processes and quality of care for people with dementia. Several outcomes (e.g., feeding tube use, pressure ulcers, and hospitalizations) were less prevalent among nursing homes with a higher percentage of AD SCUs designated beds. An earlier study (Joyce et al., 2018) reported a lower use of feeding tubes and lower prevalence of pressure ulcers and

hospitalizations among AD SCU residents. Although the relationship between AD SCUs designated beds and the prevalence of physical restraints was only marginally statistically significant, our data show that the use of physical restraints was lower in facilities with a higher percentage of AD SCUs designated beds. Even though regulations (i.eg., Nursing Home Reform Act of 1987)(Elon & Pawlson, 1992) have required the reduction of physical restraints, nursing homes still rely on these approaches to manage residents. Further research should explore alternative strategies to reduce the use of physical restraints in nursing facilities, especially among residents with dementia who are more likely to exhibit aggressive behaviors (Cen et al., 2018).

However, we found that facilities with a higher percentage of AD SCUs designated beds have a higher prevalence of antipsychotic medications. Given the implementation of programs such as the National Partnership to Improve Dementia Care in Nursing Homes, implemented by the Centers for Medicare & Services (CMS) in 2012, one would expect nursing homes with a higher percentage of AD SCUs designated beds to implement strategies such as specialized training and nonpharmacological interventions to reduce the use of chemical restraints. Our findings are consistent with those of Cadigan et al. (2013), who found higher use of antipsychotic medications among SCU residents. This discrepancy may be explained by a higher prevalence of care-resistant behaviors (e.g., uncooperative behaviors, hitting or kicking the CNA, agitation) (Jablonski et al.,2011) and other behaviors (e.g., impulsivity, wandering, anxiety) among AD SCUs residents (Teresi et al., 2013).

Our results showed a higher prevalence of falls among facilities with a higher percentage of AD SCU designated beds. These findings support prior research that

reported that SCU residents were more likely to have falls than those in other units (Luo et al., 2011) (Van Doorn et al., 2003). Intrinsic risk factors in people with dementia, such as medications, cognitive and functional impairment, and gait disorders may increase the likelihood of falls among these residents (Teresi et al., 2013; Zhang et al., 2019).

Several findings related to organizational and market characteristics were also associated with nursing homes' quality of care. Organizational factors such as size, occupancy rate, nursing staff intensity, acuity mix, and payer were predictors of nursing homes' quality of care. Similarly, environmental factors like per capita income, Medicare Advantage penetration, market competition, and location were also associated with nursing home quality of care. For-profit status was associated with higher use of antipsychotic medications. In line with these results, Hughes et al. (2002) found that for-profit facilities and the presence of special care units were associated with a higher prevalence of antipsychotic medication use (Hughes et al., 2000). Size and occupancy rates were associated with better processes and outcomes measures of quality. Larger facilities may have additional resources to provide specialized training to staff and adequate infrastructure for residents with dementia. Likewise, facilities with higher occupancy rates might maximize their resources. Prior studies have shown that larger facilities and higher occupancy rates were associated with a higher quality of care (Lapane & Hughes, 2004; You et al., 2016). Staffing patterns have shown effects on nursing home outcomes of care (Weech-Maldonado et al., 2004).

Our nurse staffing findings showed mixed results; while RN and LPN skill mix was associated with lower use of physical restraints, RN and LPN skill mix was related to a higher prevalence of hospitalizations. This may be explained by a higher acuity index in

these facilities and functional decline among residents. Prior research has shown similar findings regarding the relationships between full-time RNs and lower prevalence of pressure ulcers (Weech-Maldonado et al., 2004). Lastly, CNA skill mix was associated with a lower percentage of pressure ulcers and hospitalizations. One explanation is that CNAs are further involved in more physical intensive care which might explain the lower prevalence of these outcomes. Residents' case mix and acuity index were predictors of nursing homes' quality of care. Similar to previous research (Hughes et al., 2000), increasing percentages of residents with dementia were related to higher use of antipsychotic medications. On the other hand, rising percentages of residents with dementia were associated with a lower prevalence of feeding tube use, pressure ulcers, and hospitalizations. Regarding acuity index, a higher acuity index was associated with higher prevalence of physical restraint use, feeding tube use, and pressure ulcers. Future research should promote nonpharmacological interventions to address care-resistant behaviors at nursing homes to improve processes and outcomes of care. Black residents were more likely to reside in nursing homes with lower quality of care (i.e., feeding tube use, and pressure ulcers). These results regarding disparities in quality of care are consistent with earlier studies of disparities in nursing home quality among minorities with ADRD (Rivera-Hernandez et al., 2019). Although Medicare and Medicare as primary payers are not related to AD SCUs designation (Blackburn et al., 2018), increasing percentages of Medicare and Medicaid were associated with mixed results regarding processes and outcomes measures of quality of care. For instance, a higher percentage of Medicare residents was associated with a lower prevalence of physical restraints and antipsychotic medications but a higher prevalence of feeding tube use.

Similarly, a higher proportion of Medicaid residents was a predictor of a higher prevalence of restraint use, feeding tube use, and antipsychotic medication usage. These findings are somewhat in contrast with results from Lapane & Hughes (2004) that reported a higher percentage of Medicare residents was associated with higher use of medications. In addition, the associations between Medicaid as primary payer with a lower prevalence of pressure ulcers, falls, and hospitalizations, may indicate a misalignment of resources in poorer communities, existing limited alternative LTC providers. Therefore, individuals who need minimal help with ADLs have to access to resource-intensive NHs when their level of care does not merit that. Finally, environmental factors such as per capita income, Medicare Advantage penetration, and urban location were predictors of quality of care in AD SCUs. Past research found Medicare Advantage enrollees more likely to reside in lower-quality facilities (Meyers et al., 2018).

Our study presents several strengths. First, by using Donabedian's framework this study is one of the first papers to explore the relationships between the adoption of AD SCU and quality of care in nursing homes. Second, this research expands the scope in examining NHs' quality of care by using as exposure the percentage of AD SCUs designated beds per nursing home to elucidate the effects of AD SCUs instead of using a dichotomous variable as previous studies (Luo et al., 2010). Third, this study used a longitudinal design for our study population over a 13-year period.

This study provides several implications; this study suggests AD SCUs may have a positive effect on nursing homes' quality of care for people. Further research should focus on determining if the higher quality outcomes are associated with facilities' policies

overall or are exclusively attributable to AD SCUs. This would have important quality of life implications for people with dementia that do not have access to alternate long-term care facilities. In addition, nursing home administrators could use these findings to identify the specific factors related to better processes and outcomes measures of quality, enhancing the efficiency of AD SCUs as an organizational approach to delivering specialized care for people with dementia.

Despite the strengths, our study has several limitations. This study used secondary and self-reported data by nursing homes, which were collected mainly for reporting rather than research purposes. This might introduce bias in our results due to underreporting. Even though several states have provided some specifications about requirements for delivering care on AD SCU, we could not find a consistent definition of SCU nationwide. Finally, as we included hospitalizations per resident as an outcome variable, there may be confounding factors such as residents' comorbidities and disease stages that can influence hospitalizations rate.

CONCLUSIONS

Our findings suggest differences in care processes and outcomes associated with AD SCUs adoption. AD SCUs would be an effective organizational approach to delivering specialized care for people with dementia. Although delivering specialized care follows a slow trend on the nursing home industry, our results suggest a reduction in the physical restraints, feeding tubes, pressure ulcers, and hospitalization rates. In addition, these results highlight the effects of appropriate staffing on nursing homes quality of care. Although each staff member contributes to the quality of care of the

residents, this finding is relevant for nursing homes administrators considering variations in staffing ratios, qualifications, and preparedness of the nursing staff. Given the rising ADRD prevalence, policies to promote the standardization of AD SCUs may be warranted.

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Figure 1. Donabedian's structure-process-outcome Model

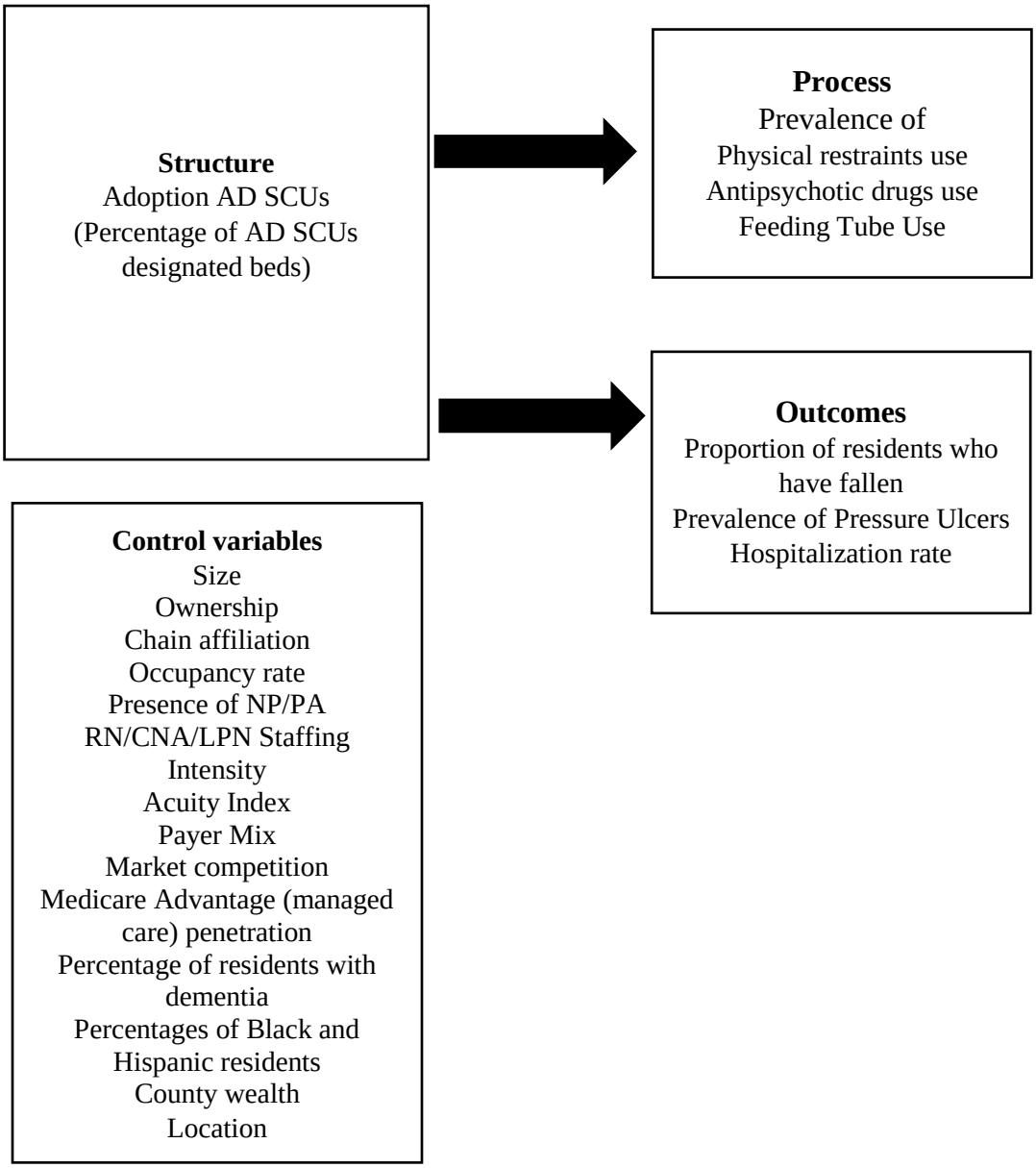

Table 1 Variables' definition and sources

Variable	Definition	Source
Independent variable		
Percentage of AD SCUs beds	It was calculated by dividing the number of AD SCUs designated by the number of NHs beds	OSCAR & CASPER
Dependent variables		
Physical restrains use	Proportion of facility residents who were restrained.	LTC FOCUS
Feeding tubes	Proportion of facility tube placement	OSCAR & CASPER
Antipsychotic usage	Proportion of facility residents who got an antipsychotic medication	OSCAR & CASPER
Hospitalization's rate	Number of hospitalizations during the calendar year for every 365 nursing home resident days.	LTC FOCUS
Falls	Proportion of residents who have fallen	LTC FOCUS
Pressure Ulcers	Proportion of long-stay residents with pressure ulcers.	LTC FOCUS
Organizational Characteristics		
Size	Number of beds	LTC FOCUS
Ownership	0 = for-profit, 1 = not-for-profit	LTC FOCUS
Multi-facility chain member	Indicates whether the facility is part of a chain	LTC FOCUS
Occupancy	% of NH beds occupied	LTC FOCUS
Presence of Nurse Practitioner /Physician Assistant	Indicates whether or not facility has a physician extender, meaning a nurse practitioner or physician's assistant	LTC FOCUS
CNA Staffing Intensity	CNA hours per resident day.	LTC FOCUS
LPN Staffing Intensity	LPN hours per resident day.	LTC FOCUS
RN Staff Intensity	RN hours per resident day.	LTC FOCUS
Average Acuity Index	Indicator of the care needed by a nursing home's residents; it is estimated based on the number of residents requiring different levels of activities of daily living (ADL) assistance and the number of residents receiving special treatment.	LTC FOCUS

Payer mix		
% Medicare	The proportion of facility residents whose primary support is Medicare	LTC FOCUS
% Medicaid	The proportion of facility residents whose primary support is Medicaid	LTC FOCUS
% Black	Proportion of residents present on the 1st Thursday in April who are Black.	LTC FOCUS
% Hispanics	Proportion of residents present on the 1st Thursday in April who are Hispanic.	LTC FOCUS
% Residents with dementia	The percentage of residents with a diagnosis of dementia present	OSCAR & CASPER
Market characteristics		
Herfindahl–Hirschman Index	Nursing home competition in the county ranging from 0 to 1. The closer to 1, the closer the county is to have a monopoly in nursing home beds.	LTC FOCUS
Medicare managed care penetration	Medicare managed care organization penetration rate. (%)	LTC FOCUS
Per Capita income	Income level in the county	AHRF
Location	Metro and urban areas = 1 or rural areas =0	AHRF

OSCAR & CASPER: Online Survey Certification and Reporting (OSCAR)/Certification and Survey Provider Enhanced Reporting (CASPER)
AHRF: Area Health Resource File

Table 2 Descriptive Statistics of Variables (N=148,707 nursing home-year observations)

	Baseline 2006 n= 10,620		Endline 2018 n= 10,361		
Variables	Mean (SD) or Frequency (%)				p
Dependent variables					
Percentage of residents physically restrained	6.74	(8.46)	0.61	(3.56)	<0.001
Proportion of facility residents who got an antipsychotic medication	26.36	(14.15)	18.94	(13.19)	<0.001
Percentage of feeding tube use	5.72	(6.96)	3.95	(6.11)	<0.001
Proportion of long-stay residents with pressure ulcers	2.41	(2.89)	7.56	(5.03)	<0.001
Proportion of residents who have fallen	16.03	(5.93)	20.83	(7.56)	<0.001
Hospitalizations per residents in 365 days	0.89	(0.47)	1.11	(0.54)	<0.001
Independent Variable					
Percentage of AD SCU Beds	3.37	(10.32)	3.66	(10.74)	0.05
Organizational control variables					
Total beds (n)	108.88	(57.70)	107.95	(55.54)	0.2359
For-profit status					
Yes	7,945	(74.81%)	7.724	(74.55%)	0.6615
No	2,675	(25.19%)	2,637	(25.45%)	
Chain affiliation					
Yes	6,052	(56.99%)	6,553	(63.25%)	<0.001
No	4,568	(43.01%)	3,808	(36.75%)	
Occupancy Rate (%)	85.31	14.41	79.49	14.88	<0.001
Nurse practitioner/physician assistant					
Yes	3,165	(29.8%)	3,047	(29.41%)	0.5321
No	7,455	(70.2%)	7,314	(70.59%)	
RN hours per resident day	0.33	(0.61)	0.22	(0.35)	<0.001
LPN hours per resident day	0.80	(0.81)	0.42	(0.49)	<0.001
CNA hours per resident day	2.23	(0.98)	1.11	(1.27)	<0.001
White (%)	80.98	(26.05)	78.30	(24.82)	<0.001
Black/African American (%)	9.00	(19.10)	10.20	(19.28)	<0.001
Hispanic (%)	2.25	(9.93)	2.62	(10.70)	0.0102
Residents with dementia (%)	46.32	(17.87)	45.41	(16.26)	0.0001
Acuity index (%)	11.10	(1.49)	12.20	(1.34)	<0.001
Medicare (%)	13.73	(12.22)	13.38	(12.31)	0.0399
Medicaid (%)	62.62	(21.24)	60.03	(22.74)	<0.001

Market control variables					
Herfindahl Index (%)	0.20	(0.23)	0.40	(0.23)	<0.001
Medicare Advantage penetration (%)	11.83	(13.0)	31.72	(13.64)	<0.001
Per Capita Income ($)	35,992.90	10,470.48	50,656.96	14,380.18	<0.001
Location					
Urban	10,207	(96.11%)	9,862	(96.15%)	0.9988
Rural	413	3.89	399	3.85	

Table 3: Fixed effects regression results for processes measures of quality (N=148,707 nursing home-year observations)

	Percentage of residents physically restrained		Proportion of facility residents who got an antipsychotic medication		Percentage of feeding tube use	
Independent Variable	Coef.	SE	Coef.	SE	Coef.	SE
Percentage of AD SCUs Beds	-0.47	0.27∞	1.24**	0.38	-0.30*	0.12
Control Variables						
Total beds (n)	-0.43	0.25	-0.72	0.42	-0.46*	0.2
For profit status	5.96	11.53	52.83*	18.39	1.79	8.08
No	Ref.					
Chain affiliation	9.27	6.66	-0.93	10.32	2.53	4.19
No	Ref.					
Occupancy Rate (%)	-1.2**	0.25	-0.62	0.45	-0.61*	0.19
Nurse practitioner/ physician assistant	-6.61	4.38	-8.97	6.76	-4.86	2.83
No	Ref.					
RN hours per resident day	-19.05**	4.73	-26.17	15.57	16.24	14.07
LPN hours per resident day	-14.72**	3.81	12.397	12.386	6.156	8.033
CNA hours per resident day	1.17	2.58	-6.21	4.79	-0.5	3.94
White (%)	Ref.					
Black/African American (%)	-0.32	0.44	1.39	0.71	3.62**	0.41
Hispanic (%)	-3.24**	0.86	-1.11	1.19	0.42	0.71
Residents with dementia (%)	0.69**	0.15	4.99**	0.26	-1.39**	0.13
Acuity index (%)	20.88**	2.29	3.31	3.21	55.98**	2.45
Medicare (%)	-1.15**	0.32	-5.60**	0.51	0.61**	0.23
Medicaid (%)	0.57*	0.22	5.22**	0.38	0.86**	0.17
Herfindahl Index (%)	59.92	42.35	20.64	73.94	32.93	28.24
Medicare Advantage penetration (%)	0.905	0.53	-2.60*	0.85	-1.94**	0.36
Per Capita Income ($)	0.01**	0.00	0.00*	0.00	0.00	0.00
Location	773.18	469.89	-303.02*	114.8	-2.27	130.72

∞ <0.10 * <0.05 ** <0.001

Table 4: Fixed effects regression results for outcomes measures of quality (N=148,707 nursing home-year observations)

	Proportion of long-stay residents with pressure ulcers		Proportion of residents who have fallen		Hospitalizations per residents	
Independent Variable	Coef.	SE	Coef.	SE	Coef.	SE
Percentage of AD SCUs Beds	-0.54*	0.17	1.33**	0.32	-0.06**	0.01
Control Variables						
Total beds (n)	-0.12	0.21	-2.31**	0.39	-0.18	0.09
For profit status	4.09	9.85	3.26	15.74	0.50	0.88
No	Ref.				Ref.	
Chain affiliation	-9.24	5.46	-6.18	8.77	-0.64	0.79
No	Ref.				Ref.	
Occupancy Rate (%)	-1.54**	0.23	-3.63**	0.42	-0.42**	0.04
Nurse practitioner/physician assistant	-2.31	3.74	-2.08	6.11	0.18	0.52
No	Ref.				Ref.	
CNA hours per resident day	-7.72*	2.65	3.46	5.40	-0.95*	0.39
LPN hours per resident day	17.816*	6.86	-7.88	16.37	2.51*	0.92
RN hours per resident day	-7.51	9.81	-89.61**	16.70	3.01*	1.41
White (%)	Ref.				Ref.	
Black/African American (%)	2.14**	0.37	-4.63**	0.62	0.07	0.05
Hispanic (%)	0.80	0.58	-2.24*	0.96	-0.08	0.06
Residents with dementia (%)	-0.71**	0.13	2.04**	0.22	-0.21**	0.02
Acuity index (%)	7.25**	1.73	-5.66*	2.84	0.04	0.61
Medicare (%)	-0.08**	0.30	-1.75*	0.56	1.20**	0.10
Medicaid (%)	-0.57**	0.18	-1.22**	0.32	-0.13**	0.02
Herfindahl Index (%)	5.60	41.15	204.41*	59.23	-3.23	3.85
Medicare Advantage penetration (%)	1.99**	0.46	1.46	0.75	0.01*	0.05
Per Capita Income ($)	-0.003**	0.00	-0.004*	0.00	0.00	0.05
Location	86.85	123.54	236.35	179.00	-3.79	10.20

* <0.05 ** <0.001

THE ASSOCIATIONS BETWEEN ALZHEIMER'S DISEASE SPECIAL CARE UNITS' DESIGNATION AND NURSING HOMES FINANCIAL PERFORMANCE

by

GIOVANNA PILONIETA, ROBERT WEECH-MALDONADO, RITA A. JABLONSKI, AMY LANDRY, JUSTIN LORD, FERHAT ZENGUL

Format adapted for dissertation

ABSTRACT

Objective: This study examined the relationship between AD SCU designation and financial performance among nursing homes using the resource-based view of the firm (RBV) as a conceptual framework.

Data Sources: A national sample of 110,351 nursing home-year observations was used in this study for the period of 2006-2018. Data on NHs' organizational and market characteristics were extracted from LTC Focus, OSCAR & CASPER, and AHRF files. NHs financial performance data were extracted from Medicare Costs Reports.

Study Design: We performed panel data linear regressions with facility fixed effects and year fixed effects to estimate the effects of AD SCUs adoption for each of the financial variables controlling for a range of organizational and market covariates.

Principal findings: The adoption of AD SCUs was marginally significant associated with improved nursing homes' financial performance. Organizational factors such as nursing home size, for-profit status, occupancy rate, dementia census, percentage of Hispanic residents, and Medicare and Medicaid census were predictors of financial performance. Further, market characteristics such as per capita income, market competition, and Medicare Advantage penetration were also associated with NHs' financial performance.

Conclusion: As nursing homes seek to deliver high-value care, one potential strategy to improve financial performance is the adoption of AD SCUs. AD SCUs adoption resulted in a higher operating margin among nursing homes. Results suggest associations between organizational and market characteristics and nursing homes' financial performance.

These findings will provide policymakers and nursing home administrators with a better understanding of nursing homes' financial performance and the relationship between AD SCUs and NHs' profitability.

Keywords: Nursing homes, Alzheimer’s disease, financial performance, special care units.

INTRODUCTION

Nursing homes have been operating in a rapidly changing environment. Challenges such as changes in the reimbursement system (Zinn et al., 2009), regulatory reforms (e.g., staffing requirements)(Bowblis, 2015), increasing competition from alternative providers (Lord et al., 2018), and changes in the payer mix (i.e., higher proportion of Medicaid residents) (Konetzka et al., 2015) have impacted nursing homes (NHs) financial viability. The expansion of the assisted living industry has been one of the most recent challenges. Previous research has shown that the growth of assisted living communities has impacted the nursing home market structure. One study found that the expansion of assisted living resulted in delayed nursing home admissions and reduced nursing home demand (Bowblis, 2014). Another study showed the negative impact of assisted living capacity on nursing homes' financial performance (Lord et al., 2018).

In response to environmental uncertainty, nursing homes may adopt strategies to minimize the adverse effects of competition and improve their financial performance. One example of these approaches is care specialization through Alzheimer's disease special care units (ADSCUs) adoption (Castle, 2008). Organizations use their unique internal resources to develop market strategies to achieve competitive advantage (Arbab Kash et al., 2014). Firms' resources are attributes that may be heterogeneous and immobile and used to explore opportunities and neutralizes threats in the environment (Barney, 1991). According to the resource-based view (RBV) tenets, firms capitalize on

rare, valuable, and imperfectly imitable resources that contribute to long-term organizational performance differing from their competitors (Barney, 1991).

Nursing homes may choose to use their assets and capabilities to adopt an Alzheimer's Disease Special Care Unit (AD SCU) as a unique service to distinguish themselves from the competition. Alzheimer's disease SCUs involve a specific area in the facility or number of beds with structural characteristics (physical environment, staffing training) and care interventions designed for cognitively impaired residents who may or may not have a definite diagnosis of Alzheimer's disease (Blackburn et al., 2018; Nazir et al., 2011). Castle (2008) found a positive relationship between opening an Alzheimer's Special Care Unit and private-pay occupancy. These improvements in payer mix and occupancy might enhance facilities' financial performance.

Despite the growing body of research, prior studies have not yet ascertained the relationship between delivering specialized care with financial performance in the nursing home industry. Adopting a firm resource-based model by providing specialized care through AD SCUs might lead AD SCUs adopters to achieve a competitive advantage over other organizations in the market in which nursing homes operate. Using the resource-based view of the firm (RBV) as a conceptual framework, this study examined the relationship between AD SCU adoption and financial performance among nursing homes. Our findings will provide a better understanding of attributes and performance differences across organizations in the nursing home industry and provide insights to managers into identifying the most performance-enhancing strategies in their market segments.

CONCEPTUAL FRAMEWORK

According to the RBV, organizational performance differences are related to variance on organization's assets (Barney, 1991). Firms deploy their internal resources to adopt strategies to improve efficiency and effectiveness and achieve competitive advantage (Barney, 1991). Resources are defined as an attribute, process, or capability that can be considered an asset for the organization, making them different from its competitors. These resources are classified as physical capital resources, human capital resources, and organizational capital resources. Physical capital resources include equipment, facilities' infrastructure, and location. Human capital resources involve training, knowledge, and experience. Organizational capital resources include firms' structure, strategic planning, and systems. Among them, human capital resources are unique and difficult to imitate (Barney, 1991). RBV highlights the role of organizational strengths in managing uncertainty instead of the use of them to respond to changes in their external environment (Burton & Rycroft-Malone, 2014).

Based on the core notions of RBV, assets, and capabilities that are valuable, rare, and inimitable lead to a competitive advantage over rivals firm (Barney, 1991). In addition, an organization achieves competitive advantage by implementing a value-added, profitable approach that is not being adopted by its competitors (Barney, 1991). For the purposes of this study, we defined firm resources as the adoption of AD SCU. AD SCUs are a combination of physical resources (NHs physical structure), human capital resources (specialized care trained staff), and organizational capital resources (care procedures and processes) that can contribute to competitive advantage (Castle, 2008).

The resource-based view perspective has been extensively used in the health care industry to explore associations between organizational strategies, environment combinations, and organizational performance (Arbab Kash et al., 2014; Dayama et al., 2022; Everhart et al., 2013; Holdford, 2018; Upadhyay et al., 2020; Van de Wetering et al., 2018; Weech-Maldonado et al., 2004). Previous research has found that nursing homes adopt strategic responses to achieve a competitive advantage (Dayama et al., 2022). For example, a valuable and tangible asset such as the implementation of health information technology has been associated with the superior financial performance of high Medicaid nursing homes. Similarly, services differentiation has been considered an organizational competitive strategy to acquire a greater share of private pay residents by delivering value-added services (Weech-Maldonado, Pradhan, et al., 2019). The results of this study revealed that nursing homes with higher process quality (e.g., restorative ambulation and pressure sore prevention) experienced better financial performance.

The theoretical foundations of the RBV consist of firm resource heterogeneity and firm resource immobility. First, firm resource heterogeneity refers to the differences across firms due to their unique internal resources and the combination of these assets. These assumptions imply that these resources represent entry/mobility barriers for other firms to imitate their strategy. Second, firm resource immobility means that resources are difficult to obtain by the competitors due to a lack of resources and the cost of developing or acquiring them (Barney, 1991).

Human resources are considered a critical foundation of an organization's competitive advantage (Kim et al., 2009). Early data reported that knowledge derived from a higher registered nursing (RN) staffing intensity was associated with better

financial performance and quality of care in nursing homes (Everhart et al., 2013; Weech-Maldonado et al., 2004). Then, applying the RBV framework was linked to organizational response to their external environment and competition (Arbab Kash et al., 2014).

The adoption of AD SCUs can be viewed as a valuable, rare, non-substitutable, and inimitable resource. First, AD SCUs provide environmental design intended to maintain residents' functional status and decrease behavioral problems (Mobley et al., 2017). Second, AD SCUs have adequate staffing training to meet residents' needs, prevent and address care resistance behaviors (Gilbert et al., 2019; Grant et al., 1995). Third, although AD SCUs are the most common type of specialized care (Blackburn et al., 2018), it remains relatively rare; only 15 % of the nursing homes have a designated unit or floor as AD SCUs (Harris-Kojetin et al., 2019). Finally, delivering behavioral health services can be challenging due to inadequate infrastructure, care coordination, and staff training (Orth et al., 2019); therefore, it can be considered inimitable.

The RBV theory provides a theoretical framework to explore how specialized care delivery contributes to nursing homes' financial performance. Based on the resource-based view of the firm perspective (Figure 1), this study posits that a unique structural characteristic such as AD SCUs may allow NHs to differentiate from other organizations by providing specialized care for people with dementia (Gilbert, Ward, & Gwinner, 2019). This strategy focuses on seeking innovative financial opportunities through revenue-generating services.

Hypothesis 1: Nursing homes that adopt AD SCUs will have, on average, a higher financial performance compared to other NHS.

METHODS

Data

This study utilized secondary data from four different sources: Medicare Cost Reports, Brown University's LTC Focus, OSCAR & CASPER files, and the Area Health Resource File (AHRF) for the period of 2006 to 2018. The Medicare Cost Report provided financial and utilization data for Medicare-certified nursing homes. LTC Focus provided data on AD SCUs adoption, nursing home characteristics, demographics, and market information. This data was the combination of multiple sources of data, including the Minimum Data Set, OSCAR, and state policy data. The Online Survey Certification and Reporting (OSCAR) system was an administrative database of the Centers for Medicare and Medicaid Services (CMS) for several years. Since July 2012, the OSCAR System was substituted by the Certification and Survey Provider Enhanced Reporting (CASPER) system. OSCAR and CASPER files provided information about the residents' characteristics such as percentage of residents with dementia. The Area Health Resource File (AHRF) provided socioeconomic data at the county level of the markets where nursing homes are located (Health Resources & Services Administration, 2020).

Sample

This study used a national sample of freestanding nursing homes that operated during a 13-year period from 2006-to 2018. First, government and hospital-based facilities observations were excluded because these facilities have different organizational and financial structures. Second, facilities with no Medicare Costs Reports

or OSCAR/CASPER data were excluded. Third, we excluded financial variables that were classified as extreme outliers (nursing home observations that fall outside of the 1st and 99th percentile) (Doyle et al., 2017; Sharma & Xu, 2021). Then, observations with financial variables that were ± five standard deviations from the mean were dropped. The sample consisted of 110,351 nursing home-year observations or an average of 8,428 nursing homes per year.

Variables

Table 1 lists the variables included in this study and notes the definition and source of each measure.

Dependent Variables

The dependent variable was the financial performance of nursing homes. NHs financial performance was operationalized as total margin and operating margin. Total margin is an indicator of overall profitability, including all revenues (operating and non-operating revenues) and all expenses (operating and non-operating expenses) (Gapenski & Reiter, 2016).

Total profit margin = (Total revenue- total expenses)/ Total revenue

The operating margin focuses on core activities of a business (patient-related activities) and eliminates the effect of non-core revenues such as investment income and philanthropic contributions (Gapenski & Reiter, 2016). It is calculated as follows:

Operating margin = (Operating revenue - operating expenses)

/ Operating revenue

Total and operating margins have been used in the nursing home literature as indicators of organizational financial performance (Lord et al., 2018; Velez-Gonzalez et al., 2011; Weech-Maldonado, Pradhan, et al., 2019)

Independent variable

The independent variable in the study was the adoption of AD SCUs or not. This variable was obtained from the LTC Focus dataset and was coded as a dichotomous variable (0,1) with a value of 1 if the facility has an AD SCU and 0 otherwise. The independent variable, the adoption of AD SCUs, was lagged for 1 year to evaluate the possible lagged effect of AD SCU on financial performance.

Control variables included organizational and market characteristics that may predict financial performance (Lord et al., 2018; Lord et al., 2020; Weech-Maldonado et al., 2012; Weech-Maldonado, Pradhan, et al., 2019). Organizational characteristics included chain affiliation, size, occupancy, ownership, payer mix, percentage of residents that are minorities (% non-Hispanic Blacks and % Hispanics), percentage of residents with a diagnosis of dementia, and acuity index. Chain affiliation was a dichotomous variable that indicates whether the nursing home is a member of a chain (member of a chain- Yes=1, 0=No). Chain affiliation has been related to nursing home financial performance. Chain-affiliated nursing homes showed a better financial performance measured as operating margin (Weech-Maldonado et al., 2012). Nursing home size was measured by the number of beds. Facilities size has been considered a predictor of financial performance. One study reported that larger nursing homes had better financial performance (Weech-Maldonado, Pradhan, et al., 2019). Occupancy rate was defined as the proportion of occupied beds in the facility. A higher occupancy rate was statistically

significant associated with higher total margin and operating margin (Weech-Maldonado, Pradhan, et al., 2019). Ownership indicated whether a nursing home was for-profit (for-profit status – Yes=1, 0=No). Payer mix was the proportion of residents in the facility whose primary care is Medicare and Medicaid. Being for-profit and having a higher Medicare census have been associated with higher financial performance (Weech-Maldonado, Pradhan, et al., 2019). The percentage of residents that are minorities was defined as the proportion of residents in the facility who were identified as non-Hispanic Black and Hispanic. The racial/ethnic composition of residents has been related to NHs' financial performance. Nursing homes with a high proportion of black residents had lower total and operating margins (Chisholm et al., 2013). The percentage of residents with a diagnosis of dementia was included as an additional measure of nursing homes' case mix, which may be related to financial performance. The Acuity Index was calculated based on the number of residents receiving special treatment (e.g., respiratory care, iv therapy, tracheostomy care) and needing several levels of activities of daily living assistance (ADLs). Higher nursing home residents' acuity has been associated with lower financial performance (Weech-Maldonado, Pradhan, et al., 2019).

Market characteristics included market competition, location, Medicare Advantage (managed care) penetration, and per capita income on the county level data. The Herfindahl–Hirschman Index **(**HHI) index was used to measure competition among nursing homes. The HHI index was calculated as the sum of the squared market shares (based on residents) of the facilities in the county. The index ranges from 0 to 1; higher values indicate less competitive markets. Lord and colleagues (2018) found that competition (i.e., assisted living capacity) was negatively associated with nursing homes'

financial performance. Location was a dichotomous variable that indicates whether the facility operates in metropolitan and urban areas or rural areas. It was based on the Urban Influence code. Metro and urban areas vs. rural areas were evaluated to ascertain differences in both markets. Medicare Advantage (managed care) penetration was the proportion of all Medicare beneficiaries in the county who are enrolled in a Medicare managed care organization. Nursing homes located in a market with higher MA penetration experienced higher financial performance (Weech-Maldonado, Pradhan, et al., 2019). Lastly, county wealth was measured by the county's per capita income to control for variations in economic environments across markets. Weech-Maldonado et al. (2019) found that nursing homes that operated in markets with higher per capita income had a better financial performance.

Analysis

We conducted descriptive statistical analysis for the sample of nursing homes dependent, independent, and control variables. Differences in the distribution of categorical and continuous variables were performed for both the baseline year of 2006 and the final year of 2018. Bivariate analyses were performed to compare nursing homes that adopted ADSCUs to those that did not. Panel data linear regression with the facility (control for time-invariant unobserved characteristics) and year fixed effects (control for time trends) were performed to estimate the effects of AD SCUs adoption for each of the dependent variables. Robust clusters at the facility level were used to address within-group correlation. The independent variable, AD SCUs adoption, was lagged for 1 year to account for the possible lagged effect on financial performance. Models were adjusted by

organizational and market factors. SAS 9.4/ Stata 17 were used for data management and analyses. A p-value of <0.05 was used as the statistical significance threshold.

The resulting equations are presented below. All the independent and control variables are represented. The general model specification for the "i" th is the nursing home, and the "t" is the year.

$$Y_{it}\,(\text{Financial performance}) = ß_0 + ß_1\,(\text{Adoption of AD SCUs}_{it-1}) + ß_2\,(\text{Chain/ system Affiliation}_{it}) + ß_3\,(\text{Size}_{it}) + ß_4\,(\text{Occupancy Rate}_{it}) + ß_5\,(\text{Ownership}_{it}) + ß_6\,(\text{Payer Mix-Medicare}_{it}) + ß_7\,(\text{Payer Mix- Medicaid}_{it}) + ß_8\,(\text{Percentage Black residents}_{it}) + ß_9\,(\text{Percentage Hispanics residents}_{it}) + ß_{10}\,(\text{Percentage residents with dementia}_{it}) + ß_{11}\,(\text{Acuity Index}_{it}) + ß_{12}\,(\text{Rural / Metro \& Urban areas}_{it}) + ß_{13}\,(\text{Market Competition}_{it}) + ß_{14}\,(\text{Per Capita Income}_{it}) + ß_{15}\,(\text{MA penetration}_{it}) + ß_{16}\,(\text{Year Dummy variable}_{it}) + ß_{17}\,(\text{Facility Dummy variable}_{it}) + ų(\text{Year}_t) + ų\,(\text{Facility}_i) + Ɛ_{it}$$

Ɛ-error term

Whereas Y_{it} (Financial performance) = Total margin and operating margin

RESULTS

Descriptive analysis for the sample of nursing homes at the study baseline (2006) and the final study year (2018) are displayed in Table 2. There was a significant reduction in the percentage of nursing homes adopting AD SCUs during the study period (18.3% vs. 15.2%) (p<0.001). In the study period, there was a significant decrease in the average total margin (0.02 vs. -0.01) and average operating margin (1.02 vs. 0.97) (p<0.001). With respect to organizational characteristics, 65.3% of nursing homes were chain affiliated in 2018, which had slightly increased from 64.2% in 2006, and the occupancy rate significantly decreased from 86.4% in 2006 to 79.7% in 2018 (p<0.001). The nursing

home's acuity index increased from 11.3 in 2006 to 12.2 in 2018 ($p<0.001$). In contrast, the percentage of residents with dementia decreased (46.4 vs. 45.5) ($p<0.05$), as well as the percentage of residents with Medicare as primary payer (14.8 vs. 13.2) and Medicaid as primary payer (64 vs. 61) ($p<0.001$). Market competition (HHI) decreased from 0.2 in 2006 to 0.4 in 2018 ($p <0.001$). Additionally, Medicare Advantage penetration increased from 12.8% to 31.8% ($p<0.001$). The mean per capita income was $35,354 in 2006 and significantly increased to $50,170 in 2018. In the study's final year, most nursing homes were primarily in urban and metropolitan areas, 96.3%.

The bivariate analyses performed in this study are summarized in Table 3. These analyses compared the nursing that adopted AD SCUs to those that did not adopt AD SCUs. The results indicate that there were statistically significant differences between AD SCUs adopters and non-AD SCUs adopters. On financial performance, there was a statistically significant relationship between total margin (0.014 ±0.01 vs. 0.010 ±0.10) ($p<0.01$), operating margin (0.997 ±0.100 vs. 0.999±0.105) ($p<0.05$) and AD SCUs adoption. For an organizational characteristics perspective, the bivariate results indicated that nursing homes that adopt AD SCUs tend to be larger in size, for-profit, and chain affiliated. Nursing homes that adopted an AD SCU had a higher occupancy rate (83.01 ±13.53 vs. 82.25 ±14.26; $p< 0.001$), higher proportion of White residents (85.01 vs. 78.25, $p <0.001$), higher proportion of residents with dementia (53.11 vs 45.45, $p<0.001$) and slightly higher percentage of Medicaid residents (61.60 vs. 61.22; $p<0.05$), compared to nursing homes that did not adopt an AD SCU. On the other hand, nursing homes that adopted an AD SCU had a lower percentage of Medicare (12.46 vs. 15.31; $p<0.001$), lower proportion of Black/African American residents (7.57 vs. 10.15, $p <0.001$), and

Hispanic residents (1.55 vs. 3.05, $p<0.001$) and a slightly lower acuity index (11.67 vs.11.91, $p<0.001$) compared to nursing homes that did not adopt an AD SCU. For environmental control variables, nursing homes that adopted an AD SCU were more likely to be located in urban areas (97.2 vs. 96.4; $p<0.001$), operated in more monopolistic markets (0.23 vs.0.22, $p<0.001$), in communities with lower per capita income ($42,442.72 vs. $43,023.42) and with lower rate of MA penetration (24.88 vs. 25.64, $p<0.001$).

Table 4 shows the results of the panel data linear regression for the two dependent variables (total margin and operating margin). In terms of financial performance, our hypothesis was partially supported. AD SCUs adoption was marginally significant associated with NHs' financial performance evaluated as total margin ($\beta=-0.116$, $p=0.333$) and operating margin ($\beta=0.188$, $p<0.10$).

Among the organizational control variables, larger nursing homes and for-profit nursing homes had significantly higher total margin ($p<0.001$) and operating margin ($p<0.001$). Facilities with higher occupancy rates were found to have statistically significant higher total margin ($p<0.001$) and operating margin ($p<0.001$). Nursing homes with a higher percentage of Medicare residents were found to have higher total margin ($p<0.001$) and operating margin ($p<0.001$). Facilities with a higher percentage of residents with a diagnosis of dementia had better financial performance measured as total margin ($p<0.05$) and operating margin ($p<0.05$). On the other hand, nursing homes with a higher percentage of Medicaid residents had lower total operating margin ($p<0.001$) and operating margin ($p<0.001$), as well as nursing homes with a higher percentage of Hispanic residents ($p<0.05$).

Among market characteristics, nursing homes had higher total and operating margins ($p<0.05$) when operating in more monopolistic markets. Nursing homes operating in markets with a higher rate of Medicare Advantage penetration had lower total margin ($p<0.005$) and operating margin ($p<0.005$). Nursing homes operating in higher Per capita income had lower total and operating margins. ($p<0.005$). There was no significant difference in financial performance related to chain affiliation, residents' characteristics such as acuity index, the proportion of Black/ African American residents, and market characteristics such as location (urban/rural).

DISCUSSION

Care specialization can be described as a combination of rare and inimitable assets to deliver differentiated services in nursing homes markets. Nursing homes may focus on adopting AD SCUs as an innovative financial opportunity to create innovative revenue-generating services. However, to date, no study has empirically evaluated the impact of ADSCUs adoption on nursing homes financial performance. Based on RBV, this research aimed to ascertain the effects of AD SCUs adoption by nursing homes on their financial performance. Specifically, this study sought to determine whether there were financial performance differences associated with the adoption of AD SCUs. Our hypothesis that the adoption of AD SCUs would be associated with higher financial performance, was partially supported. In this sample of freestanding nursing homes, the adoption of AD SCUs was marginally significantly associated with financial performance measured as operating margin. While there are no prior studies examining the effects of AD SCUs adoption on financial performance, the results for the association between care specialization and revenues align with prior research. Establishing AD SCUs has been

associated with higher occupancy rates and private pay occupancy, which may influence organizational performance (Castle, 2008). Although providing specialized care might involve costly processes such as specialized training, higher staffing ratios, and infrastructure changes in nursing homes, nursing homes administrators might designate AD SCUs to increase their revenues and achieve competitive advantages by providing care to residents with special care needs which is reimbursed at higher rates (Thies, Bleiler & Alzheimer's Association, 2013), increasing occupancy rates and attracting private pay residents.

Among the organizational control variables, nursing home size, for-profit status, occupancy rate, dementia census, and Medicare and Medicaid census were predictors of financial performance. Among organizational factors, our study found that larger nursing homes had higher total and operating margins. These findings are consistent with earlier data reporting nursing home size as a predictor of financial performance (Weech-Maldonado, Pradhan, et al., 2019). Larger organizations may have greater resources to implement organizational approaches such as delivering high-value services to achieve a competitive advantage and lower average costs due to economies of scale.

Similarly, for-profit nursing homes had better financial performance than not-for-profit nursing homes. In line with this, others have found that for-profit nursing homes had higher total and operating margins than not-for-profit facilities (Weech-Maldonado et al., 2012). For-profit nursing homes generally seek to provide services at a lower average cost to maximize profitability. Compared to not-for-profit organizations, for-profit nursing homes rely on investors who expect to receive dividends in return for their investments. In addition, higher occupancy rates and percentage of Medicare residents

were positively associated with higher financial performance. On the other hand, the Medicaid census was associated with lower profitability. Prior research has shown that higher percentage of Medicare residents and occupancy rate were associated with higher profitability (Clement, 2016). Medicare reimbursement rates are higher than Medicaid rates; therefore, a larger Medicare census may compensate for Medicaid reimbursement deficits. Likewise, facilities with higher occupancy rates might maximize their resources to increase profitability.

In addition, nursing homes with a higher proportion of Hispanic residents had a lower financial performance. Earlier research reported a negative association between the proportion of minority residents and financial performance (Chisholm et al., 2013). This may be because Hispanics may have higher costs of care due to more inpatient care (e.g., later stages diagnosis and more comorbidities) than their White counterparts. Lastly, a higher dementia census was associated with better nursing homes' financial performance. This may be explained by higher reimbursement rates associated with care delivered in special care units and to dual-eligible beneficiaries with AD diagnosis.

As far as market control variables, nursing homes operating in less competitive markets had higher total and operating margins. This finding provided support to prior research, which found that high Medicaid nursing homes operating in more monopolistic markets had higher operating margins (Weech-Maldonado, Lord, et al., 2019). Nursing homes in more competitive markets may experience higher operating costs due to less munificent environments and scarcity of nurse staffing resources.

Higher per capita income and MA penetration were negatively associated with lower total and operating margins. Previous research reported a better financial

performance in nursing homes operating in markets with higher per capita income and MA penetration (Weech-Maldonado, Pradhan, et al., 2019). One possible reason is that Medicare Advantage attempt to limit utilization and control cost; therefore, a greater Medicare Advantage penetration would affect reimbursement rates and reduce revenues. Regarding per capita income, one could posit that individuals with higher financial resources may opt for alternative long-term support services. Finally, residents' characteristics, such as the percentage of minority residents and nursing home location, were not predictors of nursing homes' financial performance.

Our study presents several strengths. First, by using resource-based view perspective, this study is one of the first papers to explore the relationships between the adoption of AD SCU and nursing homes' financial performance. Second, this research expands the scope of examining NHs' performance by exploring the effects of AD SCUs on nursing homes financial performance. Third, this study used a longitudinal design for our study population over a 13-year period.

This study provides several implications for policymakers, researchers, and nursing home administrators. Our findings may help NHs administrators to make informed financial decisions while considering delivering specialized care. Although our findings are not conclusive, this study provides policymakers, researchers, and nursing home administrators a better understanding of the relationship between AD SCUs, organizational and market factors, and NHs' profitability.

Our study has several limitations. First, this study depended on secondary data from Medicare Costs Reports; therefore, information regarding Medicaid dependent or private pay nursing homes is not included. Moreover, the financial variables calculated in

this study are based on these reports and may be subject to errors. We tried to address this matter by excluding outliers of each variable and the composite variables used in this study. Second, this study relied on secondary data from LTC Focus for the independent variable; this database combine data from other sources such as OSCAR & CASPER datafiles; this is self-reported data by nursing homes and collected mainly for reporting rather than research purposes. This might introduce bias in our results due to underreporting or over reporting.

CONCLUSIONS

This study attempted to build upon the existing knowledge regarding the AD SCUs and explored the relationship between the adoption of ADSCUs and the financial performance of nursing homes. As nursing homes seek to deliver high-value care, one potential strategy to improve financial performance is the adoption of AD SCUs. Our findings suggest that AD SCUs adoption may result in a higher operating margin among nursing homes. Results suggest associations between organizational and market characteristics and nursing homes' financial performance. Further research should explore the effects of changing demographics, racial/ethnic composition of nursing home markets, and alternative competitors such as assisted living facilities on nursing homes' financial performance.

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Figure 1 The relationship between AD SCUs adoption and Nursing Homes' financial performance

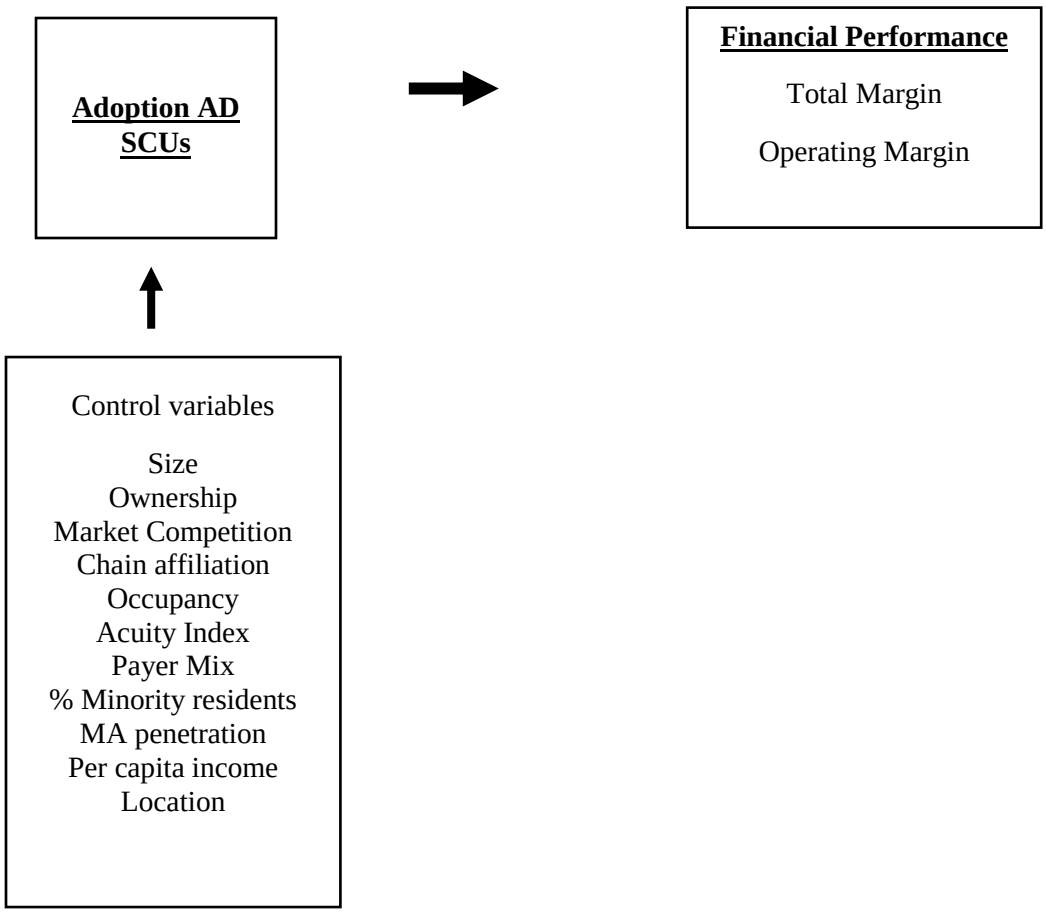

Table 1 Variables' definition and sources

Variable	Definition	Source
Independent variable		
Has Alzheimer's dementia unit?	Indicates whether the facility has an Alzheimer's disease Special Care Unit (SCU) Yes =1 No=0	LTC FOCUS
Dependent variables		
Total margin	(Net Income/Total Revenues)	Medicare Cost Reports
Operating margin	(Net patient revenue-operating cost)/net patient revenue	Medicare Cost Reports
Organizational Characteristics		
Size	Number of beds	LTC FOCUS
Ownership	0 = for-profit, 1 = not-for-profit	LTC FOCUS
Multi-facility chain member	Indicates whether the facility is part of a chain	LTC FOCUS
Occupancy	% NH beds occupied	LTC FOCUS
Average Acuity Index	Indicator of the care needed by a nursing home's residents; it is estimated based on the number of residents requiring different levels of activities of daily living (ADL) assistance and the number of residents receiving special treatment.	LTC FOCUS
% White	Proportion of residents present on the 1st Thursday in April who are White	LTC FOCUS
% Black	Proportion of residents present on the 1st Thursday in April who are Black.	LTC FOCUS
% Hispanics	Proportion of residents present on the 1st Thursday in April who are Hispanic.	LTC FOCUS
% Residents with dementia	The percentage of residents with a diagnosis of dementia present	OSCAR & CASPER
Payer mix		
% Medicare	The proportion of facility residents whose primary support is Medicare	LTC FOCUS
% Medicaid	The proportion of facility residents whose primary support is Medicaid	LTC FOCUS

Market characteristics		
Herfindahl–Hirschman Index	Nursing home competition in the county ranging from 0 to 1. The closer to 1, the closer the county is to have a monopoly in nursing home beds.	LTC FOCUS
Location	Metro and urban areas = 1 or rural areas =0	AHRF
Medicare managed care penetration	Medicare managed care organization penetration rate. (%)	LTC FOCUS
Per capita income	Income level in the county per 1K	AHRF

OSCAR & CASPER: Online Survey Certification and Reporting (OSCAR)/Certification and Survey Provider Enhanced Reporting (CASPER)
AHRF: Area Health Resource File

Table 2 Descriptive Statistics of Variables (N=110,351 nursing home-year observations)

	Baseline 2006 n=3,434		Endline 2018 n=9,163		
Variables	Mean (SD) or Frequency (%)				p
Dependent variables					
Total Margin	0.02	(0.08)	-0.01	(0.10)	**
Operating Margin	1.02	(0.09)	0.97	(0.11)	**
Independent Variable					
Adoption of AD SCUs (%)					
Yes	628	(18.29%)	1393	(15.2%)	**
No	2806	(81.71%)	7,770	(84.8%)	
Organizational control variables					
Total beds (n)	107.35	(36.39)	108.28	(49.71)	
For profit status	2,810	(81.83%)	7,013	(76.54%)	*
Chain affiliation	2,206	(64.24%)	5,982	(65.28%)	
Occupancy Rate (%)	86.36	(12.37)	79.69	(14.59)	**
White (%)	79.88	(25.61)	78.36	(24.41)	*
Black/African American (%)	9.81	(19.48)	10.54	(19.52)	
Hispanic (%)	3.06	(12.36)	2.66	(10.83)	
Residents with dementia (%)	46.38	(17.55)	45.49	(15.87)	*
Acuity index (%)	11.31	(1.32)	12.21	(1.25)	**
Medicare (%)	14.77	(10.73)	13.25	(11.53)	**
Medicaid (%)	63.85	(18.36)	60.83	(21.43)	**
Market control variables					
Herfindahl Index (%)	0.19	(0.22)	0.36	(0.23)	**
Medicare Advantage penetration (%)	12.76	(13.66)	31.78	(13.57)	**
Per capita Income ($)	$35,354.51	($9,547.15)	$50,170.56	($13,633.69)	**
Location					
Urban	3,361	(97.87%)	8,825	(96.31%)	*

* $p<0.05$
** $p<0.01$

Table 3 Bivariate Analysis of Variables (N=110,351 nursing home-year observations)

	Nursing Homes adopting AD SCUs		Nursing Homes not adopting AD SCUs		
	n=17,750		n= 92,601		
Variables	Mean (SD) or Frequency (%)				p
Dependent variables					
Total Margin	0.014	(0.095)	0.010	(0.100)	**
Operating Margin	0.997	(0.100)	0.999	(0.105)	*
Organizational control variables					
Total beds (n)	126.94	(52.66)	104.68	(46.67)	**
For profit status	12,378	(69.73%)	74,846	(80.83%)	**
Chain affiliation	11,391	(64.17%)	57,414	(62%)	**
Occupancy Rate (%)	83.01	(13.53)	82.25	(14.26)	**
White (%)	85.01	(19.94)	78.25	(25.60)	**
Black/African American (%)	7.57	(16.49)	10.15	(19.57)	**
Hispanic (%)	1.55	(6.87)	3.05	(11.59)	**
Residents with dementia (%)	53.11	(15.70)	45.45	(16.91)	**
Acuity index (%)	11.67	(1.27)	11.91	(1.47)	**
Medicare (%)	12.46	(9.24)	15.31	(12.55)	**
Medicaid (%)	61.60	(18.47)	61.22	(20.85)	*
Market control variables					
Herfindahl Index (%)	0.23	(0.23)	0.22	(0.24)	**
Medicare Advantage penetration (%)	24.88	(14.64)	25.64	(14.51)	**
Per capita Income ($)	$42,442.72	($11,175.17)	$43,023.42	($12,315.47)	**
Location					
Urban	17,253	(97.2%)	89,261	(96.4%)	**

* $p<0.05$
** $p<0.01$

Table 4: Fixed effects regression results for financial performance
(N=110,352 nursing home-year observations)

	Total Margin			Operating Margin		
Independent Variable	Coef.	SE		Coef.	SE	
ADSCUs adoption	0.116	0.120		0.188	0.112	∞
Control Variables						
Total beds (n)	0.057	0.006	**	0.061	0.006	**
For profit status	1.738	0.283	**	2.490	0.290	**
No-for-profit	Ref.					
Chain affiliation	-0.227	0.129		-0.008	0.125	
Non-chain-affiliated	Ref.					
Occupancy Rate (%)	0.253	0.006	**	0.238	0.005	**
Acuity index (%)	0.006	0.035		-0.070	0.032	
Medicare (%)	0.077	0.006	**	0.077	0.006	**
Medicaid (%)	-0.023	0.004	**	-0.023	0.004	**
Black/African American (%)	-0.006	0.008		-0.002	0.008	
Hispanic (%)	-0.025	0.012	*	-0.022	0.011	*
Residents with dementia (%)	0.009	0.003	*	0.008	0.003	*
Herfindahl Index (%)	2.604	0.827	*	2.486	0.806	*
Medicare Advantage penetration (%)	-0.023	0.011	*	-0.033	0.011	*
Per Capita Income ($)	-0.001	0.000	*	0.000	0.000	*
Location	0.821	2.053		0.997	1.810	

∞ p <0.10
* p<0.05
** p <0.01

CONCLUSIONS

The purpose of this study, consisting of three papers, was to satisfy gaps in the current literature and broaden our knowledge regarding the adoption of AD SCUs and its implications on nursing homes' organizational performance. This study seeks to build on the existing literature by using a theoretical framework and longitudinal data from a national sample of nursing homes for each paper. The first study evaluated factors associated with AD SCUs adoption. Once these factors were identified, we evaluated the impact of AD SCUs on quality of care and financial performance.

Summary of Findings

The purpose of the first paper was to fill the knowledge gap in our understanding of AD SCUs adoption among nursing homes. Using a resource dependence theory framework, this study ascertained the environmental and organizational characteristics associated with a nursing home's strategic decision to adopt an AD SCU. The relationships between AD SCUs adoption and nursing homes' environmental and organizational factors were evaluated using panel logistic regression with random effect and state and year fixed effects. This study utilized data from two different sources: LTC-Focus and the Area Health Resource File. The study was a longitudinal analysis using a panel design of nursing homes from 2005 to 2019. The final analytical sample consisted of 193,652 nursing home-year observations. The environmental factors were

conceptualized as munificence (the percentage of the population 65 years and older, percentage of Black/African American, Hispanics, and other race population, and socioeconomic conditions as per capita income and poverty level), complexity (market competition) and dynamism (percent change in the population 65 years and older and the percent change in the Medicare Advantage penetration rate (2005-2019). The nursing homes' organizational factors were chain affiliation and nursing home size. The main findings suggest an association between the environment in which a nursing home operates and its decision to adopt AD SCUs. Nursing homes operating in a less munificent external environment and more dynamic environment were less likely to adopt AD SCUs. Contrary to what was hypothesized, nursing homes operating in more monopolistic markets were more likely to adopt AD SCUs. In addition, organizational factors such as size, for-profit status, occupancy rate, and payer mix were significant predictors of AD SCUs adoption. These findings provide NHs administrators and policy makers insights into how environmental and organizational factors influence nursing homes strategy choice, in this case, delivering specialized care for people with dementia.

The second paper examined the impact of AD SCUs adoption on nursing homes processes and outcomes of care. This paper utilized the Donabedian's Structure, Process, Outcomes (SPO) framework to explore the relationships between AD SCUs adoption and quality of care. This study used data obtained from three sources: LTC-Focus, Online Survey Certification and Reporting (OSCAR)/Certification and Survey Provider Enhanced Reporting (CASPER), and the Area Health Resource File (AHRF). The final analytical sample for this study consisted of 148,707 nursing home-year observations over the 14-year study period. The independent SPO variable was conceptualized as

structure (percentage of AD SCUs designated beds). Then, the dependent variables were operationalized as processes (percent of restraints use, the prevalence of anti-psychotic medications usage, and the prevalence of tube feeding) and outcomes (prevalence of pressure ulcers, falls, and percentage of hospitalizations). Data were analyzed using a panel data linear regression with facility fixed effects (FE), robust clusters, year fixed effects to examine the relationship between the process and outcome (SPO) variables, and a lagged independent continuous variable that identified the percentage of AD SCUs designated beds. This second paper found that nursing homes with a higher percentage of AD SCUs designated beds had a lower prevalence of feeding tubes, pressure ulcers, and hospitalizations among nursing home residents. Furthermore, a higher percentage of AD SCU beds resulted in a marginal decrease in physical restraints. These findings will help nursing home administrators to identify the specific factors related to better processes and outcomes measures of quality, enhancing the efficiency of AD SCUs as an organizational approach to delivering specialized care for people with dementia.

The third paper examined the relationship between AD SCU designation and financial performance among nursing homes using the resource-based view of the firm (RBV) as a conceptual framework. Specifically providing answers to whether there are financial performance differences related to AD SCUs adoption. The relationships between the total margin, operating margin, and the adoption of AD SCUs were evaluated using a panel data linear regression with facility fixed effects (FE), robust clusters, year fixed effects. This third paper found that the adoption of AD SCUs was marginally statistically significantly associated with nursing homes' financial performance in this sample of nursing homes. Specifically, adoption of AD SCUs was

associated with higher operating margins. Organizational factors such as nursing home size, for-profit status, occupancy rate, dementia census, percentage of Hispanic residents, and Medicare and Medicaid census were predictors of financial performance. Further, market characteristics such as per capita income, market competition, and Medicare Advantage penetration were also associated with NHs' financial performance. To conclude, this study regarding the effect of AD SCUs on the nursing homes' financial performance can be considered as an initial step toward future research to understand the relationship between AD SCUs and NHs' profitability.

These three papers represent a distinctive contribution to the existing literature. The findings of these studies can be used by NHs administrators to make informed decisions when adopting specialized care for people with dementia. In addition, these findings may help to identify additional factors related to better processes and outcomes measures of quality, enhancing the efficiency of AD SCUs as an organizational approach to delivering specialized care for people with dementia. Because of the relationships between geographic location and concentration of ethnic minority populations and the adoption of AD SCUs, policies to reduce differences in access should focus on communities with high concentrations of minority racial/ethnic groups. Lastly, this study offers a comprehensive evaluation of the relationships between AD SCUs adoption and nursing homes' organizational performance that may contribute to future research to understand the mechanisms by which AD SCUs may influence nursing homes' financial performance and quality of care. Given the continued growth in ADRD prevalence, long-term service utilization will continue to grow. As more individuals require specialized care, it becomes crucial that the care delivered is equitable, efficient, and effective.

Future research should explore relationships between community characteristics such as social deprivation to explain differences in access to specialized care for Alzheimer's disease in nursing homes. Finally, further research should focus on ascertaining if the higher quality of care is related to facilities' policies overall or are exclusively attributable to AD SCUs.

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APPENDIX

INSTITUTIONAL REVIEW BOARD APPROVAL

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

470 Administration Building
701 20th Street South
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NHSR DETERMINATION

TO: Pilonieta, Giovanna

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)
IORG Registration # IRB00012550 (IRB 03)

DATE: 08-Dec-2021

RE: IRB-300008428
Alzheimer's Disease Special Care Units and Nursing Homes' Organizational Performance

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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:

De-identified publicly available data sets