Fall Risk Factors among Hospitalized Older Adults with Alzheimer's Disease and Related Dementias

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Dedication

This dissertation is dedicated to my husband, Kenny Sconza. Also, to Terri Combs Orme and John Orme, and my late parents, Margaret and Raymond Bettencourtt. You have given me a wealth of love and support throughout my life; I am so fortunate and grateful. Without you, the dream of completing my doctorate would not have become a reality.

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Abstract

Falls are a common and devasting complication of hospital admission for older adults. Falls are especially significant for those with Alzheimer's Disease and related dementias (ADRD) as they are at high risk to fall and to suffer injuries from falling. Despite the large body of research on falls in hospitals, less is known about fall risk factors among patients with ADRD in the acute inpatient care setting. The purpose of this retrospective case-control study was to determine which risk factors are predictors of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD) by comparing 100 patients who fell with 100 patients who did not fall.

There was a statistically significant relationship between falls and: length of stay (LOS), sex, race, agitation/restlessness, altered awareness of immediate physical environment, the diagnosis related group (DRG) of infectious disease, elimination (incontinence), required assistance required for ambulation, and unsteady gait. The odds of falling were lower for females, and for patients with altered awareness of their immediate physical environment, DRG of infectious disease, incontinence, and those who required assistance required for ambulation. The odds of falling were higher for African American, Asian, Hispanic or Latino patients, as well was those with agitation/restlessness, and unsteady gait. There was no statistically significant relationship between falls and: age, high-risk comorbidities, high-risk medications, severity of illness (SOI), confusion, forgetfulness, impulsivity, lack of understanding of one's physical and cognitive limitations, history of a fall within six months, use of an assistive device to ambulate (e.g., cane, walker), visual or auditory impairments affecting mobility.

The findings from this study are important because, to the best of my knowledge, this is the first study to compare hospitalized older adults with ADRD who fell and those who did not.

The findings suggest that agitation/restlessness and unsteady gait are key risk factors for hospitalized older adults with ADRD. This study serves as a first step, laying the groundwork for future studies in which effective fall prevention programs are developed to address the specific risk factors for this vulnerable population.

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List of Abbreviations

AD	Alzheimer's Disease
ADRD	Alzheimer's Disease and Related Dementias
AHRQ	Agency for Healthcare Research and Quality
BMAT	Banner Mobility Assessment Tool
CAM	Cognition Assessment Method
CARES	Connect, Assess, Respond, Evaluate, Share
CCU	Cardiac Care Unit
CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicare and Medicaid Services
CI	Cognitive Impairment
DHHS	U.S. Department of Health and Human Services
DRG	Diagnosis Related Group
EJGH	East Jefferson General Hospital
EHR	Electronic Health Record
Fall TIPS	Tailoring Interventions for Patient Safety
GBH	Geriatric Behavioral Health
H&P	History and Physical
HAC	Hospital Acquired Condition
HIIFRM	Hendrich II Fall Risk Model
ICU	Intensive Care Unit
IHI	Institute for Healthcare Improvement
JHFRAT	Johns Hopkins Fall Risk Assessment Tool
LOS	Length of Stay
MAR	Medication Administration Record
MACT	Mobility Action Group
MRN	Medical Record Number
NAPA	National Alzheimer's Project Plan Act
NCOA	National Council on Aging
NDNQI	National Database of Nursing Quality Indicators

NIA	National Institute on Aging
NQF	National Quality Forum
NQS	National Quality Strategy
NSI	Nursing Sensitive Indicator
OR	Odds Ratio
PfP	Partnership for Patients
PHI	Protected Health Information
PT	Physical Therapy
QCM	Quality Caring Model
QI	Quality Improvement
QHOM	Quality Health Outcomes Model
RCT	Randomized Control Trial
SNF	Skilled Nursing Facility
SOI	Severity of Illness
STEADI	Stopping Elderly Accidents, Deaths, And Injuries
STRATIFY	St. Thomas Risk Assessment Tool in Falling Elderly Patients
TUG	Timed Get Up and GO Test
VDI	Virtual Desktop Imaging
VHA	Veterans' Healthcare Administration
WHCOA	White House Conference on Aging

Chapter 1: Introduction

A large body of research on falls exists, and the evidence demonstrates that risk factors are known, and advances have been made in fall prevention, yet few studies have focused on older adults with ADRD in the acute inpatient care setting. Falls remain a complication of hospitalization for older adults and those with ADRD are at high risk to fall and sustain injuries. To address the gap in the literature, I conducted a retrospective, case-control study to determine which risk factors are predictors of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD) by comparing those who fell with those who did not fall. The findings of this study identified agitation/restlessness and unsteady gait as strong predictors of falls among hospitalized older adults with ADRD. With this knowledge, future studies that focus on nursing interventions that target these key risk factors are warranted.

In this chapter, I will describe the background of the problem of falls, its significance to nursing, the theoretical framework used to guide the study, and also present the study purpose, hypothesis, aims, definitions, and limitations.

Background

Falls among older hospitalized adults. Falls are a major problem in acute care hospitals. Inpatient falls are among the most frequently reported adverse events, with approximately 700,000 to 1,000,000 falls occurring annually (Currie, 2008). Up to one-third of all inpatient falls are considered to be avoidable (Ganz, 2013). Falls with injury occur in 26 to 51% of acute care hospital stays, with up to ten percent resulting in serious injuries such as hip fractures, intracranial bleeding, and death (Bouldin et al., 2013; Boushon, 2012). Falls with major injuries increase hospital length of stays 6 to 12 days and add an average of $13,000 in cost per patient stay (Bouldin et al., 2013). Patients who are injured from a fall experience longer

hospital stays, and higher morbidity and mortality (Park, 2018; Quigley, Barnett, Bulat, & Friedman, 2016; Spetz, Brown, & Aydin, 2015; Wong, 2011). In addition to pain, fear of falling leads to decreased mobility, independence, debilitation, and decline (Park, 2018; Quigley et al., 2016; Spetz et al., 2015; Wong, 2011). Fall rates with major injury or death were highest among patients 80 years and older (Williams, Szekendi, & Thomas, 2014). In 2010, adults 85 and older were hospitalized five times more often than adults 65 years of age and under, a trend that is expected to increase as the U.S. population ages (Levant, Chari, & DeFrances, 2015).

Studies on inpatient falls have identified multiple contributing factors. Increased risk for falls includes age greater than 80, delirium, dementia, and the use of certain medications, such as antihypertensives, diuretics, and sedative hypnotics (Titler, et al., 2016). Toileting and ambulating without assistance are associated with falls, and unassisted falls more often result in injury (Carroll, Dykeys, & Hurley, 2010; Titler et al., 2016; Staggs, Mion, & Shorr, 2014). Fall prevention programs on acute care units can be effective. Standardized fall risk assessment tools and utilization of universal and general fall precautions are the foundation for multiple fall prevention programs (Ganz et al., 2013; Titler et al., 2016). Studies have shown an association between increased nurse staffing and decreased patient fall rates (Everhart et al., 2014; Kalisch, Tschannen, & Lee, 2012; Lake, Shang, Klaus, & Dunton, 2010). Assessment of patient-specific risk factors is key to successful multicomponent fall prevention interventions (Ganz et al., 2013). In the acute care setting, evidence demonstrates that patient and family engagement in fall care planning is effective in reducing falls (Dykes et al., 2018; Quigley, Barnett, Bulat, & Friedman, 2016).

Fall prevention efforts. Multiple fall prevention resources exist. The Agency for Healthcare Research and Quality (AHRQ) developed *Preventing falls in hospitals: A toolkit for*

improving quality of care (Ganz et al., 2013). The Health Research and Educational Trust (HRET), through the Hospital Improvement Innovation Network (HIIN), developed a fall reduction change package that is provided to over 1600 participating hospitals (HRET, 2017). Despite the availability of these fall prevention resources, the rate of falls among hospitalized patients from 2010 through 2014 remained steady at 7.9 per 1,000 patient days (AHRQ, 2018).

Programs implemented by the Centers for Medicare and Medicaid Services (CMS) which reduce reimbursement for hospital-acquired conditions (HAC), including falls with injury or trauma, have had the unintended consequence of limiting patients' mobility (Growdon, Shorr, & Inouye, 2017). Falls with injury have been labeled as a "never event," which has contributed to a culture in which patient mobility is restricted to achieve a goal of zero falls (King, Pecanac, Krupp, Liebzeit, & Mahoney, 2016). CMS HAC initiatives have not been associated with decreased incidence of falls with injury (Thirukumaran, 2017).

Although fall prevention is a part of the national public policy agenda, policy specific to fall prevention among hospitalized older adults with Alzheimer's disease (AD) and related dementias (ADRD) has not been addressed. The first Falls Free National Action Plan was developed in 2005 by the National Council on Aging (NCOA) and the National Falls Prevention Resource Center. The plan was updated in 2015 at the Falls Prevention Summit, sponsored by the NCOA and White House Conference on Aging ([WHCOA]; National Falls Prevention Resource Center, 2015; WHCOA, 2015). In 2012, the CDC launched STEADI: Stopping Elderly Accidents, Deaths, And Injuries (CDC, 2012b). The purpose of the STEADI initiative was to implement the American and British Geriatrics Societies' clinical practice guideline for fall prevention. The National Alzheimer's Project Plan Act (NAPA) became law in January of 2011 and requires a national strategic plan to address AD (Alzheimer's Association, 2018b). One of

the milestones of the NAPA was expansion of research in the care workforce and supply of skilled labor to "identify barriers to entry, challenges of retention, and causes and effects of turnover" (National Institute on Aging [NIA], 2015, p. 45). Strategies to accomplish this include building a workforce with the skills to provide high-quality care and identifying high-quality dementia care guidelines (dementia capable care) and measures across care settings (U.S. Department of HHS, 2018). Dementia capable refers to the competency and skills of staff members in delivering care the meets the needs of persons with dementia (Lin, & Lewis, 2015).

Falls among patients with ADRD. AD affects over five million Americans, and by 2050 this number is estimated to rise to 14 million (Alzheimer's Association, 2018). Approximately 30% of patients greater than age 65 who are admitted to acute care hospitals are affected by dementia (Oliver, Healy, & Haines, 2010). Hospitalized patients with dementia have greater declines in physical functioning than those without cognitive impairment and are at greater risk for falls (Taylor et al., 2019). The use of psychotropic and antipsychotic medications in patients with dementia also increases fall risk (Enderlin et al., 2015). Impaired judgement and inattention are associated with falls due to impulsive behaviors (Harrison, Ferrari, Campbell, Maddens, & Whall, 2010). Urgency related to elimination needs is also associated with impulsivity-related falls (Grealish et al., 2019). For patients with cognitive impairment, programs promoting engagement and education on fall prevention have been less effective than for patients without cognitive impairment (deJong, Kitchen, Foo, & Hill, 2018).

Summary. Nurses in acute care settings care for patients with a wide range of illnesses, as well as varied levels of altered mental status and cognitive impairment. Falls and falls with injury are nurse-sensitive indicators, reflecting the quality of nursing care. If we better understood risk factors associated with falls among hospitalized older adults with ADRD,

effective programs targeting these risk factors could be developed to prevent falls. The issue of fall prevention among hospitalized older adults with ADRD requires urgent attention and further nursing research.

Statement of Problem

Despite the availability of fall prevention resources, the rate of falls among hospitalized patients has not significantly decreased (AHRQ, 2018). CMS initiatives have not been associated with decreased incidence of falls with injury (Thirukumaran, 2017). Both fall prevention and ADRD are included in the national public policy agenda, yet policy specific to fall prevention among hospitalized older adults with ADRD has not been addressed. Although evidenced based inpatient fall prevention strategies exist, less is known about the influence of risk factors which drive nursing interventions to prevent falls specific to hospitalized older adults with ADRD. Base on a systematic review of the literature, Harlein, Dassen, Halfens, and Heinze (2009) found a lack of rigorous studies related to fall risk factors in patients with dementia or cognitive impairment. Large-scale research studies which used the National Database of Nursing Quality Indicators (NDNQI) are limited because the dataset does not contain data on diagnoses or patients who did not fall. Few studies have compared patients who have fallen with those who did not. Therefore, a case-control design to compare risk factors among hospitalized older adults with ADRD who fell ("fallers") with those who did not ("non-fallers") will add valuable knowledge to the body of research on falls.

Purpose of Study

The purpose of the study was to determine which risk factors are predictors of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD) by comparing those who fell with those who did not fall.

Hypothesis

The central hypothesis of the study is that a relationship exists between patient characteristics (fall risk factors) and falls among hospitalized older adults with ADRD. I tested the relationship of structure (patient characteristics) and outcomes (falls) between two groups of older adults (aged 60 and greater) hospitalized in an acute care setting: who experienced a fall and those who did not. The specific aims of this study are:

Aim 1: To describe differences in fall risk factors between fallers and non-fallers

Aim 2: To determine which risk factors predict falls among hospitalized older adults with ADRD by comparing fallers to non-fallers.

Philosophical Perspective

The philosophical perspective which underlies this study is historicism. Historicism "placed importance on the context and processes in which scientific activity takes place" (Rodgers, 2005, p. 99). The key argument in historicism is that science must be studied from contextual (time, situation, people) and process viewpoints (Rodgers, 2005). Historicists "engage in studies of the actual activities, behavior patterns, and reasoning processes" (Reed & Shearer, 2011, p. 157). The historicism philosophy of science supports this study's theoretical framework outlined below.

Theoretical Framework

The Quality Health Outcomes Model (QHOM) was developed by a group of experts on health care quality from the American Academy of Nursing to provide a framework for evaluating quality of care and outcomes research and was published in 1998 (Mitchell, Ferketich, & Jennings, 1998; Mitchell & Lang, 2004). The QHOM consists of four constructs: system characteristics, client characteristics, interventions, and outcomes (Mitchell, Ferketich, &

Jennings, 1998; Mitchell & Lang, 2004). The foundation of the QHOM is the Donabedian model, which is a framework to assess quality of care by evaluating the structure, process, and outcomes that contribute to care (Donabedian, 1966, 1988). Structure includes the setting or system in which care is delivered; processes include patient care activities and interventions, including decision making and appropriateness; outcomes reflect the effect of care on a patient's health status (Cohen & Shang, 2015; Donabedian, 1988). The QHOM is a dynamic model that takes into account the interaction among system characteristics, client characteristics, interventions, and outcomes (Mitchell, Ferketich, & Jennings, 1998; Mitchell & Lang, 2004). In the QHOM, interventions are not driven by system or client characteristics alone to achieve a desired outcome. Reciprocal relationships and multiple feedback loops exist, as system and client characteristics, interventions, and outcomes influence one another (Mitchell, Ferketich, & Jennings, 1998; Radwin, & Fawcett, 2002). Figure 1 displays the interaction among the constructs in the QHOM.

System characteristics include hospital or system size, ownership, nursing skill mix, patient demographics, technology, and nursing practice environment; client characteristics consist of health status, demographics, and risk factors for disease (Mitchell, Ferketich, & Jennings, 1998). Interventions include clinical processes and activities involved in the delivery of patient care (Mitchell, Ferketich, & Jennings, 1998). In addition to the traditional outcome measures of death, disease, disability, discomfort, and dissatisfaction, the authors of the QHOM proposed five nursing sensitive outcome categories: self-care, health promoting behaviors, health-related quality of life, feeling well cared for, and management of symptoms (Mitchell & Lang, 2004). These categories describe outcomes resulting from nursing care structures and processes that (Mitchell, Ferketich, & Jennings, holistically address the patient's health care

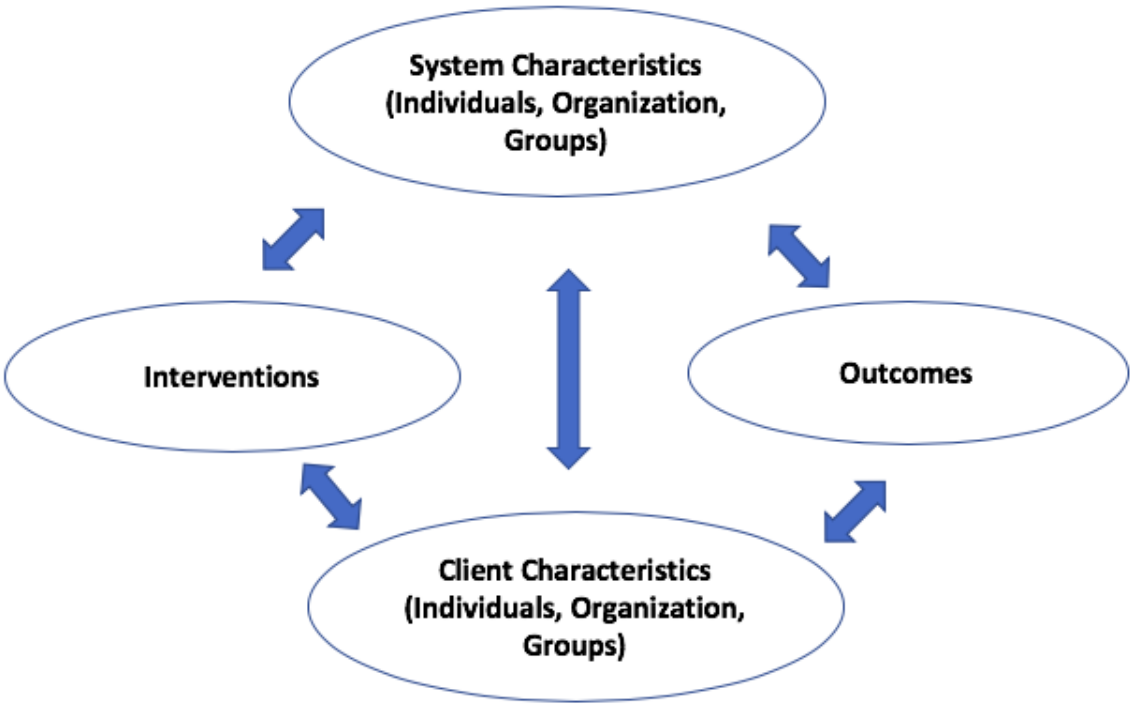

Figure 1: The Quality Health Outcomes Model

Adapted from "Quality health outcomes model," by P. H. Mitchell, S. Ferketich, & B. M. Jennings, B. M., 1998, Journal of Nursing Scholarship, 30, p. 44.social, psychological, physical and physiologic factors

experience, including functional, 1998). The identification of patient outcomes from nursing interventions developed by incorporating patient and system characteristics is a key feature of the QHOM, as is the focus on nursing outcome research to advance nursing science (Cohen & Shang, 2015; Radwin, & Fawcett, 2002).

The constructs within the QHOM provide an ideal framework to guide research in the area of fall prevention among hospitalized older adults with ADRD. In the QHOM, system characteristics include nursing skill mix and staffing; client characteristics consist of demographics and risk factors for disease; interventions include clinical processes and activities involved in the delivery of patient care; outcome measures include death, disability, discomfort, and dissatisfaction (Mitchell, Ferketich, & Jennings, 1998). As applied to fall prevention among older adults with ADRD, patient (client) characteristics will be measured using the variables of fall risk factors. The outcome variables will be patient falls. These variables are consistent with the QHOM and supported by evidence from falls research. System characteristics, including nursing skill mix and staffing, are outside of the scope of this study, as data are not available on staffing for patients with ADRD who fell or did not fall. Nursing interventions are also outside of the scope of the current study. Use of the QHOM will guide my research in fall prevention specific to hospitalized older adults with ADRD. The relationships among system characteristics, patient (client) characteristics and outcomes will be tested between groups of hospitalized older adults with ADRD who experienced a fall and those who did not. The findings of this study will be significant because a better understanding of patient characteristics (risk factors), which influence nursing interventions and affect outcomes (falls), will advance the development of effective patient-centered fall prevention programs.

Assumptions

Assumptions of this study based on the theoretical framework include the following:

1. Structural characteristics drive processes which produce outcomes (Donabedian, 1988).
2. The QHOM is useful in evaluating relationships among structure, nursing process, and patient outcomes (Fawcett & Desanto-Madeya, 2012).
3. Nursing assessment of patient-specific risk factors and individualized care plans are key to successful fall prevention interventions (Dykes et al., 2017; Quigley, Barnett, Bulat, & Friedman, 2016).
4. Patient factors associated with falls can be mitigated by nursing interventions (Munsterman, Hodo, and Newcomb, 2018).

Definitions

Outcomes: Falls. NDNQI (National Nursing Database of Nursing Quality Indicators, 2016, p2) defines a patient fall as "a sudden, unintentional descent, with or without injury to the patient, that results in the patient coming to rest on the floor, on or against some other surface (e.g., a counter), on another person, or on an object (e.g., a trash can). When a patient rolls off a low bed onto a mat or is found on a surface where you would not expect to find a patient, this is considered a fall. If a patient who is attempting to stand or sit falls back onto a bed, chair, or commode, this is only counted as a fall if the patient is injured." Falls with injury are categorized as minor (e.g., bruise, abrasion), moderate (requiring suturing, steri-strips), major (requiring surgery, all fractures), and death (NDNQI, 2016). The NDNQI is the largest repository of hospital fall data in the U.S. and the fall definition is a widely accepted as the hospital industry standard (Garrard, Boyle, Simon, Dunton, & Gajewski, 2016).

Fall risk factors. Risk factors for falls will be collected from the Electronic Health Record (EHR). The data elements included: age, fall history, medications, elimination, mobility, cognition, length of stay, reason for admission, comorbidities, and severity of illness.

Limitations

A limitation of this study is that it may not be generalizable to hospitals of different sizes, case mixes, and geographic locations, or to other healthcare settings. Also, this study will not examine factors such as nurse staffing, skill mix, or nursing interventions.

Significance for Nursing

Inpatient falls and falls with injury per 1,000 patient days are hospital patient safety measures developed by the American Nurses Association (ANA) and endorsed by the National Quality Forum ([NQF]; ANA, 2018). Falls and falls with injuries are considered nursing-sensitive indicators, reflecting the quality of nursing care (Burston, Chaboyer, & Gillespie, 2014; Heslop & Lu 2014; Sung-Heui, 2016). Two objectives of Healthy People 2020 are related to falls: prevention of an increase in fall related deaths in all persons and prevention of an increase in fall related deaths in persons 65 years of age and older (U.S. Department of Health and Human Services (DHHS), 2010). In support of the National Quality Strategy (NQS) to improve the safety of healthcare, the Partnership for Patients (PfP), coordinated by DHHS, set a goal to reduce patient harm from hospital acquired conditions. This goal includes the reduction of falls with injury and immobility among inpatients (CMS, 2016; NQF, n.d). Prevention of falls is a significant concern for nursing.

Despite advances in inpatient fall prevention and numerous studies on risk and contributing factors to falls, less is known specific to hospitalized older adults with ADRD. The findings of this study are significant because a better understanding of risk factors associated

with falls among hospitalized older adults with ADRD is urgently needed in order to reduce falls for these vulnerable patients. This study lays the groundwork for future studies in which effective fall prevention programs are developed which target the specific fall risk factors for hospitalized older adults with ADRD.

Chapter 2: Literature Review

A comprehensive literature review was conducted, identifying articles related to the topic of falls and fall prevention in acute care and long-term care facilities. Electronic searches were conducted using CINAHL, PubMed, Google Scholar, and PsychINFO databases. Searches were limited to peer review journal articles and literature review articles in English from January 2009 through July 2019. Keyword search terms included falls, fall risk factors, fall risk assessment, and fall prevention. The search yielded more than 15,000 results. The review was further refined, adding search terms of older adults, diagnoses of Alzheimer's disease (AD) and dementia, and specifying the inpatient/hospital setting. These refinements yielded over 5,000 results. Articles were extensively examined, and the final 60 studies selected were based on relevancy, recency, accuracy, and evidence hierarchy (landmark studies, randomized control trials (RCT), meta-analyses, meta-syntheses, or systematic literature reviews). These studies were then grouped into themes based on constructs within the Quality Health Outcomes Model (QHOM): system/organizational characteristics, patient characteristics (fall risk factors), and fall prevention interventions.

System and Organizational Characteristics

In the QHOM, system characteristics include hospital or system size, ownership, nursing skill mix, patient demographics, technology, and nursing practice environment (Mitchell, Ferketich, & Jennings, 1998). System and organizational characteristics related to fall prevention include nurse staffing, nurse skill mix, and an organizational culture supporting evidence-based fall prevention. Sixteen studies fell into this category.

Organizational culture. Effective fall prevention programs require the support of hospital leadership for evidence-based practice, teamwork, communication, and a strong patient

safety culture (Quigley & White, 2013). Multiple studies have shown that no one intervention is effective in preventing falls and organizational support for multicomponent, evidence-base fall prevention strategies is what drives fall reduction (Ang, Mordiffi, & Wong, 2011; France et al., 2017; Spoelstra, Given, & Given, 2012; Titler, et al., 2016; Trepanier & Hilsebeck, 2014). Organizational support for appropriate nurse staffing, and programs comprised of education and partnerships with patients and families, is also critical in preventing inpatient falls with injury (DuPree, Fritz-Campiz, & Musheno, 2014).

Nurse staffing and skill mix. Studies have consistently shown an inverse relationship between adverse events and levels of nursing surveillance and staffing (Dresser, 2012; Kutney-Lee, Lake, & Aiken, 2009). Kalisch, Tschannen, and Lee (2012) studied fall rates, missed nursing care, and staffing. The authors found higher levels of nurse staffing and completed nursing care (i.e., ambulation and toileting assistance) contributed to fewer patient falls. Hours per patient day were negatively associated with patient falls and missed nursing care was associated with increased fall rates. Higher levels of total nurse staffing and hours per patient day, as well as higher registered nurse (RN) staffing levels, are associated with fewer inpatient falls (Cox et al., 2015; Everhart et al., 2014; He, Dunton, & Staggs, 2012).

The American Nurses Credentialing Center (ANCC) recognizes hospitals for nursing excellence by awarding them Magnet® status (ANCC, 2016). Lake, Shang, Klaus, and Dunton (2010) compared nurse staffing level and falls among hospitals with and without Magnet recognition. Hospitals recognized for nursing excellence by the American Nurses Credentialing Center (ANCC) with Magnet status had five percent fewer falls than non-Magnet hospitals. Decreased fall rates in Magnet facilities were associated with higher registered nurse (RN) staffing levels. Tzeng, Hu, and Yin (2016) conducted a study utilizing the CMS Hospital

Compare database of over 3,200 hospitals and found nurse staffing to be associated with fewer falls with injury. Zhao et al. (2018) studied data from the National Database of Nursing Quality Indicators (NDNQI) for over 400 hospitals and found RN hours per patient day were associated with fewer injurious falls.

Patient characteristics and fall risk factors

In the QHOM, patient/client characteristics consist of health status, demographics, and risk factors for disease (Mitchell, Ferketich, & Jennings, 1998). Numerous studies describe risk factors for falls, as well as fall risk due to dementia, yet studies in the acute care hospital setting are not specific to patients with ADRD. Eleven studies fell into this category. Risk factors for falls among hospitalized patient include age greater than 60, unsteady gait, orthostatic hypotension, history of recent fall, altered mental status, urinary incontinence or frequency, and the use of certain medications, such as antihypertensives, diuretics, and sedative hypnotics (Oliver, Healy, & Haines, 2010; Titler et al., 2016; Williams, Szekendi, & Thomas, 2014; Zhao et al., 2019). Risk factors for falls with injury are age greater than 80 and the use of anticoagulants (Zhao e al., 2019).

Contributing factors. Common contributing factors to inpatient falls include toileting and ambulating without assistance (Titler et al., 2016; Williams, Szekendi, & Thomas, 2014). Carroll, Dykes, and Hurley (2010) conducted a qualitative study on patient perceptions of falls. Patients reported that the major reasons for their falls were urgent toileting needs, and overestimating their ability to ambulate without assistance, then developing weakness and loss of balance. Staggs, Mion, and Shorr (2014) studied falls in over 1,400 U.S. hospitals and found that injuries occurred more often in unassisted falls, than when patients are lowered to the ground by hospital staff.

Risk factors for falls for patients with ADRD. Patients with dementia have greater declines in physical functioning than those without cognitive impairment and are at greater risk for falls (Taylor et al., 2019). Impairments in gait and balance increase fall risk for patients with dementia (Lim, Manun, & Lim, 2014). The use of psychotropic and antipsychotic medications in patients with dementia also increases fall risk (Enderlin et al., 2015). Impaired judgement and inattention are associated with impulsivity-related falls (Harrison, Ferrari, Campbell, Maddens, & Whall, 2010). Urgency related to elimination needs is also associated with impulsivity-related falls (Grealish et al., 2019).

Fall prevention interventions. In the QHOM, interventions include clinical processes and activities involved in the delivery of patient care (Mitchell, Ferketich, & Jennings, 1998). Thirty-three studies fell into this category. Inpatient fall prevention, although not specific to patient with ADRD, is grounded in a strong body of research. Numerous fall prevention resources exist, including fall prevention guides and toolkits from the Agency for Healthcare Research and Quality (AHRQ), the Veteran's Healthcare Administration (VHA), and the Institute for Healthcare Improvement (IHI) (Boushon, et al., 2012; Ganz et al., 2013; Zubkoff et al., 2016). Standardized fall risk assessment tools and utilization of universal and general fall precautions are the foundation for multiple fall prevention programs (Ganz et al., 2013; Zubkoff et al., 2016), yet falls continue to be a serious patient safety issue. According to the Agency for Healthcare Research and Quality (AHRQ, 2018), the rate of falls among hospitalized patients from 2010 through 2014 remained steady at 7.9 per 1,000 patient days. Williams, Szekendi, and Thomas (2014) studied over 25,000 fall related incident reports across 40 academic facilities and found that multiple gaps in fall prevention and fall risk assessment existed. These findings are echoed in two separate literature reviews conducted by Quigley (2016b) and Zhao et al. (2019).

Universal fall precautions. Commonly utilized elements of fall bundles, such as signs indicating fall risk, colored socks and armbands, and bed alarms, when implemented without patient specific risk assessment and individualized care planning, are not fully effective in fall prevention (Oliver, Healy, & Haines, 2010; Quigley, Barnett, Bulat, & Friedman, 2016; Spoelstra, Given, & Given, 2012). Bed alarms limit patient movement and activity, in some cases acting as a restraint device (Schoen, Cull, & Buckhold, 2016; Shorr,et al., 2012). Another universal fall precaution is keeping the bed in the lowest position. Morse et at. (2015) conducted a study on the safety of hospital beds and found that for patients with limited hip flexion and those above average height, greater effort was required to stand when the hospital bed was in the lowest position and, therefore, this is not a safe practice for these patients.

Education, engagement and communication. Effective strategies to improve fall prevention include an accurate risk assessment and care plan that is communicated to the entire care team, patient, and family (Dykes, Carroll, Hurley, Benoit, and Middleton, 2009; Dykes et al., 2010). Carroll, Dykes, and Hurley, 2010) found patients and families desired to be included in the assessment of fall risk and fall prevention planning. Patient perceptions of fall risk often do not align with nursing risk assessments and patients do not accurately perceive their fall risk (Dykes, Carroll, Hurley, Benoit, & Middleton, 2009; Sonnad, 2014; Twibell, Siela, Sproat, & Coers, 2015). McInnes, Seers, and Tutton (2011) conducted a review of qualitative studies related to older individual's perspective of fall risk and identified the need to maintain control to preserve independent self-identity as a prominent theme related to adherence to fall precautions. Van Rhyn and Barwick (2019) conducted meta-synthesis of health care providers' perceptions falls and fall prevention in older people. The authors identified communication among staff,

patient lack of fall risk awareness, time constraints, complexity of care, and lack of training on fall precautions as barriers to implementation of fall prevention precautions.

Ang, Mordiffi, and Wong (2011) conducted a randomized control trial in acute care hospital settings and found that educating high-risk fall patients on their fall prevention risk and care plan, in addition to the usual fall preventions (colored arm band, bed in lowest positions, call light and personal belongings within reach), aided in reducing falls. Study results showed that use of multiple interventions targeted to address individual patient risk decreased the relative risk of falling by 71% compared with general fall prevention interventions. Zavotsky, Hussey, Easter, and Incalcaterra (2014) studied 600 patient falls in an academic medical center and found the use of structured fall safety education for patients and families, along with a fall safety agreement, to be successful in preventing serious injuries due to patient falls. DuPree, Fritz-Campiz, and Musheno (2014) reported the results of a collaborative project of seven hospitals with the Joint Commission (TJC) on the prevention of inpatient falls with injury. The 18-month project results showed a decrease in falls with injury of 62% and a decrease in overall falls by 35%. The authors described the key lessons learned: organizational support, awareness, and communication of the integrated fall safety program, patient education and partnerships to develop fall care plans (specifically scheduled toileting routines and assistance ambulating), and increased nursing presence at the bedside.

As part of a multicomponent fall prevention program in six Veterans Health Administration (VHA) facilities, a teach-back tool was implemented to improve patient engagement and retention of fall risk and prevention education (Quigley, Barnett, Bulat, & Friedman, 2016). The fall prevention teach-back tool outlines fall risk, consequences of falls, and safety actions (i.e., calling for assistance to ambulate, particularly to the bathroom). A return

demonstration and knowledge test assessed patient understanding of risk and safety actions. Utilizing the teach back tool to educate patients on fall risk, consequences of falls, and calling for assistance to ambulate, encouraged patients to participate in the plan of care and preserved patient autonomy (Quigley, 2016a). Fifty-five VHA facilities participated in a collaborative project to redesign and expand their fall prevention program (Zubkoff et al., 2016). Changes implemented by the facilities focused on communication: staff education, post-fall huddles, purposeful rounding, and patient handoff. The rate of falls with injuries decreased in participating versus nonparticipating facilities within the VHA system.

Bedside shift reporting. Partnering with patients is a key component in decreasing patient falls. Utilization of bedside reporting engages patients and families in the fall prevention plan of care, fosters teamwork among nurses, and serves to improve communication overall (Gregory, Tan, Tilrico, Edwardson, & Gamm, 2014). During bedside shift report, nurses conduct a verbal report using layperson terminology understandable to the patient and family (Chaboyer, Johnson, Hardy, Gehrke, & Panuwatwanich, 2009). Bedside reporting has shown to be effective in reducing patient falls by improving nurse to nurse and nurse-patient communication (DuPree, Fritz-Campiz, & Musheno, 2014). Sand-Jecklin and Sherman (2013) reviewed falls that occurred in seven medical/surgical units in a university health system and found that bedside reporting decreased the rate of patient falls during change of shift by 35%. Athwal, Fields, and Wagnell (2009) reported a decrease in patient falls as a result of a bedside report initiative at a San Diego community hospital. An important element in preparing for bedside report is rounding the hour prior to shift change in order to offer patients the opportunity to toilet (Lin, Heisler, Fahey, McGinnis, & Whiffen, 2015).

Individualized risk assessment and plans of care. Assessment of patient-specific risk factors is essential in implementing effective fall prevention interventions (Dykes et al., 2017; Ganz et al., 2013; Quigley, Barnett, Bulat, & Friedman, 2016). Common fall risk assessment tools for adult inpatients are the Morse Falls Scale (MFS), the St. Thomas Risk Assessment Tool in Falling Elderly Patients (STRATIFY), the Hendrich II Fall Risk Model (HIIFRM), and the Johns Hopkins Fall Risk Assessment Tool ([JHFRAT]; Zhao et al., 2019). Fall prevention care plans are frequently not individualized based on specific patient risks (Carroll, Dykes, & Hurley, 2010; Quigley, Barnett, Bulat, & Friedman, 2016). Additionally, developing a fall prevention care plan based on an individual's risk is necessary and partnering with the patient and family is crucial in the success of the fall prevention plan (DuPree, Fritz-Campiz, & Musheno, 2014).

Dykes et al. (2010) analyzed the effect of the Fall TIPS (Tailoring Interventions for Patient Safety) program in a randomized controlled trial conducted in four urban U.S. hospitals, and found fall rates to be significantly lower on intervention units than on control units. The Fall TIPS program consists of three steps: fall risk assessment, development of a tailored fall prevention care plan (in addition to general fall protocols), and consistent implementation of the plan. The care plan is developed with the patient based on individual risk factors. A poster is hung at the bedside indicating fall risk and interventions. The care plan addresses the need for ambulation (with assistive equipment, if necessary), and frequent toileting. In a follow-up Fall TIPS conducted at two Northeaster academic medical centers, Dykes et al. (2017) found compliance with Fall TIPS was associated with decreased fall with injury rates and improved patient knowledge of fall risk and prevention. The mean fall with injury rate decreased from 1.00 to 0.54 per 1,000 patient days at Brigham and Women's Hospital and the fall with injury rate at Montefiore Medical Center decreased from 0.47 to 0.31. Duckworth et al. (2019) assessed the

Fall TIPS program in three large hospitals in the Northeast. Study results showed that the Fall TIPS program was successful in improving patient and family engagement in fall prevention.

Hourly rounding. Purposeful rounding (anticipating patient needs, such as the need for pain medications, toileting, positioning, and ambulation, and intervening proactively) is key for hourly rounding to be an effective fall prevention tool (France et al., 2017; Spano-Szekely et al., 2019). France et al. (2017) evaluated a multicomponent fall prevention initiative at an academic medical center in Nashville, Tennessee. The initiative included staff and patient/family education on fall prevention, as well as purposeful rounding, safety huddles and leader rounding, and general/universal precautions (socks, armbands, signage, and bed alarms). Results of the initiative showed a 47% overall reduction in falls with harm hospital wide. Spano-Szekely et al., 2019) studied the implementation of fall prevention program in a community hospital in the Northeast which consisted of purposeful rounding, mobility assessment, and video monitoring. Results showed a 54% reduction in falls from 2.51 per 1,000 patient days to 1.15. Godlock, Christiansen, and Feider (2016) analyzed a team-based project related to fall prevention and determined that hourly rounding and staying with the patient while toileting (in the bathroom or up to the beside commode) were key elements in fall prevention. The authors reported a decrease in falls per 1,000 patient days from 1.9 to 0.69. Titler et al. (2016) conducted a pre-post implementation study at three community hospitals in the Midwest to evaluate a fall prevention program. The program consisted of a fall prevention bundle targeting mobility, elimination, medications, cognition/mental status, and risk for serious injury. Result showed a decrease in fall rates (22%).

Patient sitters and video monitoring. Utilization of sitters (unlicensed staff observing patient one on one) for high-risk fall patient is common (Spetz, Brown, & Aydin, 2015). In a

review of the literature related to sitters, Quigley (2016b) found that the evidence does not support sitters as an effective fall prevention intervention. De Jong, Kitchen, Foo, and Hill (2018) studied patient sitters as a fall prevention intervention and found training for sitters was not adequate. Sitters did not understand their role in keeping the patient safe from falls, specifically related to ambulation and toileting. However, Ayton et al. (2017) found that for patients with dementia, many nurses felt the only effective fall prevention intervention was one-on-one observation by a sitter.

Video monitoring consists of monitoring patients, usually from a webcam, in an observation center manned by a technician (Purvis et al. (2018). Hardin, Dienemann, Rudisill, and Mills (2013) studied utilization of webcams to prevent patient falls in 10 hospitals randomly chosen from a large hospital system. Results showed that use of a webcam and virtual bedrail system for high-risk patients allowed for greater nurse surveillance and medical-surgical units that employed the intervention had fewer total falls than control units. In the intervention group, there was a difference in fall rates per 1,000 admissions compared to the non-intervention groups, although there was not a statistically significant difference in fall rates per 1,000 patient days. Sand-Jecklin, Johnson, and Tylka (2016) conducted a study in which video monitoring was implemented in a large academic medical center in the mid-Atlantic. Results showed a reduction in falls from 3.9 per 1,000 patient days to 2.8, a 28.5% reduction. A similar study was conducted by Purvis et al. (2018). Video monitoring was implemented on eight units in a large academic medical center. A reduction in sitter shifts was seen, yet fall rates were unchanged. A consideration with video monitoring is the cost of monitor technicians, which offsets the cost reduction from decrease sitter shifts (Sand-Jecklin, Johnson, and Tylka, 2016).

Based on this review of the literature we know that falls are a common and devasting

complication of hospital admission for older adults. Falls are especially significant for those with ADRD because they are at high risk to fall and to suffer injuries from falling. Evidence-based fall prevention research demonstrated that programs such as teach back, structured fall risk and safety education for patients and families, as well as fall safety agreements have been effective in reducing falls. However, the research indicates that these interventions are less effective for patients with ADRD, particularly patients with advanced ADRD. Missing is research specific to hospitalized older adults with ADRD to identify critical information on which risk factors to target in order to develop individualized fall prevention interventions. Therefore, in May 2020 I conducted a focused literature review to examine the literature on falls among hospitalized older adults with ADRD.

Focused Literature Review

For this review I used CINAHL and Pubmed and searched using the following terms: fall, hospitalization, and dementia, with no exclusion criteria. This search yielded 89 results. After reviewing the titles and abstracts, articles with non-related content, non-peer reviewed research studies, not written in English, and those with publication dates prior to 2010, 22 were excluded. Sixty-seven studies were retained were for further review. After screening, 25 studies were retained, excluding those not related to falls, cognitive impairment (CI) or ADRD, or older adults. Nineteen of the studies were conducted in settings other than acute inpatient (i.e., nursing home, long-term care, home/community dwelling, hospital outpatient/clinic, sub-acute, and rehabilitation) and these were then excluded. Six were ultimately retained for final analysis. These studies focused on older adults with cognitive impairment or ADRD hospitalized in an acute inpatient setting. Two of the six studies were qualitative (Ayton et al., 2017; Grealish et al., 2019a) and four were quantitative (Chan et al., 2013; Grealish et al., 2019b, Lim, Mamun, &

Lim, 2014; Tzeng & Yin, 2013). Four of the studies focused on nursing, nurses' perceptions of fall occurrences (Ayton et al, 2017; Grealish et al., 2019a, Tzeng & Yin, 2013) and observation of nursing interventions (Grealish et al., 2019b). Two studies focused on fall risk factors (Chan et al., 2013; Lim, Mamun, & Lim, 2014).

Nurses' Perceptions and Behavior. Ayton et al. (2017) studied nurses' perceptions of preventing falls in the acute care setting among patients with dementia. Nurses in this study perceived falls to be "inevitable" for this population when standard fall prevention methods were used. This study was important because of the focus on patients with dementia and the challenges of fall prevention specific to the inpatient setting. This study could have been strengthened by exploring nurses' perception of fall prevention strategies beyond one on one observation by sitters.

Two separate studies published by Grealish et al. in 2019 looked the care of older adults with cognitive impairment to prevent falls in the inpatient setting. The first study (Grealish et al., 2019a) was based on interviews with nursing staff who cared for older cognitively impaired patients who fell. The second study in which nursing staff were observed to determine their adherence to fall prevention and CI guidelines (Grealish et al., 2019b). These studies are important because in both studies the authors concluded that although numerous fall prevention guidelines and resources are widely available, additional research is needed to explore strategies for hospitalized older adults with CI beyond the current standards. Shortcomings of the studies include the lack of definition of older adults or description of how patients were identified as CI (i.e., assessment or diagnosis).

Tzeng and Yin (2013) conducted a descriptive study of nurses' perceptions of fall risk factors and prevention activities. This study is important because results showed that while

nurses perceive CI, AD, and unsteady gait to be risk factors for falls, inconsistencies exist in perceptions of the effectiveness of interventions implemented. Among the top five interventions identified, only one (locking of bed brakes) was identified as both frequently observed as well as effective. A shortcoming of this study is the lack of outcome measures (i.e., fall rates).

Risk Factors. Chan et al. (2013) conducted a prospective case-control study to determine if impaired judgment and a history of falls are associated with cognitive impairment. This study is important because the authors compared fallers to non-fallers and identified impaired judgment of a patient related to safe toileting as a potential fall risk factor. A shortcoming of the study was the lack of evidence to support the mini-mental status exam as a tool to assess CI or dementia.

Lim, Mamun, & Lim (2014) conducted a retrospective study comparing risk factors for falls among hospitalized older with and without dementia. This study is important because of the comparison of fallers with and without dementia, which is lacking in current evidence. Study findings demonstrated fall risk factors associated with dementia include visual impairment, use of an assistive device, confusion, and urinary incontinence. Another important finding is that while a high percentage of patients had confusion at the time of a fall, few patients were diagnosed with dementia, suggesting dementia may be underdiagnosed. The authors also found, similar to Ayton et al., (2017), Grealish et al. (2019a, 2019b) and Tzeng and Yin (2013), that routine fall precautions were ineffective for this vulnerable population. Shortcomings of the lack of description of the sampling method, as well as the data collection tool and process.

Taken together, this review of the literature demonstrates that we know risk factors for falls and that advances have been made in inpatient fall prevention. Less is known specific to hospitalized older adults with ADRD. Nurses in acute care hospitals care for patients with a wide

range of illnesses, as well as varied levels of altered mental status and cognitive impairment. If we better understood risk factors associated with falls among hospitalized older adults with ADRD, more effective, individualized fall prevention care plans could be developed for these patients. Missing from this body of literature is a comparison of hospitalized older adults with ADRD in the acute inpatient care setting who experienced a fall and those who did not. Therefore, the purpose of the study was to determine which risk factors are predictors of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD). To study risk factors among hospitalized older adults with ADRD, a retrospective case-control study was conducted to examine differences in risk factors for older adults with ADRD "fallers" (cases) and "non-fallers" (controls).

Theoretical Frameworks

Three theoretical frameworks were evaluated to determine their applicability fall prevention among hospitalized older adults with ADRD: the Donabedian model, the Quality-Caring Model (QCM) and the Quality Health Outcomes Model (QHOM).

Donabedian model. The Donabedian model is a framework to assess quality of care by evaluating the structure, process, and outcomes that contribute to care (Donabedian, 1966, 1988). Structure includes the setting or system in which care is delivered; processes include patient care activities and interventions, including decision making and appropriateness; outcomes reflect the effect of care on a patient's health status (Cohen & Shang, 2015; Donabedian, 1988). Donabedian's model is a linear model in which a health care system's structure ("having the right things") drives processes ("doing the right things") which produce outcomes ("having the right things happen;" Mitchell, Ferketich, & Jennings, 1998, p. 43).

Evaluating healthcare based on structure, process, and patient outcome measures is an approach recommended by the National Quality Forum (NQF, 2010). The American Nurses Credentialing Center (ANCC) recognizes hospitals for nursing excellence by awarding them Magnet® status. The Magnet® Model promotes excellence in nursing and includes key elements that drive empirical outcomes: transformational leadership, exemplary professional practice, structural empowerment, and new knowledge, innovations, and improvement (ANCC, 2016). Hospitals are evaluated for Magnet® status based on structures, processes, and outcomes for these key elements. The NDNQI collects data on nursing sensitive indicators (NSI) from over 2,000 U.S. hospitals (Yankovsky et al., 2016). Hospitals utilize reporting and benchmarks from NDNQI to analyze structure, process, and outcomes for NSI, such as total falls and falls with injury, to evaluate nursing care (Montalvo, 2007). Quigley and White (2013) outlined characteristics of highly reliable organizations (HRO), which include utilizing Donabedian's model to evaluate structure, process, and outcomes. Kalisch, Tschannen, and Lee (2012) utilized Donabedian's framework in their study of staffing (structure), missed nursing care (process), and patient falls (outcome). Donabedian's framework has also been used in a study of call light response time related to total falls and falls with injury (Tzeng, Titler, Ronis, and Yin, 2012). Variables in the study included nursing hours per patient day (structure), response time (process), and total fall and injurious fall rates (outcome).

Quality Caring Model (QCM). The QCM was originally developed in 2002 by Dr. Joanne Duffy and Dr. Lois Hoskins to guide nursing interventions, incorporating the aspects of caring and quality (Duffy, 2015). The Donabedian model provided a foundation for the QCM. Structural factors include characteristics of patients, healthcare professionals, and the environment. Processes are healthcare interventions and outcomes are the subsequent results of

care (Duffy & Hoskins, 2003). Four main concepts make up the QCM: humans in relationships, relationship-centered professional encounters, feeling cared for, and self-advancing systems (Duffy, 2015). Relationship-centered professional practice is made up of four caring relationships: self, patient/family, community, and the healthcare team (Duffy, 2015). In the QCM, clinical knowledge is the basis for professional relationships with patients and families, leading them "feeling cared for" (Duffy, 2015, p. 296; Duffy & Hoskins, 2003). Patients and families who feel cared for more actively engage in their healthcare, and progress or self-advance toward quality outcomes (Duffy, 2015). The QCM is displayed in Figure 2.

Over 17 U.S. hospitals utilize the QCM as their professional practice model for nursing (Duffy, 2015). The QCM has been used to redesign nursing workflow and organize patient care delivery, focusing on nursing roles, resource allocation, hospital environment, communication, and caring practices (Duffy, Baldwin, & Mastorovich, 2007). Utilizing Duffy's Caring Assessment Tool (CAT), a hospital in the Southeast U.S. measured patient perceptions of nurse caring and implemented interventions based caring relationships in the model, which lead to improved patient perceptions of nursing care (O'Nan, Jenkins, Morgan, Adams, & Davis, 2014).

Quality Health Outcomes Model (QHOM). The QHOM, published in 1998, was developed by the American Academy of Nursing's expert panel on quality health care to provide a framework for evaluating quality of care and outcomes research (Mitchell, Ferketich, & Jennings, 1998; Mitchell & Lang, 2004). The QHOM consists of four constructs: system characteristics, client characteristics, interventions, and outcomes (Mitchell, Ferketich, & Jennings, 1998; Mitchell & Lang, 2004). Although the foundation of the QHOM is the Donabedian model, the QHOM is a dynamic, rather than linear, model that takes into account the interaction among system characteristics, client characteristics, interventions, and outcomes

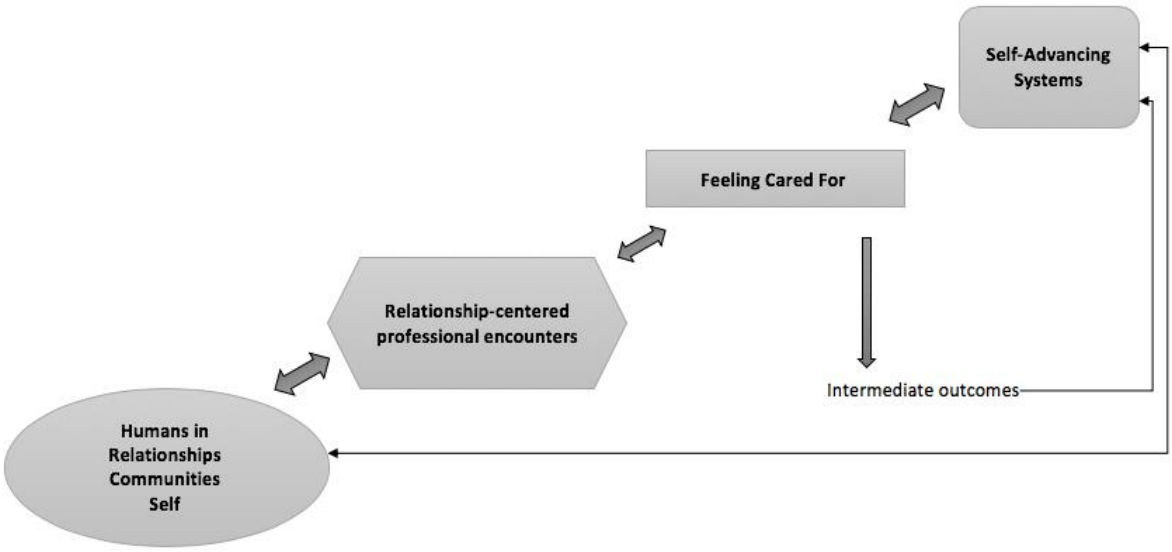

Figure 2: The Quality-Caring Model

Adapted from "Quality caring in nursing and health systems," by J. R. Duffy, 2013, p. 34.

(Mitchell, Ferketich, & Jennings, 1998; Mitchell & Lang, 2004). In the QHOM, interventions are not driven by system or client characteristics alone to achieve a desired outcome. Reciprocal relationships and multiple feedback loops exist, as system and client characteristics, interventions, and outcomes influence one another (Mitchell, Ferketich, & Jennings, 1998; Radwin, & Fawcett, 2002). Figure 1 displays the interaction among the constructs in the QHOM.

System characteristics include hospital or system size, ownership, nursing skill mix, patient demographics, technology, and nursing practice environment; client characteristics consist of health status, demographics, and risk factors for disease (Mitchell, Ferketich, & Jennings, 1998). Interventions include clinical processes and activities involved in the delivery of patient care (Mitchell, Ferketich, & Jennings, 1998). In addition to the traditional outcome measures of death, disease, disability, discomfort, and dissatisfaction, the authors of the QHOM proposed five nursing sensitive outcome categories: self-care, health promoting behaviors, health-related quality of life, feeling well cared for, and management of symptoms (Mitchell & Lang, 2004). These categories describe outcomes resulting from nursing care structures and processes that holistically address the patient's health care experience, including functional, social, psychological, physical and physiologic factors (Mitchell, Ferketich, & Jennings, 1998). The identification of patient outcomes from nursing interventions developed by incorporating patient and system characteristics is a key feature of the QHOM, as is the focus on nursing outcome research to advance nursing science (Cohen & Shang, 2015; Radwin, & Fawcett, 2002).

Framework evaluation. Although Donabedian's model is widely used and applicable to NSI, it is often applied to quality improvement (QI) activities, and I sought a more rigorous nursing research framework for my study. The QCM integrates the concepts of caring, quality nursing care, and positive patient outcomes. This model was not a good fit for hospitalized older

adults with ADRD due to the focus on patient engagement leading to self-advancement. The QHOM is useful in evaluating relationships among structure, nursing process, and patient outcomes (Fawcett & Desanto-Madeya, 2012). In the QHOM, system characteristics include nursing skill mix and staffing; client characteristics consist of demographics and risk factors for disease; interventions include clinical processes and activities involved in the delivery of patient care; outcome measures include death, disability, discomfort, and dissatisfaction (Mitchell, Ferketich, & Jennings, 1998).

System characteristics. Organizational support of a culture of safety is essential to the implementation of effective fall prevention programs (DuPree, Fritz-Campiz, & Musheno, 2014; Quigley, & White, 2013). Studies have shown an association between reduced adverse events and greater levels of nursing surveillance and staffing (Dresser, 2012; Kutney-Lee et al., 2009). Higher levels of total nurse staffing and hours per patient day, as well as higher registered nurse (RN) staffing levels, are associated with fewer inpatient falls (Cox et al., 2015; Everhart et al., 2014; He, Dunton, & Staggs, 2012; Kalisch, Tschannen, & Lee (2012).

Client (patient) characteristics. Increased risk for falls includes age greater than 60, delirium, dementia, and the use of certain medications, such as antihypertensives, diuretics, and sedative hypnotics (Titler et al., 2016). Patient factors associated with falls can be mitigated by nursing interventions (Munsterman, Hodo, and Newcomb, 2018).

Interventions. Total falls and falls with injury are considered nursing sensitive indicators that reflect the quality of nursing care (Burston, Chaboyer, & Gillespie, 2014). Standardized fall risk assessment tools and utilization of universal and general fall precautions are the foundation for multiple fall prevention programs (Ganz et al., 2013). Nursing assessment of patient-specific

risk factors and individualized care plans are key to successful fall prevention interventions (Dykes et al., 2017; Quigley, Barnett, Bulat, & Friedman, 2016).

The constructs of system characteristics, client characteristics, interventions, and outcomes within the QHOM provide an ideal framework to guide research in the area of fall prevention among hospitalized older adults with ADRD.

Chapter Summary

Evidenced-based fall prevention strategies for the inpatient setting exist, less is known about fall prevention interventions specific to risk factors of patients with Alzheimer's disease and related dementias (ADRD). Numerous studies have identified contributing factors related to falls, but how these factors influence falls specific to older adults with ADRD on inpatient units has not been thoroughly evaluated. Few studies have focused on older adults with ADRD in the acute care setting.

Patient and family engagement in fall care planning is effective in reducing falls in the acute care setting. Dykes et al. (2017, 2018) demonstrated that the Fall TIPS program was effective in reducing falls by improving patient and family engagement in risk assessment and care planning. Use of structured fall safety education for patients and families, fall safety agreements, and teach back have also been successful in preventing falls (Quigley, Barnett, Bulat, & Friedman, 2016; Zavotsky, Hussey, Easter, & Incalcaterra, 2014; Zubkoff et al., 2016). For patients with cognitive impairment, programs promoting engagement and education on fall prevention have been not been effective (de Jong, Kitchen, Foo, & Hill, 2018). Programs utilizing multiple interventions, including hourly rounding, toileting and ambulation, are key to the effectiveness of fall prevention programs (Ang, Mordiffi, & Wong, 2011; France et al., 2017; Spoelstra, Given, & Given, 2012; Titler, 2016; Trepanier & Hilsebeck, 2014).

Despite advances in inpatient fall prevention and numerous studies on risk and contributing factors to falls, less is known specific to hospitalized older adults with ADRD. If we better understood risk factors associated with falls among hospitalized older adults with ADRD, effective fall prevention programs structured to prevent falls among these high-risk patients could be developed. The findings of this study will be significant because a better understanding of risk factors associated with falls among hospitalized older adults with ADRD is urgently needed. This study will lay the groundwork for future studies in which effective fall prevention programs are structured to address patient-centered risk factors for older adults with ADRD in the acute inpatient care setting.

Chapter 3: Methods

The purpose of the study was to determine which risk factors are predictors of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD) by comparing those who fell with those who did not fall. Falls are a major problem in acute care hospitals. Inpatient falls are among the most frequently reported adverse events, with approximately 700,000 to 1,000,000 falls occurring annually (Currie, 2008). Patients injured from a fall experience longer hospital stays, and higher morbidity and mortality (Park, 2018; Quigley, Barnett, Bulat, & Friedman, 2016; Spetz, Brown, & Aydin, 2015; Wong et al., 2011). A troubling result of falls in older adults is the limitation or cessation of routine activities due to the fear of falling, leading to decreased independence and quality of life (Oliver, Healy, & Haines, 2010; Roe et al, 2009). Diminished mobility leads to decreased strength, muscle wasting, and debilitation (Oliver, Healy, & Haines, 2010; Spetz, Brown, & Aydin, 2015). Older adults with ADRD are already at risk for functional decline, including difficulty eating, drinking, speaking, and decreased activity (Sloane et al., 2017). Individuals with cognitive impairment, including dementia, are twice more likely to fall than those without cognitive impairment (Chen et al., 2018).

Although evidenced based inpatient fall prevention strategies exist, less is known about fall prevention specific to hospitalized older adults with Alzheimer's disease and related dementias (ADRD). Harlein, Dassen, Halfens, and Heinze (2009), in a systematic review of the literature, found a lack of studies related to fall risk factors in patients with dementia or cognitive impairment. Large-scale research studies which used the National Database of Nursing Quality Indicators (NDNQI) have been constrained because the dataset does not contain data on diagnoses or patients who did not fall. Although several studies have compared patients who

have fallen with those who did not, these studies were not specific to patients with ADRD. Therefore, a case-control design to compare risk factors among hospitalized older adults with ADRD who fell ("fallers") with those who did not ("non-fallers") adds valuable knowledge to the body of research on falls.

Study Design

In case-control studies, a group of subjects with the outcome of interest (cases) are identified and compared to a group of subjects without the outcome of interest (controls), looking backward to identify differences that explain why the groups had different outcomes (Hulley, Cummings, Browner, Grady, & Newman, 2013). With this retrospective design, the researcher starts with the effect and compares exposure patterns to determine the cause, identifying differences between cases and controls in pre-existing conditions (Polit & Beck, 2012). Case-control studies, unlike cohort studies, reason from the outcome back to potential causes; the direction of the inference is an important concept (Borgan, et al., 2018).

Aims and Hypotheses

The central hypothesis of the study is that a relationship exists among patient characteristics (fall risk factors) and falls among hospitalized older adults with ADRD. I tested the difference of structure (patient characteristics) and outcomes (falls) between fallers and non-fallers. The specific aims of this study were:

Aim 1: To describe differences in fall risk factors between fallers and non-fallers. To address this aim, descriptive statistics were compiled.

Aim 2: To determine which risk factors predict falls among hospitalized older adults with ADRD by comparing fallers to non-fallers. To address this aim, I conducted a series of bivariate regression analyses.

Risks and Protections

As only secondary data was used for this study, it posed minimal risk to human subjects. I am employed by EJGH and have access to the EHR and online incident reporting system. As the PI for this study, I was granted permission to access these systems to identify records meeting the study criteria and collect de-identified data. The list used to identify study records was password protected and stored separately from the data collection file on EJGH internal network. Additionally, this MRN list was not transferred outside of EJGH's internal network. Although PHI was present in the EHR, no PHI was collected for the study. The EHR was accessed using my EJGH computer equipment, a desktop computer located in my office at EJGH and a laptop, both of which are password encrypted and protected through a virtual desktop infrastructure (VDI). The de-identified data collection file was password protected. The data file was stored only on the EJGH internal network until data collection was completed. Upon completion of data collection, the de-identified, password protected data file was transferred to and stored in a shared folder on UTK's One Drive to which only Dr. Ruth Lopez, Dr. John Orme, and I had access. One Drive can be used to host institution data, including FERPA-protected information as well as PHI or other materials and information covered by the Health Insurance Portability and Accountability Act of 1996 (HIPAA). HIPAA, PHI and PII can be stored in OneDrive if they're encrypted in transit and at rest. My personal laptop is password encrypted and firewall protected. Dr. Lopez and Dr. Orme have laptop computers which are password encrypted and firewall protected. At no time were the de-identified study data downloaded to Dr. Lopez's or Dr. Orme's personal laptops. Upon completion of the study, the data file will be deleted from One Drive.

Variables

The dependent (outcome) variable in this study was patient falls. The independent variables included patient characteristics (demographics and fall risk factors). Demographic variables included age (in years), race (White (non-Hispanic or Latino)/ non- white (African American, Asian, Hispanic) or Latino), sex (male/female). Fall risk factors included fall history (more than one fall within six months prior to admission) high-risk medications (opiates, anticonvulsants, anti-hypertensives, diuretics, hypnotics, laxatives, sedatives, and psychotropics), elimination (incontinence), mobility (required assistance or supervision, unsteady gait, visual or auditory impairment affecting mobility), cognition (altered awareness of immediate physical environment, impulsive, lack of understanding of one's physical and cognitive limitations), length of stay (in days), diagnosis related group (DRG), high-risk comorbidities (Depression, Stroke, Parkinson's Disease/Seizure Disorder, Hypertension, Heart Failure, Cancer, Diabetes, and severity of illness (minor, moderate, major, extreme). The outcome variable of fall was defined using the NDNQI definition and falls were obtained from the online incident reporting system. Demographics and risk factors were obtained from the electronic health record (EHR). (see Table 1).

Study Sample

The design of a case-control study begins with identifying subjects by outcome status and then categorizing subjects as cases (with the outcome) or controls (without the outcome; Pezzi & Kass, 2014; Song & Chung, 2010). Cases are identified and enrolled, and then a sample of the population that produced the cases (without the outcome of interest) is identified and enrolled as controls (Aschengrau & Seage, 2020). Controls are subjects who reflect the exposure pattern for the source population (population at risk) from which the cases arose so that the outcome of

interest can be compared between exposed and non-exposed groups (Aschengrau & Seage, 2020). Controls should be similar to cases with the exception of having the outcome of interest, as well as similar to the population (Carlson & Morrison, 2009). Cases must be clearly defined and controls must be sampled independently of exposure status (Aschengrau & Seage, 2020).

The sample was defined as a patient, aged 60 or older, with a diagnosis of ADRD (primary or secondary), discharged from an acute inpatient unit (excluding post-acute skilled nursing, rehabilitation, and geriatric behavioral health) during a 36-month period (October 2016 through September 2019). The sample was drawn from the population described above to include all cases (fallers). The controls (non-fallers) were randomly sampled.

Statistical power is the probability of a design to detect a true relationship among variables (Polit & Beck, 2012). A power analysis was conducted utilizing the Epi Info™ application from the CDC (2018). For a 2-sided confidence interval of 95%, a power of 80%, and a ratio of controls to cases of 1:1, the recommended sample size is 97 cases and 97 controls, in order to detect an odds ratio (OR) of at least 2.25. An OR of 2.5 indicates a moderate (or medium) strength of the relationship between independent and dependent variable (Orme & Combs-Orme, 2009). The study sample consisted of 100 cases (fallers) and 100 controls (non-fallers).

Study Setting

The study hospital was an acute care hospital located in the Southeast U.S. East Jefferson General Hospital (EJGH) is a publicly owned, 400-bed non-profit, community hospital located in a suburb of New Orleans, Louisiana. EJGH is an acute care facility specializing in cardiovascular and stroke care. Other hospital services include cancer care, neurology, orthopedics, radiology, rehabilitation, surgery, and woman and newborn care. EJGH has one intensive care unit (ICU),

one cardiac care unit (CCU), three telemetry units (2 East [cardiac step-down], 3 East [cardio-pulmonary step-down, 5 East [neurologic step-down]), one medical-surgical unit (6 East), one oncology unit (6 South), and one orthopedic unit (7 East). Although specialized units exist, admissions are not limited to these units by diagnosis. There are also three post-acute units: inpatient rehabilitation unit, skilled nursing (SNF), and geriatric behavioral health (GBH). Medicare or Medicare Advantage is the primary payer for EJGH's patient population (65%).

Inclusion and Exclusion Criteria

Inclusion criteria were defined as follows: patients with a diagnosis of ADRD (primary or secondary), aged 60 or greater, admitted to an acute inpatient unit during a 36-month period. Skilled nursing and rehabilitation and geriatric behavioral health units will be excluded, as these are post-acute care units. Cases and controls should meet the same inclusion criteria (Song & Chung, 2010). Hospital based samples may have risk factors associated with the risk factors being studied (Hulley, Cummings, Browner, Grady, & Newman, 2013). For selection of control cases, Pezzi and Kass (2014) assert that the risk factor of interest should be unrelated to the reason for the hospital admission in the control group. If patients in the sample were admitted for reasons related to a fall or other applicable high-risk factors, they may not be representative of the population due to higher risk of falling. Therefore, patients with an admitted diagnosis of a traumatic fall were excluded from the study.

Study Procedures

Two data sources were used: the online incident reporting system to identify patients with falls and the electronic health record (EHR) to identify risk factors.

Record identification. I extracted a list of falls by MRN from the hospital online incident reporting system during the study period. All falls, as defined by NDNQI, are entered

into the online incident reporting system per the hospital's fall policy. NDNQI (2016) defines a patient fall as "a sudden, unintentional descent, with or without injury to the patient, that results in the patient coming to rest on the floor, on or against some other surface (e.g., a counter), on another person, or on an object (e.g., a trash can). When a patient rolls off a low bed onto a mat or is found on a surface where you would not expect to find a patient, this is considered a fall. If a patient who is attempting to stand or sit falls back onto a bed, chair, or commode, this is only counted as a fall if the patient is injured." Falls with injury are categorized as minor (e.g., bruise, abrasion), moderate (requiring suturing, steri-strips), major (requiring surgery, all fractures), and death (NDNQI, 2016). The NDNQI is the largest repository of hospital fall data in the U.S. and the fall definition is widely accepted as the hospital industry standard (Garrard, Boyle, Simon, Dunton, & Gajewski, 2016). The online incident reporting system is monitored to ensure appropriate categorization of patient safety events as falls. Standard reports currently exist within the online reporting system to identify patients with falls. Additionally, there is process of systematic review of additional hospital fall data sources as a back-up to the online reporting system. Falls are identified through standard reports (i.e., diagnosis related complication codes, daily administration report) and are entered into the online reporting system, if they had not already been reported.

Additionally, I extracted a list of records from the EHR, by medical record number (MRN), of persons age 60 and older with a diagnosis of ADRD admitted to an acute care unit between October 1, 2013 through September 30, 2019. The lists were cross referenced to identify records of fallers and non-fallers.

Data Collection

Data were obtained from electronic hospital records (EHR) to identify risk factors. Electronic hospital databases often serve as sources for cases and controls in case-control studies (Aschengrau & Seage, 2020; Hackshaw, 2015). A data collection tool was developed to capture all study variables. Once the records were identified, I extracted study data elements from the EHR. Risk factors (age, fall history, medications, elimination, mobility, cognition, length of stay, reason for admission, comorbidities, and severity of illness) were collected from the EHR by conducting chart reviews of clinical documentation. Sources with the EHR included patient demographics, history and physical (H&P), physician progress notes, nursing documentation (history, assessments, notes), physical therapy (PT) assessment and progress notes, medication administration record (MAR), final coding summary, and data from the Johns Hopkins Fall Risk Assessment Tool (JHFRAT). The JHFRAT captures data on evidence-based fall risk factors (Klinkenberg & Potter, 2017).

For this study, I was the only person with access to the EHR and the only person separating data from the identified EHR. Data collected from the EHR were de-identified by removing the MRN and substituting a study identification (ID) number. At no point were the data re-identified and no Protected Health Information (PHI) was be collected. All data were captured electronically. Table 1 displays variables, definitions, and data sources.

Data Analysis

De-identified data were analyzed using SPSS version 26. Descriptive statistics were compiled on the percentage of cases and controls with fall risk factors. Regression methods described in Table 1 were performed to determine the relationship of risk factors to falls for hospitalized older adults with ADRD and determine statistical significance, directionality, and

magnitude of the relationships. Appropriate measure of effect size and 95% confidence interval (CI) were determined. Alpha 05, two-tailed is considered to indicate statistical significance. Table 2 displays the appropriate method of analysis for the type of study variable (Borgan et al., 2018; Orme & Combs-Orme, 2009). In the analysis of case-control design data, the role of dependent and independent variables are reversed. In the regression model, the outcome measure is treated as a cofactor while the risk factor is treated as the dependent variable (Borgan et al., 2018; Keogh & Cox, 2014).

Ethical Considerations

The research protocol was reviewed and approved by the University of Tennessee Knoxville Institutional Review Board (IRB). EJGH issued a letter of support from their Chief Compliance Officer and the EJGH IRB waived oversight.

Potential Limitations

Sample. A potential disadvantage in case-control studies is sampling bias, when the sample of cases or controls is not representative of the population (Hulley, Cummings, Browner, Grady, & Newman, 2013). Sampling bias may limit generalizability of case-control results (Hulley, Cummings, Browner, Grady, & Newman, 2013; Lesser, 2012). Hospital based samples may have risk factors associated with risk factors being studied (Hulley, Cummings, Browner, Grady, & Newman, 2013). For selection of control cases, Pezzi and Kass (2014) assert that the risk factor of interest should be unrelated to the reason for the hospital admission in the control group. If patients in the sample were admitted for reasons related to a fall, they may not be representative of the population due to the higher risk of falling. Patients who experience multiple falls during the course of one inpatient admission stay and those patients with an admitted diagnosis of a traumatic fall will be excluded.

This study may not be generalizable to hospitals of different sizes, case mixes, and geographic locations, or to other healthcare settings. Sample size is also another potential limitation of the study. Small samples may be less likely to be representative of the population and are also a threat to statistical conclusion validity (Polit & Beck, 2012).

Design. Confounding is an issue in case control studies and a threat to internal validity Also referred to as a common cause variable, a confounder is a variable that is the cause of of the outcome and is associated with the predictive variable (Hulley, Cummings, Browner, Grady, & Newman, 2013; Orme & Combs-Orme, 2009).When extraneous variables are associated with the risk factor, and outcome of interest are not evenly distributed among the cases and controls, confounding occurs and leads to misinterpretation of the association between the risk factor and the outcome (Prezzi & Kass, 2014). Confounding may also conceal the association between risk factors and the outcome (Lesser, 2012). Statistical adjustment during the analysis is can be used to control for confounding variables (Hulley, Cummings, Browner, Grady, & Newman, 2013; Suarez, Perez, Rivera, & Martinez, 2017). History of a prior fall within six months may be a confounder in this study and was addressed through regression analysis.

The internal validity of the study depends on comparability of the two groups and the cases and controls should meet the same inclusion criteria (Song & Chung, 2010). Internal validity is defined as "the validity of inferences about whether observed covariation between A (the presumed treatment) and B (the presumed outcome) reflects a causal relationship from A to B as those variables were manipulated or measured" (Shadish, Cook, & Campbell, 2002, p. 38). A potential threat to internal validity is an inability to determine which variable preceded another. Detection bias, which occurs when study participants who are exposed to a risk factor are more likely to be screened, may be an issue (Lesser, 2012). This threat was minimized by drawing

the cases and controls from the same population with the same inclusion criteria. Additionally, patients admitted due to a traumatic fall were excluded from this study thus minimizing this threat.

Measurement. Potential limitations of the measurement plan are incomplete or inaccurate data. Barriers to patient safety event reporting exist, such as time-consuming reporting systems that are not user friendly, leading to decreased reporting (Flott, et al., 2018). At EJGH, falls are captured through an online incident reporting system, with a process of systematic review of additional hospital fall data sources as a back-up (e.g., daily administrative report, coded complications report). Klinkenberg and Potter (2017) examined the reliability of JHFRAT using data collected from a large academic medical center with over 13,000 patient admissions in one year. The researchers found four percent of patient records had no JHFRAT at any time during the admission. Completeness and accuracy of records in case-control studies can decrease internal validity (Song & Chung, 2010). Measurement error can occur, leading to difficulties in finding associations, and biasing the odds OR toward one (no association between exposure and outcome (Keogh & Cox, 2014). Data collection for this study was not limited to the JHFRAT, but also included H&Ps, physician progress notes, nursing documentation (history, assessments, notes), physical therapy (PT) assessment and progress notes, medication administration record (MAR), and final coding summary.

Another potential limitation of the measurement plan is inadequate inter-rater agreement or reliability among the chart reviewers. Polit and Beck (2012) define inter-rater reliability (IRR) as “the degree to which two raters or observers, operating independently, assign the same ratings or values for an attribute being measured or observed” (p. 731). I was the only person with access to the EHR and the only person separating data from the identified EHR. I have extensive

experience in chart review and as the director of quality management and patient safety officer, I manage the online reporting system and have oversight of fall data entry in NDNQI. I also serve as a consultant to the hospital's fall prevention committee.

Reporting bias or information bias may also be a concern if assessment of risk factors or clinical documentation is inaccurate (Borgan et al., 208; Lesser, 2012). Bias may contribute to over or underestimating the association between the risk factor and the outcome (Hackshaw, 2015). While age, reason for admission, medications, LOS, and coded SOI may be easily obtainable from the EHR, other variables may be more difficult to measure. Patients may be poor historians and not accurately report their falls history and all comorbid conditions may not be documented by the health care providers. Also, level of cognition, elimination needs, and mobility may change over the course of the inpatient stay.

Chapter Summary

Despite advances in inpatient fall prevention, less is known about fall risk factors specific to hospitalized older adults with ADRD. The findings of this study will be significant because a better understanding of patient characteristics (risk factors) and outcomes (falls) will help in the development of effective fall prevention programs which address specific risk factors for these patients. Determining the relationship between exposure and outcome is the goal of a case-control study. A strength of case-control studies is that numerous risk factors can be evaluated (Aschengrau & Seage, 2020; Hulley, Cummings, Browner, Grady, & Newman, 2013). This is major strength of the case-control study design in relation to falls, as multiple risk factors have been identified in the literature. With a rigorous study design, the advantages of a case-control study can outweigh the disadvantages (Aschengrau & Seage, 2020; Hulley, Cummings, Browner, Grady, & Newman, 2013). The ability to evaulate multiple risk factors and the ability to compare

“fallers” to “non-fallers” make the case-control design well suited to identifying risk factors among hospitalized older adults with ADRD.

Chapter 4: Results

The purpose of the study was to determine which risk factors predict of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD) by comparing those who fell with those who did not fall. In this chapter, I will report results of a series of bivariate regression analyses, as well as descriptive statistics. There was a statistically significant relationship between falls and: length of stay (LOS), sex, race, agitation/restlessness, altered awareness of immediate physical environment, the diagnosis related group (DRG) of infectious disease, elimination (incontinence), required assistance required for ambulation, and unsteady gait. There was no statistically significant relationship between falls and: age, high-risk comorbidities, high-risk medications, severity of illness (SOI), confusion, forgetfulness, impulsivity, lack of understanding of one's physical and cognitive limitations, use of an assistive device, history of a fall within six months, use of an assistive device to ambulate (e.g., cane, walker), visual or auditory impairments affecting mobility.

Sample

The sample consisted of 100 cases (fallers) and 100 controls (non-fallers). Patients ranged in age from 61 to 98 years old (M = 82.22, Mdn = 83, SD = 8.53, IQR = 12). Fifty-six percent (112) were female and 44% (88) male. Ninety-one percent (182) were white, non-Hispanic or Latino and 9% (18) non-white (African American, Asian, Hispanic or Latino). Length of stay ranged from 1 to 36 days (M = 6.23, Mdn = 5, SD = 5.17, IQR = 4). The number of high-risk comorbidities ranged from zero to five (M = 2.01, Mdn = 2, SD = 1.04, IQR = 2). The number of high-risk medications ranged from zero to six (M = 2.84, Mdn = 3, SD = 1.29, IQR = 2).

Aims and Hypothesis

The central hypothesis of the study is that a relationship exists between patient characteristics (fall risk factors) and falls among hospitalized older adults with ADRD. I tested the difference of structure (patient characteristics) and outcomes (falls) between fallers and non-fallers. The specific aims of this study were:

Aim 1: To describe differences in fall risk factors between fallers and non-fallers. To address this aim, descriptive statistics were compiled (Tables 3, 4, 5).

Aim 2: To determine which risk factors predict falls among hospitalized older adults with ADRD by comparing fallers to non-fallers. Results of a series of bivariate regression analyses are discussed below.

Variables without Statistically Significant Differences

There was no statistically significant relationship between falls and: age, number of high-risk comorbidities, or number of high-risk medications, SOI, disorientation/confusion, forgetfulness, impulsivity, lack of understanding of one's physical and cognitive limitations, use of an assistive device, history of a fall within six months, use of an assistive device to ambulate (e.g., cane, walker), or visual or auditory impairments affecting mobility. Additional analysis comparing each high-risk comorbidity to all others showed no statistically significant relationship. Similarly, analyses comparing each high-risk medication category to all others showed no statistically significant relationship. Results for each of the variables can be found in the following tables: age, Table 6; number of high-risk comorbidities, Table 7; number of high-risk medications, Table 8; severity of illness, Table 9; cognition–disorientation/confusion, Table 10; cognition–forgetfulness, Table 11; cognition–impulsive, Table 12; cognition–lack of understanding of physical environment, Table 13; equipment–use of assistive device, Table 14;

history of fall within 6 months, Table 15; and mobility–visual/auditory impairment, Table 16.

Variables with Statistically Significant Differences

There was a statistically significant relationship between falls and LOS, sex, race, agitation/restlessness, altered awareness of immediate physical environment, infectious disease DRG, elimination (incontinence), required assistance for ambulation, and unsteady gait.

Length of Stay (LOS). To assess the predictive value of length of stay in days, I initially conducted a Poisson regression analysis on LOS. The LaGrange multiplier test showed over dispersion; therefore, I conducted a negative binomial regression. Patients who experienced a fall had almost a 30% longer length of stay than those who did not fall (OR = 1.29, Table 17).

Sex. The odds of falling were 48% lower for females versus males (OR = 0.52) (Table 18). An OR of this size indicates that the strength of this relationship is weak to moderate.

Race. The odds of falling were 291% higher for non-whites (OR = 3.91) (Table 19). This OR indicates that the strength of this relationship is strong.

Cognition. Variables related to cognition with statistically significant differences between fallers and non-fallers.

Agitation/restlessness. For patients with agitation and restlessness, the odds of falling were 1,768% higher (OR = 18.86) (Table 20). An OR of this size indicates a very strong relationship, but an OR this large is highly unusual and the sample size must be taken into consideration. Seventeen patients had documentation of agitation and restlessness and of these patients, only one did not experience a fall. Consequently, the estimate of the OR is imprecise as evidenced by the confidence interval (3.78 to 343.71).

Altered awareness of immediate physical environment. For patients with an altered awareness of their immediate physical environment, the odds of falling were 47% lower (OR 0.53) (Table 21). An OR of this size indicates that the strength of this relationship is weak.

Diagnosis Related Group (DRG). A total of 87 DRGs were combined into eight categories based on body system/condition (Neuro/Head/Neck, Respiratory/Pulmonary, Cardiac, GI, Ortho/Skin, Endocrine/Renal/GU, Infectious Disease). Eight dichotomous variables were created, and each was compared to all others. With the exception of infectious disease (primary diagnosis of sepsis) there was not a statistically significant difference between fallers and non-fallers. For patients with an infectious disease related DRG, the odds of falling were 61% lower (OR = 0.39) (Table 22). An OR of this size indicates that the strength of this relationship is moderate.

Elimination. The odds of falling were 56% lower for patients with incontinence (OR = 0.43) (Table 23). An OR of this size indicates that the strength of this relationship is moderate.

Mobility. Variables related to mobility with statistically significant differences between fallers and non-fallers.

Required assistance. For patients who required assistance ambulating, the odds of falling were lower by 48% than for patients who were able to ambulate independently (OR = 0.52) (Table 24). An OR of this size indicates that the strength of this relationship is weak to moderate.

Unsteady gait. Patients with an unsteady gait had 253% higher odds of falling (OR = 3.53) (Table 25). An OR of this size indicates that the strength of this relationship is strong.

Chapter Summary

The purpose of the study was to determine which risk factors are predictors of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD) by

comparing those who fell with those who did not fall. The first aim of this study was to describe fall differences in risk factors between fallers and non-fallers. The second aim was to determine which risk factors predict falls among older hospitalized adults with ADRD by comparing fallers (cases) to non-fallers (controls).

Analyses demonstrated statistically significant relationships between falls and LOS, sex, race, cognition (agitation/restlessness, altered awareness of immediate physical environment), infectious disease DRG, elimination (incontinence), and mobility (required assistance for ambulation and unsteady gait). There was no statistically significant relationship between falls number of high-risk comorbidities, and the number of high-risk medications. Additional analysis comparing each high-risk comorbidity to all others showed no statistically significant relationship. Similarly, analyses comparing each high-risk medication category showed no statistically significant relationship. No statistically significant relationship was found between the following study variables and falls: age, disorientation/confusion, forgetfulness, impulsivity, lack of understanding of one's physical and cognitive limitations, use of an assistive device, history of a fall within six months, use of an assistive device to ambulate (e.g., cane, walker), or visual or auditory impairments affecting mobility. In the following chapter, I will discuss the importance, limitations, and implications of the findings.

Chapter 5: Discussion

The purpose of the study was to determine which risk factors are predictors of falls among hospitalized older adults with Alzheimer's disease and related dementias (ADRD) by comparing those who fell with those who did not fall. The first aim of this study was to describe fall differences in risk factors between fallers and non-fallers. The second study aim was to determine which risk factors predict falls among older hospitalized adults with ADRD by comparing fallers (cases) to non-fallers (controls). In this chapter, I will discuss the findings, compare them to prior research, and discuss the limitations and implications of the study findings.

The sample consisted of 100 cases (fallers) and 100 controls (non-fallers). Patients ranged in age from 61 to 98 years old (M = 82.22, Mdn = 83, SD = 8.53). Fifty-six percent (112) of patients were female and 44% (88) were male. Ninety-one percent (182) were white, non-Hispanic or Latino and 9% (18) were African American, Asian, Hispanic or Latino.

Demographics

Age. All patients in this study were age 61 and older. Age greater than 60 is a known risk factor for falls in the acute care setting (deSouza et al., 2019; Zhao & Kim, 2015), and patients of 85 or older have the highest risk (Oliver, Healey, & Haines, 2010). Results of this study showed no statistically significant differences based on age. Galik, Holmes, and Resnick (2018), studied nursing home residents age 55 and older with cognitive impairment and found no significant association between age and falls. These findings highlight the need to assess hospitalized older adults with ADRD for individual fall risk factors beyond age.

Sex. Multiple studies have identified male sex as a risk factor for falls (Currie, 2008; Lucero et al., 2018; Oliver, Healey, & Haines, 2010; Rochat, Monod, Seematter-Bagnoud, Lenoble-Hoskovec, & Bula, 2013), although no statistically significant association between sex

and falls among nursing home residents with cognitive impairment was found in a study by Galik, Holmes, and Resnick (2018). In this study, the odds of falling were 48% lower for females than for males (OR = 0.52), a relatively weak to moderate relationship. Although sex is not a modifiable risk factor, including sex as a fall risk assessment in the acute care setting may be beneficial in raising awareness of male sex as a risk factor.

Race. The evidence on the association between race and falls is inconsistent. Nicklett and Taylor (2014) studied data from the Health Retirement Study for more than 10,000 older adults and found African Americans had lower odds of experiencing a fall than non-Hispanic whites. Geng, Lo, Brickner, and Gordon (2017) studied over 6,000 older women and found the risk of falls were lower among African Americans and Asians. Han, Ferris, and Blaum (2014) conducted a systematic review of literature of fall risk and ethnicity and race among community dwelling older adults. The authors reported lower fall rates among African Americans and Asian American, when compared to whites, and similar fall rates for Hispanic Americans. The authors noted gaps in the literature on how known fall risk factors (i.e., medications, comorbidities, and CI) differ based on race and ethnicity. In a study of older nursing home residents with CI, Galik, Holmes, and Resnick (2018) found no statistically significant association between race and falls. In this study the odds of falling were 291% higher for non-whites (OR = 3.91), a relatively strong relationship. There were no statistically significant differences in LOS, SOI, number of comorbid conditions, or number of high-risk medications between white and non-white fallers. The results of this study indicate that for hospitalized older adults with ADRD, race may be a strong predictor of falls. This supports the conclusion of Han, Ferris, and Blaum (2014) that additional research on fall risk factors specific to African Americans, Asians, Hispanics, and Latinos is warranted.

Study Findings

Agitation/Restlessness. For patients with agitation and restlessness, the odds of falling were 1,768% higher (OR = 18.86), a very strong relationship. However, an OR this large is unusual and the sample size must be taken into consideration (*n* =17 patients with documented agitation and restlessness). While this sample size is small, it is important to note that 94% (16) of patients with agitation and restlessness experienced a fall. This study is consistent with the literature that agitation and restlessness are risk factors for falls (Currie, 2008), specifically for patients with dementia or cognitive impairment (Galik, Holmes, and Resnick 2018; Oliver, Healey, & Haines, 2010). This finding is important, as it identifies a modifiable risk factor for which nursing interventions can be targeted to prevent falls among older hospitalized adults with ADRD.

Altered awareness of immediate physical environment. Contrary to findings reported in the literature, in this study, for patients with an altered awareness of their immediate physical environment, the odds of falling were 47% lower (OR = 0.53), a relatively weak relationship. Cognitive impairment is a well-documented fall risk factor (Currie, 2008; Gu, Balcaen, Ampe, Goffin, 2016; Zhao & Kim, 2015). Although this study did not include nursing interventions in place to prevent falls, purposeful rounding, which is part of the hospital's fall prevention policy, may have been a mitigating factor. Hourly, or purposeful, rounding includes pain management, toileting, positioning, and placement of patient's belongings within reach (France et al., 2017; Spano-Szekely et al., 2019). Purposeful rounding to address patient needs related to ambulation and toileting has also been shown to reduce falls (Godlock, Christiansen, and Feider, 2016; Spano-Szekely et al., 2019).

Diagnosis Related Group (DRG). Results showed no statistically significant relationship between falls and DRG, with the exception of infectious disease (primary diagnosis of sepsis). For patients with an infectious disease related DRG (the majority of which were a primary diagnosis of sepsis), the odds of falling were 61% higher (OR = 0.39). An OR 0.39 indicates that the strength of the relationship between falls and an infectious disease related DRG is relatively moderate. Only one study was identified in which researchers studied DRGs and falls, and the findings were not consistent with my study. Hill, Vu, and Walsh (2007), in a retrospective observational study of over 1,000 falls in an Australian acute care hospital, found dementia, delirium, and other disorders of the nervous system to be the top three DRGs among patients who fell. Additional research is needed to explore falls among ADRD patients to understand how sepsis influences fall risk.

Elimination. Results related to incontinence are inconsistent with the literature. In this study, the odds of falling were lower by 56% for patients with incontinence (OR = 0.43). An OR 0.43 indicates that the strength of the relationship between falls and incontinence is moderate. Incontinence is a well-documented risk factor for falls among older adults in an acute care setting (Gu, Balcaen, Ampe, Goffin, 2016; Oliver, Healey, & Haines, 2010; Titler, Shever, Kanak, Picone, & Qin, 2011). Lim, Mamun, & Lim (2014) found incontinence to be associated with falls among older patients with dementia in an inpatient setting. Upon reflection, the findings of my study suggest there may have been nursing interventions in place, such as purposeful rounding with a focus on toileting. Nursing interventions were not included in this study and further evaluation is recommended.

Length of Stay. Patients who experienced a fall had almost a 30% longer length of stay than those that did not fall (OR = 1.29). Longer lengths of stay for patients experiencing a fall is

consistent with literature (Morello, et al, 2015; Najafpour, Godarzi, Arba, & Yaseri, 2019; Wong et al., 2011). The patient's LOS at the time of the fall was not included in this study. Additional research to determine if patients had a longer LOS *prior* to a fall would be valuable to better understand the role of LOS in fall risk, determining if longer LOS is a risk factor for falls or if falls drive longer LOS.

Required assistance. For patients who required assistance ambulating, the odds of falling were lower by 48% than for patients who were able to ambulate independently (OR = 0.52), a relatively weak to moderate relationship. This finding is inconsistent with the literature which demonstrates that patients with limited or impaired mobility are at greater risk for falls (Titler, Shever, Kanak, Picone, & Qin, 2011; Yip, Mordiffi, Wong, & Ang, 2016; Zhao & Kim, 2015). The findings suggest there may have been other factors in play (i.e., mitigating effect of nursing interventions focused on safe ambulation).

Unsteady gait. Consistent with findings reported in the literature, in this study, patients with an unsteady gait had 253% higher odds of falling (OR = 3.53), a relatively strong relationship. Unsteady gait is a well-documented risk factor for falls among older adults (Berry & Miller, 2008; Callis, 2016; Gu, Balcaen, Ampe, Goffin, 2016; Tinetti & Kumar, 2010; Titler, Shever, Kanak, Picone, & Qin, 2011), particularly for patients with dementia or cognitive impairment due to poor balance and gait instability (Lach, Harrison, & Phongphanngam, 2017; Oliver, Healey, & Haines, 2010; Shaw & Kenny, 1998; Vassallo et al, 2009; Whitney, Close, Jackson, & Lord, 2012). This finding is important, as it identifies a modifiable risk factor for which nursing interventions can be targeted to prevent falls among patients with ADRD in the acute inpatient setting.

Disorientation/confusion. Results of the analysis showed no statistically significant relationship between falls and patients with disorientation/confusion. This finding is inconsistent with the literature, which demonstrates and association between confusion and increased fall risk (Titler, Shever, Kanak, Picone, & Qin, 2011; Yip, Mordiffi, Wong, & Ang, 2016). Lim, Mamun, & Lim (2014) found confusion to be associated with falls among older patients with dementia in an inpatient setting. This variable was collected from the nursing assessment of cognition. As this is a subjective observation, there could have been variations in assessment. Utilization of the Confusion Assessment Method (CAM) to assess cognition would allow for a more precise measurement of disorientation or confusion. Additionally, the stage of ADRD was not included in this study.

Equipment. Use of an assistive device has been shown to be a fall risk factor (Gu, Balcaen, Ampe, Goffin, 2016). Lim, Mamun, & Lim (2014) found use of an assistive device to be associated with falls among older patients with dementia in an inpatient setting. Results of the analysis, which are inconsistent with the literature, showed no statistically significant relationship between patients who used an assistive device to ambulate (e.g., cane, walker) from those who did not. This variable was collected from the nursing fall risk assessment tool. No formal mobility assessment tool was in place to assess device utilization and nursing observations of device usage could have varied.

Forgetfulness. Results of the analysis showed no statistically significant relationship between falls and patients with forgetfulness. This finding is inconsistent with the literature. In the acute care setting, patients with short-term memory loss and those who are not able to follow directions have an increased fall risk (Currie, 2008). In a residential care setting, patients with cognitive impairment who fell were more often had memory impairment and difficulty with

attention (Whitney, Close, Jackson, & Lord, 2012). As with disorientation/confusion, this variable was collected from the nursing assessment of cognition. As this is based on subjective observation, there could have been variations in nursing assessments. Additionally, the stage of ADRD was not included in this study.

High-risk comorbidities. Results of the analysis showed no statistically significant relationship between the number of high-risk comorbidities and falls. Additional analysis comparing each high-risk comorbidity to all others showed no statistically significant relationship. This finding is inconsistent with the literature, which shows the number of comorbidities (Currie, 2008; Galik, Holmes, & Resnick, 2018; Lucero, et al., 2018) is associated with increased risk of fall, and is associated with falls among older adults with cognitive impairment (Galik, Holmes, & Resnick, 2018 Additionally, the literature shows that certain chronic conditions, such as depression, diabetes, Parkinson's, stroke, heart failure, cancer, are associated with an increased risk of falls (Berry & Miller, 2008; Gu, Balcaen, Ampe, Goffin, 2016; Whitney, Close, Jackson, & Lord, 2012). Depression has been shown to be associated with falls among patients with cognitive impairment (Galik, Holmes, & Resnick, 2018; Whitney, Close, Jackson, & Lord, 2012) and dementia (Allan, Ballard, Rowan, and Kenny, 2009). Data for this variable were collected from the final coded diagnoses summary. Healthcare providers may not have documented all comorbid conditions.

High-risk medications. Results of analysis showed no statistically significant relationship between the number of high-risk medications and falls. Analyses comparing each high-risk medication category showed no statistically significant relationship. This finding is inconsistent with the literature, which shows increased fall risk among older adults associated with high risk medications including anti-epileptics, antipsychotics, benzodiazepines, sedatives,

hypnotics, antidepressants, opioids, diuretics, and laxatives (Currie, 2008; Huang et al., 2012; Tinetti & Kumar, 2010; Titler, Shever, Kanak, Picone, & Qin, 2011). Anti-epileptics, antipsychotics, benzodiazepines, nonbenzodiazepines, benzodiazepine receptor agonist hypnotics, Eszopiclone, Zaleplon, Zolpidem, antidepressants, and opioids are included in the American Geriatrics Society (AGS) Beers® Criteria (2019) for potentially inappropriate medication use in older adults with a history of falls or fractures. Patients with cognitive impairment taking antidepressants are more likely to experience a fall (Whitney, Close, Jackson, & Lord, 2012). The total number of fall risk increasing drugs (FRIDs) a patient takes is also associated with increased fall risk (Gu, Balcaen, Ampe, Goffin, 2016; Lucero et al, 2018). In a study of comparing fallers to non-faller with moderate to severe cognitive impairment in nursing homes, falls were associated patients taking more than one psychotropic medication, but not for patients taking antiseizure medications, antidepressants, anxiolytics, or antipsychotics (Galik, Holmes, & Resnick, 2018). As medication reconciliation is required for nursing and physicians in the inpatient setting, it is unlikely that this is a documentation issue. This is an anomalous finding, requiring further exploration.

History of more than one fall within six months. Results of the analysis showed no statistically significant between patients with a prior history of more than one fall within six months of their hospital admission. This finding is inconsistent with the literature. History of a fall is a well-documented risk factor for older adults in an acute care setting (Currie, 20008; Gu, Balcaen, Ampe, Goffin, 2016; Lucero et al., 2018; Oliver, Healey, & Haines, 2010; Titler, Shever, Kanak, Picone, & Qin, 2011; Zhao & Kim, 2015). History of falls has also been shown to be a fall risk factor for older adults with dementia or cognitive impairment (Harlein, Dassen, Halfens, & Heinze, 2009).

Impulsiveness. Results of the analysis showed no statistically significant relationship between falls and patients displaying impulsive behavior. This finding is inconsistent with the literature as impulsivity has been found to be associated with a higher fall risk in the acute care setting (Currie, 2008). Whitney, Close, Jackson, and Lord (2012), in a residential care setting, found patients with cognitive impairment were more likely to be exhibit impulsive behavior. As this is based on observations of impulsive behavior, there may have been variations in nursing assessments.

Lack of understanding one's physical and cognitive limitations. Results of the analysis showed no statistically significant relationship between falls and patients who displayed a lack of understanding their physical and cognitive limitations. This finding is inconsistent with the literature. Chan et al, 2013 found impaired judgement to be associated with falls among patients with dementia or cognitive impairment. This variable was collected from the nursing fall risk assessment. As with the variable of disorientation/confusion, utilization of the Confusion Assessment Method (CAM) to assess this variable would allow for a more precise measurement of disorientation or confusion.

Severity of illness (SOI). Severity of illness related to falls is not well studied. This study's finding demonstrated no statistically significant relationship between SOI and falls. Naessens et al. (2012) conducted a retrospective cross-sectional study of over 60,000 discharges from the Mayo Clinic Rochester, Minnesota and found higher admission SOI to be associated with adverse patient safety events, including, but not limited, to falls. SOI is a factor that to be considered for further evaluation.

Visual or auditory impairment affecting mobility. Contrary to findings from the literature, results of the analysis showed no statistically significant relationship between falls and

visual or auditory impairment. Visual impairment has been shown to be a fall risk factor for older adults (Berry & Miller, 2008; Currie, 2008; Najafpour, Godarzi, Arba, & Yaseri, 2019) and older adults with dementia or cognitive impairment (Harlein, Dassen, Halfens, & Heinze, 2009; Lim, Mamun, & Lim, 2014). In a study of cognitively impaired older adults in residential care, Whitney, Close, Jackson, & Lord (2012) found no differences in vision between fallers and non-fallers. Schonfeld et al. (2018) studied older adults with dementia in assisted living facilities and found hearing loss was correlated with falls. Visual or auditory impairment affecting mobility are factors which require further evaluation.

Several of the findings from this study are consistent with the literature: the association between falls and LOS, sex, agitation/restlessness, and unsteady gait. Findings inconsistent with the literature on risk factors associated with falls include age, race, confusion, forgetfulness, impulsiveness, high risk comorbidities, high risk medications, history of falls, lack of understanding of one's physical and cognitive limitations, use of assistive device, SOI, and visual/auditory impairment. For these variables, there was no statistically significant difference between fallers and non-fallers. With larger sample, I may have been able to detect a smaller effect of known risk factors. Patients with incontinence, an altered awareness of the immediate physical environment, and those requiring assistance to ambulate had lower odds of falling. My speculation is that where these factors were recognized, there may have been nursing interventions focused on toileting & ambulation, such as hourly or purposeful rounding, which mitigated these risks, suggesting the positive effect of nursing interventions. Therefore, for hospitalized older adults with ADRD, this calls into question what we know about many of the risk factors for falls and confirms the need to focus on modifiable risk factors, such as unsteady gait, agitation/restlessness, and mobility.

Implications for Clinical Practice

The evidence is clear that patient-centered assessment of risk factors, and patient and family engagement, are essential in implementing effective fall prevention interventions (Dykes et al., 2017; Ganz et al., 2013; Quigley, Barnett, Bulat, & Friedman, 2016). Fall prevention care plans are frequently based on general fall risk assessment scores rather than individual patient risks (Carroll, Dykes, & Hurley, 2010; Quigley, Barnett, Bulat, & Friedman, 2016). Developing a patient-centered fall prevention care plan based is necessary to prevent falls (DuPree, Fritz-Campiz, & Musheno, 2014). Standard, universal fall precautions are often ineffective for patients with dementia (Lim, Manun, & Lim, 2014); Grealish et al., (2019a, 2019b) recommend the development of fall prevention strategies specific to patients with cognitive impairment. In studies of nurses' perceptions of fall among patients with dementia, nurses thought falls for this population was "inevitable" (Ayton et al., 2017, p. 71) and nurses' perceptions of both risk factors and interventions to prevent falls was inconsistent (Tzeng & Yin, 2013). Accurate fall risk assessment and a focus on modifiable risk factors is key to fall prevention (Hendrich, Bufalino, & Groves, 2020). This study's findings that unsteady gait and agitation/restlessness are associated with falls among hospitalized older adults with ADRD is important, as these are modifiable risk factors that can be addressed through nursing interventions.

Increasing mobility and safe ambulation can prevent declines that often occur in older hospitalized patients (Inouye, Brown, & Tinetti, 2009; Sinha & Detsky, 2012). Sleep disturbances are common among patients with dementia and contribute to agitation (Brown, Westbury, & Schuz, 2015). Physical activity during the day and decreased light and quiet at night improve sleep quality for patients with ADRD (Alzheimer's Association, 2015; Salami, Lyketsos, & Rao, 2010). Nursing interventions to address these issues include assessment of

patient's gait each shift and routine assistance with ambulation during purposeful rounding, as well as nursing care to target agitation. Non-pharmacologic interventions to alleviate agitation include assessment of pain, reassurance, redirection, calm, low tone of voice, eye contact, and avoidance of arguing with or correcting the patient (Alzheimer's Association, 2015). Pharmacologic interventions may be appropriate when these interventions are not effective or the patient's behavior escalates and is a safety concern (Alzheimer's Association, 2015, Hobday, Savik, Smith, & Gaugler, 2010). The Institute for Healthcare Improvement (IHI, 2020) published a framework for the care of older adults, the "4Ms" (what matters, medication, mentation, and mobility). For hospitalized older adults with ADRD, this reinforces the need for assessment of mobility to improve dementia care and potentially reduce falls. Lorgunpai et al. (2020) developed a mobility implementation resource, the Mobility Action Group (MACT) to promote mobility programs in acute care settings. The program, which includes an interdisciplinary mobility team, was implemented in over 40 U.S. hospitals and demonstrated an increase in routine ambulation of patients.

Understanding the role of gait, agitation, and mobility play in fall prevention for hospitalized older adults with ADRD is important in developing effective nursing interventions. Interventions could be focused on assessment of gait and routine ambulation. An added benefit of mobility is that further functional decline may be prevented and physical activity during the day improves sleep quality which can contribute to decreased agitation, confusion, & therefore fall risk.

Implications for Nursing Education

The findings also hold implications for nursing education. Dementia is itself a well-known risk factor. As a result of these findings we should go further to educate nurses on gait evaluation and

mobility care plans, which are often completed and conducted by physical therapy, rather than nursing. Several mobility assessment tools exist, such as the Banner Bedside Mobility Assessment Tool (BMAT) for Nurses (Boyton et al., 2014) and the timed get-up and-go (TUG) test, which was designed to measure balance and mobility among elderly patients at risk for falls (Wall, Bell, Campbell, Davis, 2000).

Dementia training for nursing is also needed. In a systematic review of the literature related to dementia care in the acute hospital setting, Rosvik and Rokstad (2020) identified the need dementia care training. The Alzheimer's Association developed the Dementia Friendly Hospital Initiative, which includes training on the recognition of dementia, management of behavior, and communication (Galvin et al., 2010). Galvin et al. (2010) evaluated the Dementia Friendly Hospital Initiative and found knowledge and skills related to dementia care significantly improved after implementation of the training program. Participants identified the need for additional staffing resources to effectively care for dementia patients. Palmer et al. (2014) also evaluated the Dementia Friendly Hospital Initiative. Education on care specific to patients with dementia was provided to hospital staff and posttest scores demonstrated increased knowledge and improvements in practice in caring of dementia patients. Another potential education resource is CARES. CARES (Connect, Assess, Respond, Evaluate, Share) is a proprietary internet-based dementia care training tool which focuses on pain management, communication, hydration, and nutrition. An evaluation of the program demonstrated significantly improved knowledge and skill related to dementia care post-training (Hobdaby, Savik, Smith, & Gaulger, 2010).

Improving the competency of nurses in assessment of gait and the unique care needs of patients with ADRD is crucial to fall prevention. Dementia training should extend beyond

nursing to all hospital staff who engage with ADRD patients (i.e., ancillary clinical staff, housekeeping, patient registration). Hospitals should include this education when onboarding staff and provide ongoing training at least annually.

Implications for Policy

For older adults with ADRD, being hospitalized can be upsetting, and the inpatient environment creates barriers to fall prevention (Ayton et al., 2017, Butcher, 2018; Grealish & Chaboyer, 2015). Odenheimer et al. (2013) conducted an evaluation of dementia management quality measures and found health care for individuals with dementia to not only be unplanned, but also "reactive and not systematic" (p. 559). Building a workforce with the skills to provide high-quality dementia care is necessary. An element of high-quality and efficient care includes dementia-capable health care systems (U.S. Department of HHS, 2018). Dementia capable refers to the competency and skills of staff members in delivering care the meets the needs of persons with dementia (Lin, & Lewis, 2015). Comprehensive, coordinated, patient-centered care for patients with ADRD and cognitive impairment requires organizational support (Butcher, 2018; Grealish & Chaboyer, 2015; Sheard, 2014). In the complex inpatient setting, the focus is on the acute condition and the issue of dementia is often not addressed. Dementia capable health systems & the dementia friendly hospital initiative are demonstrating promising outcomes for people with ADRD (Gavin et al, 2010; Palmer et al, 2014). Hospitals moving to become dementia capable and implement dementia training should be sure to address the risk factors for falling that this study identified.

Another policy implication is related to CMS penalties for falls with injury, which have had the unintended consequence of decreasing mobility, leading to debilitation and decline (Growdon, Shorr, & Inouye, 2017). Many hospitals have adopted a goal of zero falls, leading to

limitations in patients' mobility in an attempt to avoid falls (King, Pecanac, Krupp, Liebzeit, and Mahoney, 2016). This reinforces the importance of the hospital policy promoting mobility to prevent further functional decline for older hospitalized adults with ADRD.

Recommendations for hospital policy include becoming dementia capable, as well as the implementation of hourly rounding and mobility programs. Additionally, while data on falls are routinely collected and reported, monitoring of metrics regarding falls in patients with ADRD by nursing would be valuable to reinforce continual improvement in fall reduction.

A recommendation for public policy is to evaluate nurse staffing levels related to CMS reimbursement policies. Falls and falls with injury are a nursing sensitive indicators and studies have shown that increased nursing care hours are associated with decreased falls and falls with injury (Dearmon et al, 2013; Sung-Heui, 2016). The American Nurses Association (ANA) proposed to CMS the addition of nurse staffing measures to the Inpatient Quality Reporting Program and Value Based Purchasing (VBP) (ANA, 2015). Exploring the utility of adding nurse staffing measures to CMS reimbursement policies and public reporting is warranted, as increased nursing resources could improve outcomes for patients with ADRD.

Implications for Nursing Leadership

Falls are a nursing sensitive indicator, and as such, nurses are the leaders of the care team which includes other clinical disciplines and ancillary staff. Nurses lead patient-centered interventions that include family engagement. Effective fall prevention programs require the support of hospital leadership of evidence-based practice and promotion of a strong patient safety culture (Quigley & White, 2013). To measure patient safety culture, hospitals commonly use the AHRQ survey on hospital patient safety culture. Studies have shown that organizational support for multicomponent, evidence-base fall prevention strategies drives fall reduction (Ang,

Mordiffi, & Wong, 2011; France et al., 2017; Spoelstra, Given, & Given, 2012; Titler, 2016; Trepanier & Hilsebeck, 2014). Support from nursing leadership to implement dementia training and a mobility program is key to addressing the risk factor for falls for patients with ADRD that this study identified.

Programs and tools which I have recommended to address specific fall risk factors for older hospitalized adults with ADRD overlap in terms of implications for clinical practice, education, leadership, and policy. Table 26 displays these resources and how each is related to improvement opportunities identified in this study.

Implications for Future Research

Findings of this study hold implications for future nursing research. This study did not include nursing assessment of risk, nursing interventions implemented, patients' source of admission (e.g., nursing homes), or the degree of ADRD. Future studies should include the stage of ADRD in order to evaluate the progression of the disease on fall risk. This study would have been strengthened by the inclusion of the patient's functional status and source of admission, as custodial care could indicate a decline in functional status, and therefore, a higher fall risk. Future studies evaluating a fall risk assessment too specific to ADRD, as well as staffing and skill mix of nurses caring for patients with ADRD, would be valuable. The long-term goal of my research is to decreasing falls by designing and testing nursing interventions that target predictors of falls for hospitalized older adults with ADRD.

Limitations

The findings of this study need to be viewed in light of the limitations. These findings may not be generalizable to hospitals of different sizes, case mixes, and geographic locations, or other healthcare settings. In terms of the design, with a prospective longitudinal study, I may

have been able to pinpoint when falls occurred during the LOS. With larger sample, I may have been able to detect a larger effect of known risk factors. The sample was sample for and OR 2.25, which is a typical effect size, but would not detect smaller relationships or smaller effect sizes. Reporting bias is a potential limitation of case-control studies (Borgan et al., 208; Lesser, 2012). While age, reason for admission, medications, LOS, and coded SOI may be easily obtainable from the EHR, other variables may be more difficult to measure. Patients may be poor historians and not accurately report their falls history and all comorbid conditions may not be documented by the health care providers. Also, level of cognition, elimination needs, and mobility may change over the course of the inpatient stay. Completeness and accuracy of records in case-control studies can decrease internal validity (Song & Chung, 2010). Completeness and accuracy of records can also be limits of an EHR. Additionally, the stage of ADRD was not measured, nor functional status.

Despite the limitations, there are strengths that support the validity of the findings. The case control design provided the ability to evaluate multiple risk factors and compare "fallers" to "non-fallers." In case controls studies, internal validity is strengthened by having the cases and controls meet the same inclusion criteria (Song & Chung, 2010). A potential threat to internal validity is an inability to determine which variable preceded another (Lesser, 2012). This threat was minimized by drawing the cases and controls from the same population with the same inclusion criteria. Additionally, patients admitted due to a traumatic fall were excluded from this study thus minimizing this threat.

Conclusion

The findings from this study are important because, to the best of my knowledge, this is the first study to compare hospitalized older adults with ADRD who fell and those who did not.

By examining differences in risk factors for patients aged 60 or older with ADRD in the acute inpatient setting by comparing fallers and non-fallers, two important risk factors were identified: agitation and unsteady gait. This study serves as a first step, laying the groundwork for future studies in which programs are designed to target these risk factors and prevent falls among hospitalized older adults with ADRD. Further implications for research include fall risk assessment specific to ADRD, as well as staffing and skill mix of nurses caring for patients with ADRD. Although ADRD is a known risk factor for falls, care in the inpatient setting focuses on treatment of acute conditions. A patient-centered approach is necessary to deliver nursing care and improve outcomes for this vulnerable population. Findings from this study identified critical information on which modifiable risk factors to target with specific fall prevention interventions.

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Appendix

Table 1 *Variables, Definitions, and Data Source*

Variable	Definition	Data Source
Fall	NDNQI definition	Online incident reporting system
Age	Age in years	EHR: Registration demographics
Race	White (non-Hispanic or Latino)/ non- white (African American, Asian, Hispanic) or Latino	EHR: Registration demographics
Sex	Male/Female	EHR: Registration demographics
History of fall within 6 months	History of more than one fall within six months prior to admission	EHR: H&P, nursing admission history, JHFRAT
Elimination	Incontinence	EHR: H&P, progress notes, nursing documentation
Medications	Opiates, anticonvulsants, anti-hypertensives, diuretics, hypnotics, laxatives, sedatives, and psychotropics	EHR: MAR
Mobility	Required assistance or supervision, unsteady gait, visual or auditory impairment affecting mobility	EHR: Nursing documentation; PT notes
Cognition	Altered awareness of immediate physical environment, impulsive, lack of understanding of one's physical and cognitive limitations	EHR: H&P, progress notes, nursing documentation
Reason for Admission	Diagnosis Related Group (DRG)	EHR: Final billing/coding worksheet
Comorbidities	ICD-10 Diagnosis Codes (Depression, Stroke, Parkinson's Disease/Seizure Disorder, Hypertension, Heart Failure, Cancer, Diabetes)	EHR: Final billing/coding worksheet
Severity of Illness	Minor, Moderate, Major, Extreme	EHR: Final billing/coding worksheet
Length of Stay	Length of hospital stay in days	EHR: Final billing/coding worksheet

Table 2 *Variables, Variable Types, and Methods of Analysis*

Variable	Variable Type	Method of Analysis
Age	Continuous	Linear Regression
Number of High-Risk Comorbidities	Count[1]	Linear Regression
High-Risk Comorbidities	Dichotomous (0 = absence of the comorbidity, 1 = presence of comorbidity)	Binary Logistic Regression
Number of High-Risk Medications	Count[1]	Linear Regression
High-Risk Medications	Dichotomous (0 = medication not prescribed/administered, 1 = medication prescribed/administered	Binary Logistic Regression
Length of Stay	Count	Negative Binomial Regression
Severity of Illness	Ordinal	Ordinal Logistic Regression
Sex	Dichotomous (0 = male, 1 = female)	Binary Logistic Regression
Race	Dichotomous (0 = white, 1 = non-white)	Binary Logistic Regression
Cognition: Agitation/Restlessness	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Cognition: Altered awareness of immediate physical environment	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Cognition: Disorientation/confusion	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Cognition: Forgetfulness	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Cognition: Impulsive	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Cognition: Lack of understanding of one's physical and cognitive limitations	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Diagnosis Related Group (DRG)	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Elimination: Incontinence	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Equipment: Use of assistive device	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
History of fall within 6 months	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Mobility: Requires Assistance	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Mobility: Unsteady gait	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression
Mobility: Visual/Auditory Impairment	Dichotomous (0 = no, 1 = yes)	Binary Logistic Regression

[1]Although this is a count variable linear regression was used given that the variable and the residuals from the linear regression were normally distributed.

Table 3 *Descriptive Statistics*

Variable	% Total Sample	% Non-Fallers	% Fallers
Number of High-Risk Comorbidities			
0	7% (13)	39% (5)	61% (8)
1	25% (49)	41% (20)	59% (29)
2	39% (78)	56% (44)	44% (34)
3	24% (47)	47% (22)	53% (25)
4	5% (10)	60% (6)	40% (4)
5	2% (3)	100% (3)	0% (0)
Number of High- Risk Meds			
0	4% (8)	50% (4)	50% (4)
1	10% (20)	50% (10)	50% (10)
2	25% (50)	48% (24)	52% (26)
3	32% (63)	48% (30)	52% (33)
4	19% (38)	50% (19)	50% (19)
5	10% (19)	58% (11)	42% (8)
6	1% (2)	100% (2)	0% (0)
Illness Severity			
Minor/Moderate	27% (54)	50% (27)	50% (27)
Major	56% (111)	49% (54)	51% (57)
Extreme	18% (35)	54% (19)	46% (16)
Sex			
Male	44% (88)	41% (36)	59% (52)
Female	56% (112)	57% (64)	43% (48)
Race			
White	91% (182)	53% (96)	47% (86)
Non-white	9% (18)	22% (4)	78% (14)
Cognition			
Agitation/Restlessness	9% (17)	6% (1)	94% (16)
Altered awareness of immediate physical environment	39% (77)	60% (46)	40% (31)
Disorientation/confusion	59% (117)	49% (57)	51% (60)
Forgetful	42% (84)	46% (39)	54% (45)
Impulsive	14% (28)	43% (12)	57% (16)
Lack of understanding of physical/cognitive limitations	20% (39)	54% (21)	46% (18)

Table 3 *Descriptive Statistics, cont.*

Variable	**% Total Sample**	**% Non-Fallers**	**% Fallers**
Diagnosis Related Group (DRG)			
Neuro/Head/Neck	8% (15)	47% (7)	53% (8)
Respiratory/Pulmonary	11% (22)	36% (8)	64% (14)
Cardiac	19% (38)	47% (18)	53% (20)
GI	9% (17)	53% (9)	47% (8)
Ortho/Skin	10% (20)	50% (10)	50% (10)
Endocrine/Renal/GU	20% (39)	39% (15)	61% (24)
Infectious Disease	23% (46)	67% (31)	33% (15)
Other	2% (3)	67% (2)	33% (1)
Elimination: Incontinence	58% (116)	59% (68)	41% (48)
Equipment: Use of assistive device	54% (107)	53% (57)	47% (50)
History of more than one fall within 6 months	31% (61)	52% (32)	48% (29)
Mobility			
Requires Assistance	69% (138)	55% (76)	45% (62)
Unsteady gait	14% (28)	25% (7)	75% (21)
Visual/Auditory Impairment	4% (7)	43% (3)	57% (4)

Table 4 *Descriptive Statistics High-Risk Comorbidities*

High-Risk Comorbidities	**% Total Sample**	**% Non-Fallers**	**% Fallers**
Hypertension	82% (163)	42% (84)	40% (79)
Diabetes	40% (79)	20% (39)	20% (40)
Heart Failure	30% (60)	18% (35)	13% (25)
Depression	26% (51)	14% (27)	12% (24)
Parkinson's/Seizure Disorder	12% (23)	7% (13)	5% (10)
Schizophrenia/Psychosis	6% (11)	4% (7)	2% (4)
Cancer	4% (7)	2% (4)	2% (3)
Stroke	4% (7)	2% (4)	2% (3)

Table 5 *Descriptive Statistics High-Risk Medications*

High-Risk Medications	**% Total Sample**	**% Non-Fallers**	**% Fallers**
Anti-hypertensive	73% (146)	38% (76)	35% (70)
Diuretic	36% (72)	21% (41)	16% (31)
Anti-depressant	36% (72)	17% (34)	19% (38)
Anti-psychotic	28% (56)	14% (28)	14% (28)
Alzheimer's Therapy	26% (51)	11% (22)	15% (29)
Benzodiazepine	25% (50)	12% (24)	13% (26)
Opiate	23% (46)	13% (26)	10% (20)
Anti-convulsant	15% (29)	8% (16)	7% (13)
Sedative Hypnotic	10% (19)	4% (7)	6% (12)
Anti-Parkinson	9% (17)	6% (12)	3% (5)
Laxative	5% (10)	2.5% (5)	2.5% (5)

Table 6 *Age*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	82.960	.852		97.364	.000	81.280	84.640
	Fall	-1.480	1.205	-.087	-1.228	.221	-3.856	.896

a. Dependent Variable: Age

Table 7 *Number of high-risk comorbidities*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2.130	.103		20.591	.000	1.926	2.334
	Fall	-.250	.146	-.121	-1.709	.089	-.538	.038

a. Dependent Variable: Comorbidity Count

Table 8 *Number of high-risk medications*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2.910	.129		22.613	.000	2.656	3.164
	Fall	-.140	.182	-.055	-.769	.443	-.499	.219

a. Dependent Variable: Med Count

Table 9 *Severity of illness (SOI)*

Parameter Estimates

Parameter		B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
				Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
Threshold	[Severity of Illness=1]	-1.036	.2122	-1.462	-.628	23.853	1	.000	.355	.232	.534
	[Severity of Illness=2]	1.510	.2301	1.071	1.975	43.043	1	.000	4.526	2.919	7.210
Fall (Scale)		-.0821[a]	.2733	-.619	.454	.089	1	.765	.922	.539	1.575

Dependent Variable: Severity of Illness
Model: (Threshold), Fall

a. Fixed at the displayed value.

Table 10 *Disorientation/Confusion*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	.282	.2020	-.112	.683	1.947	1	.163	1.326	.894	1.979
Fall	.124	.2872	-.439	.688	.185	1	.667	1.132	.644	1.990
(Scale)	1[a]									

Dependent Variable: Disorientation Confusion
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 11 *Forgetfulness*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-.447	.2050	-.856	-.050	4.760	1	.029	.639	.425	.951
Fall	.247	.2871	-.315	.812	.738	1	.390	1.280	.730	2.253
(Scale)	1[a]									

Dependent Variable: Forgetful
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 12 *Impulsive*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-1.992	.3077	-2.648	-1.430	41.921	1	.000	.136	.071	.239
Fall	.334	.4112	-.467	1.159	.660	1	.416	1.397	.627	3.187
(Scale)	1[a]									

Dependent Variable: Impulsive
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 13 *Lack of understanding of one's physical and cognitive limitations*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-1.325	.2455	-1.831	-.864	29.123	1	.000	.266	.160	.422
Fall (Scale)	-.1911[a]	.3578	-.901	.510	.286	1	.593	.826	.406	1.664

Dependent Variable: lack of understanding of one's physical and cognitive limitations
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 14 *Use of an assistive device*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	.282	.2020	-.112	.683	1.947	1	.163	1.326	.894	1.979
Fall	-.282	.2843	-.842	.274	.983	1	.321	.754	.431	1.316
(Scale)	1[a]									

Dependent Variable: Assistive Device
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 15 *History of a fall within the last six months*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-.754	.2144	-1.186	-.343	12.363	1	.000	.471	.305	.710
Fall	-.142	.3074	-.747	.461	.212	1	.645	.868	.474	1.586
(Scale)	1[a]									

Dependent Variable: History of more than one fall within six months before admission
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 16 *Visual or auditory impairment affecting mobility*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-3.476	.5862	-4.879	-2.499	35.162	1	.000	.031	.008	.082
Fall	.298	.7772	-1.239	1.944	.147	1	.701	1.347	.290	6.988
(Scale)	1[a]									

Dependent Variable: visual or auditory impairment affecting mobility
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 17 *Length of Stay*

Parameter Estimates

			95% Profile Likelihood Confidence Interval		Hypothesis Test				95% Profile Likelihood Confidence Interval for Exp(B)	
Parameter	B	Std. Error	Lower	Upper	Wald Chi-Square	df	Sig.	Exp(B)	Lower	Upper
(Intercept)	1.690	.0430	1.605	1.773	1548.182	1	.000	5.420	4.976	5.889
Fall	.262	.0571	.150	.374	20.943	1	.000	1.299	1.162	1.453
(Scale)	1[a]									
(Negative binomial)	0[a]									

Dependent Variable: Length of Stay
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 18 *Sex*

Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	.575	.2083	.167	.984	7.627	1	.006	1.778	1.182	2.674
Fall	-.655	.2889	-1.222	-.089	5.146	1	.023	.519	.295	.915
(Scale)	1[a]									

Dependent Variable: Sex
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 19 *Race*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-3.178	.5103	-4.362	-2.308	38.784	1	.000	.042	.013	.099
Fall	1.363	.5861	.295	2.652	5.407	1	.020	3.907	1.343	14.189
(Scale)	1[a]									

Dependent Variable: Race
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 20 *Agitation/Restlessness*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-4.595	1.0050	-7.464	-3.096	20.904	1	.000	.010	.001	.045
Fall	2.937	1.0414	1.316	5.840	7.953	1	.005	18.857	3.728	343.711
(Scale)	1[a]									

Dependent Variable: Agitation Restlessness
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 21 *Altered awareness of immediate physical environment*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-.160	.2006	-.557	.232	.639	1	.424	.852	.573	1.261
Fall	-.640	.2950	-1.224	-.066	4.704	1	.030	.527	.294	.936
(Scale)	1[a]									

Dependent Variable: Altered awareness of immediate physical environment
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 22 *Diagnosis Related Group (DRG) Infectious Disease*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-.800	.2162	-1.237	-.386	13.694	1	.000	.449	.290	.680
Fall (Scale)	-.9341[a]	.3538	-1.650	-.255	6.976	1	.008	.393	.192	.775

Dependent Variable: Admission Diagnosis Related Group DRG=Infectious Dx
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 23 *Elimination*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	.754	.2144	.343	1.186	12.363	1	.000	2.125	1.409	3.275
Fall	-.834	.2933	-1.416	-.264	8.082	1	.004	.434	.243	.768
(Scale)	1[a]									

Dependent Variable: Incontinence
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 24 *Required assistance with ambulation*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	1.153	.2341	.710	1.632	24.235	1	.000	3.167	2.034	5.115
Fall (Scale)	-.663 1[a]	.3119	-1.284	-.058	4.521	1	.033	.515	.277	.944

Dependent Variable: Requires assistance or supervision
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 25 *Unsteady gait*

Parameter Estimates

Parameter	B	Std. Error	95% Profile Likelihood Confidence Interval		Hypothesis Test			Exp(B)	95% Profile Likelihood Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-2.587	.3919	-3.452	-1.892	43.558	1	.000	.075	.032	.151
Fall	1.262	.4625	.398	2.237	7.443	1	.006	3.532	1.489	9.362
(Scale)	1[a]									

Dependent Variable: unsteady gait
Model: (Intercept), Fall
a. Fixed at the displayed value.

Table 26 *Programs and Resources*

Program/Resource	**Area of Influence**	**Risk Factor or Area Addressed**	**Frequency**	**Who**
Dementia Capable Assessment	Policy Leadership	Unsteady gait (gait assessment) Agitation	Annually	Nursing Leadership
Dementia Training	Education	Unsteady gait (gait assessment) Agitation	Onboarding & Annually	All Hospital Staff
Banner Mobility Assessment Tool (BMAT) for Nurses or Timed Get Up & Go (TUB)	Clinical Practice Education	Unsteady gait (gait assessment)	Every Shift	Nursing Staff
Mobility Program – Mobility Action Group (MCAT)	Clinical Practice Education Policy Leadership	Unsteady gait (gait assessment) Agitation Unsteady gait (gait assessment) Agitation	Ongoing	Interdisciplinary Teams
Hourly Rounding	Clinical Practice Policy Leadership	Unsteady gait (gait assessment) Agitation		Nursing Staff
Fall Metrics for ADRD	Leadership	Patient Outcome	Monthly	Nursing Staff
AHRQ Hospital Patient Safety Culture Assessment	Policy Leadership	Safety Culture	Annually	All Hospital Staff

Vita

Jean Bettencourtt Sconza was born in New Orleans, Louisiana. Jean attended Louisiana State University (LSU), Baton Rouge, LA, and received a Bachelor of Arts degree in English. She then attended Louisiana State University, Health Sciences Center (LSUHSC) in New Orleans, LA, and received a Bachelor of Nursing. Jean also attended Tulane University, where she graduated with a Master of Science in Healthcare Administration. Jean has a clinical background in cardiology and has been a registered nurse for over 25 years. She has worked in many areas over the course of her career: hospital, office, and clinical analytics and informatics. Her passion is patient safety and advancing nursing research to improve patient outcomes. She is currently the director of quality management at East Jefferson General Hospital in Metairie, LA. Jean began her doctoral studies at the University of Tennessee, Knoxville in 2004 and will graduate with a PhD in Nursing in December 2020.