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Effect of Bundled Interventions by Patient Type to Reduce Falls

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
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Walden University
2020

Abstract

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by

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MSN, South University, 2015

BS, University of the Virgin Islands, 2012

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Despite consistent efforts in the healthcare field, 700,000 to 1 million patients fall in hospitals each year. There is a gap in the literature regarding identification of optimal bundles of fall prevention interventions (FPIs) for patients by type, and though patients of all ages fall in hospitals, older adults fall more, which may mean that the influence of FPIs may differ for patients by age. The purpose of this descriptive, retrospective, quantitative secondary data analysis study, guided by Virginia Henderson's need theory, was to examine the differences in the influence of bundled FPIs in reducing the number of falls (NOF) in hospitalized older (60 years and older) and younger patients (59 years and younger). De-identified falls data from 2017-2019 of 1,963 cases were analyzed using an independent *t*-test and two-way ANOVA to examine the differences of mean NOF among hospitalized older (n = 258) and younger patients (n = 331) who were and were not on FPIs. There was no statistically significant difference between the mean NOF of older adults versus younger adults and or between the mean NOF of older adults on the FPI bundle versus younger adults on the FPI bundle. The greater number of younger adults who fell compared to older adults may suggest that the bundle of FPIs (non-skid socks, yellow wrist band, assessment/re-assessment of fall risk score using Morse Fall Scale, and bed alarms) are more efficient in reducing NOF in older adults. Future research could focus on examining what bundles of FPIs have the greatest reduction in falls in young adults and in the elderly population. The findings of this study can effect positive social change by demonstrating that FPI bundles are effective for older patients and that patients under 60 may need different strategies to prevent falls.

Effect of Bundled Interventions by Patient Type on Number of Falls

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Dedication

This dissertation is dedicated to my parents, Percival Nurse and Gwendolyn Todman, who have both been very instrumental in encouraging and supporting me in my endeavors. A very special thank you to my mother who has consistently been of tremendous assistance in helping me care for my three children, all the days of my college life. This dissertation is also dedicated to my wonderful children, Cynia King, Cynae King, and Michael Tavernier, whose smiles, brilliance and unique personalities have warmed my heart and refueled my engine every time I grew tired. Most importantly, this dissertation is dedicated to God, who gives me reason to persevere despite many difficult moments.

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Chapter 1: Introduction to the Study

Falls are a worldwide public health problem with 1 million patients falling in hospitals each year, despite many initiatives such as fall prevention research, tool kits, policies, protocols, and programs instituted on national and state levels (Silva & Hain, 2017). Death and debilitating injury can result from a hospital fall and patients of all ages are at risk for falling in hospitals due to the various effects of medications, medical complications, lack of familiarity with the environment, and extraneous medical equipment associated with hospitalization (Melin, 2018; Silva & Hain, 2017). Although hospitalization puts patients of all ages at risk for falls, elderly patients, 60 years and older, experience falls more frequently than other age groups, as well as incur more injuries from falls (Dykes, Carroll, Hurley, Lipsitz, Benoit, Chang, Meltzer, Tsurikova, Zuyov, & Middleton, 2010; Silva & Hain, 2017). The topic of this study was optimal bundles of fall prevention interventions for patients by age. Through analysis of secondary data using a two-way analysis of variance (ANOVA) and independent t-tests, the variables of age, fall prevention intervention (FPI), and number of falls (NOF) were explored to determine potential relationships among the variables. This study was needed because elderly patients have a higher risk for falls and experience more falls in hospitals than do young adults, which may suggest a need for customized FPIs by age as opposed to a common approach for fall prevention in hospitals (Dykes et al., 2010; Silva & Hain, 2017). Additionally, many patients continue to fall in hospitals each year despite the fall prevention initiatives that have been instituted toward reducing NOFs (Melin, 2018; Silva

& Hain, 2017). Identification of FPIs that are most effective in reducing falls in older adults versus younger adults can inform nurses and other healthcare professionals on how existing policies, protocols, and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in hospitalized patients. In this chapter, I discuss the background, problem statement, purpose, research questions, theoretical framework, nature of the study, definitions, assumptions, scope and delimitations and significance of the study.

Background of the Problem

Patient falls in hospitals have been determined to compromise patient safety and are reported as the most common adverse event in hospitals, placing patients at risk for further psychological and physical decline (Glogovsky, 2017; Kowalski, 2018). Over 1 million falls are reported to occur in the United States each year with approximately 2.5% of hospitalized patients falling during their hospital stay (Kowalski, 2018; Lerdal, Sigurdsen, Hammerstad, Granheim, & Gay, 2018). Of those falls, approximately 33% have been identified in reports as preventable (Kowalski, 2018). Patient falls can also prolong hospital stays and increase costs to hospitals with no reimbursement by the Centers for Medicare and Medicaid Services to hospitals for any additional costs in association with falls or injuries related to falls (Hou et al., 2017; Kowalski, 2018). Severe non-fatal injuries are not covered by insurance and can diminish patients' ability to complete activities of daily living, their quality of life, and mobility (Kte'pi, 2018).

Preventing falls are a duty to all healthcare providers and ancillary staff in hospitals to ensure the safety of patients (Kowalski, 2018). Additionally, as noted by the

Joint Commission, the injuries that result from one fall lead to longer hospital stays and costs hospitals an average of $14,000 per fall per patient (Silva & Hain, 2017). The costs for fall injury to Medicare in 2015 were over $31 billion and the financial expenditure of fall related medical care is projected to cost $43.8 billion by 2020 (Rajagopalan, Litvan, & Tzyy-Ping et al., 2017).

Although FPIs have been identified in the literature as effective in reducing the NOF in some hospitals, there is a lack of research about the effect of FPIs by patient demographics such as age, gender, or ethnicity (Miake-Lye, Hempel, Ganz, & Shekelle, 2013). Because elderly patients experience more falls in hospitals than do young adults, there might be a need for customized FPIs by age as opposed to a one common approach for fall prevention in hospitals (Dykes et al., 2010; Silva & Hain, 2017). Additionally, many patients continue to fall in hospitals each year despite the fall prevention initiatives that have been instituted to reduce this NOF (Melin, 2018; Silva & Hain, 2017). Identification of FPIs that are most effective in reducing falls in older adults versus younger adults can inform practice to include the consideration of potential differences in the ability of FPIs to reduce patient falls by age. In addition, this information may encourage nurses and other healthcare professionals to include this consideration into how existing policies, protocols, and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in hospitalized patients.

Problem Statement

The nursing profession is obligated to improving the nursing care quality metrics that surround fall prevention, deeming them essential stakeholders in the

efforts of reducing patient falls in hospitals (Glogovsky, 2017). Despite existing collaborative efforts, 700,000 to 1 million patients fall in hospitals each year, which results in a higher risk for further psychological and physical decline (Glogovsky, 2017). Factors that predict or promote the successful implementation of fall prevention programs are discussed in the literature, and include pilot-testing interventions, training and educating staff, involvement of front-line staff in the design of the program, use of information technology systems to provide data about falls, guidance of the prevention program by a multidisciplinary committee, leadership support, and changes in nihilistic attitudes about fall prevention (Miake-Lye et al., 2013; Spoelstra, Given & Given, 2012). These factors reflect the implementation of interventions of various multifactorial fall prevention programs among many patient populations, and represent the sum effect of the programs. However, the programs' results are confounded by the presence of other interventions (Haines & Waldron, 2011). Furthermore, there is a gap in the literature regarding identification of optimal bundles of interventions for specific patient populations (Miake-Lye et al., 2013). Although patients of all ages are at risk for falls in hospitals, falls more commonly occur in older adults, which may mean that the influence of fall prevention interventions may differ for patients by age (Kte'pi, 2018; Melin, 2018).

Purpose of Study

The purpose of this descriptive, retrospective, quantitative secondary data analysis study was to identify and describe the differences in the influence or ability of bundled

FPIs to reduce NOF in older adults versus younger adults who were hospitalized. The dependent variable was NOF and the independent variables were age and FPI. I used a two-way ANOVA and independent *t*-tests to examine the differences of mean NOF scores between (a) patients 60 years and older not on an FPI (b) patients 59 years and younger not on an FPI, (c) patients 60 years and older on an FPI, and (d) patients 59 years and younger on an FPI. This allowed for the comparison of means of NOF across the combinations of two independent variables, FPI and age, and allowed the examination of any interaction that occurred between them. My initial plan was to examine data from two hospitals to determine if the bundle of FPIs used at each had a greater reduction in falls in young adults or in the elderly population to promote identification of the optimal bundles of FPIs to institute for hospitalized patients by age. Identification of the FPIs most effective in reducing falls in older adults versus younger adults can inform practice to include the consideration of potential differences in the ability of FPIs to reduce patient falls by age. Furthermore, nurses and other healthcare professionals might be encouraged to include this consideration into how existing policies, protocols, and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in hospitalized patients.

Research Questions

RQ1: What was the difference in the NOF in hospitalized older adults compared to hospitalized younger adults?

$H_0$1: There was no difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

H_A1: There was a difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

RQ2: What was the difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI?

H_02: There was no difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

H_A2: There was a difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

RQ3: What was the difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI?

H_03: There was no difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

H_A3: There was a difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

NOF, a continuous variable, was measured by the total number of patients' falls and had a ratio level of measurement. Age was measured in years and this variable was adjusted from a continuous level of measurement to categorical by grouping patients aged 59 years and younger into one category named "younger adults," and grouping patients aged 60 years and older into a second group named "older adults." The variable FPI was measured categorically and based on the presence or lack of FPI implementation at the time the patient fell.

Theoretical Foundation

The theory that guided my study was Virginia Henderson's needs theory, which focuses on individualized care and a nursing role that functions to assist patients with activities that are essential to recovering and maintaining health or achieving a peaceful death (Athtisham & Jacoline, 2015; Ungvarsky, 2016). This theory originated from Virginia Henderson's definition or concept of nursing, which emphasizes the independence of patients through the nursing care received (Athtisham & Jacoline, 2015). This theory posits that the goal of nursing care is to aid the individual to attain his or her optimal level of independence by providing substitutive, supplementary, or complementary nursing care (Athtisham & Jacoline, 2015). The major theoretical propositions include 14 constituents of efficient nursing care that guide nursing interventions based on the thorough assessment of the needs of the patient (Athtisham & Jacoline, 2015). The needs theory relates to this study because it proposes that the notion of nursing care that is tailored to meet the needs of patients includes the understanding that needs vary among patients (Athtisham & Jacoline, 2015). Virginia Henderson's needs theory was the most appropriate theory because in this retrospective quantitative study, secondary data was analyzed to determine if FPIs were able to reduce more falls in older adults or younger adults, with hopes to improve outcomes in reducing the NOF in both age groups. More detail on Virginia Henderson's needs theory is presented in Chapter 2.

Nature of the Study

My initial plan was to conduct a quantitative, retrospective study using a Solomon 4 group design with two-way ANOVA and two tailed independent *t*-test to determine the effect of age and FPI on NOF and to examine the differences of mean NOFs of older and younger adults on and not on FPIs. I planned to analyze secondary data from two major acute healthcare facilities in the southern region of the United States to examine the variables of age, FPI, and NOF of patients who were hospitalized. The secondary data I planned to analyze included de-identified information collected on patients who fell in one of the major hospitals two years prior to the implementation of their respective fall prevention programs and two years after their fall prevention programs were implemented. I planned to examine the effect of a bundle of FPIs at the two hospitals on the relationship between patient age and NOF to determine the if each bundle had a greater ability to reduce falls in younger adults or older adults. The dependent variable was NOF and the independent variables were age and FPI. I used two-way ANOVA and independent t tests to examine the differences of mean NOF between (a) patients 60 years and older and patients 59 years and younger (b) patients 60 years and older on an FPI and those who were not on an FPI, and (c) patients 59 years and younger on an FPI and those who were not on an FPI.

Definitions

Age: Described in years.

FPI: Any initiative implemented with the goal of reducing a patient's risk for falling and or preventing a fall (Haines & Waldron, 2011).

NOF: The total number of occurrences of patients falls (Wright, 2006).

Older adults: Patients who are age 60 and older (Oliveira et al., 2019).

Patient fall: An unplanned event where a patient comes to rest on a lower level, floor, or ground (Hauer et al., 2006; Kenny, Romero-Ortuno, & Kumar, 2017).

Younger adults: Patients who are age 59 years and younger (Oliveira et al., 2019).

Assumptions

One assumption of my study was that nurses desire to prevent fall of patients who were hospitalized. Another assumption was that the data in the database I accessed were recorded accurately and with integrity.

Scope and Delimitations

This study was a descriptive, retrospective, quantitative secondary data analysis study for which I initially planned to use a Solomon 4 group design and analyze the data with a two-way ANOVA and independent *t*-test to examine secondary data and address the research problem of the number of patient falls that occur each year in hospitals. I specifically explored the differences in the effectiveness of FPIs to reduce the NOF in younger and older adults. I chose this specific focus because more falls occur in older adults than in younger adults, which may suggest the need to determine if there are FPIs more effective in reducing the NOF in older adults versus younger adults (Haines & Waldron, 2011). The population of interest was young and older adult patients in hospitals. This population was targeted to examine the phenomenon of older adults

falling more frequently in hospitals with large numbers of patients (Haines & Waldron, 2011; Oliveira et al., 2019).

Experimental and or quasi-experimental study methods were not chosen because the scope and purpose of this study required evaluation of existing fall prevention programs. A meta-analysis method was not chosen because meta-analyses are frequently conducted regarding fall prevention interventions and the structure of a meta-analysis would not have allowed for the examination of the relationships among the study variables.

I selected Virginia Henderson's needs theory as the theoretical foundation because it focuses on individualized care and a nursing role that functions to assist patients with activities that are essential to recovering and maintaining health or achieving a peaceful death (Athtisham & Jacoline, 2015; Ungvarsky, 2016). This theory originated from Virginia Henderson's definition or concept of nursing, which emphasizes the independence of patients through nursing care (Athtisham & Jacoline, 2015). This theory posits that the goal of nursing care is to aid the individual to attain his or her optimal level of independence by providing substitutive, supplementary, or complementary nursing care (Athtisham & Jacoline, 2015). Another theory that I considered was Ronald Lippitt's theory of change, which identifies seven stages of change with a language similar to the nursing process (Mitchell, 2013). The seven stages are (a) phase 1, diagnose the problem; (b) phase 2, assess motivation or capacity for change; (c) phase 3, assess change agent, resources, and motivation; (d) phase 4, select progressive change objective; (e) phase 5, choose appropriate role of the change agent; (f)

phase 6, maintain change; and (g) phase 7, terminate the helping relationship (Mitchell, 2013). Ronald Lippitt's theory of change was not selected because the existing problem does not reflect that there is difficulty changing care for fall prevention. Virginia Henderson's needs theory was the most appropriate theory because in this descriptive, retrospective quantitative study, I analyzed secondary data to determine if implementing certain FPIs resulted in a greater reduction of falls in older adults or younger adults with hopes to inform practice on optimal FPIs for each age group to improve outcomes in reducing the NOF in both age groups.

Based on my initial plan to analyze secondary data from two major hospitals in the southern region of the United States, I intended for the results of this study to be particularly useful to hospitals in the southern region of the United States. The southern United States is identified as the least healthy region, with its states ranking among the worst for health and wellness in the United States ("5 Charts Show," 2018). People who live in the south have a vulnerability to healthcare access problems and live shorter, sicker lives ("5 Charts Show," 2018; Parish, Rose, Yoo, & Swaine, 2012). I selected hospitals in the south to enhance the applicability of my study's findings to the southern region of the United States. However, I did not investigate the health and wellness and access to healthcare of the patients who were a part of this population.

Limitations

The records of the patients were not randomly selected; therefore, the results of this study may not be generalizable. Limitations of secondary data analysis include challenges of the researcher to conclude with 100% the credibility of how the data

were collected and the integrity of how it was reported (Ellram & Tate, 2016; Kolassa, Bynum, & Holmes, 2013). Additionally, I had no control over the manner in which the secondary data were coded or structured (Ellram & Tate, 2016). One hospital declined me access to its data due to lack of personal affiliation. Therefore, I collected data from just one hospital, which limits the generalizability of the study's findings to other similar institutions. In addition, because the hospital from which I collected data experienced electronic system failures during my research, the hospital only had data reflecting patient falls from January of 2017 to the time of my request. Therefore, I could not use the Solomon 4 group design to answer RQ3, and instead, used a two-way ANOVA to examine the differences in the mean NOF across groups.

Significance

Researchers have identified that FPIs are helpful in reducing the NOF in hospitals and have established that, despite the implementation of these FPIs, many patients continue to fall in hospitals yearly. The results of my study provided results that could assist in advancing practice and knowledge regarding fall prevention through the exploration of the interactions of FPIs and NOF in younger adults and older adults. The findings of this research contribute to filling the gap in the literature regarding determining the ideal combination of FPIs to utilize for patients by age who were at risk for falls. This study addressed an aspect to FPIs and strategies that have not been researched (Miake-Lye et al., 2013). The results of this descriptive, retrospective, quantitative secondary data analysis study has the potential to elicit positive social change by adding to the knowledge of how to increase the safety of

patients in hospitals and improve the success rates of fall prevention strategies and approaches of quality and performance improvement departments informing state and federal policy makers, fall prevention committees, and health care providers of all disciplines to successfully achieve greater reductions in the NOF in hospitals.

Summary

Patient safety is a cornerstone of healthcare and a value to positive social change by its focus on putting the patient first and providing them with high quality, compassionate, and safe care (Tingle & Minford, 2017). Patients' falls in hospitals are a major concern of patient safety and continue to be a worldwide public health problem (Dykes et al., 2018). Although the literature includes discussions of the FPIs that have been effective in reducing the NOF in some hospitals, there is a lack of research regarding the effect of FPIs by patient demographics such as age, gender, or ethnicity (Miake-Lye et al., 2013). This gap in knowledge of ideal FPIs for patients by age was addressed in this study because elderly patients experience more falls in hospitals than young adults, which may suggest a need for age related customized bundles of FPIs as opposed to a one common approach for fall prevention in hospitals (Dykes et al., 2010; Silva & Hain, 2017). Additionally, many patients continue to fall in hospitals each year despite the fall prevention initiatives that have been instituted to reduce this annual NOF (Melin, 2018; Silva & Hain, 2017). Identification of FPIs that are most effective in reducing falls in older adults versus younger adults can inform nurses and other healthcare professionals on how existing policies, protocols, and programs can be revised

to achieve positive social change by attaining greater success in reducing the NOF in hospitalized patients.

In Chapter 2, I provide a review of the literature about patient falls in hospitals and the efforts to decrease their occurrence, as well as describe the theoretical foundation applied to this study.

Chapter 2: Literature Review

Over 1 million falls are reported to occur in the United States each year, with approximately 2.5% of hospitalized patients falling during their hospital stay (Kowalski, 2018; Lerdal et al., 2018). Older adults fall more frequently than younger adults and the injuries they experience from falls are a specific concern. In addition, demographics that continue to trend toward an increase in an ageing population move this concern to the forefront of healthcare (Dyck, Thiele, Kebicz, Klassen, & Erenberg, 2013). Additionally, many patients continue to fall in hospitals each year despite the fall prevention initiatives that have been instituted to reducing this NOF (Melin, 2018; Silva & Hain, 2017). Although the literature includes discussion of the FPIs that have been effective in reducing the NOF in some hospitals, there is a lack of research regarding the effect of FPIs by patient demographics such as age, gender, or ethnicity (Miake-Lye et al., 2013). This gap in knowledge of ideal FPIs for patients by age was addressed in this study because elderly patients experience more falls in hospitals than do young adults, which may suggest a need for customized FPIs by age as opposed to a one common approach for fall prevention in hospitals (Dykes et al., 2010; Silva & Hain, 2017). Identification of FPIs that reduced more falls in older adults versus younger adults can inform nurses and other healthcare professionals on how existing policies, protocols, and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in hospitalized patients. The purpose of this retrospective, quantitative study was to explore the variables of age, FPI, and NOF to examine the differences in the influence or ability of bundled FPIs in reducing the NOF for patients by age. In this chapter, the

literature search, theoretical framework, conceptual framework and exhaustive review of literature related to key variables and concepts are described.

Literature Search Strategy

The topics I researched for this literature review included fall prevention, fall prevention intervention, fall risks, and falls in hospitals. A comprehensive, thorough electronic literature search was undertaken in the database EBSCOhost. Additional databases included PUBMED, ProQuest, Academic Search Complete, Google Scholar, SAGE Journal Online, and CINAHL Plus full text. The following key terms were entered individually or combined and included the following: *fall prevention, fall risk factors, fall-reduction, the Joint Commission, Centers for Medicaid and Medicare, prevalence of falls, national initiatives, age, impact, financial, injuries, polices, protocols, patient safety, quality improvement, Ronald Lippitt, theory of change, nursing theories, Virginia Henderson, Virginia Henderson's needs theory, t-tests, moderated regression analysis, conditional probabilities, SPSS, challenges, fall prevention interventions, fall risk assessment, nursing, southern region, healthcare access, southern, hospitals, Grady Memorial, Emory, Solomon 4 group design, two-way ANOVA, secondary analysis,* and *meta-analysis*. Sources included journal articles and news articles with a range of years from 2006 to 2019. Additionally, textbooks about patient safety and quantitative statistical analysis were reviewed as secondary sources.

Theoretical Foundation

The theoretical foundation for my study was Virginia Henderson's needs theory. This theory was founded by Virginia Henderson who conceptualized nursing as a

profession that emphasizes the importance of improving the independence of patients so that post hospitalization progress is not delayed (Ahtisham & Jacoline, 2015). This theory focuses on individualized care and a nursing role that functions to assist patients with activities that are essential to recovering and maintaining health or achieving a peaceful death (Athtisham & Jacoline, 2015; Ungvarsky, 2016). I chose this theory because in this descriptive, retrospective, quantitative study, I analyzed secondary data to determine if the implemented FPIs reduced more falls in older adults or younger adults in hopes to inform practice on which FPIs can reduce falls for hospitalized patients by age and ultimately improve outcomes in reducing the NOF in both age groups. This information is important because elderly patients have a higher risk for falls and experience more falls in hospitals than young adults, which may suggest a need for customized FPIs by age as opposed to a one size fits all approach for fall prevention in hospitals (Dykes et al., 2010; Silva & Hain, 2017).

This theory posits that the goal of nursing care is to aid the individual to attain his or her optimal level of independence by providing substitutive, supplementary, or complementary nursing care (Athtisham & Jacoline, 2015). The 14 constituents of efficient nursing care that make up the major theoretical propositions of this theory include the following: (a) breathe normally; (b) eat and drink adequately; (c) eliminate body wastes; (d) move and maintain desirable postures; (e) sleep and rest, (f) select suitable clothes-dress and undress; (g) maintain body temperature within normal range by adjusting clothing and modifying environment; (h) keep the body clean and well-groomed and protect the integument; (i) avoid dangers in the environment and avoid

injuring others; (j) communicate with others in expressing emotions, needs, fears, or opinions; (k) worship according to one's faith; (l) work in such a way that there is a sense of accomplishment; (m) play or participate in various forms of recreation; and (n) learn discover or satisfy the curiosity that leads to normal development and health and use the available health facilities (Athtisham & Jacoline, 2015).

Henderson's focus was on individualized care that consists of assessment of those 14 components to determine what the custom needs of each patient are (Athtisham & Jacoline, 2015). The physiological needs of the patient are examined in components one through nine (Athtisham & Jacoline, 2015). The psychological needs of that patient are assessed in the tenth and fourteenth components (Athtisham & Jacoline, 2015). The spiritual and moral needs of the patient are examined in the eleventh component, and the sociological needs related to occupation and recreation are examined in the twelfth and thirteen components (Athtisham & Jacoline, 2015). Assessment findings should be recorded for each component, an associated nursing diagnosis, plans for each component, and an intervention for each (Athtisham & Jacoline, 2015).

Virginia Henderson's needs theory has been applied in previous research by incorporating the theory's process to nursing practice in the care of an individual patient. In one study, the theory was applied to a case scenario in a Pakistani context to develop nursing care for a 25-year-old female who attempted suicide by drinking toilet cleaner and was admitted to the surgical unit (Athtisham & Jacoline, 2015). Assessments findings for each of the 14 components were documented, and 10 nursing diagnoses were established with respective nursing interventions that were planned and evaluated

(Athtisham & Jacoline, 2015). The theory allowed for individual dynamic assessment of each of the domains of need for the patient (Athtisham & Jacoline, 2015). In the other study, Virginia Henderson's needs theory was applied to a 66- year old working woman with a history breast cancer, hypertension, type II diabetes mellitus, and hypercholesterolemia to determine individual needs, nursing diagnoses, outcomes and interventions, and allowed for focus on elderly orientation (Cavalcante Fernandes, Cavalcante Guedes, da Silva, Lira Borges, & de Freitas, 2016). Both studies were descriptive case studies and included nursing diagnoses of high risks for fall or injury, but the case scenario of the younger adult included addressing risks for injury with nursing interventions focused on stress reduction and discussion of effective coping mechanisms for stress (Athtisham & Jacoline, 2015; Cavalcante Fernandes et al., 2016). The case study with the older adult addressed risk for injury with nursing interventions such as giving advice on medication, fall prevention, safety measures at work and wearing comfortable shoes (Cavalcante Fernandes et al., 2016).

Virginia Henderson's needs theory relates to this study because it supports the notion of nursing care that is tailored to meet the individual needs of patients with the understanding that needs vary among patients. The physiological needs of older adults vary more significantly than those of younger adults and Virginia Henderson's needs theory allows for individual physiological assessment of patients to determine needs and appropriate interventions (Athtisham & Jacoline, 2015; Kaufman, 2011). Virginia Henderson's needs theory was the most appropriate theory because elderly patients have a higher risk for falls and experience more falls in hospitals than young adults, which

may suggest a need for customized FPIs by age as opposed to a one size fits all approach for fall prevention in hospitals (Dykes et al., 2010; Silva & Hain, 2017). Additionally, many patients continue to fall in hospitals each year despite the fall prevention initiatives that have been instituted to reduce this annual NOF (Melin, 2018; Silva & Hain, 2017). Identification of FPIs that are most effective in reducing falls in older adults versus younger adults can inform nurses and other healthcare professionals on how existing policies, protocols, and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in hospitalized patients. To further clarify the concepts and the relationship to this study, a diagram of this theory is found in Figure 1.

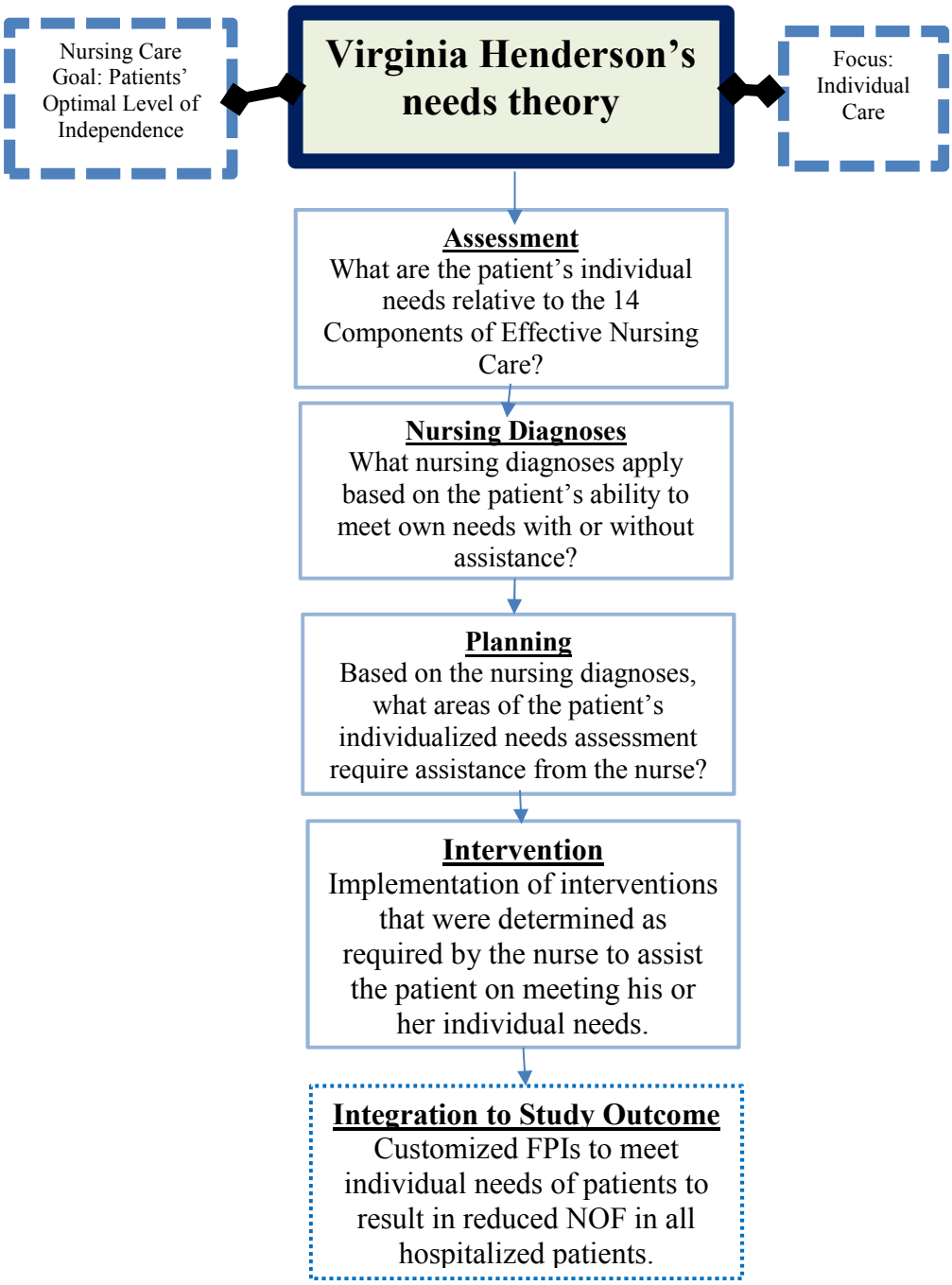

Figure 1. Diagram of Virginia Henderson's needs theory with relationship to study.

Literature Review Related to Key Variables and/or Concepts

The definition of falls is "an unplanned descent to the floor with or without injury," per the National Database of Nursing Quality Indicators and "an event which results in a person coming to a rest inadvertently on the ground or floor or some lower level," per the World Health Organization (Miake-Lye et al., 2013, p. 390). There are a number of studies that relate to the constructs of interest in this study and that speak to the interest in reducing the NOF of patients in hospitals with acknowledgement that the NOF in older adults were significantly higher than the NOF in younger adults (see Hill et al., 2013; Kte'pi, 2016; Lee et al., 2014; Lerdal et al., 2018; Melin, 2018). Many articles address the implementation of fall prevention programs in hospitals with delineation of the FPIs used within the program; some have isolated an FPI of interest to individually assess its effectiveness in reducing the NOF in a particular population or setting. A primary intervention to fall prevention includes assessing the patient's risk for falling (Kowalski, 2018). Various fall risk tools were used in hospitals, like the Morse Fall Scale, to determine which patients were at risk for falling (Kowalski, 2018). An adult patient's risk for fall can be assessed using the Morse Fall Scale and older adult patients' risk for falls can be assessed using the St. Thomas's Risk Assessment Tool in Falling Elderly Inpatients (Miake-Lye et al., 2013).

Indications of increased risk for falls include a history of falls, fear of falling, depression, and use of psychotropic medication, with anti-Parkinsonian, antihypertensive,

hypnotic, and antianxiety medications increasing the risk for falls (Lerdal et al., 2018; Yoshikawa & Smith, 2017).

Falls by Patient Type

Although all hospitalized patients are at risk for falling, variations exist in the NOF by patient type (Hill et al., 2013; Kte'pi, 2018; Lee et al., 2014; Melin, 2018). For example, female patients are less likely to fall than male patients with comorbidities, medical patients fall more than surgical patients, and higher rates of falls have been reported on specialty units such as rehabilitation, geriatrics and neurology units, and older patients fall more frequently than do younger patients (Dyck et al., 2013; Lerdal et al., 2018; Miake-Lye et al., 2013; Oliver, 2007).

Additionally, symptom distresses associated with falls were those related to symptoms of severe pain, nausea, fatigue, insomnia, diarrhea, itching, edema, and vomiting (Lerdal et al., 2018). Fear of falling, ptophobia, is also associated with falls and is more prevalent in older adult patients than in younger adults (Yoshikawa & Smith, 2017). Older adults with ptophobia are inclined to experience challenges performing activities of daily living (Yoshikawa & Smith, 2017). The decrease in physical activity of older adults increases their risks for falls by quickening declines in balance, flexibility, and muscle strength (Yoshiwaka & Smith, 2017). In the elderly population, injuries from falls are a specific concern and older adults who present to hospitals acutely ill are often also immobile to some degree and are on multiple medications (Dyck et al., 2013; Oliver, 2007).

Fall Prevention Programs

Fall prevention initiatives require multidisciplinary approaches and multivariate components in order to be successful (Dyck et al., 2013; Miake-Lye et al; 2013). Nurses are challenged with creatively collaborating with interprofessional team players and developing creative strategies and interventions that not only reduce fall rates but significantly reduce these rates (Dyck et al., 2013). Miake-Lye et al., 2013 completed a metanalysis that identified bedside signs, scheduled toileting with supervision, staff/patient education, advised footwear, review of medication profile and assessment of fall risk as common components present in the literature that promote the successful implementation of fall prevention strategies. Pilot testing of FPIs, clinical front-line staff involvement in the FPI design, removal of nihilistic beliefs of patient falls and leadership support have also been identified as important components (Kowalski, 2018; Miake-Lye et al., 2013).

Many fall prevention programs result in reductions in the NOF without a significant effect on the large number of patients who continue to fall nationally each year (Lerdal et al., 2018; Miake-Lye et al., 2013; Yoshiwaka & Smith, 2017). Many of the studies that were successful in reducing the NOF were multifactorial studies that consisted of fall prevention programs with multiple interventions and reported the sum effect of the programs. However, the programs' results are confounded by the presence of other interventions (Hanes & Waldron, 2011; Melin, 2018; Miake-Lye et al., 2013; Oliver 2007; Spoelstra et al., 2012). For example, in 2014, seven hospitals were able to reduce the NOF by 35% as they participated in the Preventing Falls with Injury project

by Joint Commission's Center for Transforming Health Care (DuPree, 2016). Throughout the duration of this project, 21 fall prevention interventions were developed and implemented with the seven hospitals including hourly rounding, education, bedside shift reporting, scheduled toileting etc. (DuPree, 2014). With 21 fall prevention interventions, the individual ability to reduce the NOF by each intervention was not known because they were all implemented simultaneously. More examples include the multifaceted fall prevention program in Canada that added the intervention of hourly rounding and was successful in reducing the NOF on one of the trial units and another multivariate quality improvement project that utilized the Iowa Model of Evidence-Based Practice that was successful in reducing the NOF by 44.5%, (Dyck et al., 2013; Melin, 2018).

Standards of Care

The Institute for Healthcare Improvement (IHI) indicates that improving the experience and outcomes of patients are explicit for healthcare related organizations (Kowalski, 2018). Patient falls can prolong hospital stays and increase costs to hospitals with no reimbursement for any additional costs in association with falls or injuries related to falls by the Centers for Medicare and Medicaid Services to hospitals (Hou et al., 2017; Kowalski, 2018; Wright, 2006). Consequences of falls also include increased incidences of discharges to long-term care facilities from hospitals (Miake-Lye et al., 2013). As a national standard of safety, hospitals are required to have fall-reduction programs by the Joint Commission and the adverse effects of patient falls are monitored regularly by the Joint Commission (Hou et al., 2017; Kowalski, 2018). However, when developing fall prevention programs for a specific hospital, it is important to consider that not all fall

prevention interventions are suitable for all wards and all patient populations (DuPree, 2014; Hanes & Waldron, 2011). Contexts deemed important in understanding efficiency and influence of FPIs in hospitals include organizational culture of patient safety, structural characteristics of the organization, teamwork, safety infrastructure, and leadership (Miake-Lye et al., 2013). The issue of falls is not a uniform one across hospital settings and patient groups and there are currently little studies that offer the investigation of the contributions of individual FPIs on the reduction of falls (DuPree, 2014; Hanes & Waldron, 2011; Lerdal et al., 2018; Miake-Lye et al., 2013). This necessitates the examination of the influence of FPIs by age to provide insight on how interventions can be bundled to promote greater reductions.

Summary and Conclusions

Many of the studies that were successful in reducing the NOF were multifactorial studies that consisted of fall prevention programs with multiple interventions and report the sum effect of the programs. However, the programs' results are confounded by the presence of other interventions (Melin, 2018; Hanes & Waldron, 2011; Miake-Lye et al., 2013; Spoelstra et al., 2012). The determination of what specific fall prevention interventions to apply to a particular hospital, ward, or patient can be difficult as different patients have varying dynamic needs and each hospital and ward has varying layouts, staffing and patient population compositions (Hanes & Waldron, 2011; Oliver, 2007).

Older adults fall more frequently than younger adults and the injuries they experience from falls are a specific concern. As people age, balance and muscle

strength is lost, susceptibility to delirium, fractures and infection increases, reflexes, visual and cardiovascular efficiency decline and postural stability becomes worst increasing the risk of falling (Kaufman, 2011; Kenny et al., 2017; Oliver, 2007). Additionally, many patients continue to fall in hospitals each year despite the fall prevention initiatives that have been instituted to reducing this alarming NOF (Melin, 2018; Silva & Hain, 2017). The FPIs that have been effective in reducing the NOF in some hospitals are present in the literature, but there is a lack of research that has explored the effect of FPIs by patient demographics such as age, gender, or ethnicity (Miake-Lye et al., 2013). This gap in knowledge of ideal FPIs for patients by age will be addressed by this study and is needed because elderly patients experience more falls in hospitals than do young adults, which may suggest a need for customized FPIs by age as opposed to a one common approach for fall prevention in hospitals (Dykes et al., 2010; Silva & Hain, 2017). Identification of FPIs that were most effective in reducing falls in older adults versus younger adults can inform nurses and other healthcare professionals on how existing policies, protocols and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in all hospitalized patients. FPIs that are most effective in reducing the NOF in older adults versus younger adults were identified by the application of a descriptive, retrospective, quantitative study to secondary data to explore the variables of age, FPI, and NOF. Further explanation of the methods used in this study are described in Chapter 3.

Chapter 3: Research Method

The purpose of this descriptive, retrospective, quantitative, secondary data anaylsis study was to explore the variables of age, FPI, and NOF to examine the differences in the influence or ability of bundled FPIs in reducing the NOF for patients by age. Identification of FPIs that achieve greater reductions of falls in older adults versus younger adults can inform nurses and other healthcare professionals on how existing policies, protocols, and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in all hospitalized patients. In this chapter, I discuss the research design, the rationale for research design, the methodology, and threats to validity.

Research Design and Rationale

The variables of this study were NOF, age, and FPI. The dependent variable was NOF and the independent variables were age and FPI. I used ANOVA and independent *t*-tests in SPSS to test the mean NOF across the 4 groups, which were (a) patients 60 years and older on an FPI, (b) 59 years and younger on an FPI, (c) 60 years and older not on an FPI, and (d) 59 years and younger not on an FPI. I selected this research method because it allowed for the comparison of means of NOF across the combinations of two factors—FPI and age—and enabled the examination of any interaction that occurred between them, thus answering the research questions(see Yin & Ozdinc, 2017). There were no time or resource constraints related to the chosen design.

Methodology

The target population for this study was hospital inpatients located in the southeastern United States. Secondary data on falls from a major hospital in the southeastern United States were analyzed.

Archival Data

I contacted the leading personnel for the Quality Assurance departments of two hospitals via phone and gave a brief overview of my study, inquiring about gaining access to their datasets. I retrieved email addresses of the final key individuals and sent those individuals emails, summarizing my study. I copied my dissertation committee chair on all emails sent. I received a positive response from one hospital. Once I received clearance from Walden University's Institutional Review Board (IRB), I completed the hospital's Data Request Form, Research Oversight Committee Application, and the Research Financial Clearance Form, and submitted the forms along with my IRB approval letter to the manager of the hospital's Office of Research Administration. The Walden University IRB approval number is 06-05-19-0675653. I also requested an Institutional Affiliation Agreement form from Walden University per this hospital's research requirements, completed the form, and submitted it to the manager of research administration where it was forwarded to the hospital's legal department and processed. Once all documents were processed and approved, the manager of research administration informed me of approval and placed me in contact with the hospital's information technology team to assist me directly with accessing the data I needed. De-identified secondary data included all in-patients who experienced a fall two years prior

to the implementation of the hospital's fall prevention program and two years after the fall prevention program was implemented.

Operationalization

NOF, a continuous variable, was measured by the total number of patient falls and has a ratio level of measurement. Age was measured in years and this variable was operationalized as a categorical level variable by grouping patients 59 years and younger into one category, and patients 60 years and older into a second group. The variable FPI was measured categorically and was based on the presence of or lack of FPI at the time the patients fell. For example, patients who fell prior to the implementation of the respective fall prevention program at the hospital were placed in the category "not on an FPI."

Data Analysis Plan

I used SPSS version 25 to conduct statistical tests relative to the analysis of the secondary data sets to which I was granted access. Secondary data was not cleaned nor manipulated, but was screened to ensure categorical organization of the independent variables of age and FPI prior to conducting statistical tests.

The following were the research questions and hypotheses in this study.

RQ1: What was the difference in the NOF in hospitalized older adults compared to hospitalized younger adults?

$H_0$1: There was no difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

H_A1: There was a difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

RQ2: What was the difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI?

H_02: There was no difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

H_A2: There was a difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

RQ3: What was the difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI?

H_03: There was no difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

H_A3: There was a difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

I accessed data from a major hospital in the southeastern region of the United States after obtaining approval from Walden University's IRB. To analyze the data, I initially planned to use a Solomon group 4 design and the dates on which patients fell by calculating a two-way ANOVA and independent *t*-test to determine the effect of age and FPI on NOF and to examine the differences of mean NOFs among the four groups. However, due to electronic system failures, the hospital only had data reflecting patient falls from January of 2017 to the time of my request, which was September, 2019 (see Falls Data, 2019). This affected my ability to use the Solomon 4 group design because it

entails investigation to a main effect (in this case, NOF) in a pretest, which must have occurred prior to exposure of the treatment (in this case, the implementation of the 2014 fall prevention program that introduced the bundle of FPI), and the main effect (NOF) in a posttest, which occurs after exposure to the treatment (see Van Engelenburg, 1999). I could not use the Solomon 4 group design because the data set did not contain information about the falls data from years immediately before and after the fall prevention program was implemented. Therefore, instead of using Solomon 4 group design to answer RQ3, I used two-way ANOVA to examine the differences in the mean NOF across groups. Statistical significance was determined by a *p*-value of less than 0.05.

Threats to Validity

I did not have a sample of the data set. Therefore, I did not know how data were coded or organized. Threats to external validity relative to reactive effects of experimental arrangements, testing reactivity, and multiple treatment interference do not apply to this study because I did not conduct an experimental study. Threats to internal validity relative to experimental mortality, multiple treatment interference, and instrumentation did not apply to this study because experimental and treatment groups did not exist in my study, nor did I use a measurement instrument to gather data. Rather, I analyzed de-identified secondary data.

Ethical Procedures

The secondary data I analyzed was de-identified by the quality assurance team of the hospital to only include demographics and fall-related information and factors. The

dataset is stored on my personal laptop secured with password protection that is only known to me. The chair of my dissertation committee, who also served as my methods expert, was given access to the dataset via email for the purposes of ensuring adequate utilization and application of statistical tests. I will store the dataset on my password protected laptop for five years per Walden University's IRB, after which I will destroy the data. There were no conflicts of interest relative to conducting this study in my own work environment or any environment with which I am affiliated.

Summary

I conducted a descriptive, retrospective, quantitative study using secondary data from a hospital in the southwestern United States. I initially planned to use Solomon 4 group design with two-way ANOVA and independent *t*-tests to answer the research questions. In Chapter 4, I address the procedures relative to the access, analysis, and results of secondary data.

Chapter 4: Results

The purpose of this descriptive, retrospective, quantitative, secondary data analysis study was to explore the variables of age, FPI, and NOF to identify and describe the differences in the influence or ability of bundled FPIs to reduce NOF in older adults versus younger adults who were hospitalized.

The following were the research questions and hypotheses in this study.

Research Question #1: What is the difference in the NOF in hospitalized older adults compared to hospitalized younger adults?

$H_0$1: There will be no difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

H_A1: There will be a difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

Research Question #2: What is the difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI?

$H_0$2: There will be no difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

H_A2: There will be a difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

Research Question #3: What is the difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI?

$H_0$3: There no difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

H_A3: There will be a difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

In this chapter, I report the baseline descriptive and demographic characteristics of the sample, univariate analyses, evaluation of statistical assumptions, exact statistics, and associated probability values of statistical tests. I also provide a summary of answers to each research questions.

Data Collection

My original plan was to examine two bundles of FPIs from two different hospitals and address potential differences in the ability of each to reduce the NOF in older and younger hospitalized patients respectively to satisfy my original. However, as I gained permission from only one hospital to use data, I had to shift my focus of analysis on one dataset.

With that shift in focus, I planned to analyze patient fall data from this hospital from 2011-2016 to capture the potential variances in the NOF in hospitalized patients before and after the implementation of the hospital's fall prevention program in 2014. However, due to electronic system failures, the hospital only had data reflecting patient falls from January of 2017 to the time of my request, which was September 2019 (see Falls Data, 2019). This affected my ability to utilize the Solomon 4 group design because it entails investigation to a main effect (in this case, NOF) in a pretest, which must have occurred prior to exposure of the treatment (in this case, the implementation of the 2014

fall prevention program that introduced the bundle of FPI), and the main effect (NOF) in a posttest, which occurs after exposure to the treatment (see Van Engelenburg, 1999). I could not use this design because the data set did not contain the falls data from years immediately before and after the fall prevention program was implemented. Therefore, instead of using Solomon 4 group design to answer RQ3, I used two-way ANOVA to examine the differences in the mean NOF across groups.

In Table 1, the descriptive statistics for age category are depicted with 21.5% being younger adults (59 and younger), 14.9% being older adults (60 and older), and majority of cases, 63.6%, having an uncaptured age. Upon recognition of such a large number of the sample having an unknown age, I contacted the falls prevention nurse administrator requesting these data, but she indicated that there was no way to capture this information. Patients with uncaptured ages, making up more than half the falls in my dataset, threaten the reliability and validity of the findings of my study.

Table 1

Descriptive Statistics of Age Category

	Frequency	Percent
Younger adults	422	21.5
Older adults	293	14.9
Unknown age	1,248	63.6
Total	1,963	100.0

In Table 2, the descriptive statistics for gender of the patients who fell 2017-2019 are depicted, with 37.9% being female patients and 56.3% being male patients.

Table 2

Descriptive Statistics by Gender

	Frequency	Percent
F	744	37.9
M	1106	56.3
Unknown	113	5.8
Total	1,963	100.0

In Table 3, the descriptive statistics for FPI status of the patients who fell 2017-2019 are depicted, with 81.1% of the patients who fell being on FPIs and 12.3% of the patients who fell not being on FPIs.

Table 3

Descriptive Statistics of FPI

	Frequency	Percent
No	241	12.3
Unknown	130	6.6
Yes	1592	81.1
Total	1,963	100.0

Crosstabulations were completed for FPI status and Age Category for each year, and are in Tables 4, 5, and 6.

Table 4

FPI Status and Age Category of 2017 Patient Falls

		Age by category			
		Younger adults	Older adults	Unknown age	Total
Fall safety precautions in place	No	32	17	30	79
	Unknown	13	6	8	27
	Yes	212	133	129	474
Total		257	156	167	580

Table 5

FPI Status and Age Category of 2018 Patient Falls

		Age by Category			
		Younger adults	Older adults	Unknown age	Total
Fall safety precautions in place	No	20	3	69	92
	Unknown	14	5	47	66
	Yes	96	99	492	687
Total		130	107	608	845

Table 6

FPI Status and Age Category of 2019 Patient Falls

		Age by Category			
		Younger adult	Older adult	Unknown age	Total
Fall safety precautions in place	No	8	3	59	70
	Unknown	4	1	32	37
	Yes	23	26	382	431
Total		35	30	473	538

Based on the G*power analysis, the minimum number of cases needed for my sample was 270; I had 1,963 cases, with 715 of those cases containing an identifiable age. My overall sample was representative because it included all patients who fell during the time frame. However, age was a variable of interest and I could only include 36% of the cases in my statistical analyses, which is not proportional to the larger population of patients who fell in that hospital.

Results

A total of 1,963 patients fell between 2017 and 2019. The majority (56.3%) of the patients who fell were male. Majority of patients who fell (63.6%) had an uncaptured age. However, there were 715 patients who fell whose ages were recorded and of those with recorded ages, 21.5% were younger adults (59 and younger) and 14.9% were older adults (60 and older).

The following section includes the first research question and the relevant statistical analyses.

Research Question 1: What is the difference in the NOF in hospitalized older adults compared to hospitalized younger adults?

$H_0$1: There will be no difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

H_A1: There will be a difference in the NOF in hospitalized older adults compared to hospitalized younger adults.

I tested for the assumptions for the independent *t*-test, which were as follows:

(a) Assumption 1: The data are normally distributed. The Shapiro-Wilks tests of normality showed that the dependent variable, NOF was not normally distributed p=.000. However, it is possible that there were deviations from normality since my sample size was large (Field, 2015). The Q-Q plot in Figure 2 shows that there were deviations from normality in NOF.

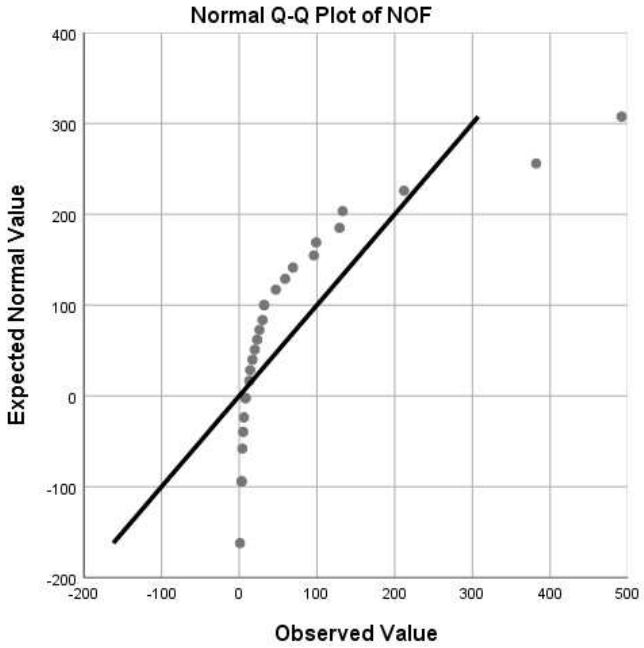

Figure 2. Q-Q plot for NOF.

(b) Assumption 2: The data are interval or ratio level. The independent variables, age and FPI, are categorical variables but NOF for younger and older adults on and not on FPIs was separated by year so that the mean NOFs could be calculated for each independent variable group, making NOF an interval level of measurement.

(c)Assumption 3: The variance (standard deviation) are the same in both groups, which indicates homogeneity of variance. Levene's Test for Equality of Variances depicts an F value of .723 and a *p* value = .443 which is not significant so there is homogeneity of variance and the assumption is met.

(d) Assumption 4: Scores are independent, coming from two groups. The NOF in each group or age category (older adults versus younger adults) are

exclusively separate. No case of a fall in the older adult group is replicated in the younger adult group.

To analyze the differences in NOF between hospitalized younger and older adults, the mean NOFs were examined. Data from crosstabulations in Tables 4, 5, and 6 were placed in a sub dataset. NOF was separated by year for each age category so that mean NOFs could be calculated for each age category and examined using the independent *t*-test. The *t*-value was .581 and the $p = .592$, which indicated that there was no significant difference between the mean NOFs in older and younger adults between 2017 and 2019. Therefore, the null hypothesis was retained (see Table 7).

Table 7

Independent t-test of Age Category and NOF

		Levene's test for equality of variances		t-test for equality of means						
									95% Confidence interval of the difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. Error difference	Lower	Upper
NOF	Equal variances assumed	.723	.443	.581	4	.592	43.000	74.029	-162.536	248.536

The second research question was as follows:

Research Question 2: What is the difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI?

$H_0$2: There will be no difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

H_A2: There will be a difference in the NOF in hospitalized older adults on an FPI compared to hospitalized younger adults on an FPI.

I tested for the assumptions for the independent *t*-test which were as follows:

(a) Assumption 1: The data were normally distributed. The Shapiro-Wilks tests of normality shows that the dependent variable, NOF, in the FPI group is normally distributed $p = .070$.

Table 8

Tests of Normality for FPI and NOF

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	FPI Status	Statistic	df	Sig.	Statistic	df	Sig.
NOF	on FPI	.274	9	.049	.848	9	.070
	no FPI	.190	9	.200*	.885	9	.179
	FPI status unknown	.289	9	.029	.800	9	.021

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 9

Welch's t-test for Unequal Variances for FPI and NOF

NOF				
	Statistic[a]	df1	df2	Sig.
Welch	2.393	2	3.410	.224
Brown-Forsythe	4.079	2	3.283	.129

a. Asymptotically F distributed.

(b) Assumption 2: The data are interval or ratio level. The independent variables, age and FPI, are categorical variables but NOF for younger and older adults on and not on FPIs was separated by year so that the mean NOFs could be calculated for each independent variable group, making NOF an interval level of measurement.

(c) Assumption 3: The variance (standard deviation) are the same in both groups which indicates homogeneity of variance because the Levene's Test for Equality of Variances depicts an F value of .832 and with a *p*-value = .413. Therefore, with a *p*-value that was not significant, the homogeneity of variance assumption was met.

(d) Assumption 4: Scores are independent: come from two groups. The NOF in each group or category (older adults, younger adults, on FPI, not on FPI) are exclusively separate. No case of a fall in the older adult group is replicated in the younger older group.

Table 10 illustrates the difference in the NOF in hospitalized older adults on FPIs was 258 and the NOF in hospitalized younger adults on FPIs was 331. To evaluate variances in NOF between hospitalized younger and older adults on FPIs, the mean NOFs were examined. Data from crosstabulations in Tables 4, 5, and 6 were placed in a sub dataset. NOF for younger and older adults on FPIs was separated by year so that the mean NOFs could be calculated for each age category on FPIs and examined using independent *t*-test. Independent *t*-tests were completed to evaluate the mean NOF for

both age categories on FPIs and the statistical significance in the difference between each mean.

Table 10

Age Category and FPI

		Age by category			
		Younger adults	Older adults	Unknown age	Total
Fall safety precautions in place	No	60	23	158	241
	Unknown	31	12	87	130
	Yes	331	258	1003	1592
Total		422	293	1248	1963

Table 11 shows the sample size was depicted as 3 for each age category because it represents the number of years captured for each age category relevant to NOFs of those patients who were on FPIs. Three years of falls, 2017, 2018, and 2019 were captured in this data set. Younger adults on an FPI had an average NOF of 110.33 across the three years and older adults on an FPI had an average NOF of 86.00 across the three years.

Table 11

Independent t-Test of NOF by Age Category on FPI Group Statistics

	Age	N	Mean	Std. deviation	Std. error mean
NOF on FPI	Younger adults	3	110.33	95.312	55.028
	Older adults	3	86.00	54.672	31.565

Levene's Test for Equality of Variances (F value) was .832 and was not significant (p =.413). Therefore, the assumption of homogeneity of variance was met. The results of the independent t-test showed no statistically significant difference between the mean NOF of older adults on FPIs and mean NOF of younger adults on FPIs

(t = .384; p = .721). Therefore, there was no significant difference between the mean NOF of older adults on FPIs and mean NOF of younger adults on FPIs (see Table 12). Therefore, the null hypothesis was retained.

Table 12

Independent t-test of Age Category and NOF for Patient on FPIs

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
NOF on FPI	Equal variances assumed	.832	.413	.384	4	.721	24.333	63.439	-151.800	200.467

The third research question was as follows:

Research Question 3: What is the difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI?

$H_0$3: There will be no difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

H_A3: There will be a difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

There were differences in the NOF for hospitalized younger and older adults on FPIs compared to hospitalized younger and older adults not on an FPI. As seen in Table 16, of the patients with identifiable ages, 589 patients were on FPIs compared to 83 patients who were not on FPIs, with 506 more falls accounting for patients who were on FPIs. A total of 331 younger adults accounted for 16% of the patients on FPIs who fell between 2017-2019 and a total of 258 older adults on FPIs accounted for 13% of the patients who fell on FPIs with a combined percentage of 29% of all patients with identified ages who fell while on FPIs. A total of 60 younger adults not on FPIs accounted for 3% of the patients who fell between 2017 to 2019 and a total of 23 older adults not on FPIs accounted for 1% with a combined percentage of 4% of all patients with identified ages who fell while not on FPIs 2017-2019.

Table 13

Age Category and NOF for Patients On and Not On FPI

		Age by category			
		Younger adults	Older adults	Unknown age	Total
Fall safety precautions in place	No	60	23	158	241
	Unknown	31	12	87	130
	Yes	331	258	1003	1592
Total		422	293	1248	1963

I tested for the assumptions for the two-way ANOVA which were as follows:

(a) Assumption 1: The data are normally distributed. The Shapiro- Wilks tests of normality show that the dependent variable, NOF, grouped by age was normally distributed p =.070, greater than .05.

(b) Assumption 2: The data are interval or ratio level for the dependent variable and there are two independent categorical variables. The independent variables, age, and FPI, are categorical variables but NOF for younger and older adults on and not on FPIs was separated by year so that the mean NOFs could be calculated for each independent variable group, making NOF an interval level of measurement.

(c) Assumption 3: The results of Levene's test for equality of variances was F = 5.611, p =.001 (see Table 14). Therefore, the assumption of equal variance was not met. The inequality of variance value was then determined using the White's Test for Heteroskedasticity, which was also significant at .034, indicating that an assumption of unequal variance was also not met.

Table 14

Levene's Test of Equality in two-way ANOVA of FPI and Age on NOF

		Levene's statistic	df1	df2	Sig.
NOF	Based on mean	5.611	8	18	.001
	Based on trimmed mean	5.285	8	18	.002

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: NOF

b. Design: Intercept + AgeCategory + FPIStatus + AgeCategory * FPIStatus

(d) Assumption 4: Scores are independent and come from 2 groups. The NOF in each group or category (older adults, younger adults, on FPI, not on FPI) are exclusively separate. No case of a fall in the older adult group is replicated in the younger adult group.

I calculated a two-way ANOVA to examine the effect of age and FPI status on the mean NOFs. To evaluate variances in NOF between hospitalized younger and older adults on and not on FPIs, the mean NOFs were examined across age category and FPI status (on FPIs or not on FPIs). Data from crosstabulations in Tables 4, 5, and 6 were placed in a sub dataset. NOF for younger and older adults on and not on FPIs was separated by year so that the mean NOFs could be calculated for each age category on and not on FPIs and examined using two-way ANOVA.

Table 15 shows that the combined interaction of age and FPI on NOF was not statistically significant (p =.065), so the null hypothesis is retained.

Table 15

Tests Between Subjects in two-way ANOVA of FPI and Age on NOF

Dependent Variable: NOF						
Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared
Corrected model	263916.296[a]	8	32989.537	6.216	.001	.734
Intercept	142717.370	1	142717.370	26.892	.000	.599
Age category	59664.519	2	29832.259	5.621	.013	.384
FPI status	147220.963	2	73610.481	13.870	.000	.606
AgeCategory * FPI Status	57030.815	4	14257.704	2.687	.065	.374
Error	95527.333	18	5307.074			

Total	502161.000	27
Corrected total	359443.630	26

a. R Squared = .734 (Adjusted R Squared = .616)

As seen in Table 16, the difference in mean NOFs between younger adults and older adults was 14.333 but was not statistically significant.

Table 16

Pairwise Comparisons in two-way ANOVA of Age on NOF

Dependent Variable: NOF

					95% Confidence Interval for Difference[b]	
(I) Age category	(J) Age category	Mean Difference (I-J)	Std. Error	Sig.[b]	Lower Bound	Upper Bound
Younger adults	Older adults	14.333	34.342	.681	-57.816	86.482
	Unknown age	-91.778*	34.342	.016	-163.927	-19.629
Older adults	Younger adults	-14.333	34.342	.681	-86.482	57.816
	Unknown age	-106.111*	34.342	.006	-178.260	-33.962
Unknown age	Younger adults	91.778*	34.342	.016	19.629	163.927
	Older adults	106.111*	34.342	.006	33.962	178.260

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table 17 shows the difference in mean NOFs between patients on FPI and patients not on FPI was 150.111 and was statistically significant with a *p*-value of .000. Therefore, the null hypothesis was rejected because there was a difference in the

NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI.

Table 17

Pairwise Comparisons in two-way ANOVA of FPI on NOF

Dependent variable: NOF

(I) FPI status	(J) FPI status	Mean difference (I-J)	Std. error	Sig.[b]	95% Confidence interval for difference[b] Lower bound	Upper bound
on FPI	no FPI	150.111*	34.342	.000	77.962	222.260
	FPI status unknown	162.444*	34.342	.000	90.295	234.594
no FPI	on FPI	-150.111*	34.342	.000	-222.260	-77.962
	FPI status unknown	12.333	34.342	.724	-59.816	84.482
FPI status unknown	on FPI	-162.444*	34.342	.000	-234.594	-90.295
	no FPI	-12.333	34.342	.724	-84.482	59.816

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Figure 3 shows that older adults had a lower mean NOF than that of younger adults. I observed that were very small numbers of patients who fell in both age groups who were not on FPIs. I also observed that though younger adults had more NOFs, the lines for both age groups resembled each other in plotting.

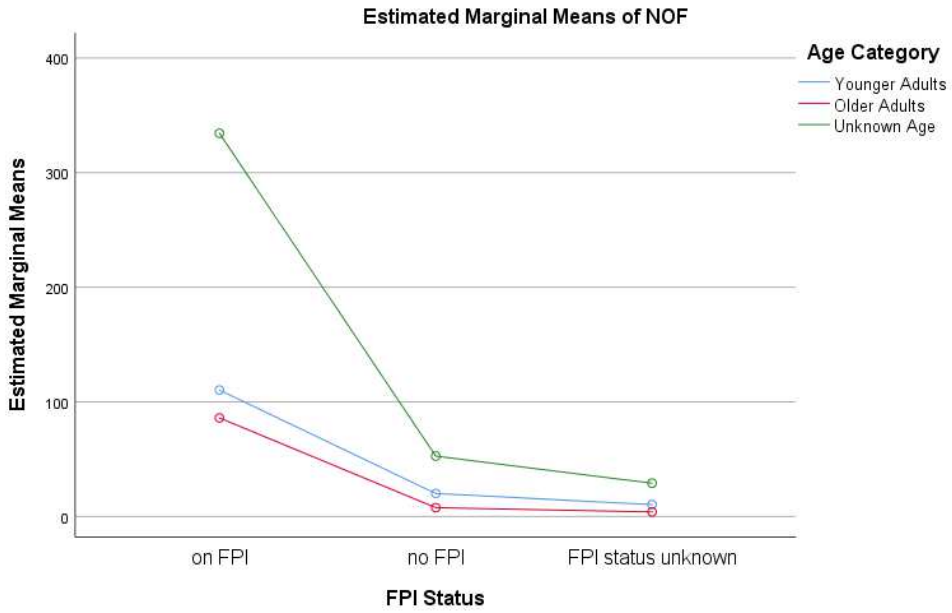

Figure 3. Profile plots for estimating marginal means of NOF in two-way ANOVA of FPI and age category on NOF with focus on FPI (Falls Data, 2019).

Summary

In summary, the null hypothesis for RQ1 was retained, which means there was no difference in the NOF in hospitalized older adults compared to hospitalized younger adults, because the difference between the mean NOF for older adults versus younger adults was not statistically significant with a (t =.581; p =.592).

The null hypothesis for RQ2 was also retained, which was that there was no difference in the NOF in hospitalized older adults on FPIs compared to hospitalized younger adults on FPIs, because the difference between the mean NOFs was not statistically significant (t =.384; p =.721).

The null hypothesis for research question 3 was rejected because there was a difference in the NOF for hospitalized younger and older adults on an FPI compared to hospitalized younger and older adults not on an FPI, (p =.000). Though a two-way

ANOVA for RQ3 was completed, and the alternative hypothesis was accepted, the assumption of homogeneity for the two-way ANOVA was not met so the results of the two-way ANOVA cannot be confidently interpreted.

The individual interventions that make up the unique FPI bundle in this study were non-skid socks, yellow wrist band, assessment and re-assessment of fall risk score using Morse Fall Scale and bed alarms. These interventions seem to more efficiently prevent falls in older adults versus younger adults. However, a challenge and threat to the reliability of these outcomes were due to 63.6% of the fall cases having an age that was not captured. Interpretation of these results, limitations of my study, and recommendations for future research and conclusions are discussed in Chapter 5.

Chapter 5: Summary, Conclusions, and Recommendations

The purpose of this descriptive, retrospective, quantitative, secondary data analysis study was to explore the variables of age, FPI, and NOF to examine the influence or ability of bundled FPIs in reducing NOF for patients by age. This study was conducted because there is a lack of research that has explored the effect of FPIs by patient demographics such as age, gender, or ethnicity (Miake-Lye et al., 2013). However key findings of this study reveal no statistically significant difference between the mean NOF of older adults versus younger adults, and there was no statistically significant difference between the mean NOF of older adults on the FPI bundle versus younger adults on the FPI bundle. Another key finding that cannot be confidently concluded is a statistically significant difference between the mean NOF of patients who were on the FPI bundle versus those who were not.

Interpretation of the Findings

A review of the literature established that hospitalized patients 60 and older fall more frequently than that of hospitalized patients 59 and younger (see Dykes et al., 2010; Miake-Lye et al., 2013; Silva & Hain, 2017). My findings indicate that with this population, a larger number of younger adults fell than older adults. Within the context of Virginia Henderson's needs theory, the greater number of younger adults who fell at this hospital 2017- 2019 compared to older adults, may suggest that the bundle of FPIs used at this hospital is more efficient in reducing falls in older adults than in younger adults. However, I did not control for comorbidities in my study, whether it is single or multi-bedding units, medication profile, nor nursing staffing ratios, all of which can all impact

NOFs (see Boyle et al., 2015; Brenna de Souza et al., 2019; Kim et al., 2019; Oliveira et al., 2019). Additionally, the patients who fell whose ages were not captured had a high number of falls, indicating the presence of valuable data lost in that group that could have offered insight if analyzed. The ability to confirm or refute findings or extend knowledge in the literature review is limited in this study because the finding that was statistically significant could not be confidently concluded. In addition, the other findings that could be confidently interpreted were not statistically significant.

Updates in the literature include the confirmation that falls in hospitals depend on the quantity and quality of nursing care and that there is still very little known about factors associated with hospital falls (Brenner de Souza et al., 2019; Spano-Szekely et al., 2019). A retrospective study of falls in a 497-bed acute care facility in January of 2018 about falls from 2012-2017 concluded that 80% of patients who fell and experienced a serious adverse or sentinel event were 60 years and older (Brenner de Souza et al., 2019). This study also concluded that 70.8% of all falls occurred in patients who were 60 years and older and recommended that fall prevention strategies focus on patients who are 60 and older especially those who are using medications that increase their risk for falls (Brenner de Souza et al., 2019). Another study that was completed from 2014-2017 achieved a 54% reduction of falls using a fall prevention program that included video monitoring for fall risk patients who were impulsive and purposeful hourly rounding (Spano-Szekely et al., 2019).

Limitations of the Study

One major limitation to this study was not knowing 63.6% of the ages of the patients who fell. Additionally, the original years of interest, which would have captured the years before the fall prevention program was implemented, could not be accessed due to technological failures and loss of data at the hospital. This led to collection of data that contained patient falls that all occurred well after the fall prevention program was in place and a small number of patients in the not on an FPI group. These limitations are all detrimental to the reliability, validity, and trustworthiness of my findings.

Other limitations relevant to the design of the study include that the records of the patients were not randomly selected; therefore, the results of this study cannot be generalizable to other areas. Limitations of secondary data analysis include challenges to conclude with 100% certainty the credibility of how the data were collected and the integrity of how they were reported (see Ellram & Tate, 2016; Kolassa et al., 2013). I had no control over the way secondary data were coded or structured (see Ellram & Tate, 2016). I collected data from just one hospital, which limits the generalizability to other similar institutions, and these data were incomplete. Another limitation was that for assumption #3 of research question #3 both homogeneity of variance and heteroskedascity of variance values were significant, threatening the trustworthiness of my findings for that question.

Recommendations

The difference in the NOF among age is well known in the literature (see Dyck et al., 2013; Kaufman, 2011; Kenny et al., 2017). I recommend future research studies at

using other populations to determine what bundles of FPIs have the greatest reduction in falls in young adults and in the elderly population. I also recommend analyzing that existing data using an independent *t*-test and two-way ANOVA data to determine if the bundled FPIs were most effective in reducing falls in older or younger adults to inform nurses and other healthcare professionals on how existing policies, protocols, and programs can be revised to achieve positive social change by attaining greater success in reducing the NOF in all hospitalized patients (Miake-Lye et al., 2013).

Implications

This study has the potential to impact positive social change at the organizational level in the hospital setting by informing practice to reduce the NOF by determining which FPIs are most effective in reducing falls in the hospitalized older adult population. More research is needed to explore the NOFs in similar hospitals with the same FPIs and a complete dataset that offer ages for all patients who fell in order to determine if the FPIs used at this hospital (non-skid socks, yellow wrist band, assessment/re-assessment of fall risk score using Morse Fall Scale, and bed alarms) are more effective in reducing NOF in patients 60 and older. This study also has the potential to impact positive social change by contributing to the knowledge relevant to FPI bundles most effect for patients by age and by stimulating similar studies and various hospitals to build on that contribution. Guided by the theoretical foundation, Virginia Henderson's needs theory, the theoretical implications of this study include consideration for the variance in influence of FPIs to reduce NOF in hospitalized older adults versus younger adults because the needs of each age group differ. Recommendations for practice include (a)

integrating customized FPI bundles to existing fall prevention programs to implement FPIs most effective for patients by age to achieve greater reductions in the NOF in all patients and (b) thorough data collection and record keeping that captures essential variables such as age so that meaningful reliable retrospective studies can continually be completed.

Conclusion

The diligence of healthcare to prevent falls in hospitals is besmirched by the high number of 1 million patients who continue to fall each year and the tragic deaths and debilitating injuries that occur as a result (Melin, 2018; Silva & Hain, 2017). As the desire is strong to see a change in these concerning NOFs, so is the need to change the strategies of healthcare in lowering the NOFs, by first assessing how well current efforts work for patients by age and then using that knowledge to guide the initiatives to enhance existing strategies. Hospitalization puts patients of all ages at risk for falls; however, elderly patients, ages 60 and older, experience falls more frequently than other age groups and incur more injuries from falls (Brenner de Souza et al., 2019; Dykes et al., 2010; Silva & Hain, 2017; Spano-Szekely et al., 2019). Continued consistent, collaborative efforts to evaluate the influence of FPIs by patient age, with consequent thorough contributions to the literature, can inform ongoing practice and impact positive social change relevant to reducing the annual NOFs in hospitals.

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