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EFFECTIVENESS OF A FALL PREVENTION EDUCATIONAL PROGRAM FOR LONG-TERM CARE NURSING STAFF

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EFFECTIVENESS OF A FALL PREVENTION EDUCATIONAL PROGRAM FOR LONG-TERM CARE NURSING STAFF

by

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Dedication

To all elderly patients and their families who have lost their lives as a result of falls or fall related injuries and to my dad, Sir Law Chikwe Oguzie, who was here on earth when I ventured into this journey but not here to see me complete it.

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Effectiveness of a Fall Prevention Educational Program for Long-Term Care Nursing Staff

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The goal of the research study was to evaluate the impact of an educational intervention on falls in a long-term care facility by (a) measuring staff knowledge of fall prevention, (b) behavioral assessment of fall prevention approaches, and (c) evaluation of fall rates and fall injury rates. The study used convenience sampling of nursing staff members, which included nursing assistants and medication aides. A Single-Group-Repeated Measures study design was used to evaluate knowledge and use of fall prevention strategies. The nursing staff members received face-to-face educational sessions on fall prevention using AHRQ guidelines on universal fall precautions. Pre-test, one month post-intervention, and three months post-intervention questionnaires were administered to assess knowledge and behavior. Data on fall rates, fall injury rates, severity of injuries, and repeated falls were collected at three months pre-intervention and throughout the three-month post-intervention period.

The Friedman test was used to analyze the Fall Prevention Knowledge test scores and showed a statistically significant difference between the Fall Prevention Knowledge

test scores on fall prevention approach (FPT) scores across the three time points. The Wilcoxon signed rank and sign test were used to analyze the Behavior Assessment subscale scores across two time points and showed no statistically significant difference across time points. The Pearson correlation was used to determine the relationship between knowledge and behavioral change scores before time 1 and after time 2 and time 3. At one-month and three-month post educational intervention, there were significant positive correlations between knowledge and behavioral assessment scores associated with several dependent variables. This indicated a likely relationship between knowledge and behavior in the study.

At three-month post-intervention, fall rates in the healthcare living setting decreased and there were no major injuries reported. Implications for nursing relate to a need to stimulate interest in learning by staff, the importance of including all care providers in fall prevention efforts, and improvement of retention and recruitment strategies by long-term care facilities. Interest in learning may be improved through the use of incentives, time-off for education, mandatory educational training, tuition reimbursement, and an increase in hourly wages.

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List of Abbreviations

AHRQ	Agency for Healthcare Research and Quality
ANOVA	Analysis of variance
BFPT	Behavior Assessment on Fall Prevention Approach
BRPT	Behavior Assessment on Risk factors for falls
BSTT	Behavior Assessment on Safe Transfers and Mobility Technique
BMST	Behavior Assessment on Multidisciplinary strategies to reduce falls
CNA	Certified Nursing Assistants
CMA	Certified Medication Aide
FPKBAQ	Fall Prevention Knowledge and Behavioral Assessment Questionnaire
FPT	Fall Prevention Approach
IRB	Institutional Review Board
LVN	Licensed Vocational Nurse
MST	Multidisciplinary strategies to reduce falls
RN	Registered Nurse
RFT	Risk factors for falls
STT	Safe Transfers and Mobility Technique
SPSS	Statistical Package for the Social Sciences
UTMB	University of Texas Medical Branch

Chapter 1: Introduction to the Study

Chapter one introduces the study, describes the problem, provides the background of the problem, and establishes the significance of the problem. Chapter one also includes the theoretical framework, study aims, research questions, overview of the design, and significance of the study.

STATEMENT OF THE PROBLEM

In long-term care settings, 29–55% of residents fall during their stays and up to 20% of residents have injury rates two times that of community-dwelling adults (Centers for Disease Control and Prevention [CDC], 2015a; Texas Department of Aging and Disabilities [DADS], 2013). Falls among older adults cost the U.S healthcare system $30 billion annually in direct medical costs when adjusted for inflation (CDC, 2015b). By 2020, it has been estimated that the annual direct and indirect costs of fall injuries may reach $54.9 billion (CDC, 2015b). The total annual Medicare costs for falls in 2015 was $31 billion (CDC, 2016).

Falls in NHs are frequent causes of litigation and citation by regulatory agencies. Yet fall prevention constitutes a significant challenge in long-term care settings (Willy & Osterberg, 2014). NHs are at particularly high risk for falls, with approximately 20% of NH deaths being caused by falls (Becker & Rapp, 2010). Falls and fall-related injuries result in disabilities, functional decline, reduced quality of life, increased healthcare costs, and longer lengths of stay for unplanned hospital readmission (Currie, 2008).

Falls in long-term care settings can be reduced through prevention strategies focused on nursing staff. Indeed, nursing staff education is a significant part of any fall prevention program. Fall prevention education programs that focus on the need for safety

assessments, the importance of providing fall prevention services, assessments of risk factors for falls, and knowledge of interdisciplinary strategies to reduce the occurrence of falls are vital areas for sustainable and successful prevention programs used by nursing staff (AHRQ, 2012).

BACKGROUND AND SIGNIFICANCE OF THE PROBLEM

Falls in the elderly are a major health problem that often results in poor outcomes. Falls in long-term care facilities are likely to result in serious complications such as bone fractures and even death (Becker & Rapp, 2010). Ten percent of NH residents who fall suffer serious injuries, and about 65,000 NH residents suffer hip fractures annually (AHRQ, 2012). NH residents account for about 20% of the total fall deaths for adults 65 years and older (CDC, 2015a). Falls are the most frequently-reported adverse incidents in NHs and are a major source of morbidity and mortality among residents (Wagner, Scott, & Silver, 2011).

Definition of fall

The U.S. Department of Health and Human Services' (DHHS) Centers for Medicare and Medicaid Services (CMS) described falls, with or without injury, as "unintentionally coming to rest on the ground, floor or other lower level, but not as a result of an overwhelming external force [i.e., residents pushing one another]" (DHHS-CMS Manual, 2007, p. 3). Taylor and Saliba (2012) indicated that falls are an unintentional change in position, coming to rest on the ground or the next lower surface that do not result from being pushed down or collapsing from a sudden-onset medical condition.

Risk Factors for Falls

Risk factors for falls are higher for NH residents than for people living in community settings. Most NH residents have more than one recognizable risk factor such as muscle weakness, balance or gait abnormality, poor vision, delirium, cognitive impairment, functional impairment, orthostatic hypotension, and urinary incontinence (Becker & Rapp, 2010). Damian, Pastor-Barriuso, Velderrama-Gama, and de Pedro-Cuesta (2013) identified several risk factors for older adults living in NHs: number of diseases, urinary incontinence, antidepressant use, arrhythmias, and polypharmacy. Diseases that may increase the likelihood of falling include dementia, depression, stroke, and Parkinson's disease, of which the latter in turn affects attention and executive function (Becker & Rapp, 2010).

Additional risk factors for falls include a prior history of falls, wandering or impulsive behavior, lack of exercise, unsafe NH environments, low NH staffing levels, and fear of falling (Lach & Parsons, 2013; Wagner, Scott, & Silver, 2011). Nazir, Mueller, Perkins, and Arling (2012) conducted a retrospective cohort study on falls and NH residents with cognitive impairment and found that severity of cognitive impairments impacted fall incidence and should be incorporated into future fall prevention interventions. NH residents with cognitive impairments constitute a large percentage of the NH population and are at an increased risk of falling (Nazir et al., 2012).

CONCEPTUAL FRAMEWORK

Social Cognitive Theory (SCT) (Bandura, 1986) was used as a framework for this study. SCT is a psychological model of behavior that emerged from the work of Albert Bandura, and it initially was developed to understand classroom motivation and learning (Denler, 2014). Bandura (1986) indicated that behavior change was determined by a

blend of personal, environmental, and behavioral factors including observational learning, outcome expectancy (a belief that behavior change will be successful), self-efficacy (a belief that one is capable of behavior change), and positive reinforcement for attempted change. SCT also assumed that if a person is to perform a behavior, the person must know what the behavior is (i.e., knowledge of the behavior) and how to perform the behavior (skill).

Six constructs of SCT were used to frame this educational intervention study: reciprocal determinism, behavioral capacity, observational learning, reinforcements, expectations, and self- efficacy. The educational session was structured using lectures, discussions, and video based on SCT. The study assumption was that an increase in fall prevention knowledge by long-term care staff members would allow for changes in their fall prevention behaviors. It was presumed that long-term care staff members' fall prevention practices were influenced by their personal and environmental factors, and that education based on the SCT constructs would serve to increase self-efficacy towards performing a particular behavior.

Reciprocal determinism refers to the dynamic and reciprocal interaction of persons, environment, and behavior (Denler, 2014). *Behavioral capability* refers to knowledge and skills used to perform a given behavior. Considering this construct, knowledge of fall prevention strategies and risk factors were believed to help staff members perform successful fall prevention behaviors. In *observational learning*, people witness and observe behavior conducted by others then reproduce those actions. Observational learning is dependent on related processes involving attention, retention, production, and motivation. Long-term care staff members in the study learned relevant

aspects of fall prevention behavior, thus bringing to their *attention* the importance of prevention and strategies to prevent falls. *Retaining* the knowledge of what was learned and observed was the desired outcome of the study, as it would allow staff members to *reproduce* these behaviors. The intended goal of the study was to reduce falls, which could provide *motivation* to continue the practices learned in the educational intervention.

Reinforcements refer to responses to people's behavior that affects the likelihood of continuing or discontinuing a given behavior. If certain behaviors reduced fall rates, the long-term care staff members might continue to engage in those behaviors**.**

Expectations refer to projected outcomes and consequences of people's behavior. If staff members utilize the contents learned from the educational intervention, fewer falls would be anticipated and residents and staff would observe positive consequences.

Finally, *self-efficacy* refers to the level of people's self confidence in their ability to successfully perform behaviors. Higher levels of self-efficacy have been found to correlate with greater choice and persistence (Denler, 2014). It was anticipated that an increase in knowledge of fall prevention would increase self-confidence and motivate individuals to attempt new behaviors, in turn resulting in fewer falls or injuries.

DEFINITION OF RELEVANT TERMS

Falls

Falls were defined as any unplanned descent to the floor, with or without injury to patients, including all unassisted and assisted falls.

Repeat Fall

Repeat fall was defined as more than one fall in a given month by the same patient.

Injury

Injury was defined as any skin break, bruise, head trauma, or evidence of fracture

Minor Injuries

Minor injuries were defined as injuries including abrasions, skin tears, hematomas, and bruises not requiring medical attention or evaluation in emergency rooms.

Major Injuries

Major injuries were injuries including fractures, head traumas, and lacerations.

Incident Rates

Incident rates of falls were broken down into single and repeat occurrence (e.g., first, second, third, fourth) as well as injury severity rates (e.g., minor, major).

STUDY AIMS AND RESEARCH QUESTIONS

The aim of the research study was to reduce falls through an educational intervention that included an approach to fall prevention, risk factors for falls, safe transfers and mobility techniques, and multidisciplinary strategies to reduce falls. To accomplish the study objectives, two specific aims were identified.

Specific Aim 1

Specific Aim 1 was to evaluate the effectiveness of an educational intervention on knowledge and use of fall prevention strategies among nursing staff members in a NH.

SA1RQ1: Is there a significant change in the four subscale scores for knowledge of fall prevention strategies of long-term care staff members following an educational intervention from pre-test (T1) to one month post-test (T2) to three months post-intervention (T3) after controlling for associated demographic variables?

SA1RQ2: Is there a significant change in the behavioral scores for reported use of fall prevention strategies of long-term care staff members following an educational

intervention from pre-intervention to three months post-intervention after controlling for associated demographic variables?

Specific Aim 2

Specific Aim 2 was to determine if an educational intervention or any of its components reduced fall rates and fall injury rates.

SA2RQ1: What is the difference in fall rates and fall injury rates at baseline (pre-intervention average over three months) compared to one month post-intervention and three months post-intervention?

SA2RQ2: What is the relationship between knowledge and behavioral change scores before (T1) and after (T2 and T3) an educational intervention on fall prevention?

OVERVIEW OF THE DESIGN

The research design was a Single-Group Repeated Measures quality improvement fall prevention intervention study. Pre-test, one month post-test, and three months post-intervention questionnaires of the Fall Prevention Knowledge Questionnaire and Behavioral Assessment Questionnaire (FPKBAQ) were administered to study participants. Measurement of long-term care staff knowledge occurred prior to the educational intervention, one month after the educational intervention, and at three months post-educational intervention. Behavioral assessment occurred prior to the educational intervention, one month post-test, and three months post-educational intervention. Over a period of six months, average data were collected for fall rates, fall injury rates, severity of injuries, and repeated falls from three months pre-intervention to three months post-intervention. Fall incident reports of who fell, when the fall occurred, and degree of injury were used to obtain information on fall data.

SIGNIFICANCE OF THE STUDY

Fall prevention is critical to improve quality of life in the elderly. Nursing staff members are essential for promoting a culture of patient safety across different levels of health care facilities (Wagner, Damianakis, Mafrici, & Robinson-Holt, 2010). Licensed vocational nurses (LVNs), registered nurses (RNs), certified nursing assistants (CNAs), and certified medication aides (CMAs) are the first line of care for patients in most NHs.

Moreover, nurses have a professional responsibility to ensure patient safety. Nurses have assessment skills and knowledge about disease process and medications that make them critical in fall prevention. Likewise, CNAs have knowledge and skills needed to perform basic care services for residents that make nursing assistants key to fall prevention. CNAs are frontline workers that spend the most time with patients and deliver a majority of the hands-on care that NH residents receive on a daily basis (Leland, Gozalo, Teno, & Mor, 2012). CNAs' understanding and skills in fall prevention in the context of residents' daily activities are essential to preventing falls. CMAs are involved in patient care when CNAs are not available, and CMAs routinely observe residents when administering medications.

Nursing assistants are often overlooked in addressing fall prevention programs in long-term care settings (Phillips, Roberts, & Hunsaker, 2008). The role of CNAs and CMAs in fall prevention is critically important because they are the frontline staff in long-term care. The inclusion of CNAs and CMAs in this study highlights their important role in fall prevention and aims to increase their knowledge of fall prevention techniques, in turn improving fall prevention behaviors and reducing falls.

ORGANIZATION OF THE STUDY

The dissertation is organized into five chapters. Chapter one introduces the study, study aims, definitions, and significance. Chapter two provides the review of literature and identification of gaps in the literature. Chapter three highlights the research design, description of sampling method, identification of setting, description of measurement methods, and process of data collection. Chapter four presents the findings of the study and data analysis for each research question. Chapter five provides study conclusions, implications for nursing, and recommendations for further research.

Chapter 2: Literature Review

Chapter two presents a review of the literature related to falls in elderly nursing home residents and methods aimed at preventing falls. The literature review includes an examination of the complex elements contributing to falls in elderly individuals, particularly for those living in long-term care settings, and identification of gaps in the literature. Additionally, chapter two includes a summary of literature related to the effect of education on knowledge and behavior of nursing care staff relating to prevention of falls.

SIGNIFICANCE OF FALLS IN THE ELDERLY

Falls as a Part of Aging

Rather than comprising a normal part of aging, falls are a preventable geriatric syndrome (Robin, 2007). When compared to other age groups, falls in the elderly result from a combination of high incidence and high vulnerability to injuries secondary to age-related physiologic changes (Rubenstein & Dillard, 2014). Physiologic changes of aging that contribute to falls include visual alterations, decreased muscle strength, limited joint flexibility, and gait changes (Schneider & Mader, 2007). Visual changes that occur with aging include decreased depth perception, decreased dark adaptation, and greater sensitivity to glare, all of which complicate mobility (Schneider & Mader, 2007). Aging causes muscle strength in the lower extremities to decrease and joints to become stiffer and to lose cartilage, which causes degenerative changes and difficulties in walking. Gait changes include slower speed, decreased stride length, and decreased heel lift. Movements due to aging become limited and walking becomes unsteady, which may lead to an increased fall risk (Schneider & Mader, 2007).

The risk of falling increases as the numbers of diseases occurring simultaneously are increased. Chronic diseases that affect visual and neuromuscular systems, mobility, and cognition increase the risk for falls and are common in elderly individuals living in long-term care settings (Schneider & Mader, 2007).

Falls in Long-Term Care Settings

Research data on falls vary by study population and study setting (e.g., hospital, community, long-term care). Research conducted on falls in the elderly typically focuses on either community-dwelling elders or elders living in long-term care settings. Community-dwelling elders are often described as being younger, healthier, more independent in their activities of daily living, and with fewer co-morbid conditions compared to elderly living in institutions such as NHs, assisted living facilities, and rehabilitation facilities (Schneider & Maher, 2007). Consequently, interventions to prevent falls in community-dwelling elders can be directed to individuals at risk for falling, direct caregivers, or family members. The prevalence of co-morbid diseases, functional impairment, and cognitive decline contributes to a higher risk of falls in long-term care settings (Berry & Kiel, 2016; Tariq, Kloseck, Crilly, Gutmanis, & Gibson, 2013). Falls in long-term care settings must incorporate different strategies due to the characteristics of individuals who reside in these facilities. One particular challenge in long-term care is the number of residents who have dementia.

Delirium and dementia are two of the most common diagnoses in long-term care facilities, and both conditions contribute to falls in elderly NH residents (Robin, 2007). Delirium is a primary cause of cognitive impairment and common in older patients. Delirium increases fall risks, institutionalization, and functional decline (Hshieh et al., 2015). Dementia can also increase fall risk through impaired judgement and diminished

motor function (Schneider & Mader, 2007). Conditions associated with dementia (e.g., cognitive impairment, gait and balance deficits, visual impairments, wandering, weakness) are key risk factors for falls (Oakley, Jarrett, & McCloskey, 2013).

Doorn et al. (2003) conducted a prospective cohort study comparing rates of falling between NH residents with and without dementia. Results indicated a significant difference in unadjusted fall rates for residents with dementia (4.05 falls per person per year) compared to residents without dementia (2.33 falls per person per year). The researchers concluded that nursing home residents with dementia should be considered important targets for fall prevention interventions.

Research has suggested that interventions which are successful in preventing falls in community-dwelling elders might not be effective in preventing falls in NH residents (Schneider & Mader, 2008). Individualized home exercise therapies focused on strength training and endurance were successful in reducing falls in community-dwelling elders but may be difficult to implement in long-term care residents with dementia or other chronic diseases (Schneider & Mader, 2007).

Karlsson, Vonschewelov, Karlsson, Coster, and Rosengen (2013) determined that physical exercise with several training modalities (e.g., balance training, strength training) was the only intervention program that reduced the number of fallers and falls in community-dwelling elders. Fall prevention practices in community-dwelling elders could focus on individuals, individuals' families, or caregivers. Because long-term care residents often suffer from multiple comorbidities—including dementia—it may be difficult to direct fall prevention practices (e.g., balance training) at individuals. In long-

term care settings, the focus of prevention must be on care providers, with particular emphasis on nursing staff members.

CONSEQUENCES OF FALLS IN THE ELDERLY IN LONG-TERM CARE SETTINGS

Factors Contributing to Falls in Elderly in Long-Term Care Settings

Research has demonstrated that multiple factors contribute to falls in the elderly population. These contributing factors can be categorized as fixed, transient, or situational. Fixed factors are visual changes or poor vision, impaired balance or gait, muscle weakness, and other comorbidities (Quigley et al., 2010; Rubenstein, 2016). Transient factors include abnormal vital signs, dehydration, and medication changes (Quigley et al., 2010). Situational factors involve personal activities (e.g., rushing to the bathroom) (Rubenstein, 2016). Falls in the elderly in long-term care often result from a combination of the contributing factor categories.

Robinovitch et al. (2013) conducted an observational study on fixed factor contributors to falls. The study revealed that incorrect weight shifting (forward walking, standing quietly, and sitting down) was the most frequent cause (41%) of falling in elderly individuals residing in a long-term care setting. Other causes of falls were tripping or stumbling (21%), hitting or bumping (11%), and collapsing or loss of support (11%).

Kosse, De Groot, Vuillerme, Hortobagyi, and Lamoth (2015) determined that fixed factors (e.g., impaired mobility) and transient factors (e.g., use of analgesics, beta blockers, psycholeptics) were associated with higher fall rates in long-term care residents with dementia. Conversely, immobility, heart failure, and an inability to communicate were associated with low fall rates.

Further, falls may occur due to interactions among specific risk factors and physical environments; these falls are representative of situational factors (Tariq et al.,

2013). For example, assistive devices such as walkers, canes, and wheelchairs are commonly used by elderly individuals living in institutions and are associated with an increased risk of falling. In addition to difficulties in maneuvering when using assistive devices, poor maintenance or incorrect sizing can contribute to increased fall frequency (Tariq et al., 2013).

The aforementioned research studies provided baseline understanding of how multiple factors contribute to falls in elderly patients residing in long-term care settings. In addition, these findings offered a rationale for why fall prevention interventions should target nursing staff members who may work with immobile patients suffering from multiple illnesses, including dementia.

FALL PREVENTION IN LONG-TERM CARE SETTINGS

Education as a Fall Prevention Strategy

Education is a continuous process for which the purpose is to increase knowledge, competence, and confidence in exhibiting learned behaviors (Bastable, 2014). Educational outcomes are achieved through changes in knowledge, attitudes, and skills. Increases in knowledge may result in positive behavioral outcomes depending on the characteristics of adult learners, environments, and patterns of behavior. Adult learners are independent learners whose learning revolves around life tasks, social roles, and benefits derived from their learning efforts (Bastable, 2014). Adult learning may be motivated by applying new knowledge and skills to problem solving (Bastable, 2014).

Albert Bandura's Social Learning Theory (SCT) was used as the study framework. Bandura's theory focuses on the impact of social factors and the context within which learning and behavior occur (Bastable, 2014). SCT suggests that learning

involves personal characteristics of learners, or cognitive factors such as attitudes, expectations, and knowledge; behavioral factors such as skills; and environmental factors such as social norms. Learners are viewed as "central" and that which learners perceive, interpret, and respond to in social situations are important. The theory suggests that learning occurs through observation, direct instruction, and imitation. SCT proposes that learning can occur without behavioral change and expectations of reinforcements have major effects on exhibited behavior (Bastable, 2014). Use of demonstrative video and verbal instructional models as part of this study represents learning by observation. Fall prevention methods and behaviors learned through these models can be imitated and in turn exhibited by nursing staff when caring for patients.

Staff Education as Fall Prevention

NH staff education is an important component of fall prevention—it is a process that influences staff members' behavior by effecting change in their knowledge, attitudes, and skills to help promote increased quality of care (Bastable, 2014). Staff education on fall prevention and fall risk assessment has become part of the standard of practice in long-term care (Quigley et al., 2010). Research suggests that exercise programs, medication review, environmental modifications, and education of patients, family members, and staff are common fall prevention strategies (Berry & Kiel, 2016). In long-term care settings, best practices for fall prevention must involve all nursing staff members because they spend the most time with elderly patients. Education of staff members who direct and provide patient care is of utmost importance for reducing falls in long-term care facilities. CNAs and CMAs provide most patient care in long-term care

facilities; thus, they must be included in educational interventions aimed at sustaining successful fall prevention interventions.

Despite being primary caregivers in long-term care settings, CNAs' input is often not solicited for many fall prevention plans. Evidence has suggested that a lack of facility staff members' involvement in intervention implementation results in the discontinuation of interventions upon study termination (Phillips, Roberts, & Hunsaker, 2008). Thus, fall intervention programs should include staff involvement to enhance sustainability. Effective fall interventions in long-term care settings should include frontline staff members (e.g., CNAs). Yet CNAs have not been commonly included in falls prevention processes (Phillips, Roberts, & Hunsaker, 2008).

Bouwen, De Lepeleire, and Buntinx (2008) evaluated the impact of a staff-oriented intervention on the incidence of accidental falls in NH residents, both with and without cognitive impairment, through use of a clustered randomized controlled trial. Ten nursing wards from seven NHs in Belgium were randomized to control groups (5 wards with 169 patients) and intervention groups (5 wards with 210 patients) using computer software. The intervention was directed only at nurses who worked in the NHs and not at elderly patients. The intervention group received multi-faceted training about the occurrence of accidental falls, risk factors for falls, and environmental or behavioral modification reinforced by reminders directed at staff members. For each fall, intervention groups recorded relevant risk factors, evaluated fall causes, and described possible preventive actions to prevent subsequent falls with similar causes. A detailed questionnaire on fall risk factors, chronic medication use, and co-morbidity was completed for each elderly patient under the intervention group's care. The control group

did not receive any training or perform any of the interventional actions. All NH residents were evaluated for cognition and mobility using the Mini Mental State Examination and the Timed Up and Go Test (Bouwen, De Lepeleire, & Buntinx, 2008). The primary outcome measure was the number of participants with at least one accidental fall; the secondary outcome measure was the number of falls for each participant. At baseline, 21% of residents in the intervention group and 12% in the control group fell at least once; at post-intervention, 14% of residents in the intervention group and 24% in the control group fell at least once. Researchers concluded that a restricted intervention directed at nurses may result in a decreased number of falls in elderly residents, with and without mobility problems or cognitive impairments. A study limitation was that it involved only nurses without adequate explanation of the type of nursing staff members who participated.

Chapman and Newenhouse (2013) analyzed NH staff members' perceptions of a falls management intervention by mailing needs assessment questionnaires to NH administrators and directors in selected Wisconsin counties. The researchers compared NHs in largely rural counties with those in more urban counties. Using a list generated by the Wisconsin Division of Quality Assurance, five largely rural counties comprised of 22 nursing facilities were compared to 21 nursing facilities located in largely urban counties. A needs assessment questionnaire focused on falls management and efforts to reduce falls were mailed to directors of nursing and administrators of each nursing facility. Reminders to non-respondents were sent 10 days and 14 days after the initial mailing. Results of the needs assessment as well as a list of resources were mailed to both respondents and non-respondents at three months post-mailing of questionnaire.

Resources included Uniform Resource Locators (URLs) for various types of evidence-based best practices and peer-reviewed fall prevention trainings. A follow-up questionnaire also was mailed to both respondents and non-respondents asking about changes made for falls management and whether individuals were utilizing the fall management resources.

In Chapman & Newenhouse (2013) Wisconsin study, the return rate was 46% overall on the needs assessment questionnaires. Return rates of the needs assessment questionnaires were 16 out of 43 and 23 out of 42 for the administrators and directors of nursing, respectively. More respondents from the nursing homes in the rural areas (n=27) returned their questionnaires than those in urban areas (n=12). The most often cited important barrier to better fall prevention in nursing facilities was that residents were a fall-prone population (80%); the third most commonly cited important barrier was that nursing assistants required better training in fall management (44%). Other barriers cited included (a) nursing leadership needed to listen to and learn more from nursing assistants (42%), and (b) nursing assistants needed incentives to become more conscientious about falls (23%). When asked about what fall prevention activities could be improved, respondents most often cited training new staff members in how falls management fit in with other policies (71%). Respondents indicated that important sources of useful fall prevention information were in-house nurses (79%) and in-house nursing assistants (76%). Results of the study validated CNAs as important factors in fall prevention information, emphasized the need for more training of CNAs on fall prevention techniques, and highlighted that CNAs could achieve success through improved work incentives (Chapman & Newenhouse, 2013).

Leland, Gozalo, Teno, and Mor (2012) conducted an observational study to examine the relationship between NH organizational characteristics and falls in newly-admitted NH residents. The researchers concluded that residents admitted to NH facilities with higher CNA staffing levels had lower fall rates. Only CNA staffing compared to other staffing (RNs and LVNs) was associated with a decrease in fall risk. This correlation suggested that falls may be reduced with CNA involvement in fall prevention due to CNAs' role in direct patient care. Previous research identified nursing assistants as important sources of useful fall prevention information (Chapman & Newenhouse, 2013). Evaluation of CNAs' fall knowledge and behavior in this study might help address the lack of research on their involvement in fall prevention.

The studies reported above demonstrated the need for CNA involvement in fall prevention programs in long-term care settings. Although CMAs were not part of reported research, they also have direct care responsibilities for residents of long-term care. Moreover, fall prevention in long-term care settings should be an ongoing and continuous process for all staff members due to the high rate of fall incidents.

Other Fall Prevention Interventions in Long-Term Care Settings

Many fall prevention interventions in long-term care settings have been inconclusive and warrant further research. Cameron et al. (2012) used a systematic review to assess the effectiveness of fall reduction interventions in older people in care facilities and hospitals. The study included 60 randomized control trials: 43 trials in care facilities (30,373 participants) and 17 trials in hospitals (29,972 participants). The researchers concluded that multifactorial interventions (e.g., exercise, medication review, environment, nutrition) in care facilities may have possible benefits in reducing fall rates

and the risk of falling, but the evidence was inconclusive. The review indicated that single interventions (e.g., vitamin D supplementation) reduced falls rates but not the risk of falling. Based on the systematic review, the effectiveness of exercise interventions (e.g., gait/balance training, endurance, strength/resistance training, and general physical activity) in care facilities was not conclusive due to inconsistent results.

Broe et al. (2007) also conducted a single intervention study on benefits of vitamin D on fall prevention. The methodology was a randomized, multiple dose study in which 124 NH residents were randomly assigned to receive one of four vitamin D supplement doses (i.e., 200 IU, 400 IU, 600 IU, 800 IU) or placebo daily for five months. The number of fallers and falls per facility were measured using an incident-tracking database. Results indicated that NH residents in the highest vitamin D group (800 IU) had lower numbers of fallers and a lower rate of falls. This study indicated a benefit of vitamin D supplementation in reducing falls in NH residents, but further research was needed to determine how to implement the supplementation into a current plan of care for NH residents. Cost to patients, insurance coverage, regular laboratory screening of vitamin D levels, and recommended dosage of vitamin D should be focus areas for further research.

Effect of Fall Prevention Education on Knowledge and Behavior

Researchers have demonstrated that the effect of education on knowledge and behavior to reduce fall incidents ranges from minimal to substantial. Johnson et al. (2014) conducted a study to evaluate differences in nurses' knowledge, behavior, and patient fall incidents and severity following a falls e-learning program. The study was conducted in two subacute hospitals with a high intake of elderly patients in Sydney, Australia. The

study included 71 nurses, of which there were 55% RNs, 27% LVNs, 10% assistants in nursing, 7% nurse unit managers, and 1% clinical nurse specialists. Participants' average years of nursing experience was 15.3 years. The participants received four months access to a 60-minute e-learning education program that focused on falls risk screening, prevention strategies, post-fall assessment, and documentation of fall-related issues. Nurses' knowledge was measured by the Nurses' Fall Knowledge Test (NFKT) parallel forms Part A and Part B, which each contained 21 items of true, false, or multiple choice questions on fall assessments, prevention strategies, and post-fall management. NFKT Part A was administered prior to the educational program and NFKT Part B was administered three months post-educational program.

The NFKT was pilot-tested on a sample of 166 RNs to confirm equivalence of parallel forms, resulting in a Spearman-Brown Coefficient of .616 and no differences in scores of each domain and total scores. Nurses' behaviors were measured by the Falls-Prevent Scale, a valid instrument using an eight-point scale (1=never to 8=always) prior to the e-learning and three months post-intervention. The scale contained two factors on prevention strategies and post-fall management. Fall incidents and severity data were obtained from a local Incident Information Management System. Results indicated that falls knowledge was high at pre- and post-testing with no significant difference (P=.24). Fall prevention behaviors increased post-test (P<.001) but there was no change in fall rates. Although the study indicated that education had minimal effect on nurses' knowledge, it suggested positive behavioral changes. The minimal education effect may be present because 70% of the study nurses were university educated with extensive nursing experience. The change in behavior might be linked to renewed awareness of

prevention methods resulting from e-learning. This study also addressed fall prevention in a hospital setting and utilized only RNs and LVNs while excluded CNAs. Further, assistants in nursing were leadership positions in nursing roles, not nursing assistants (Johnson et al., 2014).

Hang et al. (2016) conducted a feasibility study using a cross-sectional survey to assess knowledge and awareness of fall risks, knowledge about falls prevention, and confidence to implement fall prevention strategies among care staff members in a residential aged care setting in Australia. Forty-one care staff members (CNAs) responded to a custom-designed questionnaire consisting of 36 open- and closed-ended questions. Both quantitative and qualitative data were collected. The questionnaire used simple and clear language to ensure completion due to varying levels of literacy. Questions were focused on perceptions of falls or near-fall experience among residents under CNA care, previous CNA experiences of fall prevention training, and type of training CNAs would like to have in the future. Using open-ended questions, participants listed strategies that could help prevent falls and described actions to be taken if a fall occurred. The questionnaire response rate was 58.8%. Seven care staff reported being unsure or thinking residents were at low risk of falls. Only five care staff were able to suggest more than three fall prevention strategies. The findings suggested the need to target education on improving care staff knowledge and fall awareness. This study included CNAs who demonstrated low levels of fall knowledge, thus confirming the need for more educational training for this level of care staff.

El Enein, El Ghany, and Zaghloul (2012) conducted a quasi-experimental design in which 40 nurses, working in different orthopedic, medical, surgical, and intensive care

unit departments, participated in an educational program involving a one-day, six-hour workshop for groups of 10 nurses each. There was no information on how the nurses were grouped for the educational program. The study was conducted at a health insurance organization hospital in Alexandria, Egypt to assess the effect of the educational training program on nurses' knowledge and performance of fall prevention. Pre- and post-test questionnaires and a performance observation checklist tool designed by the researchers were used to assess knowledge and skills, respectively. The questionnaire consisted of two parts. Part one included demographic characteristics and part two consisted of 34 closed-ended questions on four factors: individual, health status, environment, and other. The performance observation checklist tool used to assess skills of nurses regarding prevention of patient falls consisted of 34 items on educational and environmental items using a "done or not done" scale. Nursing staff members' knowledge of all assessed factors improved after the educational program. The post-test performance improved in the orthopedic, medical, surgical, and intensive care unit departments. The study showed a positive effect of education on both knowledge and behavior (El Enein, El Ghany & Zaghloul, 2012).

The studies cited above illustrate the importance of educating nursing staff members at all levels of practice on fall prevention. None of the studies included CMAs, another important care provider in long-term care. The studies showed that a lack of knowledge of fall prevention practices and interventions affected fall prevention behavior, in turn leading to increased fall rates.

IDENTIFICATION OF GAPS IN THE LITERATURE

Effective fall interventions in long-term care settings should include frontline staff members (e.g., CNAs, CMAs). CNAs are important care team members who assist

residents in preventing falls in long-term settings and also support licensed nursing staff in providing patient care. To date, researchers have conducted many fall interventions but excluded staff members such as CNAs or CMAs; they have lacked adequate input on fall program policies, or actually implemented fall programs. CNAs have not yet been incorporated in the falls documentation and prevention process (Phillips, Roberts, & Hunsaker, 2008). Further, CNAs have been identified as important sources of useful fall prevention information (Chapman & Newenhouse, 2013). Evaluating the fall prevention knowledge and behavior of CNAs in this study will help to address the lack of research on CNAs' involvement in fall prevention and to identify gaps in knowledge for future training and research.

Many studies on fall prevention in long-term care settings are inconclusive. Vitamin D supplementation has been documented as beneficial in reducing fall rates but more research is needed to evaluate the best way to implement supplementation in nursing homes. Further research on both single and multifactorial fall prevention interventions need to be conducted in nursing homes, and the research should be a continuous process until successful evidence based interventions can be achieved.

SUMMARY

The literature review indicated a variety of fall intervention studies conducted to date. However, CNAs and CMAs did not participate in most studies nor provide input in neither the fall program design nor implemented fall programs. Few studies analyzed knowledge and behavior in preventing falls over time. For fall intervention programs in long-term care settings to be successful and sustainable, they must include staff cooperation including that of CNAs and CMAs.

Hang et al. (2016) did assess fall prevention knowledge of CNAs or CMAs in long-term care settings but was simply a cross-sectional survey. Hang et al.'s research study was conducted to help address the lack of fall prevention studies in long-term care facilities that focus on staff education and to involve CNAs and CMAs in addressing fall prevention in long-term care. In this research study, the investigators included CNAs and CMAs in addressing fall prevention in long-term care settings by measuring their knowledge of fall prevention and performing behavioral assessments of fall prevention approaches. However, the study only assessed the current state of knowledge and behavior without including any interventions. Due to lack of fall prevention research studies addressing care staff members' participation in fall prevention, the current research study may help to address that void in research.

Many fall prevention intervention studies have been conducted, yet despite efforts at fall reduction falls continue to occur among NH elders. The current research study was conducted to attempt to reduce numbers of falls and injuries from falls in long-term care settings by educating all nursing staff on accepted methods of fall prevention.

Chapter 3: Methodology

Chapter three presents the purpose of the study, overview of the research design, study sample, instrumentation, data collection procedures, and data analysis. The purpose of this study was to evaluate the impact of an educational intervention on falls in a long-term care facility by (a) measuring staff's knowledge of fall prevention, (b) assessing behavioral assessment of fall prevention approaches, and (c) calculating fall rates and fall injury rates.

METHODOLOGY

Research Design

The research design was a Single-Group Repeated Measures quality improvement intervention study. The aim of the study was to examine the effectiveness of a fall prevention educational program for long-term care nursing staff. Fall knowledge and behavior of long-term care staff members were assessed via questionnaire before and after a 45-minute educational session on fall prevention. Knowledge and behavior was measured using the Fall Prevention Knowledge and Behavior Assessment Questionnaire (FPKBAQ) (see Appendix A). The study design also included collection of daily fall data for three months pre-educational intervention and for three months post-intervention. Measurement of long-term care staff members' knowledge and assessment of fall-related behavior occurred prior to the educational intervention (July 2016), one month after the educational intervention (August 2016), and at three months post-educational intervention (October 2016). Over a period of six months, the researcher collected daily fall data relating to fall rates, fall injury rates, severity of injuries, and number of repeated falls. Data collection occurred for a period of three months pre-intervention (April, May,

June) and three months post-intervention (August, September, and October). Medical office records from the long-term care facility, including daily census and fall incident reports of those who fell, time when falls occurred, and degree of injury were utilized to obtain information on fall data.

Sample, Setting, and Recruitment

The study included 40 nursing staff members who worked in a long-term care facility. Convenience sampling was utilized to recruit the nursing staff members from a facility in the Houston, Texas metro area that permitted presentation of the educational intervention for staff members and access to facility fall data. Preliminary approval from the nursing facility was obtained and submitted for Institutional Review Board (IRB) review. Following IRB approval, nursing staff members were recruited through flyers (see Appendix G) distributed to the nursing stations and 5-10-minute in-service recruitment presentations conducted in all the nursing units. All nursing staff members were invited to participate.

Inclusion Criteria

Inclusion criteria for the study were CNAs, CMAs, LVNs, and RNs; the ability to speak English; and the ability to read English. Participants received nursing home administration approval to attend the educational sessions for the allotted intervention time periods

Exclusion Criteria

Employees who were non-nursing staff members and nursing staff members who could not speak or read English were excluded from the study.

Setting

The long-term care facility was located in the Houston, Texas metro area. The facility was a 62-bed Medicare licensed retirement community comprised of assisted living, independent living, and health care living levels of care staffed with over 60 nursing staff members who rotated between areas of care. The educational sessions occurred in the facility classroom and dining room located far from patient care areas in order to minimize interruptions. The follow-up data collection for the nursing staff at one month and three months post-intervention occurred in the various nursing units.

Instrumentation

An investigator-created FPKBAQ questionnaire and fall data collection tool (Appendix B) were used to collect and record data on demographic information; assess fall knowledge and behavior; and document falls and injuries from falls.

Educational Intervention

The educational intervention consisted of a 45-minute educational session on fall prevention using the Agency for Healthcare Research and Quality (AHRQ) guidelines on universal fall precautions for every patient (AHRQ, 2013a). An additional 15 minutes were reserved for completing necessary consent forms and completion of the pre- and post-test questionnaires. The educational session was a face-to-face lecture using PowerPoint slides with additional discussion, demonstrations, and videos (see Appendix C). In addition to universal fall precautions, content included specific precautions for patients with a documented history of cognitive impairment or dementia. A total of three educational sessions were conducted during the work day to accommodate as many staff members as possible. One educational session was conducted at the beginning of the day

shift and two sessions were conducted in the afternoon after the day shift to target both outgoing and incoming shifts. Food was provided for all three educational sessions as incentive and reward for participation. A certificate of completion on fall prevention strategies was provided to the nursing staff members at the end of the study and completion of the three-month post-intervention questionnaire. To maintain confidentiality and anonymity, nursing staff members created a personal identification code using three letters and three numbers that were known only to the staff member. The codes were the only identifying information used on questionnaires. Nursing staff members were asked to memorize and write down the ID code on their own copy of the written consent for easy recall.

DATA COLLECTION

Questionnaire

The data collection period was from April 2016 through October 2016. The FPKBAQ was utilized for data collection for the study and consisted of three parts: Part A: demographic information; Part B: fall prevention knowledge questionnaire; and Part C: behavior assessment questionnaire (Appendix A). The FPKBAQ Part A was utilized to collect demographic data on job title, years of experience in long-term care, age, gender, ethnicity, and educational level. The FPKBAQ Part B was used to assess the fall prevention knowledge of the nursing staff members. FPKBAQ Part C was utilized to assess behavior of nursing staff members on fall prevention focusing on four categories of prevention: importance of fall prevention; risk factors for falls; multidisciplinary strategies to reduce falls; and safe transfers and mobility techniques. These four categories were part of both the knowledge and behavioral sections of the questionnaire;

content from the four categories was included in the educational intervention. A pre-test FPKBAQ questionnaire was completed prior to the educational intervention and a post-test FPKBAQ questionnaire was completed at one month and three months post-educational intervention using the same tool. The FPKBAQ Parts B and C were used to assess long-term care staff members' knowledge of fall prevention and behavior assessment to determine knowledge retained and to what extent recommendations were used in their post-intervention practice.

Fall Data

Data on number of falls, number of injuries, total daily occupied beds, repeat falls, minor injuries, and major injuries were collected monthly from the medical records and incident reports for the three months (April, May, June) before the educational intervention and for the three months (August, September, October) following the educational intervention. Fall rates and fall injury rates were calculated and averaged over the three months preceding the study to provide a stable baseline and a degree of assurance that any changes in fall rates and fall injury rates after the intervention could be attributed to the intervention and not normal variability. Fall data were recorded using an investigator-created data collection tool (Appendix B) on date of fall, type of injuries, number of injuries, number of patient beds, and number of falls.

Process for Knowledge Assessment Scoring

The fall knowledge test section of the FPKBAQ was an investigator modified-AHRQ fall prevention knowledge test. The original AHRQ fall prevention knowledge test was a multiple-choice knowledge test designed for assessing gaps in knowledge of nurses and nursing assistants related to prevention of falls (AHRQ, 2013b). AHRQ

indicated that questions could be modified if certain questions were not consistent with any given policies and procedures at an institution (AHRQ, 2013b). A letter of permission (Appendix D) was obtained from AHRQ and submitted as part of the request for IRB approval process. AHRQ adapted the tool from the Singapore Ministry of Health Clinical Practice Guidelines on Prevention of Falls in Hospitals and Long-Term Care Institutions; the original version of the tool is available on the AHRQ website (https://www.ahrq.gov/professionals/systems/hospital/fallpxtoolkit/fallpxtk-tool2e.html).

AHRQ provided the answers to the multiple-choice questions for the AHRQ fall knowledge test but there was no specific scoring rubric or scale. The AHRQ fall knowledge test was not used extensively in research and as such did not have available validity or reliability data. The researcher chose the AHRQ fall knowledge test for this study as it was appropriate for CNAs and nurses. The researcher modified some questions' terminology for ease of understanding by all participants. Items were grouped according to the four components of the fall prevention educational intervention. The order of the questions in the AHRQ questionnaire was changed to place the questions in relevant categories for analysis. The range of possible scores for each subsection of the FPKBAQ Part B was 0-3, with 1 point scored for each correct answer in each subscale and three questions in each subscale. The subscales included fall prevention approach, risk factors for falls, safe transfers and mobility techniques, and multidisciplinary strategies to reduce falls. The maximum score for all subsections combined was 12.

Process for Behavior Assessment Scoring

The behavior assessment section of the FPKBAQ was investigator-created and based on the knowledge section of the questionnaire. The behavior questionnaire

reflected the behaviors associated with the knowledge gained in the educational session and were self-reported by staff members. Examples of behaviors included orientation of patients to their environment, equipment checks for breakage and safety, and use of safety belts during transfers. The range of scores for each subsection of the FPKBAQ part C was from 0-3, with 3 points for always, 2 points for sometimes, 1 point for rarely, and 0 points for never performing the behavior. The same scoring was used for each subscale including fall prevention approach, risk factors for falls, safe transfers and mobility techniques, and multidisciplinary strategies to reduce falls.

Pilot Study

A pilot study of the FPKBAQ was conducted among a small sample of individuals similar in demographics to the proposed participants. The pilot study was conducted at a separate long-term care facility to evaluate level of understanding and average time of completion of the FPKBAQ. The pilot study was conducted in May 2016 and included six participants. The total time for completion of the questionnaire was 5-13 minutes, and participants indicated an ease of understanding of the wording in the questionnaire. Based on the outcomes of the pilot study, no modification was made to the FPKBAQ. Permission to conduct the pilot study was obtained from the administrator of the long-term care facility and submitted as part of the IRB approval process.

Process for Fall Data Scoring

Calculation of fall rates was based on the three-month average number of patient falls divided by the three-month average number of patient bed days multiplied by 1,000. Fall injury rates were calculated as a whole and separately for two severity categories (i.e., minor, major) based on the three-month average number of falls that resulted in

injury divided by the three-month average number of patient falls multiplied by 1,000. A multiplier of 1,000 and 100 were used for consistency and per AHRQ's recommendations (AHRQ, 2013).

Data Analysis

The Statistical Package for Social Sciences (SPSS, Version 24) software was used for all data analyses. Descriptive statistics were used to determine data range, distribution, normality, and linearity of the sample. The sample demographic characteristics were analyzed using descriptive statistics including means, standard deviations, and percentages. A code book was created by breaking down the different parts of the FPKBAQ into numbers and ranges of scores. Part A (demographic information) was broken down into numeric data, with scores ranging from 1-5. Part B (fall prevention knowledge) was broken down into the possible range of scores for each subscale and Part C (behavior assessment) was also broken into the possible range of scores. All data were coded into Excel before SPSS analysis.

Specific plans for analyses of each research question were:

Specific Aim 1: To evaluate the effectiveness of an educational intervention on knowledge and use of fall prevention strategies among nursing staff members in a selected nursing home.

SA1RQ1: Is there a significant change in the four subscale scores for knowledge of fall prevention strategies of long-term care staff members following an educational intervention from pre-test (T1) to 1-month post-test (T2) to three months post-intervention (T3) after controlling for associated demographic variables?

Aim 1 SA1RQ1 Analysis

The within repeated measure ANOVA is used when measuring the same participants under different conditions or when measuring participants at different time points. Single group designs are considered within designs and involve one continuous dependent variable. For this study, the dependent variable was scores on the fall prevention knowledge section Part B of the FPKBAQ with three repetitions. Nursing staff were asked to complete the FPKBAQ Part B both before intervention (Time 1) and after the intervention at one month (Time 2) and at three-month (Time 3) intervals. A within repeated measures ANOVA was used to compare the pre-test scores, post-test 1, and post-test 2 scores on the four knowledge subscales of the FPKBAQ.

SA1RQ2: Is there a significant change in the behavioral scores for reported use of fall prevention strategies of long-term care staff members following an educational intervention from pre-intervention to three months post-intervention after controlling for associated demographic variables?

Aim 1 SA1RQ2 Analysis

The components of the FPKBAQ, Part C, included four subscales: importance of fall prevention, risk factors for falls, multidisciplinary strategies to reduce falls, and safe transfers and safe mobility techniques. The paired-samples t-test was used to compare the pre-intervention, and three months post-intervention scores of the four behavioral assessment subscales of long-term care staff members. The paired-samples t-test involved one categorical independent variable with two different levels (Time 1 and Time 3) and one continuous dependent variable which was the scores of the four behavioral subscales on each section of the FPKBAQ. Nursing staff were asked to complete a FPKBAQ Part C

both before intervention (Time 1) and at one and three months after intervention (Time 2 and Time 3).

Specific Aim 2: To determine if an educational intervention or any of its components reduced fall rates and fall injury rates.

SA2RQ1: What is the difference in fall rates and fall injury rates at baseline (pre-intervention average over three months) compared to one month post-intervention and three months post-intervention?

Aim 2 SA2RQ1 Analysis

Reports of incidence rates for falls, fall injury, fall severity and repeated fall were calculated. Incidence rates for falls were classified as single and repeated falls and severity rates were classified as major and minor injuries.

SA2RQ2: What is the relationship between knowledge and behavioral change scores before (T1) and after (T2 and T3) an educational intervention on fall prevention?

Aim 2 SA2RQ2 Analysis

Pearson's correlation was used to compare relationships between knowledge and behavioral change at the three points in time assessed in the study (T1, T2, T3).

PROTECTION OF HUMAN SUBJECTS

Ethical issues related to this proposed study included informed consent procedures, confidentiality of study participants, facility identification, and use of medical records. The participants were frontline staff members in a long-term care facility who provided care to elderly patients. The rationale for using a long-term care facility was the increased risk of falls in the elderly patients who live in those facilities and a desire to improve patient outcomes by fall rate reduction. Permission to conduct

this study was obtained from The University of Texas Medical Branch IRB (Appendix E). A letter of agreement to participate was obtained from the two long-term care facility administrations and submitted as part of the IRB process. Consent was obtained from the long-term care staff members to participate in the study.

To ensure confidentiality, the researcher was the only person that collected data from the health records containing data on falls and injuries from falls. The participants who were staff members created a personal identification code using three letters and three numbers that were known only to the participant. These self-created identification codes were the only identifying information used on the questionnaires. To ensure confidentiality for the facility, the names of the facilities was not identified in any publication and the letter of agreement remained confidential. The purpose of the study and study topics were revealed without any form of deception.

Informed consent was obtained from long-term care staff members prior to data collection with a statement that participation was voluntary and without risk. The researcher informed participants that they could withdraw from the study at any time without penalty or effect on their employment. No digital photograph or images were taken in any form throughout the study. There was no form of physical, psychological, financial, or legal risks involved in the study. Data collected on falls and fall injuries did not contain any patient identifiers or patient health information. Although participation in the educational program was not anonymous, all data collected directly from the participants was de-identified.

Chapter 4: Results

Chapter four presents the results of the study, characteristics of the sample, data analysis, and results for each research question. The purpose of this study was to evaluate the impact of an educational intervention on falls in a long-term care facility by (a) measuring staff's knowledge of fall prevention, (b) assessing behavioral approaches to fall prevention, and (c) calculating fall rates and fall injury rates. The research aims of the study were (1) to evaluate the effectiveness of an educational intervention on knowledge and use of fall prevention strategies among nursing staff members in a selected nursing home and (2) to determine if an educational intervention or any of its four components reduced fall rates and fall injury rates.

SAMPLE CHARACTERISTICS

The study was conducted over three months beginning July 14, 2016 and ending October 31, 2016. The overall sample consisted of a convenience sample of 40 nursing staff members working in a long-term care facility. The investigator recruited nursing staff participants via flyers and in-service presentations. Forty participants enrolled in the study, attended the educational session, and completed the pre-test questionnaire. The total number of participants who completed the one-month and three-month post-intervention questionnaires was 34 and 23 participants, respectively.

Demographic characteristics across the total sample are shown in Table 4.1. The majority of the participants were female (n=38, 95%) African American (n=34, 87.2%) Certified Nurse Assistants (n=19, 47.5%) with a high school diploma or GED (n=24, 61.6%), between the ages of 31-40 (n=13, 32.5%) or above 50 years of age (n=13, 32.5%), with 0-5 years of experience (n=12, 30%).

Table 4.1. Demographic Characteristics of Overall Sample (n=40)

Demographics	N	%
Job Titles		
CNA	19	47.5
CMA	7	17.5
LVN	10	25
RN	4	10
Years of Experience		
0-5	12	30
6-10	7	17.5
11-15	9	22.5
16-20	7	17.5
Above 20	5	12.5
Age		
16-20	0	0
21-30	5	12.5
31-40	13	32.5
41-50	9	22.5
Above 50	13	32.5
Gender		
Male	2	5
Female	38	95
Ethnicity		
Black or African American	34	97.2
Latino or Hispanic American	4	10.3
Asian	0	0
White	1	2.5
Native Hawaiian or Pacific Islander	0	0
Education Level		
GED	4	10.3
High School Diploma	20	51.3
Associate’s Degree	11	28.2
Bachelor’s Degree	3	7.7
Master’s Degree	1	2.5

DISTRIBUTIONS OF THE DEMOGRAPHIC VARIABLES

To evaluate related or associated extraneous variables needed to be accounted for in subsequent analyses, differences across all demographic variables were tested against the dependent variables**.**

Nominal Variables

Nominal variables in the study were ethnicity, educational level, gender, and job titles. For analysis purposes, ethnicity, educational levels and job titles were regrouped into new variables (Ethnicity2, Education2, Jobtitle2) as presented in Table 4.2. The regrouping was done due to subgroups with few participants in one or more of the subgroups, and thus could not be used for subsequent analyses. Regrouping of these variables allowed for statistical comparisons, as it would not have been possible to compare groups with only one or zero variables in further statistical analyses. Ethnicity was regrouped into Black or African American and Others (Latino or Hispanic American, Asian, White, Native Hawaiian); educational level was regrouped into high school (GED, high school diploma) and greater than high school (associate's degree, bachelor's degree, master's degree). To understand the potential impact of patient care roles the demographic variables of job titles were regrouped. A second job titles group categorization was created (Jobtitle2) in which CNAs (n=19) and CMAs (n=7) were grouped together as care assistants (n=26), and LVNs (n=10) and RNs (n=4) were grouped together as nurses (n=14). An independent t-test was used for subsequent analyses with ethnicity, education level and job title. Gender could not be used in any subsequent analysis because there were only two males in one subgroup.

Table 4.2. Demographic Characteristics of New Variables Ethnicity2, Education2 & Jobtitles2

Variables	N	%
Ethnicity2		
Black or African American	34	87.2
Others	5	12.8
Education2		
High school	24	61.5
Greater than high school	15	38.5
Jobtitles2		
Care Assistants	26	65.0
Nurses	14	35.0

Preliminary Analyses

Preliminary analyses were completed to identify any differences between demographic subgroups on the dependent variables in the study. Subgroup differences would indicate a need to control for extraneous independent variables by including them as covariates. Failure to find differences would support treatment of the sample as a homogeneous group. Table 4.3 lists the coded labels for each dependent variable with the relevant explanation of the label.

Independent t-tests were used to investigate differences in nominal level demographic variables with two subgroups. Because subgroup sample sizes were small, the nonparametric Kruskal-Wallis test was used to investigate differences in all nominal or ordinal level demographic variables having more than two subgroups.

Table 4.3. Coded Labels of Dependent Variables

Variables	Definitions
FPT1	Fall Prevention Knowledge pretest scores of fall prevention approach
RFT1	Fall Prevention Knowledge pretest scores of risk factors for falls
STT1	Fall Prevention Knowledge pretest scores of safe transfers and mobility technique
MST1	Fall Prevention Knowledge pretest scores of multidisciplinary strategies for falls
FPT2	Fall Prevention Knowledge test scores on fall prevention approach one-month post educational intervention
RFT2	Fall Prevention Knowledge test scores on risk factors for falls one-month post educational intervention
STT2	Fall Prevention Knowledge test scores on safe transfers and mobility technique one-month post educational intervention
MST2	Fall Prevention Knowledge test scores on multidisciplinary strategies to reduce falls one-month post intervention
FPT3	Fall Prevention Knowledge test scores on fall prevention approach three-month post educational intervention
RFT3	Fall Prevention Knowledge test scores on risk factors for falls (three-month post educational intervention)
STT3	Fall Prevention Knowledge test scores on safe transfers for falls (three-month post educational intervention)
MST3	Fall Prevention Knowledge test scores on multidisciplinary strategies to reduce falls three-month post educational intervention
BFPT1	Behavior Assessment pretest scores on fall prevention approach
BRFT1	Behavior Assessment pretest scores on risk factors for falls
BSTT1	Behavior Assessment pretest scores on safe transfers and mobility technique
BMST1	Behavior Assessment pretest scores on multidisciplinary strategies to reduce falls
BFPT2	Behavior Assessment on fall prevention approach one-month post educational intervention

BRFT2	Behavior Assessment on risk factors for fall one-month post educational intervention
BSTT2	Behavior Assessment on safe transfers and mobility technique one-month post educational intervention
BMST2	Behavior Assessment on multidisciplinary strategies to reduce falls one-month post educational intervention
BFPT3	Behavior Assessment on fall prevention approach three-month post educational intervention
BRFT3	Behavior Assessment on risk factors for falls three-month post educational intervention
BSTT3	Behavior Assessment on safe transfers and mobility technique three-month post educational intervention
BMST3	Behavior Assessment on multidisciplinary strategies to reduce falls three-month post educational intervention

Independent t-tests

The purpose of an independent t-test is to determine the difference between means of two independent groups on a continuous dependent variable (Pallant, 2013). Thus, an independent t-test was used to investigate the differences between the regrouped two-level nominal demographic variables (ethnicity, education level, jobtitle2) on each of the dependent variables. The dependent variables were the subset scores of fall prevention and behavior assessment questionnaires across all the time points (pre-test, one-month post-test, three-month post-test). The results of the independent t-test for ethnicity, educational level and Jobtitle2 are shown in Tables 4.4, 4.5, and 4.6 respectively.

Table 4.4. Independent t-test Analysis of Nominal Value Ethnicity2 and Dependent Variables

	Black/African American		Others				
Variable	M	SD	M	SD	t	df	P
FPT1	1.68	.945	2	0	-1.997	33	**.054**
RFT1	1.94	.422	2.20	.837	-.679	4	.532
STT1	1.15	.857	2	1.414	-1.314	4	.253
MST1	1.76	.781	2.80	.447	-2.875	37	**.007**
BFPT1	8.47	.896	8.50	.577	-.064	36	.950
BRFT1	8.74	.666	8.50	.577	.676	36	.503
BSTT1	8.59	.988	8.00	1.000	.988	35	.330
BMST1	8.79	.620	8.67	.577	.338	30	.738
FPT2	1.86	.693	2.0	.707	-.410	32	.685
RFT2	1.83	.759	2.60	.548	-2.167	32	**.038**
STT2	1.93	.677	2.20	1.095	-1.623	4	.171
MST2	1.93	.842	2.40	.894	-1.141	32	.262
BFPT2	8.18	1.492	7.40	3.050	.905	31	.372
BRFT2	8.85	.613	8.20	1.789	.799	4	.467
BSTT2	8.30	1.409	7.40	3.050	.645	4	.522
BMST2	8.67	1.317	7.60	3.130	.746	4	.494
FPT3	2.13	.500	2.40	.548	-1.052	19	.306
RFT3	1.94	.659	2.60	.548	-2.030	20	.056
STT3	1.24	.752	2.20	1.095	-2.278	20	**.034**
MST3	2.12	.928	2.60	.548	-1.096	20	.286
BFPT3	8.33	.900	7.80	2.168	.798	18	.435
BRFT3	8.60	.828	8.00	2.236	.587	4	.586
BSTT3	8.73	.458	7.60	2.074	1.212	4	.290
BMST3	8.67	.888	7.25	3.500	.801	3	.479

Note M=Mean. SD=Standard Deviation. P value is significant at = or <0.05

Table 4.5. Independent t-test Analysis of Nominal Value Education2 and Dependent Variables

	High School		More than High School				
Variable	M	SD	M	SD	t	df	P
FPT1	1.54	.833	1.87	.915	-1.141	37	.261
RFT1	2.00	.511	1.93	.458	.412	37	.683
STT1	1.13	.947	1.33	.900	-.681	37	.500
MST1	1.75	.794	2.13	.834	-1.439	37	.159
BFPT1	8.42	.974	8.50	.650	-.284	36	.778
BRFT1	8.63	.770	8.79	.426	-.717	36	.478
BSTT1	8.57	.728	8.57	1.342	-.018	35	.986
BMST1	8.81	.680	8.73	.467	.358	30	.723
FPT2	1.95	.722	1.72	.622	.827	32	.414
RFT2	2.00	.756	1.83	.835	.844	32	.558
STT2	1.55	.800	1.42	.793	.450	32	.656
MST2	1.86	.941	2.25	.622	-1.274	32	.212
BFPT2	8.19	1.601	7.83	2.082	.553	31	.585
BRFT2	8.79	.713	8.67	1.155	.367	29	.716
BSTT2	8.50	1.395	7.58	2.109	1.483	30	.148
BMST2	8.68	1.376	7.86	2.610	1.058	24	.300
FPT3	2.25	.622	2.10	.316	.730	16.901	.475
RFT3	2.00	.739	2.18	.603	-.643	21	.527
STT3	1.58	.996	1.27	.786	.825	21	.419
MST3	2.33	.888	2.00	.894	.896	21	.380
BFPT3	8.27	1.009	8.10	1.524	.309	19	.761
BRFT3	8.64	.924	8.10	1.595	.954	19	.352
BSTT3	8.70	.483	8.09	1.514	1.215	19	.239
BMST3	8.63	1.061	8.11	2.315	.575	15	.574

Table 4.6. Independent t-test Analysis of Jobtitle2 and Dependent Variables

	Care Assistants		Nurses				
Variable	M	SD	M	SD	t	df	P
FPT1	1.54	.905	2.00	.784	-1.609	38	.116
RFT1	1.92	.484	2.07	.475	-.931	38	.358
STT1	1.12	.909	1.50	1.019	-1.224	38	.229
MST1	1.73	.724	2.21	.893	-1.856	38	**.071**
BFPT1	8.38	.941	8.62	.650	-.792	37	.433
BRFT1	8.77	.652	8.54	.660	1.038	37	.306
BSTT1	8.44	1.121	8.77	.599	-.984	36	.332
BMST1	8.81	.680	8.75	.452	.270	31	.789
FPT2	1.91	.733	1.82	.603	.372	32	.712
RFT2	1.78	.795	2.27	.647	-1.778	32	**.085**
STT2	1.52	.790	1.45	.820	.229	32	.820
MST2	1.83	.887	2.36	.674	-1.775	32	**.085**
BFPT2	8.14	1.490	7.91	2.300	.344	31	.734
BRFT2	8.85	.671	8.55	1.214	.906	29	.373
BSTT2	8.33	1.528	7.82	2.089	.798	30	.431
BMST2	8.65	1.455	8.11	2.315	.727	24	.474
FPT3	2.27	.647	2.09	.302	.845	14.152	.412
RFT3	1.92	.793	2.27	.467	-1.296	21	.209
STT3	1.25	.965	1.64	.809	-1.035	21	.312
MST3	2.17	1.030	2.18	.751	-.040	21	.968
BFPT3	8.50	.972	7.91	1.446	1.087	19	.291
BRFT3	8.70	.949	8.09	1.514	1.091	19	.289
BSTT3	8.82	.405	7.90	1.524	1.930	19	**.069**
BMST3	8.57	1.134	8.20	2.201	1.407	15	.689

The results of the independent sample t-test comparing ethnicity groups as displayed in Table 4.4 showed statistically significant differences ($P \leq 0.05$) at each time point in the mean scores of: a marginally significant difference on Fall Prevention Knowledge pre-test scores for fall prevention approach (FPT1), and statistically significant difference on multidisciplinary strategies to reduce falls (MSTI), risk factors for falls one-month post-educational intervention (RFT2), and safe transfers and mobility techniques one-month post-educational intervention (STT3) for each ethnic group (i.e. Black or African American, Others). The "Others" group demonstrated consistently higher scores compared to the Black group. Results of the independent t-test indicated no significant differences between educational levels on any of the dependent variables (Table 4.5). Even though the majority of participants were African American, the "Others" combined ethnicity groups scored higher in all sections of the Fall Prevention Knowledge test. This may have been influenced by the small sample size of the "Others" combined ethnicity groups. Results of the independent t-test comparing job title groups (Table 4.6), indicated marginally significant differences on Fall Prevention Knowledge pre-test scores for multidisciplinary strategies to reduce falls (MST1), risk factors for falls one-month post-educational intervention (RFT2), multidisciplinary strategies to reduce falls one-month post-educational intervention (MST2), and Behavior Assessment on safe transfers and mobility techniques three-month post-educational intervention (BSTT3).

Nurses scored higher in almost all sections of the fall prevention knowledge test except on the fall prevention approach (FPT2) and safe transfers and mobility techniques (STT2) at one-month post-educational intervention, and on fall prevention approach at

three months post-educational intervention (FPT3). The FPT test score of the nursing care assistants improved over time but that of the nurses trended down at time 2 while remaining unchanged at time 1 and time 3. There were no changes in the mean fall prevention knowledge scores on risk factors for falls (RFT) for nursing care assistants and nurses at all time points. Nursing care assistants' Fall Prevention Knowledge on safe transfers and mobility techniques (STT) scores dropped at time 3, whereas STT scores of the nurses remained stable. The nursing care assistants' Fall Prevention Knowledge on multidisciplinary strategies to reduce falls (MST) scores improved at time 3 but that of the nurses trended down.

The nursing care assistants' responses improved on Behavior Assessment scores on fall prevention approach (BFPT) and safe transfers and mobility technique (BSTT) across the time points. The nurses' fall prevention behavior scores improved for Behavior Assessment on risk factors for falls (BRPT) and on multidisciplinary strategies to reduce falls (BMST). Nursing care assistants performed better than nurses on Behavior Assessment pre-test scores on risk factors for falls (BRFT1) and multidisciplinary strategies to reduce falls (BMST1). At the three-month post-educational intervention time point, nursing assistants scored better than nurses on fall prevention approach (BFPT3), risk factors for falls (BRFT3), and safe transfers and mobility technique (BSTT3).

The paucity of significant differences supports treating these subgroups as similar and homogenous. Thus, these demographic variables do not represent potential covariates that need to be included in subsequent analyses of study questions.

Kruskal-Wallis Test

A Kruskal-Wallis test is a rank-based nonparametric test that can be used to determine statistically significant differences between two or more groups of independent variables on a continuous or ordinal dependent variable (Pallant, 2013). Nonparametric approaches are preferable when subgroup sample sizes are small, unequal or there is the presence of significant heterogeneity in the dependent variable. The small and unequal sample sizes of subgroups were the primary concern for this study.

A Kruskal-Wallis test was used to investigate the differences between the job titles subgroups (before regrouping) on the dependent variables. The variable job titles had four subgroups (e.g., CNA, CMA, LVN, and RN) but were regrouped as mentioned previously to better understand patient care roles.

Table 4.7 displays the comparisons of differences across job titles. The results showed only a few significant differences among job title subgroups on the Fall Prevention Knowledge pretest scores on multidisciplinary strategies to reduce falls (MST1) scores. There was a significant difference between MST1scores (pre-test scores of the FPKQ on Multidisciplinary strategies to reduce fall) across different job titles. RNs with a mean rank score of 32.63 had the highest MST1 scores (even though the sample was small [n=4]), while CNAs had the lowest MST1 scores, with a mean rank score of 17. As indicated in Table 4.7, there were no significant differences between job titles and the other dependent variables.

Table 4.7. Demographic Group Differences on Job Titles

	(n) Mean Ranks				Significance	
Variables	CNA	CMA	LVN	RN	H	P
FPT1	(19) 16.47	(7) 23.71	(10) 23.15	(4) 27.38	5.555	.135
RFT1	(19) 18.13	(7) 23.50	(10) 20.95	(4) 25.38	3.668	.300
STT1	(19) 17.13	(7) 24.79	(10) 20.90	(4) 28.00	4.852	.183
MST1	(19) 17.00	(7) 20.50	(10) 22.30	(4) 32.63	**7.818**	**.050**
BFPT1	(19) 20.11	(7) 17.29	(10) 19.60	(3) 27.00	2.128	.546
BRFT1	(19) 21.32	(7) 21.86	(10) 16.70	(3) 18.33	2.485	.478
BSTT1	(18) 19.53	(7) 15.64	(10) 20.65	(3) 24.50	2.614	.455
BMST1	(17) 17.47	(4) 19.50	(10) 16.30	(2) 11.50	2.598	.458
FPT2	(16) 16.88	(7) 20.71	(7) 15.00	(4) 18.75	1.722	.632
RFT2	(16) 16.44	(7) 13.79	(7) 21.57	(4) 21.13	3.362	.339
STT2	(16) 16.50	(7) 21.36	(7) 16.43	(4) 16.63	1.695	.638
MST2	(16) 14.88	(7) 17.29	(7) 20.57	(4) 23.00	3.363	.339
BFPT2	(15) 17.67	(7) 14.07	(7) 18.21	(4) 17.50	1.133	.769
BRFT2	(13) 16.31	(7) 17.50	(7) 15.43	(4) 13.38	2.151	.542
BSTT2	(14) 18.64	(7) 15.43	(7) 15.07	(4) 13.38	2.008	.571
BMST2	(12) 13.92	(5) 15.00	(7) 13.29	(2) 8.00	4.115	.249
FPT3	(7) 11.29	(4) 14.75	(8) 9.50	(3) 13.00	3.189	.363
RFT3	(7) 10.64	(5) 10.90	(8) 13.13	(3) 14.00	1.365	.714
STT3	(7) 10.93	(5) 10.00	(8) 12.69	(3) 16.00	2.143	.543
MST3	(7) 14.71	(5) 8.90	(8) 10.25	(3) 15.50	4.010	.260
BFPT3	(6) 12.17	(4) 13.75	(8) 9.88	(3) 8.00	2.391	.495
BRFT3	(6) 12.00	(4) 14.00	(8) 9.25	(3) 9.67	2.944	.400
BSTT3	(6) 13.42	(5) 13.10	(7) 7.71	(3) 10.33	4.698	.195
BMST3	(4) 8.38	(3) 10.50	(8) 9.56	(2) 5.75	2.834	.418

A Kruskal-Wallis ANOVA (Table 4.8) was used to investigate the differences between the levels of the demographic variables (years of experience, and age) on the dependent variables. The results of the Kruskal-Wallis ANOVA indicated only significant differences between the years of experiences subgroups on BFPT2 (Behavioral Assessment on fall prevention approach at one-month post-educational intervention) and BRFT2 (Behavioral Assessment on risk factors for falls at one-month post-educational intervention) (Table 4.8). Nursing staff members with 6-10 and 16-20 years of experiences had the highest scores (m rank=23) on the Behavioral Assessment on fall prevention approach one month after the educational intervention (BFPT2). Staff members with more than 20 years of experience had the lowest BFPT2 scores (m rank=7.50). Nursing staff members with 0-5, 6-10, 11-15 and 16-20 years of experiences had the highest scores (m rank=17.50) on the Behavioral Assessment on risk factors for falls one month after the educational intervention (BRFT2). Individuals with more than 20 years of experience had the lowest BRFT2 scores (m rank=8.20).

Table 4.8. Demographic Group Differences on Years of Experience

	(n) Mean Ranks					Significance	
Variables	0-5	6-10	11-15	16-20	Over 20	H	P
FPT1	(12) 16.92	(7) 25.79	(9) 17.56	(7) 21.79	(5) 25.20	4.774	.311
RFT1	(12) 16.50	(7) 23.50	(9) 22.94	(7) 18.36	(5) 24.50	5.790	.215
STT1	(12) 22.67	(7) 23.07	(9) 14.39	(7) 17.07	(5) 27.50	6.511	.164
MST1	(12) 21.17	(7) 18.43	(9) 21.22	(7) 17.79	(5) 24.30	1.501	.826
BFPT1	(12) 17.29	(7) 22.14	(9) 20.67	(70 23.36	(4) 17.00	2.539	.638
BRFT1	(12) 19.88	(7) 19.21	(9) 20.39	(7) 24.50	(4) 13.00	4.901	.298
BSTT1	(12) 19.88	(7) 19.64	(9) 20.22	(6) 21.67	(4) 13.25	2.595	.628
BMST1	(10) 16.30	(7) 17.21	(8) 15.19	(5) 19.50	(3) 19.50	2.248	.690

FPT2	(11) 15.09	(6) 21.00	(8) 14.88	(4) 22.25	(5) 19.00	3.936	.415
RFT2	(11) 16.86	(6) 15.92	(8) 18.00	(4) 18.00	(5) 19.60	.529	.971
STT2	(11) 17.77	(6) 17.25	(8) 19.75	(4) 15.00	(5) 15.60	1.094	.895
MST2	(11) 18.36	(6) 13.50	(8) 16.63	(4) 17.50	(5) 21.80	2.291	.682
BFPT2	(11) 16.41	(5) 23.00	(8) 17.00	(4) 23.00	(5) 7.50	**11.312**	**.023**
BRFT2	(10) 17.50	(5) 17.50	(7) 17.50	(4) 17.50	(5) 8.20	**16.663**	**.002**
BSTT2	(10) 16.20	(5) 19.30	(8) 17.81	(4) 22.00	(5) 7.80	8.842	.065
BMST2	(8) 13.50	(4) 15.00	(6) 12.83	(4) 15.00	(4) 11.50	2.035	.729
FPT3	(8) 10.81	(4) 12.13	(4) 7.38	(3) 13.00	(3) 16.50	6.085	.193
RFT3	(8) 14.44	(4) 10.50	(5) 9.00	(3) 10.50	(3) 14.00	3.997	.406
STT3	(8) 12.69	(4) 9.00	(5) 10.20	(3) 13.17	(3) 16.00	2.901	.575
MST3	(8) 12.50	(4) 10.25	(5) 10.20	(3) 12.50	(3) 15.50	1.694	.792
BFPT3	(8) 12.63	(4) 11.50	(4) 10.25	(3) 13.00	(2) 2.00	6.278	.179
BRFT3	(8) 11.75	(4) 11.25	(4) 11.00	(3) 14.00	(2) 3.00	6.547	.162
BSTT3	(8) 11.44	(4) 11.75	(5) 11.20	(3) 11.83	(1) 1.00	3.718	.445
BMST3	(6) 9.25	(3) 10.50	(4) 8.38	(2) 10.50	(2) 5.75	3.042	.551

There were marginally significant differences found between the age groups on the Fall Prevention Knowledge pre-test scores on safe transfers and mobility techniques (STT1), Behavior Assessment on risk factors for falls one-month post educational intervention (BRFT2), Fall Prevention Knowledge test on risk factors for falls three-months post educational intervention (RFT3), and Fall Prevention Knowledge test on safe transfers and mobility techniques three-months post educational intervention (STT3). (see Table 4.9) across all three time points (pre-test, one-month post-test, three-month post-test reflecting a high degree of homogeneity across age groups on study variables

Table 4.9. Demographic Group Differences on Age

	(n) Mean Ranks				Significance	
Variables	21-30	31-40	41-50	Over 51	H	P
FPT1	(5) 18.30	(13) 22.23	(9) 19.06	(13) 20.62	.713	.870
RFT1	(5) 17.40	(13) 22.31	(9) 19.00	(13) 20.92	1.556	.669
STT1	(5) 26.10	(13) 21.27	(9) 12.83	(13) 22.88	6.523	**.089**
MST1	(5) 18.30	(13) 23.12	(9) 21.22	(13) 18.23	1.693	.639
BFPT1	(5) 20.20	(13) 22.62	(9) 20.67	(12) 16.58	2.477	.479
BRFT1	(5) 17.10	(13) 20.23	(9) 22.44	(12) 19.13	1.508	.681
BSTT1	(5) 20.20	(13) 19.27	(8) 19.69	(12) 19.33	.051	.997
BMST1	(5) 16.30	(12) 15.50	(6) 16.42	(10) 19.50	2.593	.459
FPT2	(4) 18.75	(11) 16.36	(8) 18.25	(11) 17.64	.337	.953
RFT2	(4) 24.25	(11) 15.73	(8) 16.44	(11) 17.59	2.682	.443
STT2	(4) 20.13	(11) 19.64	(8) 15.44	(11) 15.91	1.803	.614
MST2	(4) 23.25	(11) 18.27	(8) 13.88	(11) 17.27	2.763	.430
BFPT2	(4) 16.25	(10) 21.65	(8) 17.00	(11) 13.05	5.670	.129
BRFT2	(4) 17.50	(10 17.50	(7) 17.50	(10) 12.85	6.729	**.081**
BSTT2	(4) 14.25	(10) 20.65	(8) 17.81	(10) 12.20	6.250	.100
BMST2	(4) 12.00	(7) 15.00	(6) 12.83	(9) 13.44	1.523	.677
FPT3	(4) 12.13	(8) 10.81	(3) 6.67	(7) 14.00	4.674	.197
RFT3	(4) 15.75	(8) 13.13	(4) 6.00	(7) 12.00	6.991	**.072**
STT3	(4) 14.25	(8) 11.63	(4) 5.25	(7) 15.00	7.158	**.067**
MST3	(4) 12.50	(8) 13.25	(4) 5.88	(7) 13.79	4.634	.201
BFPT3	(4) 13.75	(8) 11.50	(3) 8.33	(6) 9.83	1.954	.582
BRFT3	(4) 9.50	(8) 12.63	(3) 10.00	(6) 10.33	1.467	.690
BSTT3	(4) 7.88	(8) 12.19	(4) 15.00	(5) 8.40	5.193	.158
BMST3	(4) 8.63	(6) 10.50	(1) 2.00	(6) 8.92	5.594	.133

Regrouped Years of Experience

A secondary years of experience group categorization was created (Yrsexp2) due to small sample sizes and subgroups with few subjects. Individuals with 0-5 (n=12) and 6-10 (n=7) years of experience were grouped together as 0-10 years of experience (n=19) and those with 11-15 years of experience (n=9), 16-20 years of experience (n=7), and more than 20 years of experience (n=5) were grouped as greater than 10 years of experience (n=21).

Mann-Whitney U Test

A nonparametric Mann-Whitney U test is used to test differences between two independent groups on continuous or ordinal dependent variables (Pallant, 2013) when sample sizes are small or unequal or issues of heterogeneity preclude use of parametric approaches. Given the need to collapse categories for both years of experience and job title subgroups, concerns about violations of parametric assumptions suggested a more conservative approach be used. Mann-Whitney U test (see Table 4.10 and Table 4.11) was used to investigate the differences between the regrouped demographic level variables for job title and years of experience. Results displayed in Table 4.10 found only a single marginal difference between years of experience groups association on Behavioral Assessment on risk factors for falls one-month post-educational intervention (BRFT2) scores. Behavioral assessments on risk factors were reported more often by nursing staff with 10 years or fewer years of experience at the one-month post-educational session. There was no statistically significant difference found between years of experience groups on any other dependent variable again indicating a high degree of homogeneity across demographic subgroups on study variables.

Table 4.10: Mann-Whitney U test on Combined Years of Experience (Years of Experience2) and Dependent Variables

Variables	(n) Mean Ranks		Z	U	P
	0-10 Years	Over 11 Years			
FPT1	(19) 20.18	(21) 20.79	-.177	194	.859
RFT1	(19) 19.08	(21) 21.79	-1.003	173	.316
STT1	(19) 22.82	(21) 18.40	-1.284	156	.199
MST1	(19) 20.16	(21) 20.81	-.194	193	.844
BFPT1	(19) 19.08	(20) 20.88	-.578	173	.563
BRFT1	(19) 19.63	(20) 20.35	-.268	183	.789
BSTT1	(19) 19.79	(19) 19.21	-.208	175	.835
BMST1	(17) 16.68	(16) 17.34	-.318	131	.750
FPT2	(17) 17.18	(17) 17.82	-.218	139	.827
RFT2	(17) 16.53	(17) 18.47	-.617	128	.538
STT2	(17) 17.59	(17) 17.41	-.058	143	.953
MST2	(17) 16.65	(17) 18.35	-.529	130	.597
BFPT2	(16) 18.47	(17) 15.62	-.986	113	.324
BRFT2	**(15) 17.50**	**(16) 14.59**	**-1.733**	**98**	**.083**
BSTT2	(15) 17.23	(17) 15.85	-.493	117	.622
BMST2	(12) 14.00	(14) 13.07	-.556	78	.578
FPT3	(12) 11.25	(10) 11.80	-.254	57	.799
RFT3	(12) 13.13	(11) 10.77	-1.027	53	.304
STT3	(12) 11.46	(11) 12.59	-.445	60	.657
MST3	(12) 11.75	(11) 12.27	-.198	63	.843
BFPT3	(12) 12.25	(9) 9.33	-1.177	39	.239
BRFT3	(12) 11.58	(9) 10.22	-.625	47	.532
BSTT3	(12) 11.54	(9)10.28	-.537	48	.592
BMST3	(9) 9.67	(8) 8.25	-.868	30	.385

As indicated in Table 4.11, statistically significant differences were found between job title subgroups on Fall Prevention Knowledge pre-test scores on multidisciplinary strategies to reduce falls (MSTI) and Behavioral Assessment on safe transfers and mobility technique three months after the educational intervention (BSTT3) scores. A marginal significant association was observed between job titles and Fall Prevention Knowledge pre-test scores on fall prevention approach (FPT1), Fall Prevention Knowledge scores on risk factors for falls one month after the educational intervention (RFT2), and Fall Prevention Knowledge scores on Multidisciplinary strategies to reduce falls one month after the educational intervention (MST2). Fall Prevention Knowledge pre-test scores on multidisciplinary strategies to reduce falls (MST1) in nurses were significantly higher than in care assistants (m rank=25.25), whereas the care assistants exhibited higher scores than nurses on Behaviors Assessment for safe transfers and mobility techniques at three months post-educational intervention (m rank=13.27). Nurses' FPT1 scores (m rank=24.36), RFT2 scores (m rank=21.41), and MST2 scores (m rank=21.45) were higher than those of nursing care assistants.

Table 4.11. Mann-U Whitney test on Combined Job Titles (Jobtitles2) and the Dependent Variables

	(n) Mean Ranks				
Variables	Care Assistants	Nurses	Z	U	P
FPT1	**(26) 18.42**	**(14) 24.36**	**-1.668**	**128**	**.095**
RFT1	(26) 19.58	(14) 22.21	-.933	158	.351
STT1	(26) 19.19	(14) 22.93	-1.039	148	.299
MST1	**(26) 17.94**	**(14) 25.25**	**-2.110**	**116**	**.035**
BFPT1	(26) 19.35	(14) 21.31	-.595	152	.552
BRFT1	(26) 21.46	(13) 17.08	-1.541	131	.123
BSTT1	(25) 18.44	(13) 21.54	-1.056	136	.291

BMST1	(21) 17.86	(12) 15.50	-1.082	108	.279
FPT2	(23) 18.04	(11) 16.36	-.530	114	.596
RFT2	**(23) 15.63**	**(11) 21.41**	**-1.717**	**84**	**.086**
STT2	(23) 17.98	(11) 16.50	-.458	116	.647
MST2	**(23) 15.61**	**(11) 21.45**	**-1.695**	**83**	**.090**
BFPT2	(22) 16.53	(11) 17.95	-.467	111	.640
BRFT2	(20) 16.73	(11) 14.68	-1.167	96	.243
BSTT2	(21) 17.57	(11) 14.45	-1.059	93	.290
BMST2	(17) 14.24	(9) 12.11	-1.214	64	.225
FPT3	(11) 12.55	(11) 10.45	-.971	49	.332
RFT3	(12) 10.75	(11) 13.36	-1.141	51	.254
STT3	(12) 10.54	(11) 13.59	-1.197	49	.231
MST3	(12) 12.29	(11) 11.68	-.231	63	.818
BFPT3	(10) 12.80	(11) 9.36	-1.399	37	.162
BRFT3	(10) 12.80	(11) 9.36	-1.592	37	.111
BSTT3	**(11) 13.27**	**(10) 8.50**	**-2.045**	**30**	**.041**
BMST3	(7) 9.29	(10) 8.80	-.293	33	.769

Summary of Preliminary Analyses

Results confirmed a high degree of homogeneity across demographic subgroups for all study variables with few and scattered differences that fall within test-wise error in which a certain proportion of analyses will be found to be significant purely by chance. With alpha at .05 (the standard), 5 out of 100 results will be ‘significant’ erroneously. Thus, the paucity of significant results for the preliminary analyses supports a conclusion that substantial differences between demographic subgroups are largely absent and there were no demographic variable that needs to be treated as an additional covariate in subsequent study analyses.

STUDY VARIABLES

The dependent variables in the study included the subset scores of the FPKBAQ (see Table 4.3). Total subscale scores for each time period were created, leading to 24 subscale dependent variables. Table 4.12 and Table 4.13 show the means and standard deviations of the calculated subscales scores of all participants for the Fall Prevention Knowledge and Behavioral Assessment Questionnaires.

Fall Prevention Knowledge Questionnaire Scores

The results of the Fall Prevention Knowledge Questionnaire (FPKQ) (Table 4.12) indicated that participants scored highest on the pre-test scores for the risk factors for falls, and lowest scores on pre-test scores on safe transfers and mobility technique. At one month- post educational session, participants scored highest on the multidisciplinary strategies to reduce falls and lowest on safe transfers and mobility techniques. At three months post-educational intervention, participants scored highest on Fall Prevention approaches, and lowest on safe transfers and mobility techniques. Participants' scores on the multidisciplinary strategies to reduce falls were nearly identical to the fall prevention approach. The participants performed poorly on safe transfers at all time points (see Table 4.12). Comparisons of all three time points showed improvement of scores on the Fall Prevention Knowledge test from pre-test to three months post-educational intervention.

Table 4.12: Mean and Standard Deviation of the Subscale Scores of Fall Prevention Knowledge

	Fall Prevention		Risk Factors		Safe Transfers		Multidisciplinary	
Variable	M	SD	M	SD	M	SD	M	SD
Time 1	1.70	.883	1.98	.480	1.25	.954	1.90	.810
Time 2	1.88	.686	1.94	.776	1.50	.788	2.00	.853
Time 3	2.18	.501	2.09	.668	1.43	.896	2.17	.887

Behavior Assessment Scores

The pre-test scores of the Behavior Assessment were highest on multidisciplinary strategies to reduce fall and lowest on fall prevention approach (Table 4.13). At one-month post-educational intervention, participants scored highest on risk factors for falls and lowest on the fall prevention approach. At three months post-intervention, participants performed highest on both risk factors for falls and safe transfer and lowest on fall prevention approach. Participants scored lowest on their behavior assessment of the fall prevention approach at all time points.

Table 4.13: Mean and Standard Deviation of the Subscale Scores of Behavioral Assessment

	Fall Prevention		Risk Factors		Safe Transfers		Multidisciplinary	
Variable	M	SD	M	SD	M	SD	M	SD
Time 1	8.46	.854	8.69	.655	8.55	.978	8.79	.600
Time 2	8.06	1.767	8.74	.893	8.16	1.725	8.46	1.772
Time 3	8.19	1.250	8.38	1.284	8.38	1.161	8.35	1.801

RESEARCH QUESTION ANALYSES

Specific Aim 1: To evaluate the effectiveness of an educational intervention on knowledge and use of fall prevention strategies among nursing staff members in a selected nursing home

SA1RQ1: Is there a significant change in the four subscale scores for knowledge of fall prevention strategies of long-term care staff members following an educational intervention from pre-test (T1) to 1-month post-test (T2) to three months post-intervention (T3) after controlling for associated demographic variables?

The first research question for specific aim one was analyzed using a one-way repeated measures ANOVA to compare the pre-test scores, post-test1 and post-test2 scores on the fall prevention subset scores across each time point. Assumptions of the one-way repeated measures ANOVA included testing for outliers, testing for normality using the Shapiro-Wilks test of normality, and testing for sphericity using Mauchly's test of sphericity. The additional tests were calculated using SPSS. Outliers were assessed by inspection of box plots produced by SPSS statistics and were present.

Due to the small sample size (n=40), a Shapiro-Wilks Test (Table 4.14) was completed to determine if the dependent variables (fall prevention knowledge subset scores) were normally distributed at each time points (pre-test, post-test1, post-test2); all were determined to be statistically significant, further indicating the subset scores were not normally distributed for each time point.

Table 4.14: Shapiro-Wilks Test for Normality of the Fall Prevention Subscale Scores

Variable/Subscales	Statistic	df	P value
Fall prevention approach			
FPT1	.828	19	.003
FPT2	.803	19	.003
FPT3	.708	19	.000
Risk factors for falls			
RFT1	.688	20	.000
RFT2	.816	20	.002
RFT3	.714	20	.003
Safe transfers and mobility			
STT1	.879	20	.017
STT2	.817	20	.002
STT3	.815	20	.001
Multidisciplinary strategies to reduce fall			
MST1	.796	20	.001
MST2	.873	20	.013
MST3	.810	20	.001

Due to the violation of normality and presence of outliers, a Friedman's test was calculated (Table 4.15) on the Fall Prevention Knowledge subscale scores to deal with this issue of non-normality and outliers. The Friedman test is the non-parametric alternative to the one-way repeated measures ANOVA test and can be used when the same groups of participants are measured at three or more time points (Pallant, 2013). However, a one-way repeated measures ANOVA analysis also was carried out because it can be considered robust to violations of normality and can still produce valid results (Laerd Statistics, 2015).

The result of the Friedman test (Table 4.15) indicated a statistically significant difference in the Fall Prevention Knowledge on fall prevention approach (FPT) scores across the three time points. The median values showed no changes from pre-intervention to one-month post-intervention and three-month post-intervention.

Due to the statistical significance of the results in the Friedman test, Wilcoxon Signed rank test (Table 4.16) was performed on the Fall Prevention Knowledge on fall prevention approach (FPT) scores to determine where exactly the differences across each time points existed. The Wilcoxon signed rank test is used to determine if there is a statistically significant median difference between two related groups and the shape of the distribution of the difference has to be symmetrical (Laerd Statistics, 2015).

The results of the Wilcoxon Signed rank test of the Fall Prevention Knowledge test on fall prevention approach (FPT) scores showed that the scores were statistically significantly different between FPT1 and FPT3, and between FPT2 and FPT3. The median of the differences at these two time points were statistically significantly different from zero and the shape of the distribution of the differences were symmetrical.

Table 4.15: Friedman Test of Fall Prevention Knowledge Test

Null hypothesis	P value	Decision	Median	Mean Ranks
FPT1			2	1.84
FPT2	**.049**	**Reject the null hypothesis**	**2**	**1.82**
FPT3			2	2.34
RFT1				
RFT2	.911	Retain the null hypothesis		
RFT3				
STT1				
STT2	.741	Retain the null hypothesis		
STT3				
MST1				
MST2	.290	Retain the null hypothesis		
MST3				

H0: the distribution of scores are the same across time points, P<.05

Table 4.16. Wilcoxon Signed Rank Test of FPT

Variable	Test Statistics	P value	Median	Median difference
FPT1	1.164	.244	2.00	.00
FPT2			2.00	.00
FPT1	2.511	**.012**	2.00	.00
FPT3			2.00	.00
FPT2	2.33	**.020**	2.00	.00
FPT3			2.00	.00

P<.05

The assumption of sphericity using Mauchly's Test of sphericity (Table 4.17) was used to determine if the assumption of sphericity was met before interpretation of the one-way repeated measures ANOVA. Sphericity was defined as the variances of the

differences between all combinations of the time points are equal and was important because its violation increases the chance of Type 1 error rate (Laerd Statistics, 2015).

Table 4.17: Assumption of Mauchly's Test of Sphericity

Variables	P value
FPT	**.031**
RFT	.882
STT	.456
MST	.671

The results of the test of sphericity were violated on the FPT. Results from a modified one-way repeated measure ANOVA with adjustments to the degree of freedom was used to avoid bias and to avoid an incorrect conclusion of a statistically significant result.

Results of the one-way repeated measures ANOVA of the Fall Prevention Knowledge test showed no statistically significant changes between the fall prevention subscale scores across all time points (Table 4.18). There were no statistically significant changes between the subscale scores on fall prevention, risk factor, safe transfers, or multidisciplinary strategies to prevent falls over the three time points (pre-test, 1-month post-test and 3-month post-test).

In response to research question SA1Q1, there was a statistically significant difference in the fall prevention approach scores across all time points and the scores were statistically significantly different between FPT1 and FPT3, and between FPT2 and FPT3. The median of the differences at these two time points were statistically significantly different from zero.

Table 4.18. One-way Repeated Measures ANOVA of Fall Prevention Knowledge Test

	FPT				RFT				STT				MST			
Variables	df	SS	MSQ	F	df	SS	MSQ	F	df	SS	MSQ	F	df	SS	MSQ	F
Within	1.498	2.772	1.850	3.427	2	.000	.000	.000	2	.433	.217	.553	2	1.233	.617	1.518
Error	26.964	14.561	.540		38	11.333	.298		38	14.900	.392		38	15.433	.406	
P value		.059				1.00				.580				.232		
Time 1 Mean(SD)		1.68 (.820)				2.05 (.510)				1.50 (1.000)				2.05 (.759)		
Time 2 Mean(SD)		1.84 (.688)				2.05 (.759)				1.65 (.933)				1.85 (.875)		
Time 3 Mean(SD)		2.21 (.535)				2.05 (.686)				1.45 (.945)				2.20 (.894)		

SA1RQ2: Is there a significant change in the behavioral scores for reported use of fall prevention strategies of long-term care staff members following an educational intervention from pre-intervention to three months post-intervention after controlling for associated demographic variables?

The second research question for specific aim one could not be analyzed using a parametric paired sample t-test since there were only two time points (Time 1 and Time 3). Assumptions of the paired samples t-test, which included assessing for outliers and testing for normality of the dependent variables across the time points, were assessed by calculating the differences between the paired-value using SPSS. New variables were created to quantify the amount of change by subtracting the pre-test scores from the post-test scores. Outliers were assessed by inspection of box plots produced by SPSS statistics and were found to be present.

A Shapiro-Wilks Test (Table 4.19) was completed to determine if the difference scores of the dependent variables (Behavior Assessment subset scores) were normally distributed. Results of the Shapiro-Wilks test showed statistically significant levels ($p<.05$) only on the difference scores of the Behavior Assessment on risk factors for falls;

safe transfers and mobility; and multidisciplinary approach to reduce falls. These scores were not normally distributed. The difference score of the Behavior Assessment of fall prevention approach ($p>.05$) was not statistically significant, indicating the scores were normally distributed.

The Wilcoxon signed rank test is a non-parametric test used when the same group of participants are measured at two or under two time points (Pallant, 2013). Due to a violation of normality and presence of outliners, the non-parametric Wilcoxon signed rank test was used to investigate these violations (Table 4.20).

After assessing for symmetry, the distribution of differences between the Behavior Assessment on fall prevention approach (BFPT) and Behavior Assessment on safe transfers and mobility techniques (BSTT) were found to be symmetrical in shape and were analyzed using the Wilcoxon signed rank test, while the distribution of differences between the Behavior Assessment on risk factors for falls (BRFT) and Behavior Assessment for multidisciplinary strategies to reduce falls (BMST) were not symmetrical and therefore were tested further using a Sign test (see Table 4.21).

Table 4.19. Shapiro-Wilks Test for Normality on the Difference Scores of the Behavior Assessment Subscale Scores

Variables/Subscales	Statistic	df	P value
Fall prevention approach			
Difference score of BFPT	.914	20	**.076**
Risk factors for falls			
Difference score of BRFT	.709	20	.000
Safe transfers and mobility			
Difference score of BSTT	.838	19	.004
Multidisciplinary approach to reduce falls			
Difference score of BMST	.565	16	.000

Table 4.20. Wilcoxon Signed Rank Test of Behavior Assessment

Variable	Test Statistics	P value	Median	Median difference
BFPT1	-.237	.813	9.00	.00
BFPT3			9.00	.00
BSTT1	-.905	.366	9.00	.00
BSTT3			9.00	.00

P<.05

Table 4.21: Sign Test of Behavior Assessment Subset Scores

Variable	Test Statistics	P value	Median	Median difference
BRFT1	.000	1.000	9.00	.00
BRFT3			9.00	.00
MST1	.500	.625	9.00	.00
BMST3			9.00	.00

Results of the Wilcoxon signed rank test (Table 4.20) for the Behavior Assessment on fall prevention approach (BFPT) showed no statistically significant difference (p>.813) between the two time points. Further, there was no median difference between the related groups in the population. There was also no statistically significant difference (p>.366) on the Behavior Assessment on safe transfers and mobility technique (BSTT) and no median difference between the groups.

A sign test is an alternative to Wilcoxon signed rank test that is conducted when distributions of differences between paired groups are not symmetrical (Laerd Statistics, 2015). Results of the sign test (Table 4.21) demonstrated no statistically significant differences between the Behavior Assessment on risk factors for falls (BRFT) (p>1.000)

and Behavior Assessment on multidisciplinary strategies to reduce falls (BMST) ($p>.625$) across two time points. The median of the differences at two time points were not statistically significantly different from zero.

Therefore, in response to the research question SA1Q2, there were no statistically significant differences found between the behavior assessment scores across the two time points.

Specific Aim 2: To determine if an educational intervention or any of its components reduced fall rates and fall injury rates.

SA2RQ1: What is the difference in fall rates and fall injury rates at baseline (pre-intervention average over three months) compared to one month post-intervention and three months post-intervention?

Fall and injury rates were calculated differently between two different settings (assisted living and healthcare living). The healthcare living sample was made up of nursing and skilled nursing facility areas. The same nursing staff members worked in both the assisted living and healthcare living settings. A MedCalc (version 17.0.4) was used to calculate the fall incidence rates. Calculation of fall rates prior to the educational intervention was based on the three-month average number of patient falls divided by the three-month average number of patient bed days, and multiplied by 1,000. Fall injury rates were calculated as a whole and separately for two severity categories (e.g., minor, major) based on the three-month average number of falls that resulted in injury divided by the three-month average number of patient, falls multiplied by 1,000.

The first research question for aim two was analyzed by computation of fall rates; fall injury rates; and minor and major injuries (Table 4.22). The fall rate in the assisted

living setting increased at three months post-educational session but decreased in the healthcare living setting at the same time point. Fall injury rates decreased across time in the assisted living setting increased at one-month post-intervention and decreased at three-month post-educational session in the healthcare living setting. Minor injuries increased in both the assisted living and healthcare living settings at one-month post-educational session, decreased at the three-month post-educational session in the healthcare living setting. There were no minor injuries at three-month post-education session in the assisted living setting. Major injuries increased across all time points in the assisted living setting and increased at one-month post-education session in the healthcare living setting. There were no major injuries at three months in the healthcare living setting.

Table 4.22. Incidence Rates of fall, Fall Injuries, Minor and Major Injury

	Assisted Living			Healthcare Living		
Rates	Pre	1 month	3 months	Pre	1 month	3 months
Fall	6.2	6.2	8.3	6.5	6.5	4.5
Fall injury	384.6	333.3	166.7	347.8	375.0	166.7
Minor Injury	230.7	333.3	0	192.3	250.0	166.7
Major Injury	76.9	111.1	166.7	38.5	125.0	0

Run charts (Figures 4.1 and 4.2) were used to visually examine monthly fall rates at three-month pre-education session and three-month post- educational session. The run chart for the assisted living setting indicated an overall increase in fall rates, whereas the run chart for the healthcare living setting showed an overall decrease in fall rates after educational intervention..

Figure 4.1 Run Chart of Fall Incidence Rates in Assisted Living Setting

Figure 4.2: Run Chart of Fall Incidence Rates in Healthcare Living Setting

SA2RQ2: What is the relationship between knowledge and behavioral change scores before (T1) and after (T2 and T3) an educational intervention on fall prevention?

The second research question for specific aim two was analyzed using Pearson's correlation analyses (see Table 4.23). Change scores of both the knowledge and

behavioral scales between T1 and T2 as well as T1 and T3 were calculated. Data analysis with Pearson's correlation involves presence of a linear relationship between the variable while checking for outliers and normality (Laerd Statistics, 2015). The establishment of the existence of a linear relationship was accomplished by visually inspecting the variables through use of scatterplots—a linear relationship was found to exist between the variables. Only one outlier was found between the variables on safe transfers and mobility techniques, and this outlier was included in the analysis. A test of normality was conducted using the Shapiro-Wilks test due to the small sample size and because not all variables were normally distributed. Pearson's correlation was conducted because the test was considered to be somewhat robust to deviations from normality (Laerd Statistics, 2015).

Table 4.23. Pearson Correlation between Knowledge and Behavioral Change Scores before Time 1 and After Time 2 and Time 3

	BFPT2T1		BRFT2T1		BSTT2T1		BMST2T1	
Variable	r	P value	r	P value	r	P value	r	P value
FPT2T1	.012	.950	-.072	.705	.045	.814	-.082	.717
RFT2T1	.146	.426	.000	1.000	.087	.646	.245	.272
STT2T1	.311	.083	.000	1.000	.108	.570	.127	.572
MST2T1	.109	.511	-.041	.830	**.355**	**.054**	**.455**	**.034**
	BFPT3T1		BRFT3T1		BSTT3T1		BMST3T1	
Variable	r	P value	r	P value	r	P value	r	P value
FPT3T1	**.503**	**.024**	.032	.892	.044	.863	.167	.537
RFT3T1	**.710**	**.000**	**.485**	**.030**	.092	.707	**.623**	**.010**
STT3T1	-.255	.278	.077	.748	-.356	.135	-.083	.759
MST3T1	.122	.609	.425	.062	-.036	.884	.471	.066

Pvalue <.05, small r=.10 to .29, medium r=.30 to .49, large r=.50 to 1.0
Key to Abbreviations:
FPT-fall prevention approach; RFT-Risk factors for falls; STT- safe transfers and mobility techniques; MST-multidisciplinary strategies to reduce falls; BFPT-behavior fall prevention approach; BRFT-behavior risk factors for falls; BSTT- behavior safe transfers and mobility technique; BMST-behavior multidisciplinary strategies to reduce falls

One Month Post-Intervention

Results of the correlation analyses (Table 4.23) indicated a moderately and significantly positive correlation between:

- Fall prevention knowledge test scores on multidisciplinary strategies to reduce falls (MST2T1) and Behavior Assessment scores on safe transfers and mobility techniques (BSTT2T1);
- Fall Prevention knowledge test scores on multidisciplinary strategies to reduce falls (MST2T1) and Behavior Assessment scores on multidisciplinary strategies to reduce falls (BMST2T1).

  This may suggest that an increase in knowledge of multidisciplinary strategies to reduce falls had a moderate relationship to the staff behavior for safe transfers and multidisciplinary strategies to reduce falls.

Three Months Post-Intervention

Results of the correlation at three months post-intervention showed a highly and significantly positive correlation between:

- Fall Prevention Knowledge test scores on fall prevention approach(FPT3T1) and Behavior Assessment scores on fall prevention approach (BFPT3T1);
- Fall Prevention Knowledge test scores on risk factors for falls (RFT3T1) and Behavior Assessment scores on fall prevention approach (BFPT3T1)
- Fall Prevention Knowledge test scores on risk factors for falls (RFT3T1) and Behavior Assessment scores on multidisciplinary strategies to reduce falls (BMST3T1) and a moderately and significantly positive correlation between Fall

Prevention Knowledge test scores on risk factors for falls (RFT3T1) and Behavior Assessment scores on risk factors for falls (BRFT3T1).

The above results may suggest that as the participants' knowledge of risk factors for falls increased, their behaviors on fall prevention approaches and multidisciplinary strategies to reduce falls also increased. It is possible that over time, as participants incorporated new knowledge into practice, they implemented new behaviors based on their new knowledge.

SUMMARY

The study sample consisted of 40 nursing staff members who were primarily CNAs or CMAs (65%). The majority of the sample was African American (87.2%) and female (95%). This sample constituted the typical long-term care nursing staff profile in the study's geographic area based on the PI's observations. Nursing staff members with 6-20 years of experiences had the highest scores on the Behavioral Assessment on fall prevention one month after the educational intervention (BFPT2), and staff members with more than 20 years of experience had the lowest BFPT2 scores. Nursing staff members with 0-20 years of experiences had the highest scores on the Behavioral Assessment on risk factors for falls one month after the educational intervention (BRFT2), whereas those staff members with more than 20 years of experience had the lowest BRFT2 scores at one month post-educational intervention. Nurses scored higher than nursing assistants in almost all sections of the fall prevention knowledge test except on the fall prevention approach (FPT2) and safe transfers and mobility techniques (STT2) at one month post educational intervention, and on fall prevention approach at the three-month post-educational intervention (FPT3). Nursing care assistants scored higher than nurses on

Behavior Assessment pre-test scores for risk factors for falls (BRFT1) and multidisciplinary strategies to reduce falls (BMST1) at the pre-test time point. Further, nursing care assistants scored higher than nurses at the three-month post-educational intervention time point on fall prevention approach (BFPT3), risk factors for falls (BRFT3), and safe transfers and mobility technique (BSTT3).

In an attempt to answer the research questions, the one-way repeated measures ANOVA was used to analyze the differences between the fall prevention knowledge subscale scores across different time points. The one-way repeated measures ANOVA results indicated no significant difference across the different time points. The Friedman test indicated a statistically significant difference between the Fall Prevention Knowledge test on fall prevention approach (FPT) scores across the different time points, and these FPT scores were the only subscale scores that increased across time. The Wilcoxon signed rank test and sign test were used to analyze the Behavior Assessment subscale scores across the two time points (pre-education session and three-month post-education session). The Wilcoxon signed rank test showed no statistically significant difference across the time points. Fall rates in the healthcare living setting decreased at three-month post-intervention and there were no major injuries at three-month post-intervention in the healthcare living setting.

The Pearson's Correlation was used to determine the relationship between knowledge and behavior change scores before Time 1 and after Time 2 and Time 3. Results of the correlation at one-month post intervention indicated a moderately and significantly positive correlation between Fall Prevention Knowledge test scores on multidisciplinary strategies to reduce falls (MST2T1) and Behavior Assessment on safe

transfers and mobility techniques (BSTT2T1), Fall Prevention Knowledge test scores on multidisciplinary strategies to reduce falls (MST2T1) and Behavior Assessment on multidisciplinary strategies to reduce falls (BMST2T1). Results of the correlation at three months post-intervention showed a highly and significantly positive correlation between Fall Prevention Knowledge test on fall prevention approach (FPT3T1) and Behavior Assessment test on fall prevention approach (BFPT3T1), Fall Prevention Knowledge test on risk factors for falls (RFT3T1) and Behavior Assessment on fall prevention approach (BFPT3T1), Fall Prevention Knowledge test on risk factors for falls (RFT3T1) and Behavior Assessment on multidisciplinary strategies to reduce falls (BMST3T1) and a moderately and significantly positive correlation between Fall Prevention Knowledge test on risk factors for falls (RFT3T1) and behavior Assessment on risk factors for falls (BRFT3T1). Even though the participants had the lowest scores on risk factors for falls, their knowledge of risk factors for falls had a positive relationship with their behaviors of fall prevention and multidisciplinary strategies to reduce falls. Chapter five will discuss the importance of the findings and implications for practice and future research.

Chapter 5: Discussion, Recommendations, and Conclusions

Chapter five includes a summary of the study and a review of the findings in context with extant literature. The chapter concludes with study strengths, limitations of the research study, and implications for nursing.

SUMMARY OF THE STUDY

Staff education was frequently cited as an effective fall prevention strategy in long-term care settings (Quigley et al., 2010). Although research on fall prevention in long-term care supported staff education as important component in fall prevention (Quigley et al., 2010), more research was needed to examine the potential influence of education on all care providers in fall prevention. The impact of education on fall rates and injuries was also an important area for research. The purpose of this research study was to reduce fall by providing an educational intervention for long-term care nursing staff members that included fall prevention approach; risk factors for falls; safe transfers and mobility technique; and multidisciplinary strategies to reduce falls.

REVIEW OF METHODOLOGY

A single group repeated measures design was used to evaluate the impact of an educational intervention on falls in a long-term care setting by measuring staff members' knowledge of fall prevention; assessing the behavior of staff in using fall prevention approaches; and evaluating fall rates and fall injury rates following educational intervention. A convenience sample of 40 nursing staff members (e.g., CNAs, CMAs, LVNs, RNs) attended an educational session and completed a fall prevention knowledge and behavior assessment questionnaire at pre-educational intervention, one month post-educational intervention, and three months post educational intervention. The fall

prevention knowledge and behavior assessment questionnaire was broken down into four subscales: (1) fall prevention approach; (2) risk factors for falls; (3) safe transfers and mobility techniques; and (4) multidisciplinary strategies to reduce fall. Data on falls and fall injuries were collected monthly for three months before the educational intervention and monthly for the three months post-educational intervention.

The questionnaire was based on AHRQ guidelines for universal fall precautions. The subscales were groupings from within the guidelines for preventing falls and included elements such as checking equipment and orientation to environment for prevention approach; clearing equipment from hallway for risk factors for falls; using safety belts and teaching safe transfers for safe transfers and mobility techniques; and frequent rounding on patients and placing frequently used items within reach for multidisciplinary strategies to reduce fall.

SUMMARY OF FINDINGS

The overall sample consisted of 40 nursing staff members' participants. The majority of the sample was African American (87.2%), female (95%), CNAs (47.5%), with greater than 10 years of nursing experience (52.5%), and with a high school diploma or less (61.6%). Other studies have reported similar samples in relation to gender distribution (Johnson et al., 2014). Johnson et al. (2014) used a sample that involved a majority of female nurses (78%), although about 70% of the nurses had a university education. However, Johnson et al. (2014) did not fully describe nurses' ethnicity and included nurses in the hospital setting rather than a long-term care setting.

The inclusion of CNAs and CMAs in the current study was representative of the need to include all caregivers in fall prevention, which may be beneficial in improving

caregivers' fall knowledge and behaviors. Indeed, Hang et al. (2016) assessed knowledge and awareness of fall risks and knowledge about falls prevention among CNAs and found low levels of knowledge among care staff members. The pre-test knowledge scores among non-nurses in this study showed low levels of knowledge which increased on two subsections at one-month (fall prevention approach, safe transfers for falls) and three-month (fall prevention approach, multidisciplinary strategies to reduce falls) after the educational intervention.

Specific Aim 1: To evaluate the effectiveness of an educational intervention on knowledge and use of fall prevention strategies among nursing staff members in a selected nursing home.

SA1RQ1: Is there a significant change in the four subscale scores for knowledge of fall prevention strategies of long term care staff members following an educational intervention from pre-test (T1) to one month post-test (T2) to three months post-intervention (T3) after controlling for associated demographic variables?

There was one statistically significant difference in the Fall Prevention Knowledge test scores on the fall prevention approach (FPT) across the three time points ($p=.049$). There were no statistically significant differences in the other fall prevention knowledge test sections (e.g., risk factors for fall, safe transfers and mobility techniques, multidisciplinary strategies to reduce falls).

Although not statistically significant, there were interesting findings related to the knowledge and behavioral assessment scores. The highest scores on fall prevention knowledge varied among different subscales for all three time points. Prior to the educational intervention, the highest scores were on safe transfers and mobility

techniques; at one month post-intervention, highest scores were on multidisciplinary strategies to reduce falls; and at three months post-intervention, highest scores were on fall prevention approach. The lowest scores in the fall prevention knowledge test were on safe transfers and mobility techniques. These fall prevention knowledge questions included items such as what to do for patients who cannot walk. This might mean that the nurses need more hands-on techniques and knowledge on transfer techniques.

Further, the highest scores on the behavior assessment questionnaire varied among different subscales for all three time points. Prior to the educational intervention, nursing staff members performed highest on multidisciplinary strategies to reduce falls; at one month post-intervention, highest scores were on risk factors for falls; and at three months post-intervention, highest scores were both on risk factors for falls and safe transfers and mobility techniques. The lowest scores of the behavior assessment were consistently on fall prevention approaches. The fall prevention approaches portion of the behavior assessment included questions on orienting patients and reinforcing safe activities. Given that many patients in the long term care have dementia, staff may have found these activities difficult or impossible to implement.

The current study findings corresponded to those of El Enein, El Ghany, and Zaghloul (2012), which showed significant improvement in knowledge after an educational program. However, Johnson et al. (2014) found no significant difference in fall knowledge at pre- and post-educational learning program. This suggests that pre-existing knowledge and background of participants vary. Johnson et al. (2014) found that 50% of nurse participants had undertaken training in falls education within the past two years, which might have contributed to a high level of knowledge. Indeed, all but one

nurse in the study did not undergo any previous training on falls education (Johnson et al., 2014).

Nurses (LVNs, RNs) scored higher than care assistants (CNAs, CMAs) in almost all sections of the Fall Prevention Knowledge test except on fall prevention approach at one month post-intervention (FPT2), fall prevention approach at three months post-intervention (FPT3), and on safe transfers and mobility techniques at one month post-intervention (STT2). The Fall Prevention knowledge test scores on fall prevention approach (FPT) of nursing care assistants improved over time, whereas scores of nurses trended down at Time 2 and stayed stable at Time 1 and Time 3. Based on their education, one would expect nurses to score well on knowledge of fall prevention approach. The lower scores for care assistants suggest a need for continuous education for nursing care assistants due to a low level of fall prevention knowledge through training.

SA1RQ2: Is there a significant change in the behavioral scores for reported use of fall prevention strategies of long term-care staff members following an educational intervention from pre-intervention to three months post-intervention after controlling for associated demographic variables?

There was no statistically significant change between the behavior subscale scores across the two time points (pre-test and three months post-test). This result may be secondary to poor response rates at one month and three months post-educational intervention. Although there was no significant change, there was improvement on the scores of the care assistants on Behavior Assessment on the fall prevention approach (BFPT) and safe transfers and mobility techniques (BSTT). Nurses improved on

Behavior Assessment for risk factors for falls (BRPT) and on multidisciplinary strategies to reduce falls (BMST). Behavior improvement found in this study is similar to other studies indicating (1) post-test performance improvement after an educational intervention and (2) significant increase in fall prevention behaviors following a six-hour educational training program for nurses (El Enein et al., 2012; Johnson et al., 2014).

Specific Aim 2: To determine if an educational intervention or any of its components reduced fall rates and fall injury rates.

SA2RQ1: What is the difference in fall rates and fall injury rates at baseline (pre-intervention average over three months) compared to one month post-intervention and three months post-intervention?

The fall rate in the assisted living facility area increased at three months post-educational session but decreased in the skilled nursing setting at the same time point. This may be due to limited staffing in the assisted living units because patients in these settings were more independent and needed minimal assistance in performing their activities of daily living. Patients in assisted living units were not as closely supervised as patients in healthcare living area regarding fall prevention (e.g., minimal use of ambulatory equipment such as walkers and wheelchairs). Although nursing staff members may be aware of and use various fall prevention strategies, patients are more independent and are not observed or guided in their behavior throughout the day and night. Falls may occur regardless of nursing staff vigilance. A similar study by Johnson et al. (2014) showed no change in fall rates in association with a 60-minute e-learning program focusing on fall risk screening, prevention strategies, post-fall assessment, and management procedures.

In the healthcare living setting, fall rates declined steadily after the educational intervention. The fall rate declined from a peak of 8.08 in July to 4.47 in October. The differences in the fall rate between the assisted living and healthcare living could be related to staffing, the number of healthcare staff who attended the educational program, change in patient mix, or various other factors. Although not statistically significant, the data on fall rates are worth considering in developing future educational programs.

SA2RQ2: What is the relationship between knowledge and behavioral change scores before (T1) and after (T2 and T3) an educational intervention on fall prevention?

There was a statistically significant positive relationship between change scores at one-month post-intervention for: Fall Prevention Knowledge test on multidisciplinary strategies to reduce fall (MST2T1) and Behavior Assessment on multidisciplinary strategies to reduce falls (BMST2T1). In addition, there were statistically significant positive relationships between change scores at three-month post-intervention for:

- Fall Prevention Knowledge test scores on fall prevention approach (FPT3T1) and Behavior Assessment scores on fall prevention approach (BFPT3T1)
- Fall Prevention Knowledge test scores on risk factors for falls (RFT3T1) and Behavior Assessment scores on fall prevention approach (BFPT3T1)
- Fall Prevention Knowledge test scores on risk factors for falls (RFT3T1) and Behavior Assessment scores on risk factors for falls (BRFT3T1)
- Fall Prevention Knowledge test scores on risk factors for falls (RFT3T1) and Behavior Assessment scores on multidisciplinary strategies to reduce falls (BMST3T1)

Results suggested that an increase in fall prevention approach scores of the fall knowledge test were associated with an increase in the fall prevention approach subset scores of the behavior assessment at three months post-intervention. Also, an increase in the risk factors for falls scores were associated with an increase in behavior scores on fall prevention and multidisciplinary strategies to reduce falls. An increased awareness of fall prevention strategies may translate into behavioral changes. This change score relationship corresponded with other study findings that indicated improvement of knowledge and behavior after a training program for nurses (El Enein et al., 2012). Fall prevention knowledge on environmental factors and assessment of skills on environment items were the only similar corresponding sections assessed among other study measures (El Enein et al., 2012). No mention was made of whether an increase in knowledge of the environmental factors correlated with improved performance of skills on environment items.

IMPLICATIONS FOR NURSING

One barrier to nursing staff education in long-term care settings is a lack of interest in learning (Brady, 2016). In the current study, the lack of interest was evident as staff members rushed through the educational session to return to work or go home. The lack of interest in learning may be related to low job satisfaction, in turn leading to a failure to learn the material and integrate knowledge into practice. Possible ways to improve learning could be to motivate staff through incentives, benefits, and time off for education (Brady, 2016). Institutions or facilities should consider making all educational training on fall prevention mandatory, staffing at low provider-patient ratios, increasing staff compensation, more highly valuing the CNA role by nurses and supervisors, and

providing options for career advancement in long-term care settings by recognizing years of experience with formal job titles such as CNA1, CNA 2, and CNA 3.

The 2016 Texas Center for Nursing Workforce Studies of Long Term Care Staffing Study indicated that long-term care facilities lack adequate retention and recruitment strategies for full- and part \-time employees. This long-term care staffing study identified paid vacation days, health insurance, and employee recognition as the most frequently used retention and recruitment strategies. Other strategies that might promote learning such as tuition reimbursement and career advancement for staff members (CNAs, CMAs, LVNs, RNs) were less frequently used (Texas Department of State Health Services [DSHS], 2016a). The ability to retain staff can create opportunities for ongoing education and effective fall prevention outcomes.

Retention of long-term care staff can be a challenge due to high turnover rates. The 2016 Long Term Care Nurse Staffing Study revealed that the overall median facility turnover rate for CNAs was 78.5%, CMAs was 33.3%, direct care RNs was 50%, and direct care LVNs was 52.6%. Increasing hourly wages, especially those of CNAs, may help to reduce turnover rates by adding value for CNAs' workload in long-term care settings. The 2016 Long Term Staffing Study also revealed that the difference in entry level and experienced median wages was smaller for CNAs than for other nursing staff members (i.e., $10 for entry level, $11.75 for experienced CNAs) (DSHS, 2016b).

Study findings can provide focus areas for future studies. Fall prevention behaviors and educational programs should be regularly assessed and updated to account for changing work practices and evidence-based research. The lowest scores of the fall prevention knowledge were consistently on safe transfers and mobility techniques, while

the lowest scores of the behavior assessment were consistently on fall prevention approaches. It could be advantageous to focus on these areas for future education and new studies. Moreover, staff compliance with fall prevention behaviors should be routinely reviewed for effective outcomes.

RECOMMENDATIONS FOR FUTURE RESEARCH

The following recommendations are suggested for any further research: CNAs and CMAs should be included in fall-related research in long term care settings; studies should be conducted using a larger sample; educational programs should be mandatory for all staff to ensure favorable response rates; and demographic data should be collected at interval levels in order to provide more accurate data on specific age and years of experience. Researchers should design experimental or quasi-experimental studies using pre-test/post-test design both within and between groups to measure change, determine differences between groups, and document change within groups. Qualitative data on challenges of fall prevention in long-term care setting are also needed. Further studies are needed to determine the reliability and validity of the FPKBAQ and its application to long-term care nursing staff.

STRENGTHS OF THE STUDY

The major strength of this research study was the inclusion of CNAs and CMAs as study participants. CNAs are the primary first-line providers in long-term care and consequently occupy major role in fall prevention in long-term care settings. CNA roles in fall prevention are often underrepresented in research on falls and fall prevention. The study also addressed a major issue in long-term care, which was falls and the need to prevent falls from occurring.

STUDY LIMITATIONS

One major limitation of the study was the lack of availability of participants for follow-up questionnaires due to complex staffing challenges in the long-term care settings. In long-term care, there are often high turnover rates of nursing staff members. As a result, there are not consistently available full- and part-time employees. This made it difficult to obtain participation for follow-up testing.

Additional limitations of this study were the small sample size, over-representation of African American nursing staff members, and under-representation of other ethnicities. The small sample size increased the chance that the significant differences are false positive and that important differences could be missed. Moreover, the over- and under-representation of the different ethnicities may limit the generalizability of the results of the study. Selection bias also might exist due to failure of randomization of study participants.

The areas which did not show significant improvement after the educational intervention necessitates development and examination of future strategies to improve the methodologies and learning strategies used during this study. For example, demonstration of behavioral techniques may be helpful and periodic reinforcement of learning may be needed.

CONCLUSIONS

This study was based on Bandura's social cognitive theory. Bandura posited that learning can occur without change in behavior and that expectations of reinforcements have major effects on behavior exhibited (Bastable, 2014). Education should be ongoing and repeated until desired outcomes are achieved. Using positive reinforcers such as

rewarding small successes, acknowledging ideas and actions, recognizing individual contributions, and using incentives can instill satisfaction and lead to desirable behaviors (Bastable, 2014). There was a statistically significant difference in the Fall Prevention Knowledge test on fall prevention approach across three time points (pre-test, one month post-educational intervention, and three months post-educational intervention). There was no statistically significant difference found between the behavior assessment scores across two time points (pre-test and three month post-educational intervention). Learning occurred in the current study—although there was no significant change in fall prevention behaviors, some behavior changes were noted in scores at three months post-educational intervention on risk factors for falls as well as safe transfers and mobility techniques.

Retention of knowledge through learning and observation was the desired outcome of the study. Nursing staff members' scores on the Fall Prevention Test increased at three months post-educational intervention on fall prevention approach, risk factors for falls, and multidisciplinary strategies to reduce falls. This increase in test scores after the intervention could suggest nurses' retention of content presented and observed through use of demonstrative videos and verbal instructional models.

The study was supported by the assumption that if the long-term care staff members' knowledge of fall prevention increased; it would be possible for their fall prevention behaviors to change. Bandura's theory states that learning can occur without a consequent behavioral change. It is possible that study participants gained new knowledge, yet the knowledge was not consistently applied to their behaviors. An increase in change scores of the fall prevention knowledge subscale was associated with increases in the same subscale scores in the behavioral assessment section. Higher change

scores at one month post-educational intervention on the Fall Prevention Knowledge test on multidisciplinary strategies to reduce falls were associated with higher change scores on one month post-educational intervention on Behavior Assessment scores on multidisciplinary strategies to reduce falls.

Increased knowledge on the part of fall prevention practices of long term care givers can help reduce falls. Fall rates were decreased in the skilled nursing setting at three months post-educational intervention. An increase in knowledge of fall prevention was observed for nursing staff members. The Fall Prevention Knowledge test scores on fall prevention approach of the CNAs and CMAs improved over time, resulting in an improvement in their multidisciplinary strategies to reduce fall scores at three months post-educational intervention.

Fall prevention in the long-term care setting continues to be one of the greatest challenges in geriatric nursing due to a continuous increase in fall-related injuries. Fall prevention in elderly individuals is of utmost importance because they are vulnerable to life-changing injuries, including death. Fall prevention strategies in long-term care settings should target all care providers to ensure favorable outcomes in fall reduction. Education on fall prevention in long-term care settings should be a continuous process aimed at reinforcement of new learning and achievement of desired outcomes. Educational outcomes can be achieved through changes to knowledge and skills.

Appendix A: Fall Prevention Knowledge and Behavior Assessment Questionnaire (FPKBAQ)

Part A-Demographic Information

1. Name:
2. Job Title: □CNA □CMA □LVN □RN
3. Years of Experience: □0-5 □6-10 □11-15 □16-20 □Above 20
4. Age: □16-20 □21-30 □31-40 □41-50 □Above 50
5. Gender: □Male □Female
6. Ethnicity/Race: □Black or African American □Latino or Hispanic American □Asian □White □Native Hawaiian or Other Pacific Islander
7. Education level: □GED □ High school diploma □Associates degree □Bachelors □Masters

Part B-Fall Prevention Knowledge Questionnaire

Each question may have more than one option as the correct answer.
Please circle the letters that correspond to the correct answers.

1. Fall prevention approach

A. Fall prevention programs should include:
a. Individual fall prevention plans
b. Education for patient/family and health care workers
c. Environmental safety
d. Safe patient handling

B. Which of the following statements is NOT true?
a. Fall prevention efforts are only the nurses' responsibility/duty.
b. A patient who is taking four or more oral medications is at risk for falling.
c. A patient who is taking psychiatric medication is at higher risk for falling.
d. Hip protectors should be considered for patients who are at high risk for falls and fractures

C. In nursing homes, fall prevention programs should include:
a. staff education on fall precautions or protections
b. provision and maintenance of mobility aids like wheelchair, walkers
c. investigation of falls to learn ways to prevent future falls
d. all the above

2. Risk factors for falls

A. Which of the following statements is true?

a. The cause of a fall is often an interaction between patient's risk, the environment, and patient's risky behavior.

b. Increase in hazardous environments increases the risk of falls.

c. The use of a patient identifier (such as an identification bracelet) helps to alert staff those patients at risk for falls .

d. A fall risk assessment should include review of history of falls, mobility problems, medications, mental status, continence, and other patient risks.

B. In the assessment of nursing home patients, which of the following statements is NOT true?

a. All patients should be assessed for fall risk factors at admission, at a change in status, after a fall, and at regular intervals.

b. Medication review should be included in the assessment.

c. All patients should have their activities of daily living and mobility assessed.

d. Environmental assessment is not important in the nursing home because all nursing homes are the same

C. Risk factors for falls in the nursing home residents include:

a. Parkinson's disease

b. Incontinence

c. Previous history of falls

d. All of the above

3. Safe transfers and mobility technique

A. Patients who cannot walk on their own should be:

a. Kept in bed

b. Encouraged to move with assistance

c. Assisted with transfers

d. Referred for an exercise program or recommended to use walking equipment (like wheelchairs, walker) if needed

B. Exercise programs for an ambulatory elderly should:

a. Be very demanding or difficult

b. Not be supervised

c. Be ongoing

d. Include personalized strength and balance training

C. Which of the following statements on safe transfers and mobility technique is FALSE?

a. Instruction on safe transfers and use of assistive device should only be provided at admission

b. Education program on safe transfers and mobility should target health care providers, patients, and caregivers
c. Instruction on safe mobility, with emphasis on high risk patients, should be provided to both patients and families
d. Mobility aids should be checked regularly.

4. Multidisciplinary strategies to reduce fall

A. The management of the very confused patient should include all of the following EXCEPT:
a. Moving patients away from the nursing station
b. Involving family members to sit with the patient
c. Orienting or familiarizing patients to the their environment/room/facility
d. Reminding patients and their families of what a patient can or cannot do

B. Which of the following is recommended to improve patient safety?
a. Locking wheeled furniture when it is at a stop or not moving.
b. Having nonslip flooring.
c. Placing frequently used items (including call bell, telephone, and remote control) within reach of the patient
d. Bed should be in lowest practical height when the patient is in bed

C. Multidisciplinary strategies to reduce fall should include:
a. Increased observation and communication for high risks fall patients
b. Patient/family/caregiver education on falls prevention
c. Education for health care workers
d. All of the above

Part C- Behavior Assessment Questionnaire
Check the box that best applies to you

How often do you ……..

Fall prevention approach	Always	Sometimes	Rarely	Never
Orient and re-orient patients to their environment				
Reinforce activity limits and other safety needs to patients or their families				
Check equipment such as wheelchair, walker or canes to be sure they are not broken				
Risks factors for falls	Always	sometimes	Rarely	Never
Clear equipment from the hallway and patients' surroundings/room				
Encourage patients to wear their eye glasses and/or hearing aids				
Check that patients are wearing well-fitting and low heeled shoes				
Safe transfers and mobility techniques	Always	Sometimes	Rarely	Never
Lock wheeled furniture (bed/wheelchair) when it is not moving or at a stop				
Use safety/gait belts for patients in wheelchairs during transfers				
Teach safe transfer techniques from beds, chairs, toilet and wheelchairs				
Multidisciplinary strategies to reduce fall	Always	Sometimes	Rarely	Never
Place frequently used items including call bell, telephone, remote control within reach of patient				
Round on your patient during your shift				
Place the bed in the lowest practical height when patient is in bed and before leaving the room				

Appendix B: Investigator Created Data Collection Tool

Days of the month	Number of falls	Total daily occupied beds	Level of injury (minor or major)	Repeat falls
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
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27				
28				
29				
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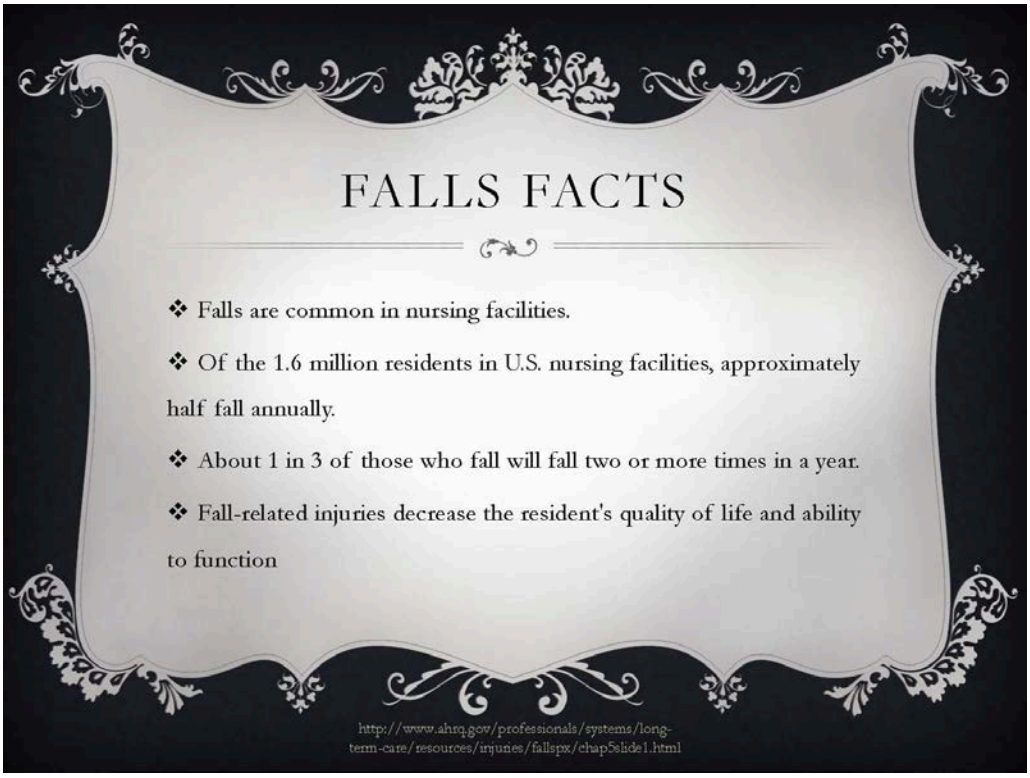
31				

Appendix C: Educational PowerPoint Presentation on Fall Prevention



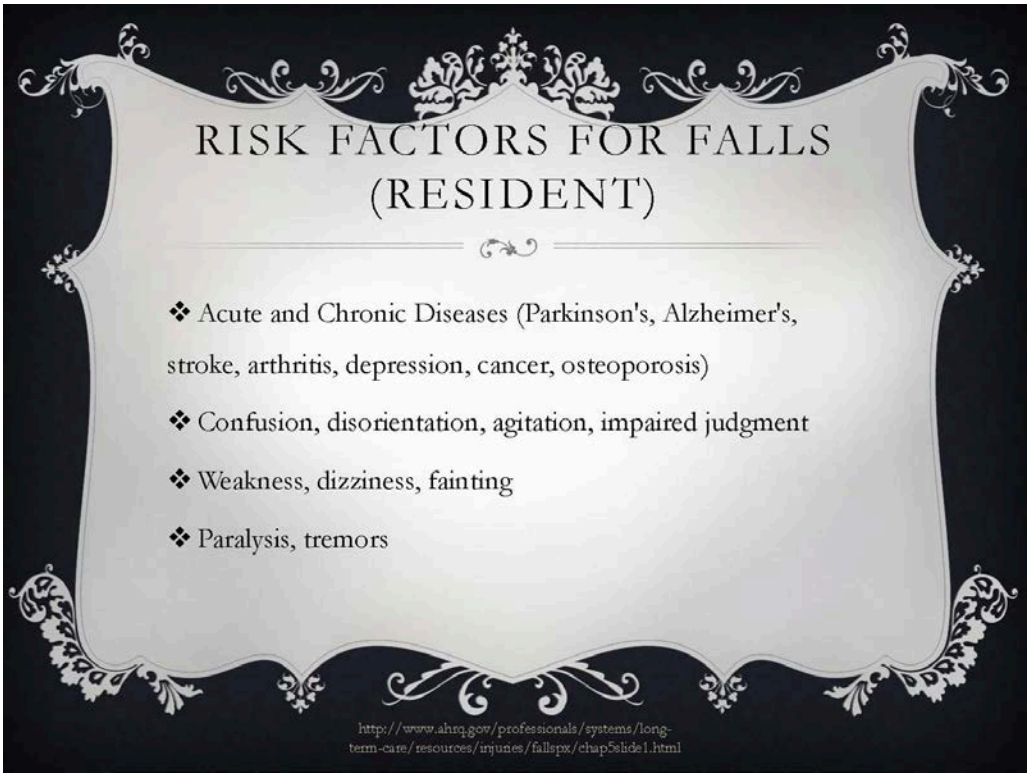

FALLS FACTS
❖ The average age at admission to a nursing facility is 82.6 years
❖ Over 50% of those admitted to a nursing facility have three or more admitting diagnoses
❖ One in two patients in nursing facilities fall every year
❖ Of those patients who fall, 30-40% will fall again
❖ People ≥85 years are 10-15 times more likely to experience hip fractures than those people who are 60-65 years
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


FALL DEFINITION
❖ According to Department of Health and Human Services (DHHS), Centers for Medicare and Medicaid (CMS), a fall without an injury is still a fall and refers to "unintentionally coming to rest on the ground, floor or other lower level, but not a s a result of an overwhelming external force" like a resident pushing another (CMS Manual, 2007, p. 3).
❖ According to Taylor & Saliba (2012), a fall is an unintentional change in position, coming to rest on the ground or the next lower surface that does not result from being pushed down or collapsing from a sudden onset medical condition.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


FALL PREVENTION APPROACH
❖ Use of fall risk assessment tools to identify high risk patients
❖ Fall prevention must be balanced with other priorities for the patient and with the need to mobilize patients.
❖ It may be tempting to leave patients in bed to prevent falls, but patients need to transfer and ambulate to maintain their strength and to avoid complications of bed rest.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


FALL PREVENTION APPROACH
❖ Fall prevention is one of many activities needed to protect patients from harm during their stay
❖ Fall prevention is interdisciplinary. Nurses, physicians, pharmacists, physical therapists, occupational therapists, patients, and families need to cooperate to prevent falls.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


RISK FACTORS FOR FALLS (RESIDENT)
❖History of previous falls
❖ Side effects of medications like antipsychotics, antidepressants, sedatives/hypnotics
❖Gait and balance impairments
❖Vision and hearing impairments
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


RISK FACTORS FOR FALLS (RESIDENT)
❖ Acute and Chronic Diseases (Parkinson's, Alzheimer's, stroke, arthritis, depression, cancer, osteoporosis)
❖ Confusion, disorientation, agitation, impaired judgment
❖ Weakness, dizziness, fainting
❖ Paralysis, tremors
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


RISK FACTORS FOR FALLS (RESIDENT)
❖ Loss of joint mobility, contractures
❖ Lower extremity weakness
❖ Drop in blood pressure upon standing, after meals, or after voiding
❖ Continence- patients with urinary frequency and frequent toileting needs are at higher risk for falls
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


RISK FACTORS FOR FALLS (ENVIRONMENT)
❖ Clutter in the room and hallway
❖ Inadequate lighting, glare
❖ Uneven or wet floors, raised thresholds, missing tiles or linoleum
❖ Unstable or lightweight furniture
❖ Insecure toilet seat or handrail
❖ Hard-to-reach personal items
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


RISK FACTORS FOR FALLS (ENVIRONMENT)
Unstable wheels
Low toilet seat
Lack of handrail support in bathroom
Unsafe shoes or slippers
Hard-to-manage clothing
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


RISK FACTORS FOR FALLS (ENVIRONMENT)
Missing wheelchair parts
Incorrect wheelchair fit
Inadequate wheelchair seating
Broken parts of mobility equipments
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


SAFE TRANSFERS AND MOBILITY TECHNIQUES
❖ Patients should have any needed assistive devices, such as canes or walkers, in good repair at the bedside and within safe reach.
❖ If patients bring their assistive devices from home, staff should make sure these devices are safe for use and checked by the rehab department
❖ Even with assistive devices, patients may need help from staff for mobility.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


SAFE TRANSFERS AND MOBILITY TECHNIQUES
❖ Help keep pathways around bed and to bathroom clear
❖ Provide only stable furniture from home
❖ Remove items no longer needed
❖ Always use a gait belt for transfers and make use of transfer equipment like Hoyer lifts for obese patients
❖ Remove bedside commode if unused
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html

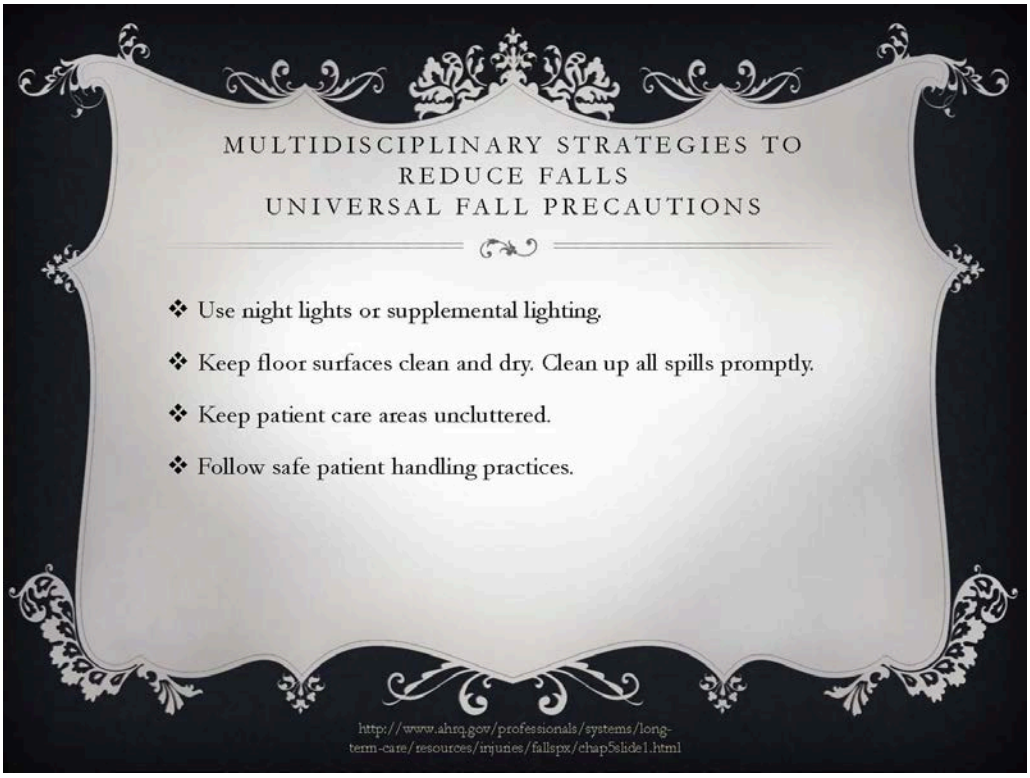

SAFE TRANSFERS AND MOBILITY TECHNIQUES
❖ Call for help when unsure about safety
❖ Provide easy-to-manage clothing with elastic waist and Velcro fasteners
❖ Lock wheelchair brakes before transfer
❖ Keep all seating items in wheelchair
❖ Put bedside table next to the bed
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html

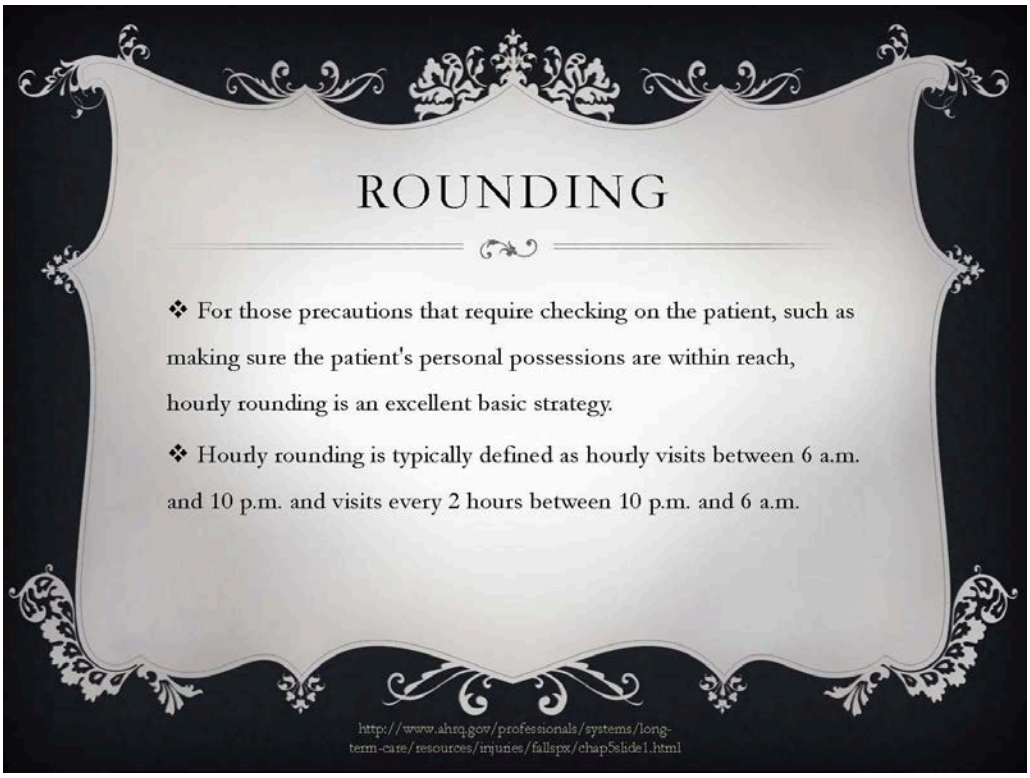

CONSEQUENCES OF FALL
❖ Serious injury such as hip fracture
❖ Increased risk of death associated with hospitalization and complications
❖ Loss of independence and decreased ability to function
❖ Loss of self-confidence and fear of falling
❖ Reduced quality of life
❖ Increased need for care
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html

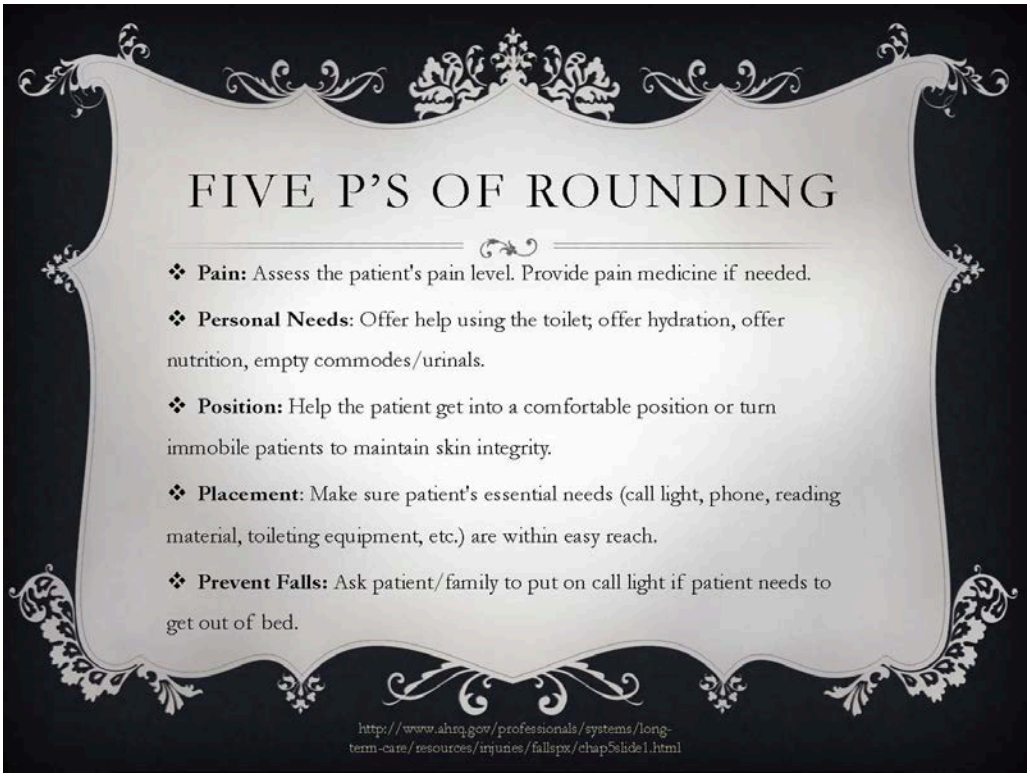

MULTIDISCIPLINARY STRATEGIES TO REDUCE FALLS
UNIVERSAL FALL PRECAUTIONS
❖Universal because it applies to all patients regardless of fall risks
❖Constitutes the basics of patient safety
❖Revolve around keeping the patient's environment safe and comfortable.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html

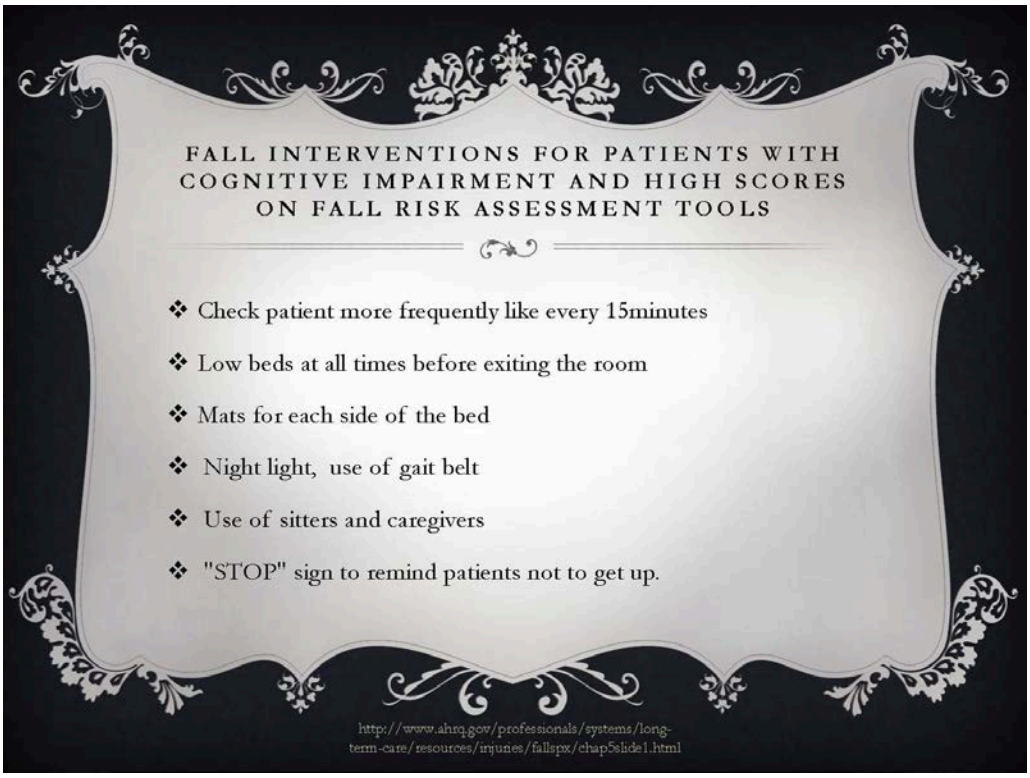

MULTIDISCIPLINARY STRATEGIES TO REDUCE FALLS-
UNIVERSAL FALL PRECAUTIONS
❖ Familiarize the patient with the environment.
❖ Have the patient demonstrate call light use.
❖ Maintain call light within reach.
❖ Keep the patient's personal possessions within patient safe reach.
❖ Have sturdy handrails in patient bathrooms, room, and hallway.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


MULTIDISCIPLINARY STRATEGIES TO REDUCE FALLS-
UNIVERSAL FALL PRECAUTIONS
❖ Place the bed in low position when a patient is resting in bed; raise bed to a comfortable height when the patient is transferring out of bed.
❖ Keep bed brakes locked.
❖ Keep wheelchair wheel locks in "locked" position when stationary.
❖ Keep nonslip, comfortable, well-fitting footwear on the patient.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html

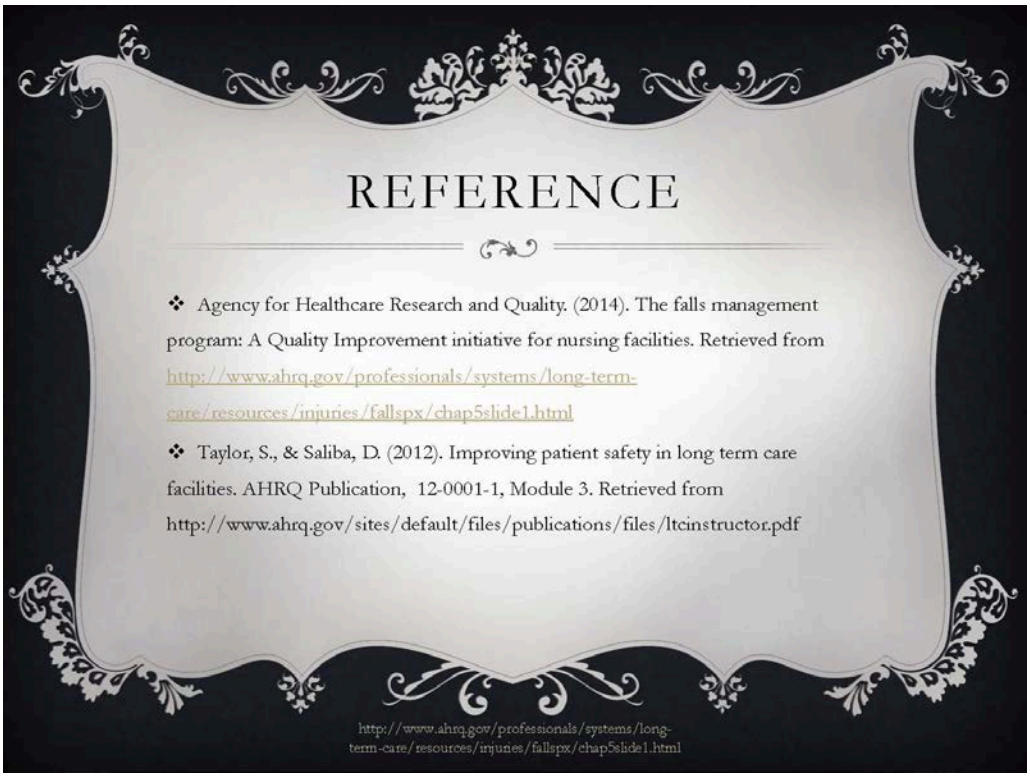

MULTIDISCIPLINARY STRATEGIES TO REDUCE FALLS
UNIVERSAL FALL PRECAUTIONS
❖ Use night lights or supplemental lighting.
❖ Keep floor surfaces clean and dry. Clean up all spills promptly.
❖ Keep patient care areas uncluttered.
❖ Follow safe patient handling practices.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


ROUNDING
❖ For those precautions that require checking on the patient, such as making sure the patient's personal possessions are within reach, hourly rounding is an excellent basic strategy.
❖ Hourly rounding is typically defined as hourly visits between 6 a.m. and 10 p.m. and visits every 2 hours between 10 p.m. and 6 a.m.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


FIVE P'S OF ROUNDING
❖ **Pain:** Assess the patient's pain level. Provide pain medicine if needed.
❖ **Personal Needs**: Offer help using the toilet; offer hydration, offer nutrition, empty commodes/urinals.
❖ **Position:** Help the patient get into a comfortable position or turn immobile patients to maintain skin integrity.
❖ **Placement**: Make sure patient's essential needs (call light, phone, reading material, toileting equipment, etc.) are within easy reach.
❖ **Prevent Falls:** Ask patient/family to put on call light if patient needs to get out of bed.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


FALL INTERVENTIONS FOR PATIENTS WITH COGNITIVE IMPAIRMENT AND HIGH SCORES ON FALL RISK ASSESSMENT TOOLS
Check patient more frequently like every 15minutes
Low beds at all times before exiting the room
Mats for each side of the bed
Night light, use of gait belt
Use of sitters and caregivers
"STOP" sign to remind patients not to get up.
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


FALL PREVENTION
https://www.youtube.com/watch?v=i2udK9Hte34
https://www.youtube.com/watch?v=IuWWafzP0ZQ
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html


REFERENCE
❖ Agency for Healthcare Research and Quality. (2014). The falls management program: A Quality Improvement initiative for nursing facilities. Retrieved from http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html
❖ Taylor, S., & Saliba, D. (2012). Improving patient safety in long term care facilities. AHRQ Publication, 12-0001-1, Module 3. Retrieved from http://www.ahrq.gov/sites/default/files/publications/files/ltcinstructor.pdf
http://www.ahrq.gov/professionals/systems/long-term-care/resources/injuries/fallspx/chap5slide1.html

Appendix D: AHRQ Permission Letter

DEPARTMENT OF HEALTH & HUMAN SERVICES

Agency for Healthcare Research and Quality

540 Gaither Road
Rockville MD 20850
www.ahrq.gov

July 28, 2015

Nkechi Ogoh, APRN, MSN, WHNP-BC, GNP-BC
School of Nursing
University of Texas Medical Branch
Galveston, TX

Dear Nkechi Ogoh:

To restate what I said in earlier emails, I am responding to your request for permission to use the "Fall Knowledge Test" (Tool 2E in *Preventing Falls in Hospitals: A Toolkit for Improving Quality of Care*; AHRQ Publication No. 13-0015-EF) on behalf of Ms. Randie Siegel, Associate Director, Office of Communications and Knowledge Transfer, Publishing and Electronic Dissemination.

Based on what you said in the email preceding this response, you have AHRQ's permission to reprint the test, with or without modification, for your thesis research. Please note at the bottom of each copy "Reprinted/Adapted with permission of the Agency for Healthcare Research and Quality."

I have concluded that you can use it for your doctoral research, as long as you note in your thesis (and any subsequent professional publications) that the "Fall Knowledge Test" was used with permission of the Agency for Healthcare Research and Quality, and was adapted from a test developed by the Singapore Ministry of Health. Since you are using it for research/improvement of the quality of patient care and not reprinting the test for sale commercially, giving the citations should be adequate. The suggested source citation for the tool is:

> Preventing Falls in Hospitals: A Toolkit for Improving Quality of Care. (Tool 2E. "Fall Knowledge Test," in: Chapter 7–Tools and Resources.) January 2013. Agency for Healthcare Research and Quality; Rockville, MD. http://www.ahrq.gov/professionals/systems/hospital/fallpxtoolkit/fallpxtk7.html

The source citation for the Singapore report from which Tool 2E was adapted is:

> Prevention of Falls in Hospitals and Long-Term Care Facilities (Ministry of Health Clinical Practice Guideline 1/2005) "Self-Assessment" (pp. 32–5). December 2005; Singapore.
> https://www.moh.gov.sg/content/dam/moh_web/HPP/Nurses/cpg_nursing/2005/prevention_of_falls_in_hosp_ltc_institutiions.pdf

Sincerely,

David I. Lewin

David I. Lewin, M.Phil.
Health Communications Specialist/Manager of Copyright & Permissions
Office of Communications and Knowledge Transfer
Agency for Healthcare Research and Quality
+1 301-427-1895 phone
+1 301-427-1873 fax
David.Lewin@ahrq.hhs.gov email

Appendix E: IRB Approval Letter

utmb Health

Working together to work wonders.™

Institutional Review Board
301 University Blvd.
Galveston, TX 77550-0158
409.266.9475

21-Apr-2016

MEMORANDUM

TO: Nkechi Ogoh
Grad School Biomedical Science GSBS9999

FROM: Robin Dickey, MA, CIP
Institutional Review Board, Chairman

RE: Exempt from IRB Review

IRB #: IRB # 16-0048

TITLE: Effectiveness of a fall prevention educational program for long term care nursing staff

The UTMB Institutional Review Board (IRB) reviewed the above-referenced research project and determined this request met the criteria for exemption from review by the IRB in accordance with the 45 CFR 46.101(b). This determination was made on **21-Apr-2016.**

Further review of this project by the IRB is not required unless the protocol changes in the use of human subjects. In that case, the project must be resubmitted to the IRB for review. Please inform the IRB when this research project is completed.

If you have any questions, please do not hesitate to contact the IRB office at 409-266-9475.

Exemption Category

2;4

Exempt Categories

Category 1: Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:

i. research on regular and special education instructional strategies, or
ii. research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

Category 2: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

i. information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
ii. any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Category 3: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if:

i. the human subjects are elected or appointed public officials or candidates for public office; or
ii. Federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

Category 4: Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

Category 5: Research and demonstration projects which are conducted by or subject to the approval of Department or Agency heads, and which are designed to study, evaluate, or otherwise examine:

i. public benefit or service programs;
ii. procedures for obtaining benefits or services under those programs;
iii. possible changes in or alternatives to those programs or procedures; or
iv. possible changes in methods or levels of payment for benefits or services under those programs.

Category 6: Taste and food quality evaluation and consumer acceptance studies if:

i. wholesome foods without additives are consumed; or
ii. a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

Appendix F: Research Consent Form

You are being asked to participate as a subject in the research project entitled "Effectiveness of a fall prevention educational program for long term care nursing staff". Under the supervision of Nkechi Ogoh, MSN, RN, GNP-BC.

PURPOSE OF THE STUDY

The purpose of the study is to evaluate the impact of an educational intervention on falls in a long term care facility by measuring staff's knowledge of fall prevention, behavioral assessment of fall prevention approaches and evaluation of fall rates and fall injury rates. You are being asked to participate because you are a long term care staff and play a role in fall prevention.

PROCEDURES RELATED TO THE RESEARCH

The study will include evaluation of knowledge and behavior on fall prevention through use of questionnaires obtained before and after an educational session on fall prevention.

RISKS OF PARTICIPATION

There is no potential risk of harm from participation in this study. There is no possible risk from loss of confidentiality or loss of employment that may arise from participation in the study. Your participation in this study is completely voluntary, and you may refuse to participate in this study at any time without penalty or loss of employment.

NUMBER OF SUBJECTS PARTICIPATING AND THE DURATION OF YOUR PARTICIPATION.

The anticipated number of subjects involved in this study will be 50. The length of time for your participation is 3 months.

BENEFITS TO THE SUBJECT

You will benefit by increasing your knowledge about fall prevention and understanding how to change your interactions or behaviors with patients to prevent falls.

REIMBURSEMENT FOR EXPENSES

There will be no reimbursement for participation in this study.

If you have any complaints, concerns, input or questions regarding your rights as a subject participating in this research study or would like more information, you may contact the Institutional Review Board office at 409-266-9475.

The purpose of this research study, procedures to be followed, risks and benefits have been explained to you. You have been allowed to ask questions and your questions have been answered to your satisfaction. You have been told who to contact if you have additional questions. You have read this consent form and voluntarily agree to participate as a subject in this study. You may withdraw your consent at any time. You may

withdraw your consent by notifying Nkechi Ogoh, MSN, RN, WHNP-BC, GNP-BC at 281-546-5931. You will be given a copy of the consent form you signed.

_____ _____

Signature of Subject Date

Appendix G: Flyers

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Vita

Nkechi Elizabeth Ogoh was born on May 14, 1977 in Aba, Abia State Nigeria to Sir Law and Elizabeth Oguzie. Nkechi is married and blessed with two daughters and three sons, aged 15, 14, 11, 8, and 1 year old. Nkechi received her first Bachelor of Science Degree in Economics from Imo State University in Owerri, Nigeria in 1999. She then received her Bachelor of Science Degree in Nursing from Texas Woman's University in Houston, Texas, in 2005; her Master's Degree in Nursing from University of Texas Health Science Center in Houston, Texas, in May 2010; and her Post-Master's Gerontology Nurse Practitioner Specialization in August, 2010, from University of Texas Health Science Center Houston.

Nkechi worked as a nursing assistant for two years and as a Registered Nurse for five years at Memorial Hermann Healthcare System. She currently works as a Geriatric Nurse Practitioner in the long-term care setting with Trumen Physicians.

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This dissertation was typed by the author, Nkechi Elizabeth Ogoh.