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Using an Online Learning Module in a Nursing Program to Improve Knowledge and Skills to Prevent Falls in the Community Dwelling Older Adult Population

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Using an Online Learning Module in a Nursing Program to Improve Knowledge and Skills to
Prevent Falls in the Community Dwelling Older Adult Population

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Community Health Promotion

by

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Abstract

Nationally, 28.4% of older adults fall each year. Falls and resulting injury result in decreased mobility, functional impairment, loss of independence, and increased mortality. Utilization of evidence based protocols by providers to identify older adults at risk of falling is limited and rates of participation by older adults in prevention activities is low. Because of nursing's increasing role in caring for older adults, development of fall prevention education for nursing students would result in increased awareness of the need for fall prevention in community dwelling older adults and increased access of older adults to falls risk assessment. There is a need to extend research to inform teaching and learning strategies for fall prevention.

After pretesting, a convenience sample of 52 BSN students and 20 graduate nursing students completed an online education program and performed a falls risk assessment on an older adult before completing a posttest and self-efficacy survey. Data were analyzed using multivariate statistical tests. A qualitative approach was used to investigate a subset of student's views about relationships between acquiring knowledge, self-efficacy, and skill mastery and their perceptions of barriers and facilitators to incorporating falls risk assessment into practice. Data were analyzed using the constant comparative method to review, code, and categorize data.

Results revealed a rise in knowledge and student self-reporting of self-efficacy with falls risk assessment skills. Themes that emerged from semi-structured interviews included nurses are too busy to perform fall risk assessments, the older adult is a barrier, the importance of increasing awareness of falls prevention among nurses, opportunities to address health beliefs of older adults, and need for policies or guidelines.

In conclusion, an online program enhanced with opportunity for hands on practice provides an effective environment for learning to use falls risk tools and should be incorporated into nursing education in order to increase older adults' access to fall risk assessment.

Dedication

I dedicate my dissertation work to my family: past, present, and future. Although my parents never obtained an advanced degree, they understood the value of education and passed on a love of learning and a push for tenacity. I hope to continue the legacy.

Acknowledgements

I would like to express my appreciation to my advisor, Dr. Ches Jones, for the guidance provided to me through completion of this degree. I feel fortunate to have had the opportunity to work with him.

I would also like to thank my committee members, Drs. Nan Smith-Blair, Leah Jean Henry, and Bart Hammig for the guidance, mentorship, challenging suggestions, and collegiality provided to me over the years. A great deal of gratitude is also reserved for Drs. Kristen Jozkowski, Kathleen Barta, Marianne Neighbors, and Wen-Juo Lo for the contributions each made to my education at the University of Arkansas. I would like to acknowledge Drs. Audrey Weymiller and Charleen McNeill for reviewing my data. I reserve a special thank you for my students for providing inspiration and giving meaning to the John Cotton Dana quote: "Who dares to teach must never cease to learn."

Finally, I would like to acknowledge the innumerable sacrifices made by my husband, Robert, and granddaughter, Elizah, as they supported my pursuit of this final degree.

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Chapter 1

Introduction

According to the National Center for Injury Prevention and Control (2015), one-third of people aged 65 and older fall each year, every 20 minutes an older adult dies from a fall in the United States, and one out of five falls causes a serious injury such as a head trauma or fracture. A hospital based study attributed 40% of hospital admissions of older adults to fall-related injuries, resulting in a length of stay of 11.6 days. Approximately 50% of older adults hospitalized for fall related injuries are discharged to a nursing home (cited in Shumway-Cook et al., 2009). The Centers for Disease Control and Prevention (CDC) estimates that, based on inflation adjustments for a 2006 study, direct fall-related medical costs for people 65 years old and over in the United States were $34 billion in 2013. On average, the hospitalization cost for a fall injury tops $35,000 (Cameron, Schneider, Childress, & Gilchrist, 2015).

The risk of falling and sustaining an injury as the result of a fall increases with age (American Geriatrics Society/British Geriatrics Society, 2011). Older adults who fall once are two to three times more likely to fall again within one year (Nicklett & Taylor, 2014). Other risk factors for falling include female gender, leg weakness, balance disorders, poor vision, certain medications such as sedatives, and environmental hazards such as uneven walking surfaces. The likelihood of falling increases linearly with the increasing number of risk factors (Stevens & Phelan, 2013). Evidence indicates that early identification of older adults at risk for falls can decrease rates of falls and fall-related injury. Clinical guidelines recommend annual falls risk screening for adults over sixty-five, and evidence based screening tools are available to health care providers. However, uptake of evidence based screening and assessment protocols has been limited (Shubert, 2013).

Recent systematic reviews of interventions for primary care settings found that in addition to risk assessment; group based exercise such as Tai Chi, physical therapy, home safety assessment, and vitamin D supplementation are effective in reducing fall rates and injuries from falls in community settings (Moyer, 2012; Gillespie, Robertson, Sherrington, Gates, & Lamb, 2012; Choi & Hector, 2012). Despite evidence that intervention combined with follow-up can reduce the rate of falls by as much as 24% (Gillespie et al., 2012), diffusion of assessment and management practices into the clinical setting remains challenging (Fortinsky et al., 2008). One study showed that only half of older adults reported talking to a health care provider following a fall. Among those who reported a fall, only 60% reported receiving information to prevent future falls (Shumway-Cook et al., 2009).

In the face of high quality reviews and clinical guidelines providing evidence for prevention of falls in community dwelling older adults, the annual rate of falls requiring medical care is rising, independent of age (Cigolle, 2015). It is clear that both clinicians and older adults may be required to change behavior in order to successfully prevent falls (Goodwin, Jones-Hughes, Thompson-Cook, Boddy, & Stein, 2011). Several studies have addressed the public health impact and translation potential of fall prevention interventions into practice settings, some using the Diffusion of Innovations theory to explain how fall prevention programs spread. High level leadership involvement, engagement of and collaboration with stakeholders, the use of clinical leaders as champions, observable benefits of the intervention, adaptability of the program to meet the needs of the organization, and adequate allocation of resources were found to be facilitators of successful spread of fall prevention programs (Fortinsky et al., 2008; Goodwin et al., 2011; Miake-Lye et al., 2011). Applying the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework to evaluate the external validity of

physical activity interventions, McMahon and Fleury (2012) found that few studies report specific descriptions of program content, making replication of interventions in practice difficult.

Fall prevention programs can only be effective if older adults participate in them. Uptake rates in the community are often less than 50% (Yardley, Donovan-Hall, Francis, & Todd, 2006) and, engagement rates are typically around 50% at 12 months following intervention (Nyman & Victor, 2012). Studies using constructs from behavioral change models have demonstrated that a better understanding of older adults' perceptions is needed in order to increase uptake and adherence to fall prevention interventions. In fact, research suggests that many older people don't know that fall risks can be reduced because there is a fatalistic acceptance of falling that may contribute to low uptake of falls prevention interventions (World Health Organization, [WHO] 2007). With the goal of increasing participation levels, the Prevention of Falls Network Europe (ProFaNE) developed guidelines for maximizing the acceptability of falls-prevention interventions among older people (Yardley et al., 2007) based on the literature. There is evidence that these behavioral change recommendations, such as emphasizing the benefits of undertaking interventions and utilizing a variety of forms of social encouragement or reinforcement, should be included in all fall prevention programs.

It has been demonstrated that falls are reduced when clinicians are trained to assess risk and apply evidence based prevention strategies (Goodwin et al., 2011). However, lack of sufficient knowledge to deliver falls prevention education is a barrier identified by providers (Stevens & Phelan, 2013; Zachary, Casteel, Nocera, & Runyan, 2011). To fill the knowledge gap, CDC's Injury Center developed a suite of materials to help clinicians incorporate falls risk assessment, management, and referral into practice. The completed Stopping Elderly Accidents, Deaths, and Injuries (STEADI) toolkit is based on current evidence of what works to prevent

falls and incorporates behavioral change strategies based on Prochaska's Transtheoretical Stages of Change Model (Stevens & Phelan, 2013).

Translated programs also need a delivery system in order to implement a successful fall prevention program. Research is needed to determine the capacities required to deliver a program with fidelity and how much training is needed for a particular health care professional to effectively implement fall prevention (Stevens, Baldwin, Ballesteros, Noonan, & Sleet, 2010). Because of the multifactorial nature of falls, fall risk reduction programs are a shared responsibility of all health care providers. Nurses, with their professional focus on health, their presence as the largest segment of the health care profession and one of the largest segments of the U.S. workforce as a whole, and their access to older adults in the community are well positioned to increase the capacity for fall prevention. Because of the rapidly increasing number of older adults utilizing health care services (by 2030, the number of U.S. adults aged 65 or older will more than double to about 71 million [CDC, 2015]), most nurses will care for older adults during the course of their careers. Nursing education programs must meet this challenge by incorporating gerontological nursing content throughout the curriculum to ensure that graduates are competent to meet the needs of the aging population.

Incorporating the skills required to assess and manage fall risk in community dwelling older adults into the education of undergraduate and advanced practice nurses would increase the presence of health promotion competencies and domains in nurses' practices and result in increased access of older adults to fall screenings and management.

Statement of the Problem

Despite the need for the integration of fall prevention in community dwelling older adults into nursing education, the pedagogical basis is limited. Though there is evidence from studies of

fall prevention education programs for health professionals, there is little research that explores the effectiveness of teaching strategies to increase knowledge and application of fall prevention in nursing students.

Purpose of the Study

A mixed methods study was conducted to examine the effect of an online education module using STEADI resources on the knowledge and self-efficacy in falls risk assessment and management among undergraduate and graduate nursing students.

Research Questions and Hypotheses

There were five research questions for the study.

1. Does completion of an online falls prevention course increase the knowledge in falls risk assessment and management among undergraduate and graduate nursing students? We know that falls are reduced when clinicians are trained to assess risk and apply evidence based interventions (Goodwin et al., 2011) and that online delivery of the training is effective in increasing knowledge among health care professionals (Maloney et al., 2011; Scott et al., 2011). Falls prevention knowledge increased when nursing students completed a face to face interdisciplinary course in fall prevention in older adults, although the number attending was small (Dauenhauer, 2015). My hypothesis is that among nursing students, completion of an online training module in falls prevention will increase knowledge of falls assessment and management.

2. Does completion of an online falls prevention course increase self-efficacy in falls risk assessment and management among undergraduate and graduate nursing students? We know that medical students reported an increase in self-confidence after completing a hands on falls assessment on an older adult (Demons et al., 2014). My hypothesis is that

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nursing students will report an increase in self-efficacy in falls assessment and management after performing an assessment on an older adult and formulating a prevention plan.

3. What is the relationship between knowledge as measured by test scores and self-efficacy in falls risk assessment and management in the study group? My hypothesis is that students who were successful in knowledge acquisition will also perceive that they performed well when applying their knowledge and skills.

4. What is the relationship between skill mastery and self-efficacy? My hypothesis is that students who are provided an opportunity to practice the skills of falls assessment will also perceive that they performed well.

5. What are the perceptions of nursing students on the barriers and facilitators to integrating falls risk evaluation and management into practice? The intention is identify themes that informed students identify as integral to evaluation and management that would result in improved implementation in practice. As no previous study investigated this specific topic in nursing students, I plan to use qualitative methods for concept development.

Definitions of Terms

For the purposes of this study, *fall* will be defined as an unexpected event in which the participant comes to rest on the ground, floor, or lower level (Lamb, Jorstad-Stein, Hauer, K., & Becker, C., 2005). The definition was developed and is recommended by ProFaNE, a collaborative project to reduce the burden of fall injury in older people through excellence in research and promotion of best practice. The goals of the ProFaNE project are to identify major gaps in knowledge in fall injury prevention and to facilitate collaboration necessary for large scale clinical research activity.   It is particularly important to have a clear, simple definition for

studies in which older adults self-report their own falls as their concept of a fall may differ from that of researchers or health care providers (Gillespie et al., 2009).

Community dwelling refers to older adults who are not residing in a long term care facility or who are not hospitalized in an acute care facility. A *multifactorial intervention* is defined as a program or protocol that includes assessment of and interventions for more than one of the multiple risk factors that contribute to the likelihood of falling and involves contributions from several health disciplines (Shubert, 2011). A *single factor intervention* addresses one of the risk factors for falling. Examples include medication management, home safety education, or exercise (Shubert, 2011). *Evidence based interventions or programs* are interventions that have been translated and tested in the community setting in randomized controlled trials and found to be effective in reducing the risk of falling (Shubert, 2011). *Frailty* is defined as a clinical syndrome in which three or more of the following criteria were present: unintentional weight loss (10 pounds in past year), self-reported exhaustion, weakness (grip strength), slow walking speed, and low physical activity. *Serious fall injuries* are defined as all fractures and dislocations, head injuries resulting in loss of consciousness and hospitalization, joint injuries other than dislocations, and internal injuries resulting in hospitalization (Tinetti, Doucette, Claus, & Marottoli, 1995).

Theoretical Framework

Two theoretical frameworks were used to guide this study. I chose Kirkpatrick's Model of Evaluation for educational events because the design of my study involves an educational event as an intervention. Dr. Donald Kirkland created the model in 1954 as the subject of his doctoral dissertation on evaluating training in industry. He had observed that technical training could be evaluated by observing participant's reactions, learning, and behavior as well as the

impact on the organization for which the learners worked (Yardley & Dorman, 2012). The model

evaluates the effectiveness of education at four different levels with each level building on the

previous one. Level one, reaction, refers to how learners react to the educational event - their

level of satisfaction, engagement, and perception of relevance. Level two, learning, refers to the

degree to which learners acquire the knowledge and skills based on their participation in the

event. Level three, behavior, refers to the degree participants transfer or apply what they learned

in their own practice. Level four, results, refers to the degree targeted outcomes occur as a result

of the educational event and subsequent event. For purposes of this study, levels one through

three will be evaluated.

In the late 1990's, the Best Evidence for Medical Education (BEME) adopted a modified

version of Kirkpatrick's levels and referred to it as the *hierarchy*, to be used to grade the impact

of education interventions and appraising research in medical education (Yardley & Dorman,

2012). In Kirkpatrick's hierarchy of levels of evaluation, the complexity of behavioral change

increases as evaluation of intervention ascends the hierarchy as shown in Figure 1. The model is

often used to evaluate programs in medical education, where there is a need to make a link

between educational interventions and patient outcomes (Hutchinson, 1999).
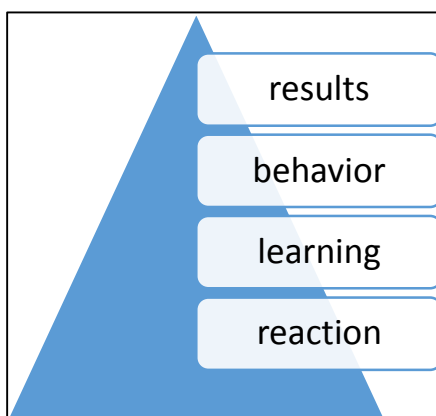
Figure 1. Model depicting Kirkpatrick's Hierarchy of Levels of Evaluation.

In critiquing the suitability of Kirkpatrick's levels for appraising educational interventions, Yardley and Dornan (2012) point out that the levels may be unsuitable for evaluating long-term or continuous learning as opposed to short-term learning with tangible outcomes. Kirkpatrick's solution to measuring intangible benefits of training was to link them to tangible behaviors that were specific and measurable. Another criticism of the hierarchy is the lack of supportive evidence to indicate that lower-level outcomes are pre-requisite to higher-level ones (as cited in Yardley & Dornan, 2012).   Although the model can be useful in evaluating outcomes which can be observed with experimental design and there are numerous references to the successful application of the levels, none are from a field as complex as education in health sciences. Furthermore, the model does not allow for the variety of outcomes that can be evaluated using qualitative as well as quantitative methods. Therefore, I chose a different theory to guide the qualitative component of the study, the *Social Cognitive Theory (SCT).*

The interview protocol for the qualitative component of the study was based on constructs of the SCT. I wanted a model of behavior change that would address knowledge, attitudes, social influences, and self-efficacy of providers. I chose SCT because of the emphasis on learning and maintenance of behavior over time. Originally known as the Social Learning Theory (SLT), Albert Bandura based the theory on work and research done by Miller and Dollard in 1941 (Rimer & Glanz, 2005).   Bandura later updated the SLT by adding the construct of self-efficacy and renaming it SCT. There are six constructs in SCT:

1. Reciprocal determinism is the central concept of SCT and refers to the dynamic and reciprocal interaction of a person with a set of learned experiences, the environment or external social context, and behavior.

2. Behavioral capability refers to a person's ability to perform a behavior through essential knowledge and skills.

3. Expectations are the anticipated outcomes of a behavior. They derive principally from previous behavior and focus on the value that is placed on the outcome.

4. Self-efficacy refers to the level of a person's confidence in his or her ability to successfully perform a behavior. It is influenced by a person's capabilities and also by environmental barriers and facilitators.

5. Observational learning is a behavioral acquisition that occurs by watching the actions and outcomes of others' behaviors.

6. Reinforcements are responses to a person's behavior that increase or decrease the likelihood of reoccurrence (Rimer & Glanz, 2005).

The theory posits that self-efficacy beliefs operate together with behavioral capability, outcome expectations, and perceived environmental barriers and facilitators in the regulation of motivation and behavior (Bandura, 1998). I used several constructs of the theory in planning the learning intervention for this study. According to Bandura (1994), the most effective way to increase self-efficacy is through progressive mastery experiences. As part of the online program, students will complete a test to measure their knowledge, complete a case study, and perform an actual falls risk assessment on an older adult. The second way of increasing self-efficacy is through vicarious experiences provided by social models. Prior to conducting an assessment and developing a fall prevention plan for an older adult, students will have an opportunity to watch a video recording of an exemplary assessment and plan. Reinforcement through instructor feedback will also strengthen beliefs that they can successfully provide fall risk prevention information to patients. This study tested the relationships between behavioral capabilities, self-

efficacy, outcome expectations, and the health promotion behavior of falls risk assessment and

management (see Figure 2).
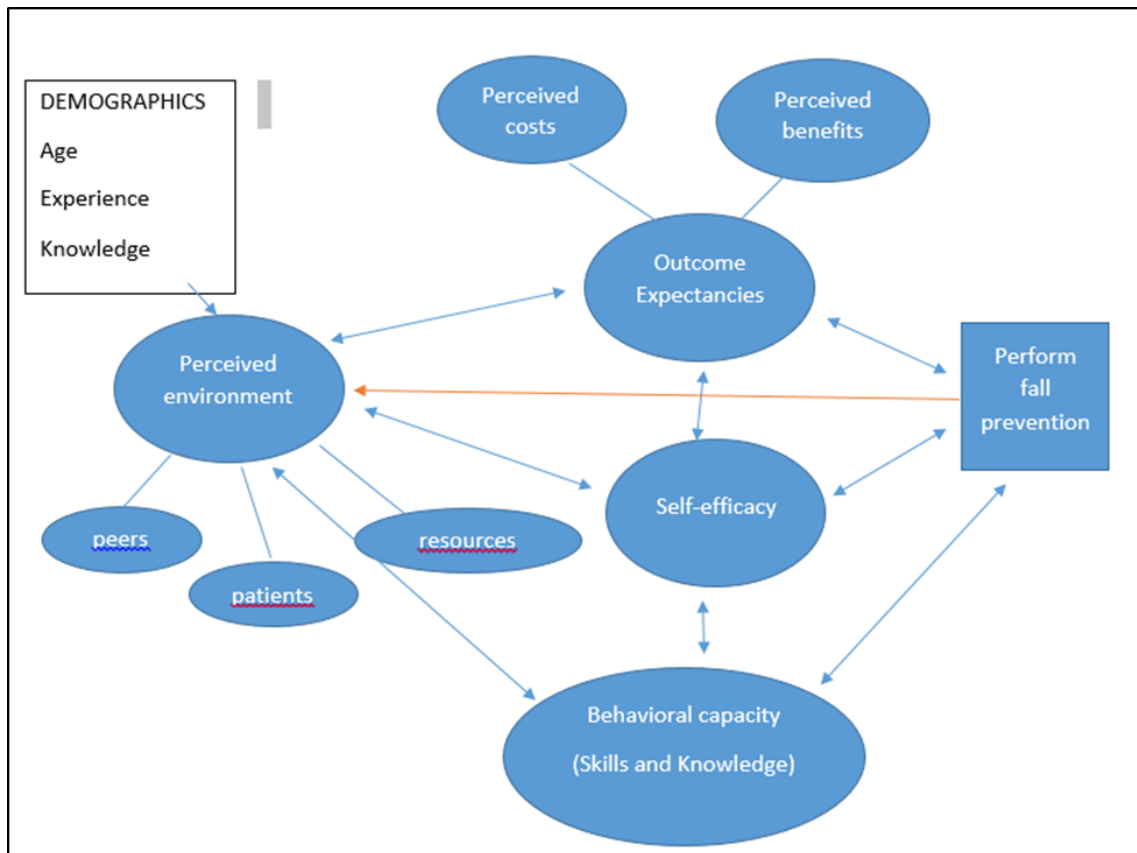
Figure 2. Visual Depiction of Factors Influencing Outcomes of Falls Risk Assessment and Management Learning Intervention Based on Bandura's Social Cognitive Theory.

Chapter 2

Review of the Literature

Chapter Two includes a review of literature on falls in community dwelling older adults,

best practices for assessing and managing fall risk, translating evidence into practice, and

strategies for training healthcare providers in falls assessment and management. This review is

divided into the following sections: epidemiology of falls in community dwelling older adults,

risk factors for falling, evidence on effective risk assessment tools, evidence on effective

interventions, evidence for engaging older adults and caregivers, evidence for engaging healthcare providers, and evidence on effective teaching/learning strategies for fall prevention

Approach to the Literature

The primary search strategy considered the Medline EBSCO database, articles published between January 2008 and June 2015, articles published in English, and key words "fall prevention", "older adults", and "community". Date delimitations were 2008 to the present. The initial search retrieved 151 abstracts. Inclusion criteria were original research studies or systematic reviews in peer-reviewed journals that examined fall prevention in community dwelling older adults and included literature on falls prevention from Scandinavia, the Netherlands, Britain, Canada, Australia, and New Zealand. Literature from developing countries was not included as scant research has been conducted and few preventive programs offered on falls in older persons in developing countries. Bibliographies of selected articles were reviewed for potentially relevant articles. A number of seminal articles published prior to 2008 were included if more recent updates in these areas of research or analysis were not available. Reports from the American Association of Colleges of Nursing, World Health Organization, National Council on Aging, and Centers for Disease Control on falls prevention in older age were also reviewed.

Epidemiology of Falling in Community Dwelling Older Adults

Approximately 30% to 40% of people aged 65 and older fall each year (Cigolle, 2015; Phelan, Mahoney, Voit, & Stevens, 2015; Tinetti & Kumar, 2010). Falls are the leading cause of both fatal and nonfatal injuries in this age group (Centers for Disease Control and Prevention, 2013). More than 20% of the older adults who fall seek medical attention for suspected injury (Bohl, Phelan, Fishman, and Harris, 2012), and 10% of the falls result in serious injuries such as

fractures or head trauma (Stevens, Corso, Finkelstein, & Miller, 2006) that require

hospitalization. In 2013, 2.5 million nonfatal falls among older adults were treated in emergency

departments and more than 734,000 of these patients were hospitalized (CDC, 2010). Falls and

fatal and nonfatal fall related injuries increase with age. The death rate due to falls is 10 per

100,000 persons for those aged 65 to 74 years and 147 per 100,000 persons for those aged 85

years or older (as cited in Michael et al., 2010).

In order to estimate the number of older adults who fall and are not injured or who

sustain minor or moderate injuries and seek treatment in clinics or physician offices, the CDC

analyzed data from the 2006 Behavioral Risk Factor Surveillance System (BRFSS) survey. The

survey included the following questions about falls: "The next question asks about a recent fall.

By a fall, we mean when a person unintentionally comes to rest on the ground or another lower

level. In the past three months, how many times have you fallen?" If a fall was reported, the

next question was, "How many of these falls caused an injury? By an injury, we mean the fall

caused you to limit your regular activities for at least a day or to go see a doctor." Results of this

analysis indicate that annually one in three adults aged 65 and older fall; 20% to 30% of these

falls result in injuries that affect the ability to engage in activities of daily living (ADLs).

(United Health Foundation, 2016).

Fall related injuries among older adults are associated with significant economic costs. In

2013, the direct medical costs of falls in the United States, adjusted for inflation, totaled $34

billion (Cohen, Miller, Shi, Sandhu, & Lipsitz, 2015; Stevens et al., 2006). Fractures were the

most common and most costly type of nonfatal injury, accounting for over one third of nonfatal

injuries and 61 % of costs (Stevens et al., 2006). Falls for which medical attention are sought

result in higher costs for several months after a fall, particularly for falls requiring hospitalization

(Bohl et al., 2010). The costs of fall injuries increase with age. Costs in 2000 for women, 58% of older adults, were two to three times higher than for men across all medical treatment settings. Fractures accounted for 35% of injuries, but 61% of costs (Stevens et al., 2006).

Falls and injuries from falls are also costly to older adults' in terms of quality of life. In a prospective study of a cohort of community dwelling older persons, Tinetti and Williams (1997) found a strong association between falls and nursing home admission, even after controlling for factors known to be associated with falls or placement in skilled nursing facilities. Hazard ratios for admission to a skilled nursing facility, adjusted for demographic, psychosocial, cognitive, health-related, and functional characteristics were 3.1, 95% CI [1.9,4.9] for one fall without serious injury, 5.5, 95% CIs [2.1,14.2] for two or more falls without serious injury, and 10.2, 95% CIs [5.8 ,17.9] for one or more falls with serious injury. Older adults with a history of falling also scored lower on the Falls Efficacy Scale (Tinetti & Williams, 1997), rating on a ten point scale how confident he or she felt about carrying out each of ten ADLs.

Falls and fear of falling are among the most common causes of restricted activity among community dwelling older persons. Restricted activity associated with falling and fear of falling is significantly correlated with increases in health care utilization among older persons living in the community and the likelihood of developing new or worsening disabilities (Gill, Desai, Gahbauer, Holford, & Williams, 2001; Gill, Allore, Gahbauer, & Murphy, 2010).

"Falls prevention is a challenge to population aging" (WHO, 2007, p. 3) and a public health initiative addressed in *Healthy People 2020*. *Healthy People* was first published in 1979 as *Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention,* with the purpose of reducing mortality rates of all Americans and increasing the independence of older adults (Nardi & Petr, 2003). *Healthy People 2020*, the fourth edition of 10-year disease

prevention and health promotion objectives for the nation, includes a new focus, *Older Adults*, with the goal to improve the health, function, and quality of life of older adults. Objective 11, reduce the rate of emergency department visits due to falls among older adults, relates to fall prevention (US Department of Health and Human Services, n.d.). Although falls are the leading cause of injury deaths among older adults, nonfatal falls account for the greatest impact on public health. For every fall death, 111 fall injuries are treated in emergency departments (Stevens, Baldwin, Ballesteros, Noonan, & Sleet, 2010). In the United Sates, there were 5,235 emergency department visits per 100,000 due to falls among older adults in 2007 (age adjusted to year 2000 standard population). The rate for the population 85 years and older was 13,580 emergency visits per 100,000. The target for 2020 is a 10% improvement, which translates to 4,712 emergency department visits per 100,000 (U.S. Department of Health and Human Services, n.d.).

It should be noted that current knowledge of the epidemiology of falls is constrained by the existing sources of data: death certificates, emergency department and hospital admission records, and telephone surveys (Stevens et al., 2010). The BRFSS, for example, has a 51% response rate and relies on self-report. Many falls go unreported, especially falls without injury (Deandra et al., 2010). Emergency department admission data and hospital admission data may contain duplicate counts if patients are transferred to a higher level of care due to complications. Data from death certificates reflect the primary cause of death, although it may be secondary to a fall. Further research based on consistent sources of data is needed to determine whether disparities in state-specific fall death rates are due to underlying risk factors or issues with data collection.

Risk Factors for Falling

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Falls in older adults occur as the result of a complex interaction of biological factors (intrinsic) with behavioral (activity related) and environmental (extrinsic) factors (WHO, 2007).

> As with other conditions affecting older adults such as delirium and urinary incontinence, falling is classified as a geriatric syndrome. Defining features of geriatric syndromes include the contribution of multiple factors and interaction between chronic predisposing diseases and impairments and acute precipitating insults. The ability to transfer and walk safely depends on coordination among sensory (vision, vestibular, proprioception), central and peripheral nervous, cardiopulmonary, musculoskeletal, and other systems (Tinetti & Kumar, 2010, p. 261).

Risk factors identified in the literature include older age, female gender, White race, visual impairment, tremor, incontinence, limitations in ADLs, environmental hazards, and medical conditions such as Parkinson's disease or osteoarthritis, (American Geriatrics Society and British Geriatrics Society, [AGS & BGS], 2010; Deandra et al., 2010; Nicklett and Taylor, 2014; Shumway-Cook et al., 2009; Yamashita, Jeon, Bailer, Nelson, & Mehdizadeh, 2011), low body mass index (BMI) suggesting malnutrition, impaired cognition (Li et al., 2013), foot problems, inappropriate walking aids or assistive devices, living alone (Todd & Skelton, 2004), and comorbidities such as heart disease and diabetes (Day et al., 2011). History of a previous fall with fracture, White race, impaired balance, and cognitive impairment are risk factors associated with serious fall injuries (Stevens et al., 2010).

Most falls result from the interactions among multiple risk factors, and the risk of falling increases linearly with the number of risk factors present. In an early study of community dwelling older adults (cited in Stevens & Phelan, 2013), the proportion of older people who fell in one year increased from 19% for those with one risk factor to 32% for two risk factors, 60% for three risk factors, and 78% for four or more risk factors. The prevalence of risk factors increase with age (Stevens et al., 2010; Tinetti & Kumar, 2010), explaining why the rate of falls increases with age. However, even among community dwelling people aged 75 and older

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without other risk factors, approximately 10% will fall during any given year (cited by Phelan et al., 2015).   The rate of falling has remained at approximately 30% since 1998 (Barry, Galvin, Keogh, Horgan, & Fahey, 2014). Because falls exponentially increase with age-related biological change (WHO, 2007), falling is anticipated to increase due to changing demography. Using data from the Health and Retirement Study, Cigolle (2015) investigated temporal trends in falling from 1998 to 2010 to test the hypothesis that increases in prevalence of falling in the United States would be due to increases in the older population. Among all adults 65 years and older, the 2-year prevalence of self-reported falls increased from 28.25% in 1998 to 36.3% in 2010, which exceeds what would be expected due to aging of the population. The increase, in fact, was most marked at the younger end of the age range. Further research is needed in order to identify whether an increase in fall risk factors, an increase in fall risk behavior, or a combination of both are responsible for the increased prevalence (Cigolle, 2015).

Yamashita, Noe, and Bailer (2012) examined data from the 2004 and 2006 Health Retirement Study to identify fall risk factors and possible interaction effects and concluded that older age may serve as a surrogate measure, reflecting age-related physical functional decline and a number of chronic conditions associated with fall risk. Because of this aging phenomenon, age 77 is suggested as a cut-off for identifying higher risk groups. Grundstrom, Guse, and Layde (2012) analyzed self-reported information from the BRFSS for 2008 to identify risk factors for falls and fall injuries in adults 85 years of age and older. Below average health, male sex, perceived insufficient sleep, health problems requiring assistive devices, alcohol consumption, increasing BMI, and a history of stroke were independently associated with a greater risk of falls or fall related injuries. There was greater risk in those 85 and older due to deterioration of overall health status with age. Among those with excellent overall health status, however, there

was no greater risk of falling compared to the 65-84 year old age group. The researchers point out that further research is needed on fall reduction strategies for those with deteriorating general health and those with very high BMI.

Deandra et al. (2010) conducted a systematic review and meta-analysis to explore risk factors for falls and recurrent falls in community dwelling older people. The odds ratio for 31 risk factors were extracted from 74 studies. The strongest associations were found for history of falling, gait problems, use of walking aids, Parkinson's disease and use of antiepileptic drugs. Other risk factors identified include chronic medical conditions, problems with vision, dizziness, polypharmacy, depression, risk-taking behaviors, home and living situation, and lack of social support and contact. History of falls, fear of falling, and use of walking aids were associated with about a three-fold increase in the risk of falling. Although these factors cannot be prevented, they can help to identify persons at highest risk of falling and those most likely to benefit from intervention.

In a recent analysis of a national sample of Medicare beneficiaries (the national Health and Aging Trends Study), 24% of participants reported mobility device use and 9.3% reported use of multiple devices in the last month (Gell, Wallace, LaCroix, Mroz, & Patel, 2015). The use of mobility devices increased with age and was significantly associated with non-White race and ethnicity, female sex, lower education level, greater morbidities, and obesity. After adjusting for these demographic and health characteristics and physical function, the incidence of falls and recurrent falls was not associated with the use of devices. However, activity limiting worry about falling was significantly higher in the cane-only users than in non-users, which could indicate a mismatch between the device and the older adult. Based on data from the Health and Retirement Study, there has been a 50% increase in the use of mobility devices since 2004 (cited

by Gell et al., 2015). It is not clear whether this increase is due to increased fear of falling, increased disability, greater longevity, or increasing acceptance of the use of mobility devices. There is a need to further explore the determinants of increased use as this information will help inform clinical guidelines on how to identify the appropriate device based on impairment, physical activity level, fall risk, and home environment (Gell et al., 2015).

Leveille et al. (2009) used a 13 item joint pain questionnaire to assess chronic musculoskeletal pain in hands, wrists, shoulders, back, chest, hip, knees, and feet and observed a strong relationship between pain severity ratings with risk for falls. More severe or disabling pain at baseline was associated with higher fall rates. The relationship persisted even after adjusting for multiple confounders and fall risk factors. Stanmore (2015) estimates that one in three adults with rheumatoid arthritis, independent of age, will fall once or more times a year. To examine the prevalence of falls among middle-aged and older adults with arthritis, CDC analyzed data from the 2012 BRFSS. The prevalence of falls and fall injuries was significantly higher among adults with arthritis compared with those without arthritis (CDC, 2014). Hyashibara et al. (2010) conducted a prospective one-year study to determine the incidence of falls and risk factors in women with rheumatoid arthritis. Fifty percent of the women reported falls, two with fractures. The fall group had more swollen joints and took more antihypertensives and or diuretics, and had lower postural stability and reduced performance. It is unclear whether pain, balance and gait impairment, or side effects of drugs played a role in increasing the risk of falls. Data from the 2011 National Health and Aging Trends Study was analyzed to determine the prevalence of falls related outcomes according to chronic pain status (Patel et al., 2014). Bothersome pain was reported by 52.9% of the participants. Prevalence of recurrent (greater than two) falls among those reporting pain was 19.5% compared to 7.4% in

those without pain. The robust relationship persisted even after adjusting for arthritis and depression symptoms. These studies provide evidence that questions related to pain and painful conditions such as arthritis should be included in fall risk assessments and pain management should be a part of falls prevention programs.

The risk of falling increases with certain medications and the number of medications consumed (Cranwell-Bruce, 2008). Sedatives, antidepressants, anticonvulsants, antihypertensive medications, benzodiazepines, antipsychotics, and analgesics are considered to be fall risk increasing medications (FRIDS) (Quigley, 2007; Tinetti & Kumar, 2010; Woolcott et al., 2009). Yamashita, Jeon, Bailer, Nelson, and Mehdizadeh (2011) found that the risk of falls increases when the number of medications is equal to or greater than four. Confounding by medication indication is also an important consideration (Woolcott et al., 2009), and the combinations of medications may also be a better predictor of falls than individual medications. With polypharmacy, the factors leading to increased fall risk include adverse drug effects, drug interactions, electrolyte imbalance, and decreased drug clearance rates associated with aging (Cranwell-Bruce, 2008).

Most of the research on falls in older adults considers indoor falls even though almost half of all falls occur outdoors (Chippendale and Boltz, 2014; Kelsey, Procter-Gray, Hannan, & Li, 2012). It is important to divide them because risk factors for indoor and outdoor falls differ. Outdoor falls are associated with active lifestyle and characteristics of the environment while indoor falls are more often associated with physical difficulties and poor health (Kelsey, Procter-Gray, Hannan, & Li, 2012). Gyllencreutz, Björnstig, Rolfsman, and Saveman (2015) used emergency department (ED) hospital admission data and questionnaires to explore fall related injuries that occur when walking in public outdoor environments in Sweden. The falls occurred

more frequently in winter months and women were over-represented. Fractures were the most common injury type. Younger seniors were injured more often than older seniors. Findings from a qualitative study that explored the experience of older adults in their neighborhoods in relation to perceived fall risk and fear of falling identified uneven walking surfaces, curbs, clutter on sidewalks, poor lighting, and poor visibility of cyclists as risk factors for falling outdoors (Chippendale and Boltz, 2014).   Li et al. (2014) analyzed data on walking habits, falls, and fall injuries among participants of Maintenance of Balance, Independent Living, Intellect, and Zest in the Elderly (MOBILIZE) Boston, a longitudinal study that began in 2005. Neighborhood socioeconomic status indicators at census block levels were included in the analysis. Lower neighborhood socioeconomic status was associated with more utilitarian walking and higher rates of falls on sidewalks, streets, and curbs. *Utilitarian walking* is defined as walking to shop and do other necessary tasks of daily living. It is particularly important to older adults who are unable to drive or cannot afford to drive (Li et al., 2013). Utilitarian only walkers lived in neighborhoods with the lowest socioeconomic status and had the highest rates of falls. Falls on sidewalks and streets were more likely to result in injury than falls in recreational areas. Non-walkers had the highest rates of indoor falls. These studies point at the need to pay attention to socioeconomic status and the built environment conditions, especially in neighborhoods with high concentrations of older adults, as many of the current fall prevention measures are directed at relatively frail, inactive people who fall indoors.

In a recent study examining circumstances surrounding fall related hip fractures, falls were further divided according to activity at the time of fall. The older adults who fell during positional change had the poorest functional status, those who fell indoors due to environmental reasons had moderate physical function but high levels of co-morbidity and FRIDs, and those

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who fell in snow free outdoor environments appeared to have a poorer health and functional status, higher use of FRIDs, and a higher incidence of previous falls than those who fell on snow or ice or experienced activity related falls. Those describing activity related falls reported the least functional limitations and were the most physically active (Leavy, Byberg, Michaelsson, & Melhus, 2015). The findings from this study can help inform efforts to tailor fall prevention to individuals of varying levels of health and function who are at risk for falls and hip fracture. For example, for frail elderly people, fall prevention should focus on task specific training of muscular strength, transfer strategies, and evaluation of orthostatic hypotension. For those with a history of falls and moderate physical function, the focus should be on medication review and fall risk education. For more vigorous older adults, the emphasis should be on efforts to continue outdoor mobility as long as possible.

Recent discharge from a hospital increases fall risk (Mahoney et al., 2000). Fall rates and injurious fall rates for patients discharged from the hospital are increased for six months following discharge when compared to the general community population (Hill, 2010). Up to 40% of patients fall in the six months after discharge and up to 15% of unplanned hospital readmissions during this period are due to falls (Hill, Hoffmann, & Haines, 2013). Previous research also found the rate of falls to be higher for older adults discharged from the hospital and requiring home health care, especially within the first month after discharge (cited by Haines et al., 2009). Post-discharge falls are also more likely to result in injury compared with falls in the general community dwelling population. Older people have over the twice the risk of sustaining a hip fracture after a hospital admission, especially in the first four weeks after discharge (Hill, Etherton-Beer, & Haines, 2013). Hill et al. (2013) found that most post-discharge falls occurred indoors, between six and ten in the morning, and in the bedroom. Factors associated with falling

included requiring assistance with ADLs, falling in the hospital prior to discharge (Hill et al., 2013), requiring use of walking frame, being unable to walk one block prior to hospitalization, and having poor standing balance (Haines et al., 2009). Older people who fell and required assistance with ADLs were less likely to fall outside. Increased risk of falling in the post-discharge period is likely a result of deconditioning that occurs with immobility associated with hospitalization, surgical interventions, deteriorating health, and medication side effects. In one study, older adults admitted to a hospital in the United States were shown to not return to pre-hospitalization levels of independence in ADLs one month following discharge (cited by Haines et al., 2009).

Fear of falling is the most reported fear among older adults, exceeding fear of robbery or financial difficulties (cited by Yardley & Smith, 2002). The relationship between falling and fear of falling is circular. Previous falls predict fear of falling and fear of falling is predictive of future falls (Tiernan, Lysack, Neufeld, Goldberg, & Lichtenberg, 2014). Higher levels of perceived fall risk or fear of falling can lead to falls independent of physiological risk (Delbaere, Close, Brodaty, Sachdev & Lord, 2010). Major risk factors for developing fear of falling are one or more falls in the past six months, being female, limitations in ADLs, and being older (Boyd and Stevens, 2009; Kempen, van Haastregt, McKee, Delbaere, & Zijlstra; 2009; Scheffer, Schuurmans, van Dijk, van der Hooft, & De Rooij, 2008). In a telephone survey of older adults conducted between 2001 and 2003, 15.9% of those who reported to be moderately or very afraid of falling reported a recent fall compared to 5.7% of those who reported they were not or were slightly afraid (Boyd & Stevens, 2009). Yardley and Smith (2002) surveyed older adults over 75 years of age to assess feared consequences of falling. The most feared consequences were loss of functional independence and damage to identity. These fears were significantly correlated

with avoidance of activity after adjusting for age, sex, and recent history of a fall. In a secondary

data analysis on the National Survey of Self-Care and Aging interview data, 24% of older adults

reported falling and fear of falling was reported by 22% (Bertera & Bertera, 2008). Both

increased with age. Fear of falling was found to be the most important factor in predicting

activity avoidance among older adults, and the number of falls experienced increased the impact

fear of falling had on activity avoidance. Other reported consequences of fear of falling include

decline in physical and mental performance and progressive loss of health related quality of life

(Scheffer et al., 2008; Gell et al., 2015). Fear of falling is often operationalized by falls efficacy,

the perception of one's ability to avoid falling. Tiernan et al. (2014) found that higher falls

efficacy was associated with better self-rated health in older African Americans, suggesting that

improving falls self-efficacy in this group may be beneficial to mobility and overall health and

well-being.

Peel, McClure, and Hendrikz (2007) examined the relationship between psychosocial

determinants of healthy aging and risk of fall related hip fracture in community dwelling older

adults in Australia. Being currently married, living in present residence for five years or more,

using proactive coping strategies, having private health insurance, having a high level of life

satisfaction, and engagement in social activities in older age were all protective of fall related hip

fracture injury in older people. Another study examining the impact of psychosocial variables on

fear of falling and avoidance of activity (Kempen et al., 2009) found that psychosocial variables

did not contribute independently to the difference between mild and severe fear of falling and to

the difference between mild and severe avoidance of activity. However, low general self-

efficacy, low mastery, loneliness, feelings of anxiety, and symptoms of depression were

identified as univariate correlates of severe fear of falling and avoidance of activity. Knowledge

of these psychosocial associations can help to identify older adults at risk of fear of falling and

activity avoidance and need to be considered by those planning effective healthy aging

interventions and programs.

Effective Falls Risk Assessment Tools

The first step in fall prevention in the community is to identify older adults at risk for

falls.

> All older adults who are under the care of a health professional (or their
> caregivers) should be asked at least once a year about falls, frequency of falling,
> and difficulties in gait or balance (AGS & BGS, 2011, p. 149-150).

Any positive answer to the screening questions puts the person in a high-risk group.

Once a high-risk person has been identified, a multifactorial fall risk assessment should be

performed (AGS & BGS, 2011). The multifactorial risk assessment can reveal factors that put

the older person at risk of falling and help identify the most appropriate interventions for

prevention.

Numerous screening tools have been used to identify community dwelling older adults at

risk for falling and many have been evaluated in clinical trials. They vary in complexity from a

single question or test to scales involving 10 or more assessments (Gates, Smith, Fisher, &

Lamb, 2012). However, no tool has been widely used or widely validated and tools developed

for one population may not be appropriate for predicting falls when used in a different setting. A

recent systematic review of the evidence on the accuracy of screening tools for predicting risk of

falling in community-living older adults concluded that, at the time of report, no screening test is

accurate enough to be regarded as a gold standard for predicting falls (Gates et al., 2012; Moyer,

2012). While some evidence does exist that simple screening questions may be as accurate as

more complex screening tests in predicting who will fall, a history of falls and assessment of

abnormalities of gait or balance are found to be the best predictors of future falls (Gates et al., 2012).

The Timed Up and Go (TUG) test is a commonly used screening test for falls in the community setting and is recommended as a screening tool in guidelines published by the AGS and the BGS. It was developed in 1991 as a modified version of the Get Up and Go test. The patient is timed while they rise from an arm chair walk to a line on the floor three meters away, turn and walk back to the chair and sit down again. A faster time indicates better functional status. A score of 13.5 seconds or less is often used as a cut point to identify those at risk of falls, but values range from 10 to 33 seconds in the literature (Barry, Galvin, Keogh, Horgan, & Fahey, 2014). In a systematic review of 25 studies and a meta-analysis of 10 studies that validated the TUG test as a predictor of risk of falls in community dwelling older adults, it was found to be more useful at ruling in than ruling out falls in high risk older adults. These findings may be explained by the fact that TUG is a single test which reflects strength, balance and mobility whereas the risk of falling depends upon multiple intrinsic and extrinsic factors, including medication use and morbidity (Barry et al., 2014).

The Falls Efficacy Scale International (FES-I) is the most widely used tool that measures fear of falling during physical and social activities inside and outside the home (Greenberg, 2011). In order to compare fear of falling across a range of international cultures, the FES-I was developed and tested by The Prevention of Falls Network Europe using different samples in different countries. It is currently the best validated instrument for this purpose with excellent internal validity (Cronbach's alpha = 0.96) and test-retest reliability (Intra-class coefficient ICC, = 0.96). Factor analysis discriminated two factors. The first explained 36.8% of the variance and loaded most highly on lower demand physical activities inside the home such as getting in and

out of a chair or preparing a meal. The second factor explained 32.7% of the variance and loaded on more demanding physical activities outside the home such as walking on uneven or slippery surfaces. When a single factor solution was specified, all items loaded strongly on a unitary dimension explaining 61.7% of the variance. Scores in different sub-groups demonstrate sensitivity to demographic characteristics and fall risk factors. For example, older participants, people who reported taking more than four medications, and women had significantly higher total FES-I scores (Yardley et al., 2005). Kumar, Carpenter, Morris, Iliffe, and Kendrick (2014) used the 16 item FES-I and data collected on socio-demographic characteristics, self-perceived health, exercise, and functional measures to identify factors associated with fear of falling. Factors associated with significantly higher odds of fear of falling were female gender, age over 80, non-White ethnicity, higher BMI, social isolation, living alone, lower educational level, lower annual household income, use of walking aid, higher number of comorbidities, higher number of medications, and taking longer than 13.5 seconds to complete the TUG test. Mazumder, Lambert, Nguyen, Bourdette, and Cameron (2015) used a seven item version of the FES-I to assess fear of falling and future falls in people with multiple sclerosis (MS) and found it to be a valid measure of fear of falling in people with MS. Higher scores on the seven item version of the FES-I were associated with a higher risk of future recurrent falls, whether or not the individual had fallen in the past.

Lach (2005) tested a single item question: "At the present time are you very fearful, somewhat fearful, or not fearful that you might fall (fall again)" along with measures of depression, cognition, balance, and functional status, and history of falls to determine risk factors for developing fear of falling. Having two or more falls, feeling unsteady, and reporting fair or poor health status were independent risk factors for developing fear of falling. A secondary

analysis of the Lifespan Investigation of Family, Health, and Environment (LIFHE) data set examined the relationship between fear of falling and self-rated health. A single question: "Would you say your health is excellent, very good, good, fair, or poor?" identified older African Americans with low falls efficacy and high risk for falling (Tiernan et al., 2014). However, other studies have found that a single-item question to assess fear of falling is less sensitive than a multi-item questionnaire (cited in Mazumder et al., 2015). Whether a single question, a version of the FES-I, or a single question followed by the FES-I is used, factors associated with fear of falling are easy to assess for and can be useful in targeting falls prevention intervention to reduce falls and fear of falling.

Renfro and Fehrer (2011) describe the content selection and development of a multifactorial Fall Risk Assessment and Screening Tool (FRAST) designed specifically for use in primary care settings by minimally trained staff. Fifteen items were selected for inclusion, including four previously validated measures: balance, depression, falls efficacy, and home safety. The FRAST was validated via data collection across the state of Montana. Providers reported that the multifactorial assessment tool is comprehensive and easy to apply in the primary care setting. Further testing with different populations is currently underway (Renfro & Fehrer, 2011).

A fall risk self-assessment tool was designed with the intent of promoting early identification of evidence based fall risks (Vivrette, Rubenstein, Martin, Josephson, & Kramer, 2011). In development, focus groups with community dwelling seniors were held to identify the following risk factors: weakness, gait or balance deficiency, environmental hazards, poor vision, medications, dizziness, non-adherence to prescribed assistive devices, inattention, reaching or climbing for high objects, inappropriate footwear, and loss of sensation in feet. Forty older

adults then completed the tool and results were compared to a clinical evaluation or risks using the AGS/BGS guidelines to assess independent predictors of falls. There was strong agreement between the self-rated tool and the clinical evaluation (kappa = .875, p <.0001). Individual item kappa values ranged from .305 to .832. After dropping one item, vision risk, because of inadequate agreement with the clinical evaluation, the final tool had good concurrent validity (Rubenstein, Vivrette, Harker, Stevens, & Kramer, 2011). Interestingly, the participants' experiences with the tool reflect a lack of attention to fall prevention in primary care. Older adults did not view doctors as major resources for information on fall prevention, but they shared their intention of using the tool to prompt a discussion about fall prevention with their doctor (Vivrette et al., 2011).

It is clear that more research is needed in order to identify the most appropriate tools for use in various settings, considering effort required, applicability, sensitivity, and specificity (Todd & Skelton, 2004). It is also recommend that further studies of tools have a sufficiently large sample size to estimate sensitivity and specificity with precision, be conducted in a clinically relevant population with a sufficient duration of follow-up, and use reliable methods for recording falls. Fall records based on older adults' recall have been shown to lack reliability (Cummings, Nevitt, & Kidd, 1988). For this reason, fall diaries or caregiver reports are considered to be the gold standard for collecting fall data.

Interventions Effective in Preventing Falls

Fall prevention means optimal management of falls risk to prevent falls that are preventable. The most effective research interventions report reductions of 35% to 40% in fall rates. A certain number of older adults will still fall, regardless of intervention, but every effort should be made to minimize risk (Shubert, 2011).

Several decades of research on interventions to reduce falls have provided evidence for fall prevention interventions. Many are based on *The American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons* (2010), which provides recommendations and an algorithm describing decision-making and intervention that can be used in the management of older persons in the community setting. Development of the guideline began with a literature search that included meta-analyses, systematic literature reviews, RCTs, controlled before and after studies, and cohort studies published between 2001 and 2008. The evidence supports a multifactorial approach to interventions designed to prevent falls in older persons. In a multifactorial intervention, participants are offered only the interventions that target risk factors identified through a fall risk assessment. The targeted approach has been implemented primarily in the community setting and includes balance, gait, and strength training such as Tai Chi or physical therapy in group programs or individual programs in the home; performing environmental modification to promote safe performance of ADLs; treating vision impairment; minimization of medications; managing postural hypotension; managing heart rate and rhythm abnormalities; correcting Vitamin D deficiency; and managing foot and footwear problems.

A recent systematic review of the literature, conducted by the U.S. Preventive Services Task Force, found that interventions provided through primary care, including risk assessment, exercise, physical therapy, and vitamin D supplementation reduce falls in older adults (Moyer, 2012). Exercise and physical therapy improve strength and balance. Stimulation of vitamin D receptors in skeletal muscle promotes protein synthesis. Vitamin D receptors are known to decline with age (Moyer, 2012).

A 2012 Cochrane Systematic Review of 159 randomized controlled trials (RCTs) involving 79,193 participants of interventions to reduce falls in community-dwelling older people (Gillespie et al., 2012) found that multiple-component group exercise reduced rate of falls and risk of falling as did Tai Chi and individually prescribed multiple-component home-based exercise. Overall, vitamin D did not reduce rate of falls or risk of falling, but may have been effective in people with lower vitamin D levels before treatment. Home safety assessment and modification interventions were effective in reducing rate of falls and risk of falling and were even more effective in people at higher risk of falling, including those with severe visual impairment, and when delivered by an occupational therapist. An intervention to treat visual problems actually resulted in a significant increase in the rate of falls and risk of falling. When regular wearers of multifocal glasses were provided with single lens glasses, all falls and outside falls were significantly reduced in the subgroup that regularly took part in outside activities (Gillespie et al., 2012). A meta-analysis of RCTs conducted between 2000 and 2009 indicate that similar fall prevention programs were effective in reducing fall rates by 9% in community settings (Choi & Hector, 2012). The CDC (2010) reports that risk assessment, structured exercise programs focused on improving strength and balance, home modification focused on assessing and reducing environmental fall hazards, and multifactorial strategies including two or more approaches with a combination of risk assessment, medical assessment, medication assessment, home safety evaluation, behavioral change strategies, improving self-efficacy, group based exercise, and psychosocial support are effective interventions for preventing falls in community dwelling older adults.

Single interventions investigated in RCTs include cardiac pacing, vision improvement, home modifications, medication reduction, and physical therapy or exercise (Tinetti & Kumar,

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2010). While the evidence was not sufficient to determine the role of cardiac pacing, first cataract surgery and home safety modification in at-risk individuals were supported. Exercise is the most widely studied single intervention. Evidence supports exercise that includes progressive balance and strength, and perhaps endurance, although the optimal frequency and intensity has not been determined. Results from the Whitehorse NoFalls trial confirm the effectiveness of exercise alone in preventing falls among community-dwelling older adults and supports the position that multi-component programs do not prevent more falls than single interventions Fitzharris et al., 2010). A recent systematic review of clinical practice guidelines also supports exercise as an effective component of a fall prevention program with the caveat that individual patient impairments, functional level, and fall risk need to be matched to the appropriate evidence based exercise program (Avin et al., 2015).

Martin et al. (2012) found that physical therapist administered group based exercise was more effective in decreasing fall frequency, increasing balance, and improving quality of life than no intervention. When compared with home exercise, the results were not statistically significant although there were higher improvements in quality of life and physical functioning. However, the group based exercise promoted greater satisfaction among the participants and resulted in greater exercise adherence. Because adherence to exercise programs is typically low, this is an important finding to consider when recommending an exercise program.

The Otago Exercise Program (OEP), a home-based program that consists of resistance and balance training exercise has been shown to be effective in preventing falls (cited by Liu-Ambrose et al., 2008). A RCT was conducted to evaluate the effect of OEP on falls risk, functional mobility, and executive functioning. It was found that OEP reduced falls and significantly improved executive function, specifically response inhibition, after six months.

Response inhibition is the ability to suppress automatic reactions in favor of planned behaviors. Although evidence suggests that even mild cognitive decline is a risk factor for falls, few exercise trials of falls prevention have included measures of cognitive function. This is the first study to demonstrate that an exercise program designed to reduce falls can improve executive function in older adults with Mini-Mental State Examination (MMSE) scores of 24 or higher. The OEP includes twice-weekly walks. Results from large prospective cohort studies indicate that regular participation in low-intensity physical activity such as walking is associated with a lower risk of dementia and improved cognitive performance (cited by Liu-Ambrose et al., 2013). Thus, walking may be the component that contributed to the improvement in cognitive performance observed in this study.

Other research suggests that combining multiple fall prevention strategies result in better outcomes than a programs using a single approach. A systematic review of 33 studies found that multifactorial programs that included home evaluations and home modifications, physical activity or exercise, vision and medication checks, or assistive technology (smart home technology to operate lights, appliances, doors, and windows) to prevent falls resulted in a decreased rate of functional decline, a decrease in fear of falling, and an increase in balance and strength. When physical activity and home modifications were provided individually, the evidence that these interventions reduce falls and maintain and promote ADLs and instrumental activities of daily living (IADLs) performance was only moderate (Chase, Mann, Wasek, & Arbesman, 2012). For falls resulting in injury or in a subset requiring medical attention, a vision intervention where participants were referred to a provider if their vision tested below a predetermined criteria combined with an exercise intervention prevented more serious falls (Fitzharris, Day, Lord, Gordon, & Fildes, 2010).

Multifactorial interventions assess an individual person's risk of falling, and then provide or arrange referral for treatment to address and reduce the risk. Conclusions about the effectiveness of multifactorial interventions are also conflicting (Mahoney, 2010 & Tinetti & Kumar, 2011). Most of the effective trials included multiple factor risk assessment, physical therapy or exercise, withdrawal or reduction of medications, and home safety modification. Programs targeted to high-risk groups who have a history of falling have been most successful (cited in Lach, Krampe, & Phongphanngam, 2011). In a previous review covering this topic, the authors conclude that further research is needed to explore the difference between programs which provide integration of assessment and intervention by a multidisciplinary team, and programs which provide assessment but rely on referral to other providers and agencies for the intervention (Gillespie, Gillespie, Lamb, Cumming, & Rowe, 2009). Multifactorial interventions that actively provided treatments were more effective than those that offered knowledge or referral to existing community or health care providers (Tinetti & Kumar, 2011). Negative RCTs of multifactorial interventions all involved risk factor assessment with referral instead of direct intervention (AGS & BGS, 2010).

deVries et al. (2010) conducted an RCT to evaluate a multifactorial prevention program at geriatric outpatient clinics in the Netherlands. Two-hundred and seventeen persons aged 65 years or older with a high risk of recurrent falls participated in a multifactorial geriatric assessment and intervention consisting of calcium and cholecalciferol (vitamin D) supplementation, treatment of visual impairment, medication management, removal of environmental hazards, and balance and strength training. Within one year, 51.9% of the intervention participants and 55.9% of the usual care participants fell at least once. There was no significant treatment effect demonstrated for the time to first fall or the time to second fall. The

researchers postulate that results could be improved if balance and strength training precede

muscle strength training and adherence to intervention is increased. Adherence can be improved,

they suggest, with intensified primary care-based encouragement and supervision by nurse led

home visit programs. They comment on how difficult it can be to get patients to taper off and

discontinue benzodiazepines, because of their addictive properties. Nurse visits to support

patients while they discontinue these drugs may be helpful (deVries et al., 2010).

The Fall Prevention Center of Excellence (FPCE), an interdisciplinary center devoted to

identifying best practices in fall prevention and helping communities establish fall prevention

programs throughout California, compared nine evidence based models of multifactorial fall

prevention from the U.S., Canada, Australia, New Zealand, and Great Britain by rating

components (risk assessment, physical activity, home modification, education on fall risk,

behavior change) on a four point scale based on the intensity of the intervention content. Unlike

countries where government sponsored public health programs provide support for standardized

approaches to fall prevention, senior and community centers in the United States independently

determine how to offer fall prevention. As a result, considerable variation in intensity was found

for the components. To address the inconsistencies, FPCE developed Increasing Stability

Through Evaluation and Practice (InSTEP) in three formats, each with consistent intensity of

intervention activities across each component (physical activity, home safety evaluation, and a

medical risk assessment). Overall, participants experienced a reduction in falls, improved

perception of gait and balance, and improved dynamic gait function. The program intensity level

did not have a major effect on falls (Kramer et al., 2014). A qualitative process evaluation of

InSTEP at six sites was conducted to determine the community centers' perspectives on lessons

learned in implementation that could be shared and how they planned to maintain the health

education program after the funding period. Despite strong buy-in to the fall prevention program, fully sustaining the program was perceived as a major challenge, particularly for the moderate and high intensity programs (Kramer, Vivrette, & Rubenstein, 2011). Given that the low intensity program was found to be effective, offering this version might be an efficient way to sustain the program.

Cohen, Miller, Shi, Sandhu, and Lipsitz (2015) conducted an RCT to test the effectiveness of a multifactorial in-home assessment by a nurse with individualized intervention and a follow-up call by a nurse within two weeks. The intervention group had an 11% reduction in risk of falling and an 18% reduction in risk of injurious falls. In three years after the intervention, the intervention group had a 33% reduction in claims for long term care services. This successful program might not be generalizable to other community dwelling elders, however, due to the relatively high socioeconomic status of the study population. The willingness and ability to undertake behavioral changes and follow recommendations such as making an appointment with a primary care physician might be different among older adults in general. The researchers acknowledge that physician engagement was a key factor in helping ensure that recommendations were followed (Cohen et al., 2015).

Russell et al. (2010) conducted an RCT to investigate the effect of a referral based targeted multifactorial falls prevention program on the occurrence of recurrent falls and injuries in older people presenting to an emergency department after a fall and discharged directly home. The intervention group was referred to existing community services and health promotion activities based on falls risk factors. No significant difference was found between the intervention group and the group receiving standard care over the 12 month study period. The null result was thought to have resulted from standard care across the groups, lack of effect from

the referral based targeted multifactorial intervention, and/or delays in providing the intervention services. The study reinforces the importance of point of care services that can address directly the medical, physical, and environmental aspects of falls. This is an important consideration because studies show that older people presenting to an emergency department after a fall are at high risk for recurrent falls and that they do not generally receive the care required to manage this risk (Russell et al., 2010).

Mahoney (2010) posits that the success of multifactorial interventions depends upon three variables: target group, content, and process. Choice of target group must be considered when evaluating the success of a multifactorial intervention. For example, there is insufficient evidence to recommend for or against multifactorial interventions in long term care settings and to recommend for or against multifactorial or single interventions to prevent falls in older persons with known dementia living in the community or in long-term care facilities (AGS & BGS, 2010). There is also evidence that targeting interventions to older adults at high risk for falling is more effective. Content refers to the components of the intervention that are integral to its success. For example, evidence suggests that physical therapy should last longer than 12 weeks, focus on balance exercises, and become more rigorous as balance improves. A systematic review of trials evaluating exercise for fall risk reduction in community dwelling older adults concluded that exercise delivered in individual or group format can reduce falls and fall risk, and that interventions lasting longer than six months are more likely to be effective (Arnold, Sran, & Harrison, 2008). A meta-analysis of 17 trials concluded that exercise had a significant effect in reducing all injurious falls, falls resulting in medical care, severe injurious falls, and falls resulting in fractures (El-Khoury, Cassou, Charles, & Dargent-Molina, 2013). All of these exercise programs emphasized balance training (even in the very old and frail), gait

training, strength and endurance. Process refers to how the content is delivered. Interventions that build on stages of change theory, include adult learning principles, and focus on behavioral change are more likely to be successful. Direct provision of the intervention and high follow-through on recommendations also increase success.

In the face of increased risk for falls after discharge from an acute care hospital, there is little research investigating the effect of interventions to reduce falls among older patients in the post-discharge period. One RCT found that an extended physiotherapy program (an additional 30 minutes of home program instruction each day during acute care and a leaflet with instructions for home exercise and recommendation to follow home exercise 30 minutes each day) reduced falls but not readmissions. Cholecalciferol treatment (2000 IU per day) reduced hospital readmissions but not falls. Authors recommend combining the two interventions in the post-discharge period (Bischoff-Ferrari et al., 2010). One study determined that a home visit with environmental assessment by a trained professional and targeted modifications was effective in reducing falls including hip fractures and recurrent falls in older patients following hospital discharge (cited by Hill et al., 2013). In another study, older adults using a mobility aid discharged from a tertiary hospital received a home visit from a physiotherapist and a digital video-disk based program incorporating six exercise types. There was no significant difference between the intervention group and the control group in rate of falls, health related quality of life, physical capacity, fear of falling, and participation in ADLs. Researchers found that adherence to the intervention was reduced after the first two weeks and concluded that the lack of adherence as well as the small sample size may have contributed to the non-significant results (Haines et al., 2009). Lack of adherence to program interventions seems to be a major barrier that can be overcome with support. Shubert (2011) posits that successful fall prevention requires a paradigm

shift of physical therapy from episodic care to a continuum of care where the patient in transition remains in contact with the therapist and is not formally discharged until independence is achieved with the appropriate exercise program. I believe that this continuum of care concept is applicable to other disciplines involved in fall prevention, and would likely benefit all transitional care programs.

Considering that FRIDS have been determined to increase risk for falling, there are few studies exploring the medication manipulation as a sole intervention. Reduction of medications has been a component of several multifactorial interventions in community based studies. While not possible to assess the effect of medication reduction alone in these studies, all of the multifactorial interventions that included medication minimizations were significantly effective in reducing falls and the studies of interventions that did not include medication reduction were not found to be effective (American Geriatrics Society, 2010). Using qualitative methods, Bell, Steinsbekk, and Gransas (2014) explored factors that influence prescribing of FRIDS. They found that general practitioners did not perceive the use of FRIDS to be a prominent factor regarding falls and needed to be reminded of the connection. Receiving input from pharmacists on recommended changes in prescribing and cessation of FRIDS helped change provider behavior. Quigley (2007) described a group consensus process to develop clinical prescribing algorithms for medication classes associated with increased risk of falling or fall-related injuries. The algorithms are intended to systematically guide prescribing providers', specifically nurse practitioners, practice to evaluate medications. The algorithms were validated by 12 Fall Prevention Clinics throughout the Veteran's Administration medical centers (Quigley, 2007). However, research is needed to determine if evidence based algorithms such as these are actually effective in changing providers' prescribing behavior.

Evidence supports the assessment of fear of falling and implementation of interventions to reduce fear of falling (Batra, Melchior, Seff, Frederick, & Palmer, 2012; Beauvais & Beauvais, 2014; Zijlstra et al., 2007, Zijlstra et al., 2009). Li, Fisher, Harmer, and McAuley (2005) examined the role of falls self-efficacy as a potential mediator of the exercise and fear of falling relationship. Tai Chi participants who evidenced improvement in falls self-efficacy over the course of a six month intervention reported greater reductions in fear of falling. The researchers emphasize that if they not included a measure of falls self-efficacy, the mediation of Tai Chi and fear of falling would have been overlooked. Findings from this study emphasize the importance of considering mechanisms that underlie behavior change in intervention outcomes. A systematic review of RCTs that assessed fear of falling in community dwelling older people found that interventions that showed effectiveness were multi-factorial programs, Tai Chi, home based exercise interventions and a hip protector intervention (Zijlstra et al., 2007).   However, a more recent systematic review of 30 studies with 2878 participants aged 65 to 85 years that reported fear of falling found that exercise interventions were associated with small to moderate reduction in fear of falling immediately post intervention and concluded that there is insufficient evidence to determine whether exercise interventions reduce fear of falling beyond the end of the intervention (Kendrick et al., 2014). Given the association between fear of falling and inactivity and falling and the relationship between falls self-efficacy and fear of falling, including fear of falling and falls self-efficacy as outcomes for RCTs examining the effects of exercise interventions in older people living in the community will help to advance understanding of the benefits of exercise in falls prevention.

In summary, several decades of research on interventions to reduce falls and injuries have resulted in evidence for best practices in fall prevention, supported by systematic reviews and

meta-analyses (Lach, Krampe, and Phongphanngam, 2011). A 2012 Cochrane Systematic

Review reported that clinical assessment by a healthcare provider and effective clinical and

community interventions combined with follow-up reduced the rate of falls by 24% (Gillespie et

al., 2012). Clinical guidelines recommend annual fall risk screening for adults over sixty-five,

and evidence based screening tools are available to health care providers. A fall risk assessment

is now required as part of the Welcome to Medicare examination. However, recommendations

for appropriate screening tools have not been provided. Primary care providers can also receive

reimbursement for fall risk assessment through the Medicare Annual Wellness visit and incentive

payments for assessing and managing fall risk through the Physician Quality Reporting System

(PQRS) (Phelan et al., 2015). According to the Centers for Medicare and Medicaid Services

(CMS), falls is the eighth most reported quality indicator for the PQRS, with over 600,000 older

adults screened and assessed for falls risk (2010 reporting). Further examination of the data,

however, indicates that physical therapists, not physicians, are actually adopting and reporting

this PQRS indicator (Shubert, Smith, Prizer, & Ory, 2013). Despite evidence from RCTs that

risk factor-based interventions can reduce falls and data indicating that older adults are being

assessed for fall risk, translation of evidence into clinical practice remains challenging (Fortinsky

et al., 2008). According to population estimates based on Medicare Current Beneficiaries Survey

(2002 reporting), less than 50% of older adults reported talking to a health care provider

following a fall, and only 60% of those reported receiving fall prevention information

(Shumway-Cook et al., 2009). Lee et al. (2013) surveyed 245 older community dwellers in

Australia regarding factors associated with discussion about falls with health professionals.

Anxiety, depression, chronic medical conditions, and having a self-reported fall in the past 12

months were associated with discussion of falls. Thirty percent of older adults talked with and

initiated talk with health care providers about falls. Twenty-five percent of the talks were

initiated after a fall. Many older adults at risk of falling did not discuss fall prevention prior to a

fall (Lee et al., 2013). A question remains as to who has the responsibility for addressing fall

prevention. Older adults, their caregivers, providers, and community organizations are all

stakeholders in preventing falls. How can each be best supported?

Evidence for Engaging Older Adults and Caregivers in Fall Prevention

Fall prevention interventions can only be effective if older adults participate in them.

Uptake rates in the community are often less than 50% (Yardley, Donovan-Hall, Francis, &

Todd, 2006) and, engagement rates are typically around 50% at 12 months following

intervention (Nyman & Victor, 2012). It is clear that a better understanding of older adults'

perceptions is needed in order to increase participation and adherence to falls prevention

interventions. In a discussion of the difference between health education and health promotion,

Whitehead (2001) points out that implementing a behavior change requires a departure from a

person's usual pattern of behavior and therefore the challenge lies in identifying when and how

these changes might best occur. Health education suffers from the assumption that everyone can

be educated and fails to acknowledge that some people may be constrained in their efforts to

change behavior (Whitehead, 2001). For example, older people may distance themselves from

the possibility of a fall and involvement in prevention programs, through fear of stigma and

stereotyping (McInnes & Aski, 2004). Relevance may be low until a fall has been experienced.

Even then, fall problems were generally seen being related to environmental factors and being

very old. (Evron, Schultz-Larsen, & Fristrup, 2009). Older people may attribute falls to the

environment as a strategy to deflect from feelings of vulnerability or failing health (cited by

Leavy, Byberg, Michaelsson, Melhus, and Aberg, 2015). Older adults may already feel

threatened by their ill health status or frailty or by the required health behavior change itself and respond with ambivalence. Providers need to be mindful that they may be making health promotion recommendations that have already been rejected (Whitehead, 2001) and that uptake and adherence in falls prevention interventions is likely to be low when they carry unintentional negative messages concerning identity (Bunn et al., 2008).

In fact, research indicates that older persons are more likely to engage in fall prevention strategies to preserve independence rather than to prevent falls (Clark et al., 2011; Mahoney, 2010). Older adults value independence, sense of individuality, self-worth, and freedom to decide what activities to undertake (Yardley & Smith, 2002). Factors that facilitate participation in fall prevention programs include perception of the program as relevant and life-style enhancing (Bunn, Dickinson, McInnes, & Horton, 2008; Calhoun et al., 2011; Evron et al., 2009; McInnes & Askie, 2005).

In order to increase the acceptability of falls prevention programs among older adults, The Prevention of Falls Network Europe undertook developing guidelines about how best to involve older adults in their implementation (Yardley et al., 2007) Focus groups and interviews with older adults were conducted to gain understanding of their perceptions of falls prevention advice. Thematic analysis revealed that participants interpreted falls prevention as hazard reduction, use of aids, and restriction of activity and that falls prevention advice was regarded as not personally relevant or appropriate. Out of this work, recommendations for promoting uptake of and adherence to falls-prevention interventions were made (Yardley et al., 2007). Initially developed from review of literature and refined through consultation process drawing on Delphi survey and nominal group techniques, the recommendations represent a consensus based on current knowledge and evidence and include:

- Raise awareness in the general population that physical activities can improve balance and prevent falls. There is little awareness among older people and caregivers that falls can be actively prevented by improving strength and balance.

- When offering an intervention, promote benefits that fit with a positive self-identity. Uptake is usually promoted more by perceived benefits of preventive activities than by perceived risk of harm.

- Use a variety of forms of social encouragement to engage older adults in interventions. Encouragement and approval from health professionals and role models are known social influences on health-related behavior.

- Ensure that the intervention is designed to meet the needs, preferences, and capabilities of the individual.

- Encourage confidence in self-management by giving the older adult an active role. Self-efficacy is a powerful influencer on exercise behavior of older adults and promotes adherence.

In a meta-ethnography of qualitative studies, McInnes, Seers, and Tutton (2011) reviewed 11 articles reporting on older people's views in relation to risk of falling and need for intervention. Six key concepts emerged: (a) beliefs about risk being beyond personal control may serve as a shield for preserving perceptions of the self as competent and able, (b) older people see risk as a problem for others, specifically people who are old, (c) being at risk is perceived as synonymous with frailty and therefore not relevant to those who do not perceive themselves as frail, (d) being at risk is a marker for declining levels of control, (e) a response to declining levels of control is to take control by implementing self-management strategies, and (f) older adults are

more likely to engage in falls prevention when they are allowed to drive the decision making process to preserve identity as a competent and independent person.

McMahon, Talley, and Wyman (2011) conducted a systematic review of 19 qualitative and quantitative studies examining older people's perspectives about fall risk and prevention. Three themes emerged about risk: (a) fall risk perspectives were associated with fear of vulnerability, (b) maintaining autonomy and independence took precedence over fall risk, and (c) more autonomy and independence were perceived in the presence of trusting and consistent relationships with providers and adult children who respected their views and decision making authority. Older people who had experienced a fall were more likely to acknowledge personnel fall risk than those who had not fallen. Four themes emerged about fall prevention programs: (a) health issues and declining health were barriers to participation, (b) older people preferred programs that seemed relevant to them; (c) any threat to autonomy, control, or independence was a barrier to participation, and (d) interpersonal, organizational, and community level support influenced participation. This study supports the concept of gaining greater understanding of public health issues from the perspective of those targeted by interventions (McMahon et al., 2012). Clarifying values and beliefs about fall risk while providing support and promoting autonomy within relationships will help individualize prevention approaches and expand reach and adoption of fall prevention strategies.

Porter, Matsuda, and Lindbloom (2010) interviewed older homebound women in order to explore their intentions to prevent another fall. The overall intention was reducing risk of falling again at home by figuring out the reason for the fall and structuring lives in new ways to prevent further falls. An important finding is that compared with women who cannot explain a fall, women who can identify the reason for their fall are more likely to invoke an intention to prevent

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a fall in a similar situation. The authors recommend acknowledging that older people who fall are trying to reduce their risk of falling again and obtaining data about intentions to prevent another fall prior to making recommendations for future interventions. There is an improved effectiveness of interventions with fallers compared to older people in general which could be due to precautions they take apart from the intervention protocol. Researchers who fail to ascertain what older adults with a history of falling are already doing to prevent falls risk measuring an outcome that cannot be attributed solely to the intervention (Porter et al., 2010).

Hill et al. (2011) interviewed a large sample of older adults about to be discharged from a hospital about their fall prevention knowledge to use in the post-discharge period. Although over 50% of the participants had fallen in the six months prior to hospitalization, 35% could only suggest one strategy for preventing falls after discharge. Less than 4% of the strategies suggested were evidence based and less than 3% suggested engaging in exercise. Many strategies suggested by the older adults indicated that they viewed falls as an accident caused by their activities rather than resulting from risk factors that could be actively prevented.

Lee, McDermott, Hoffmann, and Haines (2013) explored sources of information provided to older adults during and after hospitalization and reasons why discussions about fall prevention may not take place. Six focus groups with older adults, caregivers, and health professionals were conducted. Reasons given for lack of discussions from health professionals to older adults include difference in perception of falls prevention responsibility, perceived barriers of time, medical priorities, lack of educational resources, lack of systematic approach to identifying patients at risk, and inadequate communication between disciplines. Older adults did not initiate fall prevention communication because they thought their health professional would tell them if there was something they needed to know. These studies highlight the knowledge to

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practice gap and the potential to improve falls prevention information provided to older adults during hospitalization and in preparation for discharge to assist with prevention of falls in this high-risk period.

Hill, Day, and Haines (2014) surveyed older adults about intention to participate in fall prevention using constructs from the Health Belief Model and Theory of Planned Behavior to guide the interview. Thirty-five percent reported falls in the past 12 months. Eight percent reported exposure to fall prevention and 16 percent expressed intention to undertake an intervention. Personal perception of intervention effectiveness, perceived risk of falling, perceived risk of injury, inability to walk up and down stairs without a handrail influenced intention to participate in an intervention within the next 12 months. The authors conclude that improved communication and education strategies in imparting fall prevention messages to older adults is needed. Information that falls are preventable rather than inevitable and a person centered approach where the older adult is actively engaged in decisions about fall prevention recommendations may help encourage at risk older people to engage in falls prevention programs (Hill et al., 2014)..

Another study explored the beliefs of community dwelling South Asian and White British older women about falls prevention using the Theory of Planned Behavior (Horne, Skelton, Sped, & Todd, 2014). Behavioral beliefs that influenced intention to exercise for fall prevention were categorized into proactive, moderation, reactive, adaptive and mechanistic beliefs. Proactive beliefs were beliefs about performing health promotion as a preventive measure. Most of the older adults believed that exercise offered actual and potential benefits. Moderation beliefs were cognitions about avoiding hazards. The prevailing moderation belief was about the need to take caution when being active rather than about exercising to prevent falls. Reactive

beliefs were about initiating an intention to exercise once a fall had taken place. A perceived

loss of physical strength would motivate the participants to exercise, but only exercise they were

comfortable with, such as walking. Adaptive beliefs were about adopting to a changing

circumstance, such as a fall. Those with a fall history had a more positive belief about the

potential for exercise to prevent falls but also had beliefs that they may fall again and thus

needed to avoid activity. Mechanistic beliefs were about mechanistic functioning of the body

and physical causes for poor functioning, such as balance, coordination, and muscle strength.

Instrumental aids were seen as important. Fatalistic beliefs were about inevitability and having

no control over events such as falls. Findings from this study support others that suggest that

messages emphasizing positive aspects of activity in later life such as socialization,

independence, and well-being are more effective than messages about falling (Hill et al., 2013;

Hughes et al., 2008).

Lee et al. (2013) used constructs from behavioral change models to determine older

adults' perceptions of how providers could engage them in fall prevention. Perceived

susceptibility (perception of risk of falls and risk of harm from falling), cues to action (had a

fall), perceived cost or barriers of having a discussion (consequences of losing independence),

and perceived benefits such as the importance of preventing harm from falls and fall prevention

intervention efficacy were identified as potential strategies to assist older adults engage in falls

prevention behaviors.

Using constructs of models of health behavior is believed to result in an increase in

knowledge and lead to motivation, increased adherence, and satisfaction when implementing

health promotion activities (Whitehead, 2001). These models establish relationships between

knowledge, attitudes, values, and intentions and include theories about self-efficacy, cost-benefit

analysis, perception of risk, and effectiveness of intervention. Besides offering insight into facilitators, barriers, and cues to action that underlie older adults' fall prevention behaviors, the models can assist providers plan appropriate interventions and offer a more precise and scientific approach to implementation and evaluation of fall prevention research studies (Whitehead, 2001) and analysis of results. Models such as the Health Belief Model, Theory of Reasoned Action, Social Cognitive Theory, and Stages of Change Model have been incorporated into studies to determine older adults' beliefs about fall prevention, but few studies incorporate them into interventions.

Haines et al. (2011) demonstrated that education designed using Health Belief Model constructs combined with follow up by a trained health professional after hospital discharge increased awareness and knowledge of fall prevention strategies and prompted behavior change that reduced falls in patients recently discharged from the hospital. Participants who believed they were at risk of sustaining a serious injury if they fell were significantly more likely to plan how to safely restart functional activities and adopt targeted behaviors such as home exercise. Fall rates in the intervention group were 5.4 per 1,000 patient days compared to 18.7 per 1,000 patient days in the control group (Hill et al., 2013).

Calhoun et al. (2011) conducted a qualitative study with a sample of older adults from low socioeconomic status to better understand personal and environmental factors affecting participation in programs to reduce the risk of falling. The main facilitator to participation related to outcome expectations of the program or beliefs that the program would help them, a major construct of several behavior change models. Those who turned down the program did not perceive a great need, either because they felt that they did not need it at that point in their life or because they felt they were beyond help. The authors recommend health care providers convey

the benefits of the program and describe how the program can help maintain a level of confidence, mobility, and independence in daily functioning. Desirable program characteristics include simple access, support of caregivers, and ongoing support of trusted caregivers (Calhoun et al, 2011). The study supports findings from previous studies indicating that the advice of healthcare professionals, particularly physicians, facilitates participation (Bunn et al, 2008).

Evidence from the Field of Knowledge Translation Providing Support for Falls Prevention Interventions at the Provider and Community Level

Translation and dissemination of evidence based fall prevention programs has been slow, as evidenced by the low proportion of older adults engaged in falls prevention activities and the rising incidence of falls (McMahon & Fleury, 2012). To facilitate the process, the CDC published a compendium of proven falls prevention programs in order to showcase interventions for which there is published evidence of the ability to reduce falls among community dwelling older adults. Studies included in the continuum met the following criteria: published in peer reviewed literature, included community dwelling adults aged 60 and over, used RCT study design, measured falls as an outcome, demonstrated statistically significant results in reducing falls, and took place in a community setting. Twenty-nine single interventions and 12 multifaceted interventions met criteria and are included in the third edition of the compendium (Stevens & Burns, 2015). The compendium includes guidelines for program content, target audience, and required training for providers. Instructions or links on how to access assessment tools, instruction manuals, and other resources are also included. This is important because one reason given for the lack of translation of falls prevention programs in the clinical setting is that few programs have training manuals or other information such as validated screening tools, class

curriculums, or instructor qualifications needed for replication with fidelity (Shubert, Altpeter, & Busby-Whitehead, 2011).

The results of many studies examining the effectiveness of fall prevention interventions have been reported. Few, however, have addressed the public health impact and translation potential into practice settings (McMahon & Fleury, 2012). McMahon and Fleury (2012) applied the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework to evaluate the external validity of physical activity interventions designed to reduce falls among community dwelling older adults. The RE-AIM framework was designed as a systematic framework to evaluate potential for translation and public health impact of health behavior interventions at the individual and institutional level. In the model, reach refers to participation rates of target audiences and representativeness of the population's characteristics. Effectiveness or efficacy refers to the impact of the intervention on health and behavior outcomes. Adoption is the number and representativeness of the settings and staff who are willing to initiate a program. Implementation refers to how closely staff members follow the program and the consistency of delivery. Maintenance is the extent to which a program is institutionalized or maintained over time (RE-AIM.org, n.d.). Forty-six studies on physical activity interventions published between 2000 and 2010 were analyzed. Eighteen percent had been tested in the community setting. Results of the analysis reveal that the majority of studies reported on reach; however, few reported on representativeness of the study population. Indicators of efficacy were reported and gave evidence that physical activities improve health outcomes; however, the number reporting behavioral outcomes such as falls efficacy were small. A minority reviewed mediating variables or based interventions on theories of behavior change. Measures of intervention attendance, completion, and attrition were reported and help to evaluate

the program implementation and maintenance. Few studies reported specific descriptions of program content. Based on the intervention information provided, it would be difficult to replicate interventions in practice. This criticism supports previous identified barriers to translation (Shubert et al., 2011). Additional detail to these implementation components as well as to fidelity would help the adaptation of these interventions in practice.

Shubert et al. (2011) used the RE-AIM framework to evaluate translation of a research based intervention into a community based program. The Stay Safe, Stay Active program was chosen because participants in a 37 week intervention demonstrated 40% reduction in falls compared to age matched controls, it is included in the CDC Compendium (2009) as a model program, it was designed for and tested on a similar population, and it does not require a licensed professional to deliver. The 12 week balance training course reached the targeted audience, individuals with balance impairments. Participants demonstrated significant improvements in the five times sit-to-stand test, demonstrating effectiveness of the balance program. By the time the funding period was over, the program had been adopted into the partner senior center's regular programing. Manuals and protocols were created with input from the center staff, helping to facilitate implementation of the program. By supporting center staff and providing a physical therapist for risk screenings, the center was able to maintain the program (Shubert et al., 2011).

Tai Chi, an alternative exercise that emphasizes weight shifting, postural alignment, and coordinated movement with synchronized breathing; has been shown to improve balance, strength, and flexibility; increase falls self-efficacy; reduce fear of falling; reduce blood pressure; reduce anxiety and depression; and reduce risk of falling (Li et al., 2005; Rogers, Larkey & Keller, 2009).   In order to translate, implement, and disseminate this evidence based fall prevention intervention, Li and colleagues (2005) developed a program package called Tai Ji

Quan: Moving for Better Balance and employed RE-AIM as a framework to implement and evaluate the program in local communities (Li, Glasgow et al., 2008). In the development phase, program materials were evaluated by older adults to make sure content was appropriate and attractive. A feasibility study indicated interest and support from older adults and providers. A two-week pilot program evidenced good attendance, high participant satisfaction, and interest in continuing the program (Li et al., 2008). After the program was delivered to older adults in senior centers in selected counties in Oregon for 48 weeks, outcome measures were evaluated in accordance with components of RE-AIM framework. There was a 45% reach of participants who usually attend activities at the centers. There was 100% rate of adoption by the centers. Participants showed significant pretest to posttest improvement in functional reach, get up and go, and 50 feet power walk. At 12 weeks follow up, two participants reported a single fall each and 92% of the participants continued the program. Another implementation study was conducted to investigate the potential of integrating the program through outpatient clinics in Lane County, Oregon (Li et al., 2013). Of the 252 primary care providers, medical specialists, and nurse practitioners invited to participate, 157 made referrals (62% adoption) of older adults at risk of falling to the Tai Ji Quan-based program. Sixty-seven percent of the patients referred (reach) enrolled in the program. Seventy-five percent completed the program (retention). Participants reported a reduction in falls and improvement from baseline in balance, gait, physical performance, and self-efficacy. In the exit survey, providers indicated that they intended to continue referring patients. The dissemination knowledge gained is that frequent communication with providers about the availability of evidence based programs and offering educational outreach workshops and even providing training in Tai Ji Quan helped to facilitate the referral process.

Diffusion of Innovations theory helps to explain how new ideas, products, or programs spread. Diffusion expands the number of people who are exposed to or reached by successful interventions (Rimer & Glanz, 2005). According to E.M. Rogers, originator of the theory, key attributes determine how quickly and to what extent innovation will be adopted and diffused (Rimer & Glanz, 2005). These attributes include:

- Relative advantage means that innovations that have a clear advantage over what they replace in effectiveness are more easily adopted and implemented. If potential users see no relative advantage in the innovation, they will not consider it. Relative advantage is therefore the *sine qua non* for adoption, but is not enough to guarantee widespread adoption (Greenhalgh et al., 2004).

- Compatibility means that innovations that are compatible with the intended adopter's values, norms, and perceived needs, such as preventing falls in older adults, are more readily adopted (Greenhalgh et al., 2004). This points to the importance of including the target audience when planning fall prevention interventions.

- Reinvention means if adopters can refine or adapt the innovation to suit their own needs, it will be adapted more easily (Edwards, 2011; Greenhalgh et al., 2004).

- Complexity means that innovations that are perceived as simple to use are more easily adopted (Greenhalgh et al., 2004). Perceived complexity can be reduced by practical experience and hands-on demonstration, written instructions, and videotapes.

According to Greenhalgh et al. (2004), influences that help spread the innovation lie on a continuum between pure diffusion and active dissemination and include *champions*. The adoption of fall prevention strategies by clinicians is more likely if key individuals, such as colleagues or professional organizations, support the innovation. An element of system

readiness to assimilate a particular innovation is *dedicated resources*. If a fall prevention program starts out with an adequate allocation of resources such as time and money, it is more likely to be assimilated.

In 1990, the National Institutes on Aging funded the Connecticut Collaboration for Fall Prevention (CCFP). The goal of the program was to develop a model for embedding fall prevention into the usual care and daily practice of older adults, physician practices, hospitals, home health agencies, senior centers, and other settings caring for older adults. Between 2001 and 2004, fall risk assessment and management practices for older patients were implemented in Medicare-certified home health agencies in southern New England. Results from the evaluation suggest that after receiving comprehensive training from experienced clinicians using theoretically grounded teaching principles, most clinicians can and do implement evidence based fall prevention during home visits. The experience of the CCFP team was that home health agencies with 100% implementation of recommended practices shared the feature of support by top administrators and clinical leaders, supporting the construct of innovation dissemination where champions are key to the successful spread of innovations (Fortinsky et al., 2008).

Miake-Lye et al. (2011) evaluated a fall prevention program initiated at a Veteran's Affairs facility. The intervention consisted of a nurse advice telephone line to identify at risk patients and triage them to services. Although patients and employees expressed support for the program and medical record review showed that usual care was enhanced with respect to home safety, the program was discontinued after 18 months due to staffing limitations, waning leadership support and competing priorities. This study confirms that front level staff commitment, high level leadership involvement, and adequate resources are necessary for success.

Guse et al. (2015) conducted an RCT to examine the best way to translate evidence based fall prevention into community practice in health departments or aging agencies in Wisconsin. Ten control communities received no special resources or guidance on fall prevention. Five standard support communities received modest funding to implement the Stepping On fall prevention program. Five enhanced support communities received funding and technical support. The primary outcome was hospital inpatient and emergency department discharges for falls. Compared with the control communities, standard and enhanced support communities showed significantly higher community wide reductions (9% and 8%, respectively) in fall injuries from baseline. These results support the hypothesis that population based programs can prevent fall related injuries. It is difficult, however, to attribute the findings entirely to the technical support provided by Stepping On. Physicians, pharmacists, physical therapists, and low vision specialists in the control communities were also invited to attend workshops and receive information about fall prevention and may have changed behaviors without further intervention.

Laing, Silver, York, and Phelan (2011) surveyed senior center employees and older adults on fall prevention knowledge, practices, and attitudes. The objective was to use findings from surveys to develop and enhance programs and build partnerships at the community level. Thirty-eight percent of the employees felt very knowledgeable about falls prevention. Fifty-eight percent felt somewhat knowledgeable. Thirty-eight percent offered strength and balance and falls prevention education on a regular basis. Fifty-nine percent of the older adults perceived strength and balance training as important and 54% participated in the practice, indicating that for fall prevention practices perceived to be important by older adults, ready availability of those practices may increase participation. Thirty-five percent of the older adults preferred to receive

fall prevention information from health professionals, a finding that supports the important role of health professionals in fall prevention.

Most falls prevention programs reported in the literature have been tailored to urban areas. In almost three decades of research on falls prevention, there has been little focus on rural and frontier areas in the United States (Radebaugh et al., 2011) although risks may actually be higher due to limited access to healthcare providers and resources. To increase compatibility, researchers employed a community-based participatory research approach to develop a fall prevention toolkit to be used by residents of a rural area. The Falling LinKS Toolkit consists of four fall risk reduction content sections: (a) self-directed physical activity, (b) self-medication review, (c) a visual functioning questionnaire, and (d) a home safety checklist (Radebaugh et al., 2011). Next, researchers plan to evaluate older adult's perceptions and interactions with the Toolkit regarding readability, usability, level of satisfaction, and likelihood of implementation through a pre and post intervention assessment of knowledge. Ultimately, it will be tested for its ability to reduce fall risk.

Schrodt et al. (2013) evaluated whether community providers (people without formal medical training who work with older adults in senior centers or aging service) in primary care shortage areas could be trained to perform fall risk screenings. Twenty-one providers completed training using the North Carolina Falls Prevention Coalition Fall Risk Screening Algorithm (2010) in a three hour training workshop. They completed a skills assessment by screening a simulated case role played by a researcher. Knowledge and confidence surveys demonstrated significant improvements before and after the training. One hundred and sixty one older adults from a broad geographic area were screened. Training community providers provides a relative advantage of being able to reach older persons in rural or frontier areas. The authors of this

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study point out that the familiarity and comfort older adults have with community providers may actually increase screening events and adoption of recommendations (Schrodt et al., 2013).

A Matter of Balance/Volunteer Lay Model (AMOB/VLL) is a program adapted from an evidence based fear of falling program based on social-cognitive learning (Smith, Jiang, & Ory, 2012). It targets falls-related risk factors by addressing attitudes and behaviors that predispose older adults to falls. The goal is to increase falls efficacy while simultaneously increasing physical activity to counter balance and gait defects (Smith, Hochhalter, Cheng, Wang, & Ory, 2011). The program includes eight two hour classes held over four or 8 weeks conducted by trained lay persons and a training and certification process to help ensure program fidelity. The Texas Falls Prevention Coalition disseminated AMOB/VLL throughout the state through the Area Agencies on Aging. In a study evaluating the effectiveness of the program, it was found that falls efficacy increased as a result of AMOB/VLL and maintained for at least six months (Smith, Jiang, & Ory, 2012). To examine translational research questions about the state-wide roll out of the program, Smith, Ory, Belza, and Altpeter (2012) identified sociodemographics of older adults enrolled in AMOB/VLL, and describe characteristics associated with program adherence. For purposes of the study, an adequate dose (five to seven sessions) was distinguished from a complete dose (eight sessions). Those attending one to four sessions served as the referent group. Patterns of intervention dose significantly differed between Hispanic and non-Hispanic White participants. Fewer Hispanics received the complete dose. Those participants with less education and living in rural areas were more likely to receive the adequate dose. Senior service agencies offered the most programs, but other types of delivery sites such as community centers or faith based organizations were associated with higher attendance. Another study (Smith et al., 2012) looked at programmatic influences on session attendance and

outcomes. Significant improvements in falls efficacy scale scores were observed for all class sizes. Smaller class sizes was associated with higher class attendance. Perfect class attendance was associated with greater improvements in falls efficacy and less activity limitation, suggesting the importance of implementing evidence based retention strategies such as reminders and buddy-systems. However, the overall improvements in outcomes reported, including those for participants receiving less than a complete dose, indicate that perfect attendance is not required to obtain substantial improvement in outcomes. It is possible that reinvention can provide relative advantage when the program is adapted to suit target audiences in alternative settings with fewer classes.

Steady As You Go (SAYGO) is a peer-led fall prevention exercise program that was adopted from the home based Otago Exercise Program. It is implemented in a community setting on a weekly basis for ten weeks, taught by a trained instructor. After the initial ten weeks, a peer leader is identified from the group and asked to continue to lead the classes. Peer leaders are then trained in a two day "Train the Trainer" class conducted by the Physiotherapy School at the University of Otago. Evaluation of the SAYGO program reported a 27% decrease in falls in the peer led group. Wurzer, Water, Hale, and de la Barra (2014) investigated the impact of participation in SAYGO on the rate of falls, class attendance, and long-term participation. The main finding from this 12 month prospective study was that long term participation resulted in a lower fall incidence in comparison with shorter term participation. Adults seem to adhere to this model, given the mean attendance rate of 69%. The mean length of participation was 4.3 years. This is an important finding because the higher attendance and longer participation was predictive of lower fall incidence and likely resulted from the social support provided in the group setting.

Williams and Ullmann (2012) report on the development of the Stay in Balance (SIB) program in Columbia, South Carolina. The eight year process included development of objectives, development of content and review by an expert panel, a RCT in a laboratory setting, a pilot program in a community setting, a community based RCT of program content, and pilot programs at two community sites. The program addressed fall risk factors of balance, mobility, strength, aerobic capacity, and cognitive executive function. Many lessons were learned, including the importance of training instructors to ensure confidence and competency in delivering program content and the importance of professionally prepared materials to ensure quality and consistency of the program. Target age should be considered in program development, as different age groups realize different benefits in terms of modification of fall risk factors. Obtaining consumer input into guideline development helps ensure that the guideline recommendations are compatible with clinical and behavior change realities for older adults.

Zachary et al. (2012) conducted telephone interviews with 500 senior centers nationwide to examine the prevalence of senior centers providing multi-component falls prevention education and the perceived barriers in implementing prevention programs. The Theory of Organizational Change and Theory of Diffusion of Innovations informed interview instrument development to determine organizational level factors that may act as barriers to a center's ability to adopt multi-component falls prevention education and program specific factors that may influence a senior center's choice to adopt falls prevention education. Seventy percent of senior centers offered balance class, 68% offered medication management, and 53% provided home safety information. Thirty-two percent offered all three components. Lack of staff, lack of

time, and staff not feeling they had sufficient knowledge to deliver falls prevention education were the leading barriers to providing multi-component programs.

Jones, Ghosh, Horn, Smith, and Vogt (2011) surveyed primary care physicians to examine fall prevention practices in Colorado. A 67.6% response rate was obtained from a random sample of 100 providers. Eight percent of the respondents stated they based their fall prevention practices on clinical guidelines. Barriers to using evidence based guidelines included lack of time, more pressing clinical issues, and lack of education materials. Physicians who did not accept Medicare payment were less likely to refer patients for home safety assessments than those who did. Fall prevention education materials were distributed to physicians who participated in the survey in an attempt to address the lack of education materials barrier. Time constraints and prioritization of clinical issues are more difficult barriers to overcome, however. Edwards (2011) points out that practitioners make pragmatic choices regarding the focus of clinical visits and this affects how they use guidelines and that fall prevention is unlikely to be a priority in the clinical encounter if it is not the presenting problem. If fall prevention recommendations with the strongest empirical base were inserted into other practice guidelines, such as congestive heart failure or rheumatoid arthritis, complexity would be reduced and adherence increased.

Milisen, Geeraerts, and Dejaeger (2009) evaluated the feasibility of integrating a fall prevention guideline into the daily practice of four healthcare disciplines: general practitioners, nurses, occupational therapists, and physiotherapists. Ninety-nine participants implemented the risk assessment and interventions recommended by the guideline for six months. At the end of six months, they completed a semi-structured questionnaire regarding the feasibility of using the guideline in daily practice. The average time spent implementing the guideline was 32 minutes

plus or minus 14 minutes. One hundred percent of the participants considered their profession to be responsible for the risk assessment. The nurses felt that nurses are responsible for assessing mobility impairment, postural hypotension, and vision, and 87.5% considered that they could feasibly assess whether medication contributed to a patient's risk for falling. Half of the nurses doubted the successful integration of the entire guideline, mainly due to time constraints. In an earlier study, Milisen et al. (2006) evaluated a nurse led multifactorial intervention for risk screening and assessment of fall problems among community dwelling older persons. The evaluation of risk factors took an average of 13 minutes. There are two important implications from these studies: (a) nurses are critical, yet their critical role is often hindered by competing demands and heavy workloads (Milisen et al., 2006), and (b) integration and implementation of fall risk assessment and interventions require specific task allocation, coordination, and communication between disciplines.

In one of the earliest studies to evaluate the impact of a behavioral change effort on fall prevention practices of physical therapists, training manuals with instructions for implementing assessment and intervention, a risk factor checklist, a website from which all components could be downloaded, and outreach visits from administrators of the Connecticut Collaboration for Fall Prevention (CCFP) program were provided (Brown, Gottschalk, and VanNess, 2005). Outcome measures were self-reported use of fall prevention strategies. The post CCFP knowledge of risk factors for falls was significantly and independently associated with an increase in self-reported use of fall prevention practices. The researchers posit that knowledge alone did not result in the professional behavior change, but that the provision of training materials and the hands on approach that addressed barriers and allowed time for problem solving facilitated integration of fall prevention strategies into the physical therapists' usual routine.

Tinetti et al. (2008) compared rates of injuries from falls in a region of Connecticut where clinicians had exposure to the CCFP program and a usual care region. The intervention consisted of media attention, seminars, websites, posters, educational materials for patients, and enlistment of opinion leaders. There was an 11% relative reduction in the utilization of fall related medical services in the intervention group compared with the usual care group, translating to 1800 fewer emergency department visits or hospital admission and a cost savings of $21 million based on a cost of $12,000 per episode. The authors conclude that the dissemination of evidence to clinicians about fall prevention when coupled with practice-change interventions such as enlistment of opinion leaders and demonstrations of how to incorporate fall prevention into practice may result in a reduction in fall related injuries in older adults (Tinetti, et al., 2008). In summary, translation of evidence based practice has been slow, but is effective when supported by organizational factors such as leadership, communication, coordination, and provision of resources.

Effective Teaching/Learning Strategies to Increase Provider's Knowledge, Attitudes, and Skills of Fall Risk Assessment and Prevention

It has been demonstrated that falls are reduced when clinicians are trained to assess risk and apply evidence based prevention strategies (Goodwin et al., 2011). Scott, Gallager, Higginson, Metcalfe, and Rajabali (2011) evaluated the Canadian Falls Prevention Curriculum, an evidence based education program for health care professionals and community leaders. The original version of the curriculum was offered as a two-day workshop led by two to three facilitators. Feedback from an advisory committee identified a need for an online version that could reach those in geographically isolated areas and those unable to spend two days at a workshop. This led to the development of an *e*-learning version, offered as a distance education

course by the local university. Pre and posttests of learning showed significant increases in knowledge and follow up surveys showed a positive effect on practice across the five locations offering the program. There are evaluation components built in to the delivery of the *e*-learning modules, but results were not reported in this study. Results from the workshops confirm findings from other studies that dissemination of evidence to clinicians about fall prevention coupled with practice-change interventions result in the adoption of effective strategies to prevent falls.

Maloney et al. (2011) conducted an RCT to evaluate the effectiveness of web-based versus face-to-face delivery of education in fall prevention to health care professionals. Nurses, occupational therapists, and physical therapists were randomly assigned to receive training through a one day seminar or web-based program delivered over four weeks. Outcomes were measured using one through three of Kirkpatrick's hierarchy of levels of evaluation: evaluation of reaction, evaluation of learning, and evaluation of behavior. Results on all outcome measures were equivalent for both groups. The authors suggest that practical considerations should drive the delivery method and that web-based provision might be favored for the ability to overcome access issues for health professionals in remote areas.

Dauenhauer, Glose, and Watt (2015) describe the design, delivery, and outcomes from a multi-disciplinary course Fall Prevention and Older Adults for undergraduate and graduate nursing and social work students. Outcome measures were pre and post course falls knowledge of the students and falls efficacy of community dwelling older adults completing a Matter of Balance program delivered by these students. For older adult participants, results indicate improvements in falls efficacy, control, management, and overall mobility that parallels previous research on the Matter of Balance program. There were also improvements in student learning

outcomes. However, the number of students completing the course from 2011 to 2014, 16, was small and only three nursing students attended. The study provides pedagogical suggestions on design of a falls prevention course. The student learning outcomes and falls knowledge test, for example, helped to inform the design of this study.

Demons et al. (2014) report on a falls prevention training program developed for medical students in partnership with Meals on Wheels. Previously published models for teaching falls risk assessment to medical students were limited by minimal hands on experience, lack of availability to all students, and inefficient utilization of faculty resources. In this model, third year medical students accompany a Meals on Wheels services associate to an older adult's home and perform a falls risk assessment including history of falls, fear of falling, medication review, visual acuity, the Get Up and Go test, a cognitive evaluation, and a home safety evaluation. Prior to the assessment, students completed an online GeriaSims interactive patient simulation *Functional Assessment of the Elderly Patient* (Jogerst, 2009) and read the AGS/BGS *Clinical Practice Guideline for Prevention of Falls in Older Persons (2010).* At the time of reporting, 110 students had completed the assessment and 63 had completed a one-year follow up survey. The percentage of students reporting moderate to very high confidence in performing falls risk assessments increased from 30.6% to 87.3%. Students also reported using most of the skills learned in their subsequent medical school clerkships.

In an effort to fill knowledge and practice gaps, researchers at the Centers for Disease Control and Prevention Injury Center reviewed literature and conducted interviews with providers (six geriatricians, six primary care physicians, four registered nurses, and two nurse practitioners) to determine current level of knowledge and practices related to fall prevention in older adults (Stevens & Phelan, 2013). Seventy-two percent of the providers recognized that

falls were a serious problem for older patients. However, many reported that they lacked information about evidence based fall prevention strategies. Ninety-four percent were not aware of the AGS/BGS clinical guidelines. Sixty-seven percent did not routinely ask about a patient's fall history unless the patient had visible signs of a recent fall or was obviously at high risk. Fall risk assessments were informal and usually prompted by a patient's recent fall. The biggest barrier identified was the limited time during an office visit. During the interviews, all said they would use simple, direct, concise, and easy to read materials designed for themselves and their patients. Stopping Elderly Accidents, Deaths, and Injuries (STEADI) materials were developed in response to suggestions from the providers and reviewed by six focus groups of providers from around the country. The resulting STEADI tool kit addresses identified knowledge gaps among primary health care providers and provides resources designed to help incorporate fall prevention into their clinical practice. Resources include:

- An algorithm to assess and treat or refer patients with various levels of fall risk,

- Fact sheets with statistics about falls, fall risk factors, and medications associated with falls,

- Three case studies to illustrate patients with low, medium, and high fall risk levels,

- The *Stay Independent Brochure* for patients, a validated self-risk assessment (Rubenstein et al., 2011),

- A home safety checklist,

- Instructions for measuring orthostatic blood pressure instructions,

- Written instructions and instructional videos for Timed Up and Go test, 4-Stage Balance Test, and 30 Second Chair Stand,

- A Webinar with continuing medical education credit offered,

- A one-page exercise handout for patients,

- Several educational brochures for patients.

- A website, http://www.cdc.gov/steadi/index.html, as a repository for all resources.

Acknowledging that fall prevention requires behavior change on the part of the patient and family, STEADI includes a component, *Talking About Fall Prevention With Your Patient*, designed to help providers discuss fall prevention by applying the Transtheoretical Stages of Change Model. The model, developed by Prochaska and DiClemente in 1992, evolved out of studies of the ways people quit smoking (Rimer & Glanz, 2005). The basic premise is that change is a process, not an event. As a person attempts to change behavior, he or she moves through five stages: Precontemplation, contemplation, preparation, action, and maintenance. People have different informational needs at each stage. The STEADI tool kit provides definitions of each stage and suggested interventions to address different patient informational needs corresponding to each stage.

Although STEADI was developed to be used in primary care settings, Stevens and Phelan (2013) note that several of the components may be applicable in other settings such as with older adults admitted and discharged from the emergency department with a fall related diagnosis and older adults being discharged from the acute care setting to the community or long term care setting. Limitations of STEADI include lack of field testing of the components in health care settings. The toolkit is currently being pilot tested in Colorado, Oregon, and New York. Providers will receive training and adoption and impact will be evaluated.

Next steps for implementation research includes the questions: "Who are the most effective providers to manage fall risk?" and "What attributes of a scope of practice strategically position a health care professional to effectively manage fall risk?" Given the multifactorial nature of falls, falls risk screening and management needs to be integrated into all systems of care (Shubert

et al., 2013). Providers across disciplines, including nurses, need to take an active role assessing older adults for risk of falling and providing ways to manage and limit the occurrence of falls (Dauenhauer, Glose, & Watt, 2015).

Fall prevention is health promotion, and nurses play a major role in health promotion and injury prevention (Cranwell-Bruce, 2008). Over the last few decades, nursing has been promoted as the most obvious health profession to provide health promotion (Whitehead, 2009). Simmons (as cited in Whitehead, 2009) stated that because of their professional focus on health and its' antecedents, attributes, and consequences; nurses are in a unique position to serve as leaders and role models in health promotion. In 1998, the United Kingdom Royal College of Nursing (as cited in Whitehead, 2009) stated:

> The nursing workforce remains very much a sleeping giant. Its huge size means that nurses have enormous potential as agents of social control in promoting health and well-being. It does not take too much to imagine what the impact might be if over half a million people [plus many more millions of nurses in the world] became empowered, assertive, and articulate agents of change for better health promotion.

The Royal College of Nursing Australia (as cited in Whitehead, 2009) added that nurses are well positioned for health promotion because of their education and access to the community. As the largest group of health professionals, they have a high degree of visibility and credibility within the community.

A major focus of health promotion is to minimize the loss of independence associated with functional decline and illness (AACN, 2010) related to aging. Nurses are beginning to experience the challenge of caring for an older adult population that is growing at a rapid rate. In 2010, 13% of the US population, about 40 million people, were over the age of 65. By the year 2030, it is projected that 20% of the population, 72 million people, will be over 65. The oldest-old, (those 85 and over) is projected to grow rapidly after 2030, when the "Baby Boomers" move

into this age group. The U.S. Census Bureau projects that the population age 85 and over could grow from 5.5 million in 2010 to 19 million by 2050 (Federal Interagency Forum on Aging-Related Statistics, 2012). Older adults form the core business of healthcare, representing 45% of hospital days in 2010, 82% of home health visits in 2011, and 85% of nursing home residents in 2012 (CDC, 2015). The eldercare workforce is dangerously understaffed and unprepared to care for this growing demand (Institute of Medicine, 2008). To address this problem, the Institute of Medicine (2008) recommends increasing the number of certified specialists. One of the *Healthy People 2020* objectives is to increase the proportion of registered nurses with geriatric certification by ten percent. National certification as a gerontological nurse is a way to enhance the knowledge of acute care nurses who care for older adults. However, currently only 1.4 percent of the nation's 2.2 million registered nurses are certified in gerontology (Healthy People, 2020). So, while the majority of nurses today are, by default, geriatric nurses, most have not had adequate preparation in caring for older adults. Unfortunately, the gap in expertise cannot be filled by advance practice nurses. Only a small number of nurse practitioners and even fewer clinical nurse specialists are certified as gerontological nurse practitioners or gerontological clinical specialists. Therefore, entry-level professional nurses are the workforce that will ensure that older adults receive optimum care (AACN, 2010).

 To help nurse educators incorporate geriatric-focused content and learning opportunities into the baccalaureate nursing curriculum, the Hartford Institute for Geriatric Nursing in collaboration with the American Association of Colleges of Nursing (AACN) defined 19 gerontological nursing competencies necessary to provide high quality care to older adults. The competencies are intended to guide curriculum development to ensure that undergraduate and graduate nurses will possess the knowledge and skills needed to care for this population. Several

of the competencies are directly related to fall prevention: (a) assessment of the living

environment as it relates to function and the physical needs of the older adult, (b) prevention of

risk and promotion of safety, and (c) the use of valid and reliable assessment tools to guide the

nursing practice of older adults (AACN, 2010).

As providers of direct health care services, nurse practitioners (NPs) are in a good

position to manage fall prevention. *The 2012 National Sample Survey of Nurse Practitioners*

reported that 48% of the nurse practitioner workforce is employed in primary care settings. Of

those NPs in primary care settings, 11% work in clinics with no physician onsite. In

collaboration the Hartford Institute for Geriatric Nursing and the National Organization of Nurse

Practitioner Faculties (NONPF), AACN facilitated the process to develop consensus-based

competencies for the Adult-Gerontology Primary Care Nurse Practitioner in an effort to

strengthen the capacity to provide effective, quality care to the rapidly increasing older

population. Within this role, the adult-gerontology primary care NP synthesizes theoretical,

scientific, and contemporary clinical knowledge for the assessment and management of both

health and illness states, employs evidence-based clinical practice guidelines for screening

activities, identifies health promotion needs, and provides anticipatory guidance and counseling

to address environmental, lifestyle, and developmental issues (AACN, 2011).

Undergraduate and graduate nursing students are familiar with programs to prevent falls

in acute care settings, as most clinical training for nursing takes place in acute care hospitals

where preventing falls has taken on a sense of urgency. Falls are the number one adverse event

in the hospital setting, with approximately three percent to 20% of inpatients falling at least once

during their hospitalization and the highest rate of falls occurring on the geriatric psychiatric

unit. Each year, somewhere between 700,000 and 1,000,000 people in the United States fall in

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the hospital (Ganz et al., 2013). Thirty to 51% of these falls result in some type of injury (Quigley & White, 2013). Adjusted to 2010 dollars, one fall without serious injury costs hospitals an additional $3,500, while patients with more than two falls without serious injury have increased costs of $16,500 and falls with serious injury result in additional costs of $27,000. Several regulatory agencies and professional associations have made fall prevention in acute care settings a priority. In 2008, CMS identified falls as a Hospital Acquired Condition and no longer covers the cost of care as a consequence of an inpatient fall based on the presumption that falls are preventable (Ganz et al., 2013, Hempel et al., 2013, as cited in Quigley & White, 2013). In addition, the Joint Commission requires accredited hospitals to conduct fall risk assessments for hospitalized patients to identify patients at risk for falls and implement preventive measures into the plan of care. The American Nurses Association (ANA) has asserted nurses' responsibility to assess patients' risk for falls and injury, design and implement risk reduction care plans, and evaluate effectiveness of clinical fall prevention programs (Quigley & White, 2013). Patient injury rate, most often caused by falls, is identified by the ANA as a nurse sensitive indicator, a measure of quality that links patient outcomes with availability and quality of professional nursing services. The ANA National Database of Nursing Quality Indicators® enables benchmarking of injury fall rates for participating acute care organizations. The National Quality Forum includes injury falls in their list of 28 *never events* that should never occur to a patient while being cared for in a healthcare facility and also provides benchmarking data.

Kim, Jeon, and Chon (2015) investigated nursing students' knowledge of falls, attitudes on falls, and awareness of in-patient fall risk factors. The correlation between knowledge and attitude of falls was significant. Higher scores on falls knowledge were related to better attitudes

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toward fall prevention and more falls preventive actions. Thus, the authors concluded, giving fall risk and fall prevention lessons to nursing students will help prevent falls.

In a recent publication of 22 safety practices on falls, the Agency for Healthcare Research and Quality (Ganz et al., 2013) notes that addressing multiple risk factors is more effective than an intervention that targets any single risk factor and created a fall prevention model with a systems approach to improving safety. Most hospital fall prevention programs are a combination of various components and care processes; such as risk assessment, visual alerts indicating risk, patient and family education, staff education, scheduled and supervised toileting, care rounds, bed-exit alarms, hip protectors, floor mats, medication management, and post-fall evaluations. (Quigley & White, 2013). Inpatient fall prevention, however, is an evolving science. A systematic review of 59 studies of fall prevention programs in U.S. acute care hospitals concluded that while many of these approaches are promising, only a few studies reported sufficient data to evaluate the effectiveness of their approach. Hempel et al. (2013) also point out that because hospital patients are acutely ill and average only 4.9 days in the hospital, results from fall prevention interventions in long-term care facilities may not apply to acute care settings and results from the international literature, where hospital stays are longer, may not generalize to U.S. hospitals. Similarly, results from fall prevention interventions in acute care settings may not generalize to the community setting. Although nursing students obtain experience in assessing patients for fall risk, planning care to prevent falls, and documenting fall precaution while in the acute care setting, preventing falls once patients are discharged to the community is not addressed. Focusing on preventing falls in community dwelling older adults is important from a systems perspective because efforts to prevent falls outside the hospital will help reduce the number of patients admitted to the hospital for fall related injuries.

In summary, the literature supports my belief that incorporating the skills required to assess and manage fall risk in community dwelling older adults into the education of undergraduate and advanced practice nurses would increase the presence of health promotion competencies and domains in nurses' practices and result in increased access of older adults to fall screenings and management.

Chapter 3

Method

The purpose of the study was to determine the influence of an online educational approach on pre-licensure and graduate nursing students' knowledge, skills, and self-efficacy in assessing and managing fall risk in community dwelling older adults. Research questions included: Does completion of an online falls prevention course increase the knowledge in fall risk assessment and management among undergraduate and graduate nursing students? Does completion of a falls prevention learning activity increase self-efficacy in fall risk assessment and management among undergraduate and graduate nursing students? What is the relationship between knowledge as measured by test scores and self-efficacy in falls risk assessment and management in the study group? What is the relationship between skills mastery and self-efficacy? and What are the perceptions of nursing students on the barriers and facilitators to integrating falls risk evaluation and management into practice?

Design

The study incorporated a mixed method design with a quasi-experimental approach using electronic tests and surveys administered to all subjects before and after implementation of the fall prevention education and a qualitative descriptive approach using in-depth interviews with a subset of subjects who have completed the education program and a falls risk assessment on a

patient. The qualitative and quantitative approaches were implemented as discrete components of the overall inquiry and remained discreet during data collection and analysis.

Institutional Review Board approval was obtained from the University of Arkansas (see Appendix E). Informed consent was obtained from all participants in the study. Study participants were provided with verbal and written information about the study, emphasizing voluntary participation and confidentiality. Steps were taken to safeguard the privacy of participants. All data was kept confidential. Names and other identifying information was redacted from recordings, surveys, and tests and transferred to a Microsoft Office Excel spread sheet located in a password protected computer in the researcher's office.

Study Sample

Subjects were senior nursing students enrolled in a Bachelor of Science in Nursing (BSN) program and graduate students enrolled in the Doctor of Nursing Practice (DNP) program. The nursing department, part of a public university located in the mid-southern U.S., has approximately 400 BSN students and 25 DNP students. The study included a convenience sample of students enrolled in six sections of a senior level clinical course and a graduate level health assessment course. For the quantitative analyses, I used G*Power to conduct an a priori power analysis to calculate sample size. For a power of .95 with an alpha of .05 and a large (.5) effect size, it was determined that a sample of 45 students is needed. To account for attrition, an additional 15% will be added, bringing total sample size needed to 52.

Purposeful sampling was used for the qualitative analyses. A subset of students were invited to participate in an interview about their experience in order to gain perspective on behavior change (incorporating falls risk assessment and management into practice) consequential to elements of the educational intervention. Patton (2002) makes a case for

purposeful sampling – selecting illuminative cases that offer insights into issues of central importance to the research questions. The logic and power of purposeful sampling lies in selecting information rich cases. A homogenous sample was chosen to provide in-depth information from nursing students of similar education and experiences about a specific issue, learning to conduct falls risk assessments in older adult. Charmaz (2014) points out that smaller sample sizes suffice when the sample is homogenous, the interview questions are semi-structured and standardized, and interviewing is not the only source of data.

The interview protocol was based on constructs of the SCT in order to identify underlying determinants that influence a change in behavior (see Appendix D). Data collection consisted of audio-recorded, semi-structured, face-to-face interviews conducted by the researcher. The interviews were transcribed by the researcher, and the interview transcripts provided the data for analysis.

The framework for developing trustworthiness of a qualitative inquiry developed by Lincoln and Guba (1985) was used to enhance the rigor of the study. The framework includes four criteria suggested for establishing trustworthiness: credibility or confidence in the truth of the findings, transferability or showing that the findings are applicable to other settings, dependability or showing that findings could be repeated consistently, and confirmability or the degree to which the findings are shaped by the respondents and not by researcher bias, motivation, or interest. To address these criteria, several quality enhancement strategies were employed. Method triangulation (interviews, tests, and surveys) ensured that the account was consistent and complete. All participants received a copy of their final transcript and were asked to review it for accuracy. This gave interview respondents opportunity to correct errors, challenge interpretations, and add to or confirm data. An audit trail of the raw data, interview

transcripts, data reduction and analysis, working hypotheses, methodological notes, and instrument development was maintained. Peer examination was provided by two colleagues with experience in both qualitative research, care of older adults, and nursing education.

Intervention

An on-line learning module was developed and made available to students via Blackboard Learn Learning Management System, a virtual learning environment and course management system developed by Blackboard, Inc. Learner outcomes for the module include:

1. Discuss significance of falls in older adults.

2. Identify risk factors (extrinsic and intrinsic) for falls in older community dwelling adults.

3. Conduct a fall focused assessment.

4. Develop a treatment plan that minimizes the risk of future falls and morbidity from falls.

Each student completed a pretest and researcher developed survey of self-efficacy in fall assessment and management as part of the required course assignments. A feature in Blackboard Learn, adaptive release, was activated so that the course content did not become available until the pretest and survey were completed. The course material was designed to facilitate the student learning outcomes and consisted of a researcher developed recorded lecture on the epidemiology of falls in community dwelling older adults, risk factors for falling, steps in completing a fall risk assessment, recommendations to prevent falls, and using the Health Belief Model and Transtheoretical Stages of Change Model in fall prevention education. The following resources from the STEADI program were also included: instructions on how to check for orthostatic hypotension, instructions and a video on how to perform the TUG, instructions and a video on how to perform the 4-Stage Balance test, instructions and a video on how to perform the 30 Second Chair Stand, an algorithm for screening and assessment, a home safety checklist,

an exercise handout for patients, and a case study. I chose to use the resources from the STEADI

toolkit because they are evidence based and they are simple to use. The National Council on

Aging Falls Free Initiative recommends using the STEADI toolkit resources in the recently

published National Falls Prevention Action Plan (Cameron et al., 2015).

A mixed educational method, including electronic delivery of lecture, case study,

simulation practice, and clinical exposure was used. After viewing the online lecture, all

students completed and submitted a case study.   The undergraduate students were all required to

practice the assessment in a laboratory setting. Competency with fall prevention skills was

assessed by the researcher using a competency checklist (see Appendix A). Students then

completed a falls risk assessment on an older adult in the hospital prior to discharge, on an older

adult in their home, or on an older adult residing in an assisted living facility. The graduate

students videotaped a falls risk assessment on an older adult of their choice and uploaded the

video to Blackboard Learn. The researcher used the competency checklist to assess their

competency while viewing the video. All students were then offered an opportunity to complete

a posttest and repeat the self-efficacy survey. The pre and posttest contained 10 questions based

on literature about falls prevention and material covered in the course content (see Appendix B).

Student self-efficacy was measured using a researcher developed instrument based on the

same falls risk assessment and management skill domains used in the knowledge tests (see

Appendix C). Bandura's (2006) guide for constructing self-efficacy scales was used to construct

the response scale. Students recorded the strength of their efficacy beliefs on a 100 point scale

ranging in 10 unit intervals from zero (cannot do) through intermediate degrees of assurance 50

(moderately can do) to complete assurance 100 (highly certain can do). Bandura (2006) asserts

that an efficacy scale with the 1-100 response format is a stronger predictor of performance than

one with a 5-interval scale. According to Bandura, people tend to avoid the extreme positions; so, a scale with only five steps loses differentiating information. Face validity was established through consultation with clinicians with geriatric experience. I pretested the items using a convenience sample of eight students with a plan to eliminate items that were ambiguous or rewrite them. None of the items required re-writing. To establish construct validity, responses to the post-survey were factor analyzed.

Data Analysis

Data were analyzed by descriptive statistics, Pearson correlation coefficients, *t*-tests, and multiple regression using IBM SPSS, version 21.0 (IBM, Armonk, NY, USA). Item and reliability analysis of the self-efficacy scale was performed. The performance of each item of the scale was evaluated by assessing the degree of inter-item correlation. A reliability analysis was then undertaken to calculate coefficient alpha, an estimate of the proportion of variance in the scale scores attributable to the true score. Factor analysis of the responses to the post-survey was performed. Individual item analyses were conducted on researcher created test questions. Difficulty levels or *p* levels, indicators of how difficult each item is, and a discrimination index, examining the discriminative ability of each item, were computed for each test question.

Bivariate inferential statistical analysis included paired-samples *t* tests to evaluate differences between pre- and posttest knowledge. A standardized effect size (Cohen's *d*) and 95% confidence intervals for the mean differences were calculated. Differences between pre- and post-self-efficacy scores were similarly analyzed. Correlation and multiple regression analyses were conducted to examine the relationship between gains in knowledge as measured by test scores and competency or skill mastery as measured by the competency checklist and gains in

self-efficacy as measured by the survey. Independent samples *t* tests to evaluate differences between undergraduate and graduate students on all measures were also obtained.

The qualitative analysis followed grounded theory methodology. This method, using "inductive data, invokes iterative strategies of going back and forth between data and analysis, using comparative methods, and keeps you interacting and involved with your data and emerging analysis" (Charmaz, 2014, p.1). Analysis was on-going with data collection followed by immersion in the data, reading and rereading the interview transcripts and making notes. Initial or potential codes that reflect meaning in the data were generated in a process referred to as open coding. Examples of codes used included "beliefs about nurses in practice", "there needs to be a policy", and "doing is better than seeing or reading." A process of axial coding followed, whereby codes were combined to see how they compared and overlapped. Codes with the greatest support from the data were focused on and further refined. A process that is core to the grounded theory method, "constant comparative analysis", comparing data to other data within a transcript and within other transcripts in the study, along with the researcher's own experiences (Glaser and Strauss, 1967) was used. Finally, codes were collapsed into categories that subsumed several codes and categories generated to address the research questions.

Chapter 4

Results

This chapter presents the results of the data analysis, including quantitative tests and findings from the interviews. Results of the validity and reliability analysis of the self-efficacy survey are presented. Results are then reported in five parts, representing the five research questions.

Data collection began on January 25, 2016. Posttests and surveys were open until February 22, 2016. Interviews were conducted between February 25 and March 7, 2016.

Fifty-two undergraduate students took the pretest and survey, completed a case study, practiced skills in a laboratory, and completed a falls risk assessment on an older adult. Forty-nine completed the posttest and survey, for a response rate of 94 percent. Twenty graduate students took the pretest and survey. Fourteen graduate students completed the assignment, case study, falls risk assessment, and posttest and survey for a response rate of seventy percent. The nine incomplete cases were removed from analysis, leaving a final sample of 63 students. Undergraduate students represent the highest proportion of respondents (78%). Graduate students represent 22 percent of respondents.

Recruitment for the qualitative portion of the study continued until saturation was reached as themes repeated, no new data were revealed, and clear patterns emerged from the data. Eight interviews were completed. Six of the participants were women and four had previous experience as nursing assistive personnel. Three participants completed the assessment on a patient in an acute care hospital prior to discharge to their home, three assessed a homebound patient receiving services from the Veterans Administration Home Based Primary Care Program, and two completed assessments on residents of an assisted living facility.

Analysis of scale development

Item statistics for the self-efficacy surveys are reported in Table 1. Sixty valid cases were included in the analysis. Three cases had missing values and were excluded. All items have good variability on the pre-survey, with means close to the center of the range of possible scores, 0 to 100. Mean scores increase and variability decreases on the post-survey and there is less discrimination among respondents.

Table 1
Item Statistics

Item	Definition	Pre-Survey		Post-Survey	
		Mean	Standard Deviation	Mean	Standard Deviation
1	Home safety assessment	63.83	21.91	90.90	15.30
2	Identify FRIDS	61.88	18.31	87.53	13.56
3	Triage based on algorithm	53.83	26.94	89.75	12.23
4	Identify risk factors	65.17	18.50	91.82	11.00
5	Select risk based interventions	67.25	20.22	89.98	13.00
6	Apply Stages of Change model	49.65	24.43	83.75	15.85
7	Conduct 4 stage balance test	39.08	29.90	97.83	5.16
8	Conduct 30 second chair stand	45.33	30.32	98.08	5.05
9	Assess orthostatic hypotension	78.08	19.16	98.17	5.12
10	Conduct timed up and go test	68.83	22.52	96.92	6.38

A correlation matrix of all items was used to assess degree of inter-item correlation. Inter-item correlations for the pre-survey are reported in Table 2. For items on the same subscale, inter-item correlations between .30 and .70 are recommended, with correlations lower than .30 suggesting little congruence with the underlying construct and ones higher than .70 suggesting redundancy (Polit and Beck, 2008). The lowest correlation, .330, was between items 6, apply Stages of Change model, and 2, identify FRIDS. Although these represent two distinctly different skills, congruence with the underlying construct, fall prevention, is supported by the literature. The correlation between item 7 and item 8 was high at .914. However, the two items, chair stand and 4 stage balance test, represent two distinctly different skills. Therefore, I decided to retain both items in the survey. The correlation between item 4, identifying risk factors, and item 5, selecting interventions based on risk factors, was .730. Again, the items measure two distinct skills, and I chose to retain them.

An internal consistency estimate of reliability (coefficient alpha) was computed for the self-efficacy scale. Alpha provides an estimate of the proportion of variance in the scale score

Table 2
Pre Self-Efficacy Survey Inter-item Correlations

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Item 1	1								
Item 2	.573	1							
Item 3	.415	.502	1						
Item 4	.737	.666	.456	1					
Item 5	.690	.648	.522	.730	1				
Item 6	.614	.330	.507	.458	.541	1			
Item 7	.561	.502	.675	.406	.580	.733	1		
Item 8	.530	.483	.652	.346	.483	.694	.914	1	
Item 9	.553	.615	.596	.506	.589	.487	.601	.620	1
Item 10	.717	.579	.448	.535	.621	.579	.560	.543	.567

attributable to the true score and is a key indicator of the scale's quality (Polit & Beck, 2008).

The coefficient alpha of .94 for the pre-survey and .92 for the post-survey indicate that the scale

scores are satisfactorily reliable for respondents like those in the study.

Item analyses were conducted on the ten items hypothesized to assess self-efficacy with

falls risk assessment. Generally, when item scores do not correlate well with scale scores, the

item is probably measuring something else and will lower the reliability of the scale (Polit &

Beck, 2008). The corrected approach, which removes the individual item from the calculation of

the total score, was used because inclusion of the item on the scale inflates the correlation

coefficients. Each of the ten items was correlated with the total score for self-efficacy (with the

item removed). All the correlations are higher than .50, which indicates that they correlate with

Table 3

The Corrected Item-Total Correlations for the Self-Efficacy Items

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	.745	.935
2	.699	.936
3	.692	.937
4	.670	.937
5	.787	.935
6	.641	.938
7	.747	.937
8	.685	.939
9	.734	.936
10	.739	.936

the overall score from the scale. Corrected item-total correlations are reported in Table 3. According to these results, none of the items would substantially affect reliability if they were deleted.

To determine construct validity, dimensionality of the 10 items from the self-efficacy measure was analyzed using maximum likelihood factor analysis. Three criteria were used to determine the number of factors to rotate: the a priori hypothesis that the scale was unidimensional, the scree plot, and the results of the factor solution (Green and Salkind, 2011). Based on the factor solution, 66% of the variance was explained with factor one. Based on the scree plot, two factors were rotated using Varimax rotation procedure. The rotated solution resulted in two interpretable factors, theory-based and skill-based. Items one through six loaded on the theory-based factor, accounting for 40% of the item variance, and items seven through ten loaded on the skill-based factor, accounting for 33% of the item variance, providing evidence that the scale items measure the construct.

Item analysis on the tests measuring knowledge were also performed and reported in

Table 4. The *p* level or difficulty level is an indicator of how difficult each item is. The

Table 4
Test Item Analysis

Test Question		Pretest		Posttest	
		Difficulty	Discrimination	Difficulty	Discrimination
1	Using algorithm	15.39	.01	48.98	.50
2	Incidence of falls	55.77	.17	83.68	.47
3	Interventions	78.85	.22	85.72	.42
4	Stages of Change	78.85	.22	83.68	.23
5	4 stage balance	50.00	.24	97.96	.20
6	Identifying FRIDS	15.39	.32	34.70	.52
7	Orthostatic B/P	88.47	.39	87.76	.36
8	TUG test	69.24	.41	93.88	.22
9	Risk factors	50.00	.57	73.47	.60
10	Chair stand test	46.16	.63	93.88	.16

discrimination index examines the discriminative ability of each item. Table 4 reports the

difficulty level and discrimination index for each item on the pre and posttests taken by the

undergraduate students.

Statistical and Numerical Changes in Knowledge

The first research question asked: does completion of an online fall prevention course

increase the knowledge in falls risk assessment and management among graduate and

undergraduate students? A paired samples *t* test was conducted to evaluate the difference

between test scores on the pretest and the posttest.

The paired samples *t* test is based on the assumption that difference scores are normally

distributed in the population. To test this assumption, Shapiro-Wilk statistics were obtained. This

statistic tests the null hypothesis that the data are normally distributed. It is recommended that

the null hypothesis of normality be rejected when *p* values are less than .05. For the difference in

knowledge scores, the Shapiro-Wilk statistic is 0.959, *p* = .36. The skewness value for change in

knowledge scores is 0.006, indicating only slight negative skewness. For the difference in self-efficacy scores, the Shapiro-Wilk statistic is 0.972, $p = .166$. The skewness value for change in self-efficacy is -0.149, indicating that the distribution is negatively skewed. The null hypothesis should therefore be accepted for knowledge difference scores and for self-efficacy difference scores. Because the population distribution is normally distributed and is not heavily skewed, I assumed that valid p values could be obtained by using the moderate sample size of 60 pairs of scores.

The results of the paired samples t test indicate that the mean score for the posttest (M=78.89, SD = 13.21) is significantly greater than the mean score on the pretest (M= 56.19, SD = 14.19), t (62) = 10.56, p<.001. The standardized effect size index, Cohen's d, is 1.33, indicating a large effect size. The 95% confidence interval for the mean difference between the two test scores is 18.40 to 26.96.

The pre- and posttest contained questions testing student understanding of fall prevention skills. Students demonstrated large increases in their knowledge of performing the chair stand test, the TUG test, the four stage balance test, use of the algorithm, and incidence of falling in the community. There were smaller gains in identifying FRIDs, interventions to prevent falls, and applying the Stage of Change Model. Table 5 reports knowledge results before and after training.

Statistical and Numerical Changes in Self-Efficacy

The second research question asked: does completion of an online fall prevention course increase student's self-efficacy in falls risk assessment and management? A second paired samples t test was conducted to evaluate the difference between scores on the self-efficacy scale taken before and after the learning activities. The results indicate that the mean score for the post-survey ($M = 92.47$, $SD = 8.34$) was significantly greater than the mean score on the

Table 5
Knowledge gain results

Item	Topic	Undergraduate Students			Graduate Students		
		Pretest Score (n=52)	Post-test Score (n=49)	Change in score	Pretest Score (n=22)	Post-test Score (n=17)	Change in score
1	Algorithm	15	50	+35	13	53	+40
2	Incidence	58	84	+26	68	88	+20
3	Interventions	79	86	+7	59	65	+6
4	Stages of Change	79	84	+5	86	88	+2
5	4 Stage Balance	50	98	+48	55	100	+45
6	FRIDs	15	35	+20	22	24	+2
7	Orthostatic b/p	88	88	0	77	94	+17
8	TUG	69	94	+25	64	100	+36
9	Risk factors	50	74	+24	55	59	+4
10	Chair stand	46	93	+47	68	100	+32

pre-survey ($M = 59.28$, $SD = 18.29$), $t(59) = 17.06$, $p<0.001$. The standardized effect size, d, was 2.20, indicating a large effect size. The 95% confidence interval for the mean difference between the two survey scores was 29.30 to 37.09. Table 6 reports paired samples tests of student reports of self-efficacy with fall prevention skills before and after training.

Table 6
Paired Samples Tests of Student Reports of Self-Confidence with Fall Prevention Skills

Pair	Description	Difference in mean scores	t	df	Cohen's d
1	Home safety assessment	27.65	10.18**	61	1.29
2	Identify FRIDS	25.86	12.20**	62	1.53
3	Triage based on algorithm	36.19	11.48**	62	1.45
4	Identify risk factors	27.20	12.42**	60	1.60
5	Select risk based interventions	23.00	10.77**	62	1.35
6	Apply Stages of Change model	34.53	11.86**	61	1.50
7	Conduct 4 stage balance test	59.29	16.10**	62	2.03
8	Conduct 30 second chair stand	52.14	14.03**	62	1.76
9	Assess orthostatic hypotension	19.92	8.91**	62	1.12
10	Conduct timed up and go test	27.46	11.14**	62	1.40

** $p <.001$

Relationships between Changes in Knowledge, Competency, and Changes in Self-Efficacy

      Research question three asked: What is the relationship between knowledge and self-efficacy? The fourth research question asked: What is the relationship between skill mastery and self-efficacy? A Pearson product-moment correlation explored the relationship between competency scores, change in knowledge scores, and change in self-efficacy scores. One of the assumptions underlying the significance test associated with Pearson correlation coefficient is that the variables are bivariately normally distributed. This assumption was previously tested for the change in knowledge scores and change in self-efficacy scores and the scores were found to be normally distributed in the population.

      Skill mastery was measured using a competency checklist with a maximum score of 27. As expected, the competency scores were negatively skewed. The mean score was 22.19 with a standard deviation of 3.91. The Shapiro-Wilk statistic was 0.835, $p < .001$. The skewness value for competency scores was -1.482. Figure 3 shows the distribution of competency scores. I transformed the scores logarithmically to make them more symmetric. The skewness value after
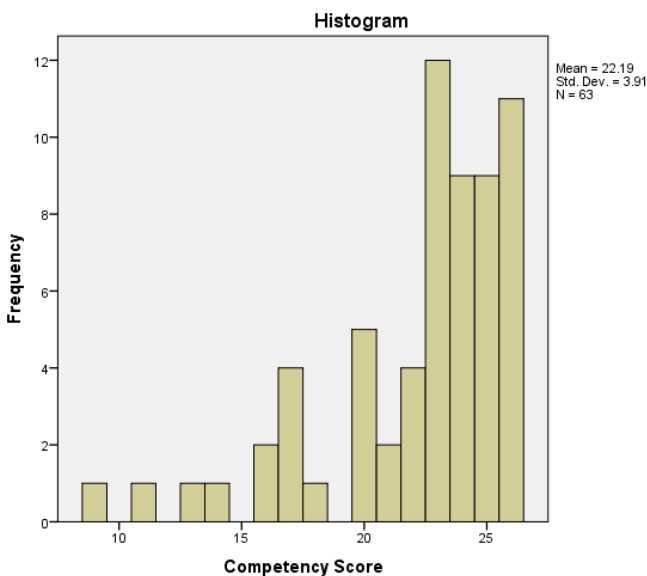

Figure 3. Distribution of competency scores.

transformation was significantly less, -0.032. However, no substantive difference in results was found between logarithmically transformed and raw data; therefore, the results using the raw data are reported.

The results of the correlational analyses, as presented in Table 7, show that gains in knowledge and gains in self-efficacy were significantly correlated with $r = .252$, $p = .026$. However, using the Bonferroni approach to control for Type 1 error across the three correlations, a p value of less than .016 (.05/3) was required for significance.

A multiple regression analysis was conducted to evaluate how well the increase in knowledge and competency scores predicted self-efficacy in falls risk assessment and management. Table 8 summarizes the descriptive statistics and analysis results. The multiple regression model with both predictors produced $R^2 = .06$, $F (2, 57) = 1.943$, $p = .153$. Six percent of the variability of gains in self-efficacy is accounted for by the two predictors. As can be seen in Table 8, gains in knowledge as measured by pretest and posttest scores had higher

Table 7
Correlations among gains in knowledge, competency scores, and gains in self-efficacy

	Competency	Self-Efficacy gains
Self-Efficacy gains	-.050	
Knowledge gains	-.216	.252*

*p< .05

regression weights, indicating students with higher knowledge gains were expected to have higher gains in self-efficacy scores, after controlling for competency scores. However, results are not statistically significant.

To make sure assumptions for regression had not been violated, I tested for homogeneity

of variances and normality of residuals. Homogeneity of variances means that the error

variances are equal across all levels of X. I checked homogeneity of error variances by

Table 8
Summary Statistics, Correlations, and Results from the Regression Analysis

Variable	Mean	Standard deviation	Correlation with self-efficacy gains	Multiple regression weights		Confidence Intervals	
				B	β	Lower	Upper
Self-efficacy gain	33.19	15.07					
Competency	22.22	3.95	-.053	.036	.009	-.974	1.046
Knowledge gain	22.33	17.41	.252	.221	.255	-.009	.450

*p <.05 ** p <.01 *** p <.001

examining the error plot displayed in Figure 4. The similar spread of points at each place along

the horizontal axis is an indication of homogeneity. To check the assumption of normality of
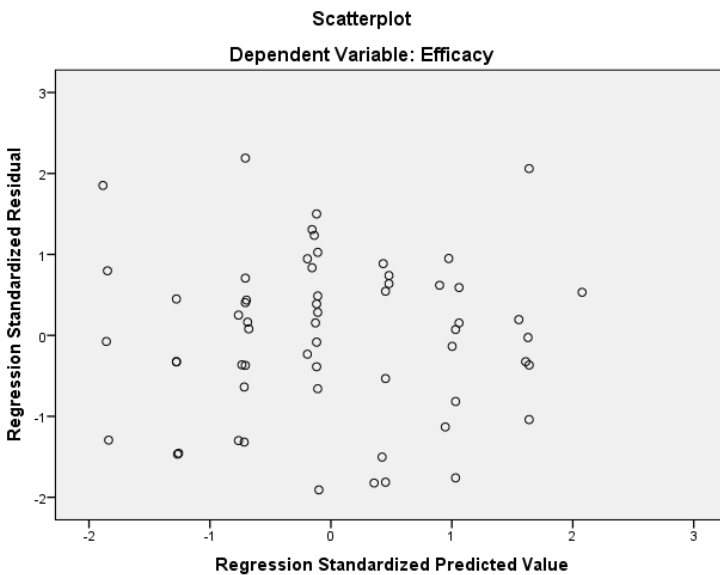
Figure 4. Scatterplot depicting the relationship between standardized predicted and residual self-efficacy scores.

residuals, I examined the histogram of the residuals displayed in Figure 5.   This one looks fairly

normally distributed.
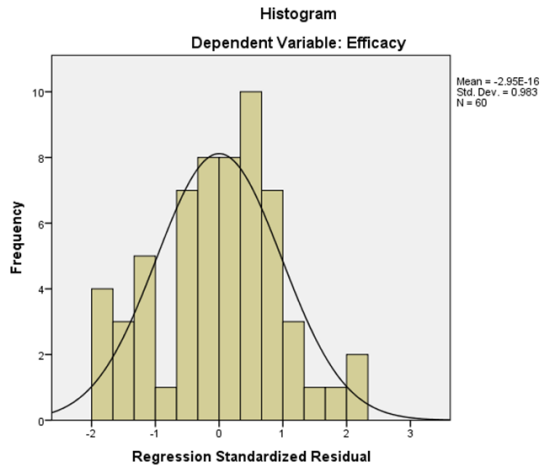
Figure 5. Histogram of residuals.

Independent samples *t* tests were conducted to evaluate the differences between

undergraduate and graduate students on knowledge, self-reported self-efficacy, and competency

scores. I decided to perform this test because the educational intervention for the two groups

varied. The undergraduate students were given an opportunity to practice the falls assessment

Table 9
Independent Samples Test

	Mean		**Standard Deviation**		*t*	*df*	**Mean difference**
	U	G	U	G			
Pretest	55.10	60.00	13.71	15.69	1.14	61	4.90
Posttest	77.96	82.14	13.91	9.75	1.05	61	4.18
Pre-survey	55.95	71.04	15.35	21.84	2.94**	61	15.09
Post-survey	92.35	92.86	6.87	12.31	.199	58	.51
Competency score	22.41	21.43	3.14	5.97	-.825	61	.980

 U = undergraduate G = graduate
*p <.05 ** p<.01

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face to face and obtain feedback from the researcher prior to completing a falls assessment on an older adult. Results, reported in Table 9, indicate that the two groups differed significantly from each other only on the pre-survey t (61) = 2.94, p = .005. The mean score of the graduate students on the pre-survey (71.04) was significantly greater than the mean score of the undergraduate students (55.95). The strength of the relationship between education program and scores on the pre-survey, as assessed by η^2, was moderate, with the program factor accounting for 12 percent of the variance of the dependent variable.

Perceptions of Nursing Students on the Barriers and Facilitators to Integrating Fall Risk Evaluation and Management into Practice

A qualitative approach was used to investigate the perceptions of nursing students on the barriers and facilitators to integrating falls risk evaluation and management into practice. Interview transcripts provided the data for analysis. The student participants all described how they assessed older adults and identified risks for falling, their perceptions of barriers to integrating fall prevention into nursing practice, and their perceptions of what would facilitate fall prevention practices. They also described how they gained self-efficacy in falls risk evaluation and management. The result is a description of their perceptions of the importance of fall prevention in older adults, the challenges of integrating it in to a busy nurse practice, and effective strategies for learning fall prevention assessment and management. The main category of barriers included two themes: (a) nurses are too busy to perform falls assessments, and (b) the older adult could be barrier. The main category of benefits or facilitators included three themes: (a) student beliefs about what it would take to get nurses to do it, focusing on staff knowledge and attitudes (b) student's beliefs about the susceptibility, severity and benefits for older adults, and (c) focus on system issues, such as the need for a policy. Two major themes were identified for increasing self-efficacy: (a) progressive mastery, and (b) observational learning and

reinforcement. Following is a detailed description of each theme with supporting data. Table 10

provides a summary categorizing the responses made by participants.

Barriers.

Nurses are too busy to perform falls risk assessments.

Many participants in the study articulated their perception that practicing nurses in the

acute care setting are too busy to assess patients for falls risk and provide management. Most of

their statements about this barrier reflected the view of one respondent who stated "But you have

five or six patients …you're getting two discharges but you're also getting two admits in their

place, it would be really hard to do those fall risk assessments." Another participant described

how the assessment might take longer if the older adult was weak:

> The longest part was the orthostatic blood pressure readings how you have to wait
> 5 minutes before you can take it lying down and then standing up both times and
> waiting amount of period between that time. My lady was very agile and didn't
> have to rest between doing the different movements, I would think if you had a
> patient who was a little bit weaker or more at risk for falls, it might take a little
> longer just to get through the different tests.

One respondent talked about how a student has more time to spend with the patient, "The

orthostatic hypotension test you have to do in increments and they have to be standing and

sitting, so I guess time. But, since we were the students, we were able to take extra time."

Another participant suggested that it would be more feasible to have a designated employee go

through the hospital and assess fall risks on all patients scheduled for discharge. The same

participant felt that she would be more likely to do parts of the assessment, such as medication

review or one or two of the strength and balance tests, than to complete a full assessment. Only

one of the three students who did the falls risk assessment in the home, did not identify time as a

barrier. This participant commented that because the nurse was already there in the home and

knew the patient and their risks for falling, including their medications, performing the strength and balance tests should only take a few extra minutes.

The older adult could be a barrier.

Almost all of the participants in the study expressed concern that there was a risk of the older adult falling while being assessed for fall risk and their uneasiness was reflected in comments such as: " If they are already a fall risk, they could fall while doing it if you're not careful," " I had my instructor steady him, so it was safe," and "We stopped pretty soon on because we realized it wasn't safe for him to do, so we determined he was a fall risk based on that."

One of the student participants who conducted the fall assessment in the older adult's home stated:

> It was really a neat experience to see a patient who was truly at risk and I was like, oh, I don't really want you to do this, but I thought, hey, you're at risk and we need to do something about it, so, it felt good but it was also kind of scary to see a patient that at risk for falling.

This was an unexpected finding. Although older adult's fear of falling as a risk for falling is well documented in the literature, the sub-theme that emerged from this data relates to student nurses' fears of patient falling while being assessed for fall risk or ambulating.

Two participants offered solutions to overcoming this barrier. One, who has experience as a nursing assistant and did the fall risk assessment on a hospitalized older adult, pointed out that keeping the older adult safe during the fall risk assessment requires the use of judgement.

> One disadvantage that I thought was if the patient wasn't really in a state of being able to get up and do those tests, if you try and force it, they are kind of at risk for the test itself being not safe, so that takes nursing judgement to know what you shouldn't do and you can just visually assess, they're there in bed and you already know they're not going to pass it.

A second student who performed the risk assessment in the hospital described how the experience of actually getting the patient up to walk increased confidence: "so it was just good to get hands on and not be afraid to get them out of bed and use a gait belt if they need it."

Another sub-theme to emerge was the perceived susceptibility of falling by the older adult as a potential barrier to participation in fall prevention. "They don't always know their limits," "It impedes on their daily activities," "They're in denial," "This couldn't happen to me," and "She felt that she didn't really need it" are examples of participant quotes demonstrating this sub-theme.

Facilitators.

Knowledge and attitudes of nurses.

Student participants perceived that practicing nurses were unaware of the importance of falls prevention and did not know how to do a falls risk assessment. One participant commented: "the nurse asked me how we did it and she wanted to know how to do the tests. If that nurse didn't know about it, a bunch of them don't know it." Another participant talked about his experience as a nursing assistant and how falls risk assessments were done, by nurses or assistive personnel, according to perception of risks instead of according to evidence: "We do fall assessment based on whether we find them at risk. If they aren't perceived to be at risk, based on our judgement, then we don't do it."

Participants voiced their opinion that nurses would be more likely to conduct fall risk assessments if they were educated about the problem of falls in older adults and could see evidence that assessments reduced falls among older adults in the community. Exemplars included: "Probably if someone did a study that showed this many patients benefited from it, like we caught this many fall risks and prevented this many falls and negative outcomes from it,"

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"General education - like these patients could go home and fall pretty easily and end up being readmitted which could affect your hospital readmission and maybe reimbursement," and "They might be more likely to do it or if they saw how it impacted the patient and if they had less falls after they were assessed." Another exemplar was:

> …the importance and how common it is and the simple things we can do to prevent it, that just getting the education out there for the nurses that this is a real issue and there's things that we can do as a nurse to change the practice to make a safer environment for our patients –just nurse awareness of the potential problem.

One student who has experience as a nursing assistant commented that prior to the educational intervention, she was aware of the importance of preventing falls in the hospital setting but had never thought about patients falling in their home. She talked about increasing awareness among nurses and patients to prevent falls after discharge:

> I can see how it would help improve their risk of falling because, like my patient definitely was a fall risk and I don't think he had had his physical therapy or anything like that so after we did it, they talked about doing that with him.

Two participants commented that education about the financial benefits to the hospital would increase the likelihood that nurses would incorporate fall risk assessment into their practice. One commented: "These patients could go home and fall pretty easily and end up being readmitted which could affect your hospital readmission and maybe reimbursement."

In order to prevent falls, nurses must not only assess for risks, but must also establish a plan to minimize risk and help the older adults put into practice preventive activities to prevent falls. This requires an attitude that fall prevention is important, that nurses are responsible for fall prevention, and that fall prevention has a high priority for intervention. One respondent expressed internalization of this attitude:

> Definitely with elderly patients and falling, there's mortality we can decrease because we know this and if we were to implement it into our practice, we could

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not only decrease the chances of patients falling, but also help out with the costs
of the results of falling, fractures…

Other student participants talked about fall prevention as a higher priority or intervention
and referred to nurses' attitudes that falls risk assessment was important in making it happen
despite time restraints: "I think time is a big barrier…really internalizing the importance of a fall
assessment would …prompt me to make that a priority". One participant commented: "time is
the biggest factor we're dealing with, but I don't know anything we can do to change that besides
the morals of the nurse. You can't make them want to make sure the patient is ok." A second
student talked about making it a priority:

> I think it would just take a little more time on the part of the providers and the
> healthcare team and diligence to realize that it is a priority when a patient is
> admitted to a hospital and then as well on discharge.

Opportunities to address health beliefs of older adults.

Overall, student participants viewed the falls risk assessment as an opportunity to
increase the older adult's awareness of their susceptibility to falling as well as address the
severity of falling and expressed opinions in line with the student who said "He was surprised, I
think, at how little he could do since he hadn't been getting up very much in the hospital and he
felt kind of weak…". Other exemplars include;

> I think for someone who didn't know they were high risk for a fall doing these
> little tests and seeing, oh, I'm really unsteady when I put heel to toe or I do take a
> long time to get up out of a chair and walk to a line and back would help someone
> understand that they were at risk for falls.

> Just by assessing the patient, sometimes they gain awareness of the importance of
> taking precautions and removing rugs and really just treating themselves as
> someone that this can happen to…I'm a fragile human being and I'd rather take
> precautions and be safe than end up in the hospital again with a broken hip.

> By putting them through these certain tests, if they can see, wow, I'm not able to
> meet these standards, then maybe I am at increased risk for falls. Then, maybe

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they'll think about getting different shoes or talking to their doctor about maybe the necessity for a walker or a cane.

They were reaching a higher age, more things were happening to them, they were noticing that they were in the hospital more frequently and we talked about how we didn't want a broken hip to be a reason.

One participant talked about making the caregiver more aware of the older adult's susceptibility and the need to make adjustments in the home: "I think it will help whoever is taking care of them be more careful. I also think it will help them place things in different areas and help them accommodate to reach things".

One student participant, in describing how conducting the falls risk assessment provided an opportunity for a therapeutic relationship to occur, said, "It was nice to just sit down and spend some time and talk with the patient.," and " I felt like that was good making that connection...reviewed their medications and making connections with what could cause them to fall." Another student talked about how he provided support and encouragement to the older adult who was already engaging in activities to prevent falls.

If you see things they're doing well, you really want to highlight them and praise them and tell them they're doing great…that kind of gives them some confidence going into the rest of the assessment. If you find an area where they don't have strengths, like the stand up and go and the sit test…give them positive feedback and help them through the areas they're struggling with.

Participants perceived that nurses have the potential to take a lead role in fall prevention in older adults, if they are made aware of the importance. They viewed the nurse-patient relationship in the various practice settings as an opportunity for increasing awareness among older adults of their susceptibility to falling, the severity of falling, and the benefits of fall prevention activities. They talked about reinforcing behavior change with support and encouragement.

Focus on staff accountability (there needs to be a policy).

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Six out of eight participants indicated that healthcare providers would be more likely to do falls risk assessments or that they would be more likely to conduct a falls assessment in their own practice going forward if the hospital had a policy, standard protocol, or guideline. Two respondents discussed the need for having a place in the electronic health record to record the results of the strength and balance tests, perhaps in the same area that hospital based risks are documented. They felt that having a place to document the tests would enable other nurses and personnel working with the older adult see risks related to strength and balance and would serve as a prompt and streamline the process. This was an unexpected finding since I was not seeking to understand falls risk assessment in the context of system factors. Instead, this is what emerged from non-specific questions about what it would take to get healthcare providers to perform falls risk assessments.

Participant quotes from this sub-theme included: "You automatically do it...if there was a standard, like there is one for skin assessment," "If I knew I had to do it, I would of course do it," and "If it's not a mandatory thing, it's going to be less likely to get done." Policies were also discussed in relation to admission assessment: "…standard protocol in the hospital when someone is admitted," and "…making it part of the initial admission assessment."

One respondent agreed that a policy might be needed, but also voiced concern over the loss of professional control and autonomy in regards to a mandatory policy: "…it would probably take making it a policy, like something you had to do, which people would end up resenting more than anything."

Increasing self-efficacy.

Progressive mastery.

Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance (Bandura, 1994). All eight of the respondents indicated that their self-efficacy increased through mastery experiences or performing a task successfully. A typical response was, "I had never heard of any of this…on the pretest, I didn't know what anything was. But afterwards, I felt pretty comfortable." Students identified mastery experiences with statements like, "The forms you gave us like the algorithm where you can look at how to do them and how to score them was helpful, " "The case study made you critically think," "My answers on the survey definitely changed dramatically after I did the assessment. I was a lot more confident." Many participants articulated the value of the materials from the STEADI program: "I learn by reading, so all the things on Blackboard where you can pull up and read about the tests, I found that really helpful," and "I felt like I gained a lot of confidence with those instruction pamphlets that showed step by step how to do it".

Observational learning and reinforcement.

Witnessing other people successfully completing a task is another important source of self-efficacy (Bandura, 1994). Several participants commented on how helpful the videos were. A typical response was, "I think the videos are what gave me the most confidence because I was able to visually see what needed to be done for the tests, and so when I see something, I'm able to duplicate that." Receiving positive feedback during performance of a task also helps people overcome self-doubt and focus on giving their best effort to the task at hand. When asked if the check-off experience in the lab was helpful, one respondent said, "Yes, that was helpful because I had more confidence when I went, I had already done it on someone and I knew what to say and what to do and I knew what order to do things in and what questions to ask." Other participants described the benefit of doing the assessment with the researcher in the skills lab:

I just think the act of doing is better than just looking and seeing and reading. I think it helps your memory and gives you confidence because you are actually doing it on someone. There's also the ease of knowing it's just you and knowing you're not at risk for falls and it good to get that over with and then go to home health.

Time I spent with you in the lab and actually practicing. That was the best for me because it was a time for me to practice the skills but it was a time for me to receive positive feedback from you and talk about things that I did well and things that I did wrong and that's provided me with some good information to truly improve my skills.

Several participants offered that the falls risk assessment was a worthwhile skill for students to learn and suggested that it be taught earlier in the curriculum so that students would have more opportunities to include it in their care of patients. One participant noted:

Useful for us because we are the nurses…taking care of the baby boomers and …we are the leaders of implementing change...definitely with elderly patients and falling, there's mortality we can decrease because we know this and if we were to implement it into our practice, we could not only decrease the chances of patients falling, but also help out with the cost of the results of falling.

Another participant expressed the idea that students could actually help spread awareness among the nursing staff. "The students bring it to attention of the hospital and to the nurses and

Table 10
Themes for fall risk prevention as reported by undergraduate nursing students (n=8)

Themes	Frequency of comments	Number of respondents
Barriers		
Nurses are too busy to perform falls risk assessments	15	8 (100%)
The older adult could be a barrier	10	6 (75%)
Facilitators		
Knowledge and attitudes of nurses	7	7 (88%)
Opportunity to address health beliefs of older adults	7	7 (88%)
Focus on staff accountability (there needs to be a policy)	11	6 (75%)
Beliefs about what increased self-efficacy		
Progressive mastery	21	8 (100%)
Observational learning and reinforcement	11	8 (100%)

kind of put it in their mind…". All of the participants felt that they had support from the staff to perform the assessments and that suggestions for care derived from the assessments were accepted.

Chapter 5
Discussion

A large body of research confirms that falls in older adults are reduced when clinicians are trained to assess risk and apply evidence based prevention strategies (Gillespie et al., 2010, Goodwin et al., 2011, Scott et al., 2011, Tinetti et al., 2008). Nurses, because of their focus on health, their presence as the largest segment of the health care profession, and the fact that most of them will be caring for older adults during their career, are well positioned to increase the capacity for fall prevention. It is estimated that by 2020, up to 75% of nurses' time will be spent with older adults (cited by Potter, Clarke, Hackett, & Little, 2013, p. 449). There is a recognized need to educate health professionals, including nurses, to improve their ability to assess potential fall risk and intervene to reduce falls. However, there is little research that explores the effectiveness of teaching strategies to increase knowledge and application of fall prevention in nursing students.

This study examined the effect of an online education module on the knowledge and self-efficacy in fall risk assessment and management among undergraduate and graduate nursing students. The study, using both qualitative and quantitative methods, sought to answer the following research questions:

1. Does completion of an online falls prevention course increase the knowledge in fall risk assessment and management among undergraduate and graduate nursing students?

2. Does completion of an online falls prevention course increase self-efficacy in fall risk assessment and management among undergraduate and graduate nursing students?

3. What is the relationship between knowledge as measured by test scores and self-efficacy in fall risk assessment and management in the study group?

4. What is the relationship between skill mastery and self-efficacy?

5. What are the perceptions of nursing students on the barriers and facilitators to integrating fall risk evaluation and management into practice?

   A convenience sample of 52 full time undergraduate nursing students completing their senior year of a BSN program and 20 graduate students enrolled in an advanced practice program were recruited for the quantitative portion of the study. Students completed the initial falls in older adults test and a researcher developed survey of falls assessment self-efficacy as part of course requirements. Students were then able to access a recorded lecture on preventing falls in older adults as well as videos and printed materials from the CDC STEADI program. The online lecture was produced using Microsoft® PowerPoint and Kaltura Media and uploaded to Blackboard Learn. All students then completed a case study as part of the course requirements. Because I wanted to measure skill mastery to determine if it was correlated and predictive of self-efficacy, I required the undergraduate students to attend a skills lab session where competencies with a simulated fall assessment were observed and documented before they were assigned to perform a falls assessment on an older adult. As the graduate program is completely asynchronous and students are geographically dispersed, I asked the graduate students to record their falls risk assessment on an older adult. I observed their recorded assessment and documented their competencies. All students were then given an opportunity to complete a posttest and repeat the self-efficacy survey.

   I used purposive sampling to hand-pick sample members for the qualitative portion of the study. I deliberately chose a homogenous sample of undergraduate students to reduce

variation and create a more focused inquiry. I purposely did not choose this group before the research began. Because of my knowledge of the student's experience with the fall assessment, I was able to intentionally choose what I considered to be rich sources of data.

After time spent completing the online learning module, completing a case study, and performing a falls risk assessment on an older adult, results revealed a rise in nursing student reporting of self-efficacy and knowledge of fall risk assessment and prevention for the older adult population. These findings support results of the small body of literature specific to nurses performing fall risk assessment in community dwelling older adults. Key findings from the qualitative portion of the study include the perception that nurses are too busy to focus on assessing fall risks in older adults in the inpatient setting in order to prepare them for discharge and the perception that nurses would be more likely to perform fall risk assessments if they were made aware of the public health issue of falls in older adults. Findings also support the literature specific to health beliefs of older adults including the observation that older adults often don't consider themselves to be susceptible to falling and the perception that addressing their beliefs about susceptibility, severity, and benefits will increase their participation in fall prevention activities.

This final chapter will present lessons learned as a result of the study. Sections of this chapter will summarize the study's findings by research questions and address the implications for the practice of fall prevention in community dwelling older adults and for the field of nursing education. Recommendations for policy and the research community are addressed in separate subsections.

Does Completion of an Online Falls Prevention Course Increase the Knowledge in Fall Risk Assessment and Management Among Undergraduate and Graduate Nursing Students?

To answer research question one, learning was measured using a using a researcher created criterion-referenced pre- and posttest and a competency checklist or rating scale to determine whether each person can perform the skills they learned. Results revealed a significant rise in student knowledge of fall risk and assessment. Students demonstrated large increases in their knowledge of performing the chair stand test, the TUG test, the four stage balance test, use of the algorithm, and incidence of falling in the community. As shown in Table 5, there were smaller gains in identifying FRIDs, interventions to prevent falls, and applying the Stages of Change Model. Scores on the skills checklist also demonstrated that learning occurred. The mean score was 22.19 out of a maximum score of 27. Reviewing the home safety checklist with the older adult, providing education on reducing fall risk, making referrals for fall prevention, and demonstrating use of the Health Belief Model and Stages of Change Model were the items most often missed by students.

One of the models used for this study was Kirkpatrick's Model of Evaluation. According to the Model, level one or *reaction*, measures how participants in an education program react to it and answers questions regarding the participant's perceptions of the program (i.e. did they find it effective?). Although I did not directly measure their satisfaction of the program, findings from the qualitative study clearly fall within this level of the Model. All of the participants agreed that the program was effective in preparing them to perform the fall risk assessment on an older adult and expressed satisfaction with presentation, content, and teaching methods. In

Kirkpatrick's hierarchal model, participant's positive perception of the program has a positive effect on level two, *learning* (Hutchinson, 1999).

Does Completion of an Online Falls Prevention Course Increase Self-efficacy in Fall Risk Assessment and Management among Undergraduate and Graduate Nursing Students?

Level three of Kirkpatrick's Model, *behavior change*, involves measuring the transfer of skills and knowledge from training context to practice. Because learning is likely to transfer when a person has confidence in his or her ability to successfully perform a behavior, I used self-efficacy as a proxy for behavior change to answer research question two. Self-efficacy, as measured by a researcher developed instrument that included the same fall assessment and prevention skills used in the knowledge tests, increased in all areas, with each skill demonstrating a large practical significance. Survey results are shown in Table 6. Particularly noteworthy is the finding that the lowest effect size is for assessing the orthostatic hypotension skill. This is understandable, as nursing students were previously taught and already proficient with the skill of checking for orthostatic blood pressure. Effect sizes were highest for skills such as the 30 second chair stand and 4-stage balance test, new skills for most nursing students.

Independent sample *t*-tests were conducted to measure differences between undergraduate and graduate students in knowledge gains, self-efficacy gains, and competency scores. Results, as shown in Table 9, indicate that the two groups differed significantly from each other only on the pre-survey of self-efficacy. This finding can be explained by the fact that graduate students have gained more experience in the nursing role and therefore have a higher baseline of self-efficacy when it comes to fall assessment skills. Most significant, however, is the finding that there was no significant difference in the two groups on the post-survey of self-efficacy, indicating effectiveness of the educational program that allowed the undergraduate

students to "catch up". This difference in the two groups is also why I decided to hand-pick participants for the interviews from the pool of undergraduate students in order to reduce variability based on experience.

What is the Relationship between Knowledge, Skill Mastery, and Self-efficacy?

To answer research questions three and four, a Pearson product-moment correlation was computed to explore the relationship between competency scores, change in knowledge scores, and change in self-efficacy scores. One of the surprising findings of this study was the lack of correlation between these variables. My original hypothesis was that self-efficacy scores would increase as knowledge scores and competency scores increased and that knowledge gains and competency scores could predict gains in self-efficacy. The correlations between self-efficacy gains and competency were low and insignificant. The correlation between gains in knowledge and self-efficacy was .252, $p = .026$, before using the Bonferroni approach to reduce Type I error (resulting in a required p value of .016 for significance). One factor that could have influenced these results was that there was less variability in the competency scores than anticipated. I had anticipated that there would be some participants who did not score as well on the competency checklist. Instead, two-thirds scored above the 50th percentile. A histogram displays the distribution of the competency scores in Figure 3.

A related unexpected finding resulted from the multiple regression analysis conducted to evaluate how well knowledge gains and competency scores predicted self-efficacy gains. The full model was not statistically significant. Based on these results, the hypotheses that self-efficacy gains are influenced by knowledge gains and competency scores were not supported. However, I am reluctant to interpret the retained null hypotheses as proof of an absence of relationships among these variables, as there are plausible explanations. First, there is a risk that

a Type II error was made. The effect size of .06, is small but not negligible. The confidence intervals, as reported in Table 8, do include zero, but are fairly close together. The power may have been insufficient. The sample of 63, while adequate, was not large. A larger sample size may have produced a significant result. Second, the results differ from those obtained by Maloney et al. (2011) because of different measures used. Maloney et al. (2011) noted a moderate correlation between knowledge test scores and scores on a case study and explains that this may have resulted from measuring two different constructs. The intent of the exam is to measure theoretical knowledge while the case study measures application. This could have been the case with this study. Unexpected results could also have resulted from my teaching and evaluation method. I made the skills checklist available to students ahead of time and gave them an opportunity to look things up, practice, and confer with each other about the skills being observed and evaluated. Changing this method of measurement may result in a significant statistical result, but may not necessarily be the best way to prepare students to conduct a falls risk assessment. Results from the qualitative analysis indicate that the opportunity to practice and receive feedback from the instructor resulted in learning and increased self-confidence. However, measuring competency with the fall assessment skills at two points, before and after the educational offering, could provide new information on how students learn most effectively.

Findings from the qualitative portion of the study also address research questions one through four and clearly fall within Bandura's Social Cognitive Theory. Participants believed that knowledge increased as a result of the educational offering and that behavioral capacity increased as they used the STEADI tools. In accordance with constructs of SCT, the observational learning that occurred when participants viewed the videos made available in the learning module and reinforcement or feedback from the researcher helped students feel prepared

to perform a fall risk assessment. The increase in knowledge following an educational program

on fall prevention is consistent with findings reported by Dauenhauer, Glose, and Watt (2015),

Maloney et al. (2011), and Scott et al. (2011).

      The educational implications of this study are significant. I did not attempt to isolate

contributions of each instructional strategy to the overall learning and self-efficacy gains, but

sought to evaluate the impact of a mixed education approach to bridge the theory to practice gap.

The use of Kirkpatrick's Model enables a detailed evaluation of level two, *learning*. Analysis of

results from the pre and posttests identify a need to emphasize FRIDs and application of the

Health Belief Model and Transtheoretical Model of Change in teaching. Data provided by

Blackboard Learn was also helpful in curriculum analysis. The recorded PowerPoint lecture was

34 minutes long. The average percent viewed was 70%. This means that 30% of the learners

"dropped" the recording before it was completed. The average view time was 23.8 minutes.

Since the health behavior change models were at the end of the recording, this could explain why

test scores and self-efficacy scores were lower in this area. Abate (2013) conducted a study

evaluating the use of traditional face-to-face lecture, an unsegmented podcast, and a segmented

podcast on retention and application of information in undergraduate nursing students. Students

in the segmented podcast group demonstrated higher scores on multiple-choice and case-study

assessments.   A recommendation based on my analysis and supported by the literature is to

create a segmented video, with three shorter segments related to the public health problem of

falling, assessing risks for falling, and using health behavior change models to develop an

intervention plan.

      According to Bandura, there is a reciprocal relationship between self-efficacy beliefs and

the accomplishment of behaviors or tasks whereby an increase in one enhances the other

(Bandura, 1994, 1998). Participants emphasized that they felt confident to conduct the fall risk assessment; and, that applying the skills in the lab and in the clinical setting increased confidence in their ability to interpret findings and communicate findings to staff and patients. This finding supported by findings from the multivariate analysis indicating a rise in knowledge and student self-reporting of confidence of fall risk assessment skills for the older adult population. The similarity between this study and one reported by Demons et al. (2014) was the reported increase in student participants reporting moderate to high confidence in performing fall risk assessments after completing them on older adults.

Participants in this study also stressed the importance of the videos for observational learning. Three short videos from the CDC STEADI program were made available as part of the online module and demonstrated the TUG, the 30 second chair stand, and the 4 stage balance test. A recommendation for improvement of the module is to create a single video demonstrating the entire fall risk assessment performed by a nurse. I believe this will make the teaching resource easier for learners to access and use and facilitate observational learning.

Student comments about the various types of learning resources made available in the program underscored the reciprocal relationship between self-efficacy and accomplishment of the behavior or tasks. In this study, completion of a case study applying content from the recorded lecture was identified as helpful for enhancing critical thinking. Student participants expressed that time spent in the skills lab practicing and receiving feedback contributed to their perception of self-efficacy. The implication for nursing education is the importance of creating opportunities for practice and providing multiple resources to accommodate multiple learning styles. As was the case in this study, providing supervised practice opportunity can present a barrier for the online learner. Requiring students to record their performance and upload it for

faculty observation and feedback is a formative evaluation strategy often used by nurse educators, but there is limited research regarding the effectiveness.

What are the Perceptions of Nursing Students on the Barriers and Facilitators to Integrating Fall Risk Evaluation and Management into Practice?

Findings from the qualitative portion of the study address research question five and clearly fall within Bandura's SCT. Outcome expectancies (perceived costs or barriers and perceived benefits) and environment influenced participant perceptions about integrating fall prevention into practice. All of the participants believed that practicing nurses do not have time to assess patients for fall risk and implement fall prevention strategies when preparing older adults for discharge from the acute care setting. They acknowledged that, as students, they had extra time to spend with patients and perform the assessments, but this was not possible for nurses with heavy workloads in chaotic task oriented environments. This finding is consistent with findings reported by Lee et al. (2013), Stevens and Phelan (2013), and Potter et al. (2013). Milisen, Geeraerts, and Dejaeger (2009), which indicate that nurses and other health care providers doubted integration of assessment tools or fall prevention into daily practice because of time constraints and competing priorities. One participant offered a solution by suggesting that nurses could coordinate with physical therapy to do parts of the assessment and that she might have time to do "parts" of the assessment, but not the whole thing. These perceptions are supported by research showing that easy to perform, quick tests identifying older adults at risk of falls can lead to targeted referrals to physical therapy, pharmacy, social work, and home health. Huded, Dresden, Gravenor, Rowe, and Lindquist (2015) reported that a program where emergency department nurses performed fall risk screening with the TUG test to identify high risk patients in preparation for discharge from the hospital or emergency department resulted in

increased referrals for home or outpatient physical therapy. A low cost option, whereby the

TUG is performed by a patient care technician, was proposed. I believe such a solution is

supported by the results of this study where nursing students learned how to perform the TUG by

watching an on-line video and developed confidence in performing the test on older adults by

practicing it once. The key, according to Huded et al. (2015), is having a protocol for prolonged

TUG scores (greater than 12 seconds). Following the protocol, home-based or outpatient

physical therapy can be ordered for patients being discharged to the home in conjunction with

their primary care provider, social work, and caregivers. This is particularly important in the

emergency department setting, where many older adults present after a fall. Huded et al. (2015)

report that without intervention, over 20% will present to the emergency department within one

year with another fall related diagnosis.

An interdisciplinary approach to increasing fall risk assessments on older adults is

supported by the findings of this study. Student participants commented that physical therapy

could do the balance and strength tests and nursing assistive personnel could do the orthostatic

blood pressure checks. It would also be feasible to have the home assessment performed by

social work, the medication review for FRIDS performed by a pharmacist, and education

provided by a health education specialist. This approach would require communication and

coordination among disciplines, but could result in more efficient and effective assessments.

An unexpected barrier identified by student participants was their own fear that older

adults would fall during the fall risk assessment. The finding of fear of older adults falling

among care providers is different from fear of falling among older adults, but may have similar

consequences. Although student participants didn't acknowledge awareness of stereotypes

associated with caring for older adults, they shared common perceptions of older adults as frail,

sick and dependent. This perception was not counterbalanced with those from the participants who expressed surprise that the older adults they assessed in the assisted living facility were independent, healthy, and had no problem exceeding cut-offs for the strength and balance tests. Although I was not expecting to find this attitude towards older adults by students, it is addressed in nursing literature. Carlson and Idvall (2015) attribute the attitudes to "limited theoretical and clinical experiences with older people" (p. 849). In a review of literature identifying the reasons why undergraduate nurses are not choosing gerontological nursing as a career, Neville, Dickie, and Goetz (2014) point out that in many nursing programs, first-year nursing students are exposed to older adults in their first clinical placement, usually in a long term care facility. The primary focus during this clinical is on psychomotor skills, with students often paired with non-licensed personnel to care for dependent older adults.   Students in the Potter el al. (2013) study revealed limitations in their curriculum with the focus on dementia, chronic disease, and medications and an inadequate focus on healthy aging.   Participants of this study seemed to agree. When asked if the fall risk assessment and prevention training should continue, the overall response was yes; but, it should be introduced in the first semester of nursing school.

The perceptions that nurses are too busy to perform fall assessments and that older adults are at risk for falling from the fall risk assessment because they are sick, frail, and dependent have implications for providing gerontological content and clinical experiences to student nurses. Findings from several studies indicate that students exposed to a geriatric-focused curriculum and specially designed clinical experiences report increased knowledge and skills as well as more positive attitudes toward older adults (Koren et al., 2008). In a study by Fox et al. (2015) to explore geriatric learning needs of acute care nurses, focus group participants reported that when nurses are deficient in geriatric knowledge, they base their practice on attitudes of older

adults as dependent, confused, or incontinent. Acute care nurses are susceptible to ageist attitudes because they are exposed to older adults who are frail and vulnerable (cited by Fox et al., 2015). Other findings highlight the importance of clinical placement. First-year students with limited clinical experiences with older adults have less favorable attitudes toward older adults and nursing students not exposed to clinical role models with gerontology expertise report more negative attitudes toward older persons (cited by Koren et al., 2008). Nurse educators should address the fact that a large component of nursing care is with aging adults and support preparation to achieve excellence in this field. With the goal of providing optimal care to older adults, nurse educators should consult gerontological experts in the development, implementation, and review of content in the curricula with careful consideration to timing. Quality clinical placements to expose students to the expert gerontological roles should be developed. Healthy aging should be a focus with clinical placement in healthy aging environments, especially early in the curriculum when attitudes about older adults are being formed (Neville et al. 2014). Gerontological content, such as fall prevention, should then be leveled appropriately across the curriculum.

The perception that older adults are at increased risk for falling while being assessed for fall risk also has implications for practice. The fear arises from the need to ambulate the older adult in order to assess gait and balance. Hospitalized older adults are especially vulnerable to functional decline due to age-related changes in cardiovascular and musculoskeletal systems. Decreased ambulation due to illness, staffing issues, or lack of nurses' awareness of the need for mobility can result in rapid advance of functional decline and an increased risk for falling while in the hospital and after discharge to the community. Since October, 2008, Medicare policy changes intended to align quality of care with hospital financial incentives have resulted in no

reimbursement to hospitals for additional care and treatments related to falls incurred while in the hospital. Understandably, there is a concern that an unintended consequence of efforts to prevent falls is reduced mobility of older adults (Callen, Mahoney, Grieves, Wells, and Enloe, 2004). Research shows, however, that inpatient walking behaviors are the same for patients who do and who do not fall and are, alone, a poor predictor of falling (Fisher et al., 2011). Nurses should be made aware of this research along with the research showing that falls can be prevented, even in very frail patients (El-Khory et al., 2013), and that prevention of falls in this group should focus on training for strength and balance, transfer techniques, and evaluation of orthostatic hypotension.

Student participants identified lack of awareness of susceptibility and severity among older adults as a barrier to participation in fall prevention. McInnes and Askie (2004), McInnes, Seers, and Tutton (2011), McMahon, Talley, and Wyman (2011), Porter, Matsuda, and Lindbloom (2010), and Yardley et al. (2006, 2007) also identified low self- perceived susceptibility as a barrier. Lee et al. (2013) surveyed 245 community dwelling older adults and found that many at risk for falling did not discuss fall prevention prior to a fall. Threat appraisal (perception of risk of falls and risk of harm from falling) was associated with discussion of falls with providers. The participants in this study also referred to time spent with the older adult conducting the fall risk assessment as a facilitator for fall prevention. They discussed the use of the fall assessment itself as a tool they could use to increase the older adults' and their caregivers' awareness of their fall risk and tailor health promotion messages as well as to advocate for the older adults with staff and providers. This is similar to findings reported by Vivrette et al. (2011) that community dwelling older adults perceived that a fall risk self-assessment tool could be used to communicate about fall risk with their provider. These results

highlight the importance of understanding why older adults do or do not engage in behaviors to prevent falls and that older adults have their own perceptions about their risk for falling that influence their adherence to fall prevention strategies. When assessing fall risk factors, all providers need to include fall-related perceptions including perceived vulnerability to falling, perceived severity of falls, fear related to falling, as well as barriers and benefits to participating in fall prevention in order to design and implement an individualized fall prevention plan.

Awareness that older adults' perceptions of susceptibility and severity regarding falls can be a barrier to fall prevention, and that the assessment itself can be used as a tool to increase awareness for the older adult and caregiver also has implications for nursing education. Using theory as a foundation for health promotion is consistent with the emphasis on using evidence based interventions in nursing practice. The use of explanatory theory, such as the Health Belief Model, helps to identify factors that contribute to falling and can be changed. The use of the Stages of Change or Transtheoretical Model helps to identify different informational needs of older adults at various stages of change and design interventions for their stage. This study demonstrates that students need more opportunities to practice application of behavior change theories that address knowledge, attitudes, social influences and self-efficacy of older adults.

When asked what they thought it would take to get health care providers to incorporate fall risk assessment and management into practice, the overwhelming response from student participants was related to providing education. They felt that nurses need education to learn fall risk assessment skills and, perhaps more importantly, to develop an attitude that preventing falls in older adults is important. Participants talked about presenting education about identifying fall risk and implementing prevention strategies in order to prevent falls and injury, prevent readmissions after discharge, and save money for the hospital and the healthcare system. An

association between knowledge of risk factors for falls and fall related practices is well documented in the literature. Demons et al. (2014) found that medical students were using most of the skills learned in a fall prevention program in their practices at one year follow-up. Brown et al. (2005) found that knowledge of risk factors for falls and fall related practices were significantly and independently associated with an increase in self-reported use of fall prevention interventions by providers. Scott et al. (2011) implemented an evidence based education program for health care professionals and community leaders. Pre and posttest findings showed significant increases in learning. Follow-up surveys showed a positive impact on practice. Dauenhauer, Glose, and Watt (2015) reported an association between improvements in student knowledge and outcomes of community dwelling older adults – falls efficacy, control, management, and overall mobility.

Other research shows that practicing nurses perceive the barriers to fall prevention programs as being related to lack of knowledge (cited by Tzeng, 2011) and that well-designed gerontological classes increase knowledge and skills and result in more favorable attitudes toward older adults (cited by Koren et al., 2008). Although their focus was on in-patient falls, Kim, Jeon, and Chon (2015) found that knowledge of fall risk factors and attitudes on falls were significantly correlated and that higher scores of knowledge and attitude on falls were associated with more fall preventive action. However, evidence on fall prevention programs indicates that increased knowledge on fall prevention via education offerings does not necessarily translate into reduced falls. I agree with Tzeng's (2011) recommendation that healthcare organizations across settings should address two education goals: increasing knowledge and skills in implementing fall preventions, and cultivation of patient-centered care attitudes. Participants of this study indicated that changing attitudes may be as or more important than learning skills. Internalizing

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attitudes such as *falls are preventable* and *fall prevention is a high priority* can help nurses overcome barriers such as time constraints. One respondent addressed the importance of caring attitude with her comment "there's things we can do as a nurse to change the practice to make a safer environment for our patients."

Student participants felt strongly that a having a policy requiring that all patients be assessed for fall risks upon admission to an acute care facility and holding staff accountable for following the policy would increase the likelihood that fall assessment would be incorporated into nurses' practice. One participant who conducted the fall risk assessment in the community setting explained:

> …there's not really rules and regulations and mandatory policies that have to be done. And I think that's why that as much as hospitals try, they still see an increase in falls in the hospitals and then as well as out of the hospital when they're discharged because patients aren't aware of what their risks are and what their limitations are as well.

None of the participants talked about the importance of re-assessing patients during hospitalization or at time of discharge or made the connection that being in the hospital might increase an older adult's risk for falling upon discharge to the community. Some of the participants did acknowledge that fall risks were being assessed at the time of admission but did not know if the assessment was evidence based and/or did not feel that strength and balance impairments were objectively identified or documented. This confidence in a policy to increase the likelihood of incorporating an assessment into practice was an unexpected finding. One possible explanation based on Benner's theory of professional development, From Novice to Expert (1984), which applies the Dreyfus Model of Skill Acquisition to nursing clinical practice. According to this theory, in Stage 1, novices or beginners have no experience of situations in which they are expected to perform; and, whether flying airplanes or practicing nursing, are

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given rules to help them perform. The rules are context-free and are applied universally. With experience, nurses pass through the stages of clinical competence to Stage 5, expert. The expert no longer relies on rules or guidelines to connect an understanding of a situation to an appropriate action. Instead, the expert nurse, with a background of experience, is proficient at quickly determining what relevant (Benner, 1984) is. Nursing students enter the clinical area as novices and have minimal understanding of the contextual meaning of recently learned material (Benner, 1984). This applies to senior students and students with experience as nursing assistive personnel as well. They may have passed through Stage 1 of skill acquisition in the hospital setting, but nurses entering a clinical setting such as the community, where they have no experience with the patient population, are limited to the novice level of performance as the goals of patient care are unfamiliar (Benner, 1984, p. 21). Knowledge and opportunity for practice helps students to become proficient and confident at performing health related tasks with patients across the life-span (Benner, 1984) without using rules to guide practice.

A competing explanation for this finding is the lack of a standard for fall risk assessment observed by students in the clinical setting. Respondents felt that nurses could be taking more responsibility and interventions could be more directive (refer to physical therapy if older adult does not pass TUG test) if there were established policies that followed evidence based guidelines. This perception has implications for nursing practice. Many of the nurses in hospitals are still at the novice or advanced beginner stage of their career and need the direction provided by a policy. Policies and guidelines are also helpful in establishing standards of care and making them routine. In the acute care setting, establishing routines to ensure that older adults are assessed for fall risk (in the same way as skin assessment is routine) would likely result in increased fall risk assessment at the time of admission, when the patient's condition changes, and

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at the time of discharge. Fall risk screening and assessment tools should be evidence based and effective in generating interdisciplinary interventions to prevent falls in the inpatient setting and in the community setting upon discharge. Health care organizations should work with electronic health records vendors to include fall risk screening questions in the patient assessment screens with direct links for referrals based on findings of the fall assessment. The use of technology could help improve communication and coordination among various disciplines. The electronic health record could also be programmed to print education materials for older adults and caregivers that stresses the importance of fall prevention activities upon discharge.

Adoption of fall risk assessment guidelines in the home care and primary care settings is also needed. Student participants pointed out that performing a fall risk assessment in the older adult's home or in primary care settings may be more feasible because it doesn't take as long as the nurses are already familiar with the older adult's medical history and their medications. Provider organizations and aging service providers such as the American Physical Therapy Association, American Occupational Therapy Association, the Visiting Nurses Association, Emergency Medical Services, and Meals-on-Wheels volunteers should be encouraged to incorporate evidence based home assessment tools such as those provided by the CDC STEADI program into care of older adults. Use of the STEADI algorithm to screen patients for fall risk could help make it a routine part of care in these settings. Results of the screening could then be used to initiate further assessment and management of fall risks. Provider organizations should be educated about the The Physician Quality Reporting System that incentivizes providers to assess fall risk and to create a fall prevention plan if a risk is identified. Eligible professionals for this program include physicians, nurse practitioners, physician assistants, occupational therapists, and physical therapists.

Recommendations for Research

Further research to quantify the individual contributions of the online module, laboratory practice, and clinical experience would provide information on how students learn most effectively and help educators design effective teaching strategies. Research has informed considerations for developing online gerontological courses, but there is limited research regarding clinical evaluation methods. Studies are needed to evaluate the effectiveness of assessing clinical competencies by reviewing digital recordings of performance and how asynchronous faculty feedback can be made comparable to face to face feedback. This will become increasingly important as the demand for online education in nursing increases (Kruger & Pearl, 2016).

With the goal of exposing students to expert gerontological nursing roles and providing quality clinical experiences with older adults, research is needed to explore the effectiveness of teaching strategies using a team of experts approach that includes faculty, preceptors, advanced practice nursing students, and clinical partners and a model that includes regular expert clinical rounds focused on older adults. With the goal of increasing fall risk assessments prior to discharge from the acute care setting, studies are needed that explore the use of an interdisciplinary approach that includes family, caregivers, physical therapy, occupational therapy, nursing, and students. Research is needed that tests the efficacy of interventions to improve gait, strength, and balance and ultimately to reduce falls in the post-discharge period.

Implementation research measuring knowledge, attitudes, change in practice in nurses and ultimately rates of falls in older adults is needed. Because attitudes toward older persons is correlated with knowledge and confidence in caring for older adults (Fox et al. 2015, Kim, Jeon,

& Chon, 2015, Koren et al. 2008) measures of attitude, such as the AGED Inventory, should be included in studies measuring the effects of gerontology education.

And finally, there is a need for longitudinal studies to determine whether education programs such as the one described in this study have an impact on nurses' practice going forward.

Recommendations for Policy

On April 30, 2015, The National Council on Aging convened a Falls Prevention Summit to establish goals and action steps and create a National Falls Prevention Action Plan (Cameron et al., 2015). There are several recommended policy changes addressed in this document that relate to the findings of this study and should be advocated for by practitioners of fall prevention.

Study participants identified a need for safe housing options for older adults that include fall prevention features such as adequate lighting, railings on stairs, and grab bars in bathrooms. Medicare and Medicaid should increase coverage for home modification services, including home assessment. Home assessment and modification should be included as a benefit under managed care and long term care insurance plans. The U.S. Department of Housing and Urban Development (HUD) and subsidized housing providers should provide funds to retrofit existing buildings so that they are supportive of frail older adults at risk for falls.

To improve transition of care between settings, acute care facilities should be incentivized to provide ongoing fall risk assessments and referrals to community providers upon discharge. The Centers for Medicare and Medicaid Services should add a measure due to fall that could include fractures, brain injury, and other injuries resulting from a fall to the hospital readmission reduction program.

To increase the numbers of older adults being assessed and treated for fall risks in primary care settings, an assessment and treatment plan should be required as part of the Welcome to Medicare Examination and the Annual Wellness Visit if an older adult indicated that he/she has had a fall or has concerns about falling. The Annual Wellness Visit should also be expanded beyond doctor's offices, into other settings in the community.

The final recommendation addresses reimbursement. All healthcare payors should be required to reimburse for fall screening with treatment plans and develop performance programs to encourage and incentivize fall screening. Eligible professionals should include physicians, nurses, nurse practitioners, physician assistants, occupational therapists, social workers, and physical therapists.

Limitations

This study has several limitations. First, the study was limited to one nursing program in the northwest region of a mid-southern state and may not generalize to other nursing programs in the state or in the country. The population consisted of senior undergraduate and first year graduate students. Logistics necessitated a sample of convenience with 52 students in one group and 20 students in the second group. Randomization of the sample would have strengthened the study, although pre-intervention equivalence observed in the pretest scores and pre-survey results reduce concern that this is a significant limitation. The statistical power of all tests is limited by the final sample size of 63. Small sample size would be a greater concern if the effect size were inadequate to reach statistical significance.

Limitations in data design may have arisen from the researcher created test, survey, and competency checklist. Analysis provided evidence of the scale's reliability and construct validity. Further attempts should be made to determine validity of the measure. A multitrait-

multimethod analysis would not be difficult to perform, using observation as a second method and the General Self-Efficacy Scale as a second trait to measure, and would contribute to the validity of the survey instrument.

A review of questions students consistently answered incorrectly on the pretest and posttest revealed that one was a multiple answer question related to specific FRIDs and the other was related to specific application of the algorithm. Wording of these questions could be made clearer to improve face validity. The pretest and posttest were conducted online and off-site and was not proctored. No grade was given to the students for the tests in order to minimize looking up answers or collusion. However, I was not able to control for looking up answers or collusion between participants.

Using my own students as participants introduces a potential source of bias: concerns related to coercion, fear of evaluative repercussions, and jeopardy to the teaching relationship can affect student participation (Loftin, Campanella, & Gilbert, 2011). Every attempt was made to ameliorate these concerns through vigilance of informed consent procedures.

Finally, as discussed previously, the results of the study are short term, and long-term follow up is important when striving for changes in attitudes or behavior.

Conclusion

Because the older population will continue to grow significantly in the future, the rate of falls, healthcare costs, and the need to assess for fall risk and provide fall related health promotion will increase. We know that use of fall prevention skills is increased (Brown et al., 2005, Demons et al., 2014, Tinetti et al., 2008) and falls in older adults are reduced when clinicians are trained to assess risk and apply evidence based interventions (Goodwin et al., 2011), that online delivery of the training is effective in increasing knowledge in healthcare

professionals (Maloney et al., 2011, Scott et al., 2011), that nursing students' knowledge about fall risk and prevention increased after attending a face to face program (Dauenhauer et al., 2015), and that medical students' confidence increased after completing a falls assessment on an older adult (Demons et al., 2014). This study extends the small body of research on effective teaching/learning strategies by demonstrating that undergraduate and graduate nursing students' knowledge and self-efficacy with falls risk assessment and prevention increased after exposure to an online education module and an opportunity to perform a falls risk assessment.

Several issues identified by the study participants such as lack of knowledge of fall related risk factors and assessment skills among nurses and lack of awareness of susceptibility and severity of falls among older adults can be addressed through education programs and active dissemination methods that incorporate models of behavior change. Because the possibility of nurses caring for older adults is increasing globally, nurse educators should use findings from this study and others to design curricula for fall prevention that includes providing clinical opportunities with older adults who are still independent in addition to those who require assistance. Other issues raised such as time constraints, fear that older adults would fall, and lack of policies or guidelines are healthcare system issues that need to be addressed. To help nurses in acute care settings with the responsibility for fall prevention, healthcare providers should consider an interdisciplinary approach focused on monitoring medications, increasing ambulation, limiting use of restraints and catheters, and providing exercise to improve strength and balance. Using the fall risk assessment to identify patients at high risk and referring them to community and home-based interventions to improve functional status after discharge will help reduce hospital readmissions. Increasing access to fall risk screening, assessment, and

management in primary care and home settings will also reduce falls and injury from falls in community dwelling older adults.

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Appendix A

Falls Risk Assessment Competency Checklist

Circle appropriate score for all criteria. 0=does not demonstrate competency
1= demonstrates competency

COMPETENCY		
Fall Risk Factor Identified		
Reviews self-assessment brochure completed by patient	0	1
Falls History		
Any falls in the past year?	0	1
Worries about falling?	0	1
Feels unsteady when standing or walking?	0	1
Medical Conditions		
Problems with heart rate and/or rhythm?	0	1
Cognitive impairment?	0	1
Incontinence?	0	1
Depression?	0	1
Foot problems?	0	1
Other medical conditions? (specify)	0	1
Medications		
Selects drug classes that can increase risk, reviews dosage	0	1
Reviews indication	0	1
Reviews dosage	0	1
Gait, Strength & Balance		
Timed Up and Go (TUG) Test (performed accurately)	0	1
Scored and interpreted accurately	0	1
30 second chair stand test (performed accurately)	0	1
Scored and interpreted accurately	0	1
4-stage balance test (performed accurately)	0	1
Scored and interpreted accurately	0	1
Orthostatic blood pressure (performed accurately)	0	1
Interpreted accurately	0	1
Vision		
Eye exam in < 1 year or measured acuity < 20/40	0	1
Home safety		
Checklist reviewed with patient	0	1
Key Fall Interventions		
Education Provided: strength and balance exercise, modify medications, manage hypotension, supplement vitamin D, address foot problems, optimize vision, optimize home safety	0	1
Demonstrated knowledge of Health Belief Model and/or Stages of Change Model when providing health promotion	0	1
Referral made: primary care, vision, fall prevention program	0	1

TOTAL SCORE =   27

Appendix B

Falls Prevention Pre and Post Test

1. What percentage of community dwelling people age 65 and over fall each year?

    a. 30%

    b. 10%

    c. 20%

    d. 50%

2. Annually, the direct medical costs for fall injuries in the United States total over _____?

    a. $28 million

    b. $30 billion

    c. $19 million

    d. $50 billion

3. Some things that older adults can do to prevent falls include (select all that apply):

    a. Begin an exercise program to improve balance.

    b. Have a clinician or pharmacist review all medications.

    c. Get an annual eye exam and update eyeglasses.

    d. Make the home safer by having good lighting, especially on the stairs.

    e. Begin an exercise program to build upper body strength.

4. Risk factors that are considered modifiable include (select all that apply):

    a. leg weakness

    b. increasing age

    c. problems with balance

    d. inactivity

    e. poor vision

    f. fear of falling

5. A 79 year old male patient who says he is worried about falling; has not fallen in the past year; and has no gait, strength, or balance problems is considered

    a. low risk and should be referred for strength and balance exercises

b. moderate risk and should be referred to physical therapy to improve gait, strength, and balance

c. low risk and should have a multifactorial risk assessment

d. high risk and should receive a follow up appointment within 30 days

6. A patient who has fallen twice in the past year and takes 20 seconds to complete the Timed Up Go (TUG) Test

a. is considered high risk

b. is considered moderate risk

c. is considered low risk

d. should be re-screened in a year

7. When administering the 4-Stage Balance Test, the nurse is concerned about the patient who cannot hold the tandem stance for at least

a. 10 seconds

b. 5 seconds

c. 20 seconds

d. 15 seconds

8. The following classes of drugs can increase fall risk. (Select all that apply).

a. Anxiolytics

b. Sedatives

c. Anticholinergics

d. Antidepressants

e. Antipsychotics

f. Anticoagulants

g. Antihypertensives

9. The chair stand test is used to assess

a. Leg strength

b. Balance

c. Gait

d. Orthostatic hypotension

10. The patient states "falling is just part of getting old". According to the Stages of Change Model, the nurse should respond with

a. "Yes, falling is common. But, there are things you can do to reduce your chances."

b. "Yes, a fall is the first step on the way to a nursing home."

c. "I want you to start an exercise program to reduce your fall risk."

d. "Unfortunately, I hear patients say that all the time."

Appendix C

Student Report of Falls Prevention Self-efficacy

Rate your degree of confidence in performing the following skills. For each skill, choose a number from 0-100, using the following scale.

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					*Moderately certain can do*					*Highly certain can do*

1. Conduct a home safety assessment to identify fall risks.

2. Identify medications that should be avoided or used with caution in order to reduce fall risk.

3. Triage a patient based on fall risk using an evidence based algorithm.

4. Watch a patient rise from a chair and walk and then interpret the findings.

5. Identify intrinsic and extrinsic risk factors for falling in community dwelling older adults.

6. Select individualized fall prevention interventions based on a patient's risks.

7. Use the Stages of Change Model to assess a patient's readiness to adopt a healthy behavior such as exercise.

8. Administer and interpret the 4 Stage Balance Test.

9. Administer and interpret the 30 Second Chair stand.

10. Assess a patient for orthostatic hypotension.

Appendix D

Fall Assessment and Prevention Interview Guide

Before we begin, I would like to thank you for participating in this interview and for your willingness to be part of my dissertation research on fall prevention. I am going to ask you a few questions related to your experience performing a falls risk assessment. With your permission, I would like to record our conversation so that I can focus on talking to you instead of taking notes. The interview is estimated to be 45 minutes, and will be transcribed later.

I would like to also inform you that this interview is confidential. Your name, address, and other identifying information will not be used in any form. Any names mentioned during the interview will be omitted from transcription to provide confidentiality (e.g., names of children, co-workers, family members). While there are no physical risks involved in this research, this interview will cover topics that may cause some discomfort, for example being recorded. I want to confirm that you realize that you can stop at any time and choose not to participate and there will be no penalty for choosing to do so. Finally, if you have questions or concerns regarding this study please contact me (the researcher) at:

Susan Patton, MHSA, MSN, APRN-BC, CNE

Clinical Instructor

Eleanor Mann School of Nursing

University of Arkansas

skpatton@uark.edu

479-525-4280

You may also contact the University of Arkansas Research Compliance Office if you have questions about your rights as a participant, or to discuss any concerns about, or problems with the research.

Ro Windwalker, CIP

Institutional Review Board Coordinator

Research Compliance

University of Arkansas

irb@uark.edu

Introduction

Let me begin by helping to make you feel comfortable with the process and purpose of the project. There are not any "right" or "wrong" answers. I am simply interested in your opinions and experiences.

Questions

1. What was it like to do the falls risk assessment and plan? Tell me about it.
2. Did you feel prepared to conduct an assessment on an older adult?
3. Did you feel prepared to conduct an assessment on fall risks?
4. How did the patient respond to the assessment? Where they cooperative?
5. Was the online module helpful in preparing you?
6. What components of the training did you think were helpful? Not helpful?
7. What are the benefits of doing a falls risk assessment on older adults?
8. What are the disadvantages or costs of doing it?
    a. How long did it take you?
9. Have you seen or heard of other nurses, doctors, or other health professionals performing a falls risk assessment?
10. What do you think it would take to get healthcare providers to do it?
11. What would increase the likelihood of you continuing to do a falls risk assessment in your own practice as a nurse?
12. What would decrease the likelihood of you continuing to do a falls risk assessment in your own practice as a nurse?

Wrap-up

1. Is there anything else you would like to tell me about your experience with falls risk assessment and management today?
2. Is there anything that you think I may have missed or don't have a good understanding of?

I really appreciate you taking the time to meet with me today.

Please feel free to contact me if you have any questions or if you think of anything else you want to add to our discussion today. After I have a chance to review our conversation in more depth, I may have things that we need to clarify with you. Would it be best to call or email you with any clarification questions?

January 14, 2016

MEMORANDUM

TO: Susan Patton
                        Ches Jones

FROM: Ro Windwalker
                        IRB Coordinator

RE: New Protocol Approval

IRB Protocol #:   15-12-432

Protocol Title: *Using an Online Learning Module in a Nursing Program to*
                        Improve Knowledge and Skills to Prevent Falls in the Community
                        Dwelling Older Adults Population

Review Type: ☒ EXEMPT   ☐ EXPEDITED   ☐ FULL IRB

Approved Project Period: Start Date: 1/14/2016 Expiration Date: 1/13/2017

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (https://vpred.uark.edu/units/rscp/index.php). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 100 participants. If you wish to make *any* modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 109 MLKG Building, 5-2208, or irb@uark.edu.