ABSTRACT

EVALUATION OF A FALLS PREVENTION PROGRAM FOR THE RURAL ELDERLY

By DaRae M. Coughlin

Falls are a major concern in the elderly population because of the significant impact on health status and quality of life. Falls are the leading cause of unintentional deaths in persons 65 and older. Modifiable risk factors associated with falls, as well as single and multi-factorial falls prevention programs, have been studied in the urban elderly. However, there is a dearth of literature on the effectiveness of falls prevention programs in the rural elderly population. The purpose of this study was to determine the effectiveness of an on-going multi-factorial falls prevention program in Wisconsin -- the Sure Step Falls Prevention (SSFP) program -- in decreasing the rate of falls in rural elderly participants.

Pender's Health Promotion Model was used as the theoretical framework for this study. A pre-post design was used to determine the effectiveness of the SSFP program in the rural elderly. A convenience sample of 67 elderly participants who met the inclusion criteria for the SSFP, and who completed the pre- and post-intervention questionnaires, was obtained from the SSFP existing data set. Pre- and post-intervention data were collected for analysis. Data were analyzed using descriptive and inferential statistics. Falls rate ratios and paired t-tests were used for comparison of pre- and post-intervention data within groups. Repeated measures ANOVA testing was utilized to compare data between groups.

Findings of the study revealed that there was a significant reduction in the rate of falls in both the rural and non-rural groups. The rural group had a 65% reduction in the mean rate of falls 6 months post-intervention. The non-rural group had a 50% reduction in the mean rate of falls 6 months post-intervention. The operational definition for effectiveness of a falls prevention program stated a 33% reduction in falls rate constituted an effective intervention, and both the rural and non-rural group met and surpassed this definition of effectiveness for a falls intervention.

In addition, the results of this study revealed there was not a significant difference in the reduction of mean rate of falls 6 months post-intervention between the rural and non-rural group, despite a lack of healthcare resources available to the rural elderly, as described in the literature.

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by

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This thesis is dedicated to my family. They have provided unwavering love and support throughout this process. They have been by my side from tears to triumph and have been the wind beneath my wings. Thank you.

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CHAPTER I

INTRODUCTION

Falls are a major concern in the elderly population because of the significant impact on health status and quality of life. In 2005, falls were the leading cause of unintentional deaths in persons 65 years of age and older, accounting for approximately 15,000 deaths per year in the United States. In 2006, over 1.8 million emergency room visits and more than 433,000 hospitalizations were due to falls (Centers for Disease Control and Prevention, [CDC] 2007).

The National Safety Council (2005) reported that approximately one in three persons, age 65 and older, was affected by falls each year. Hip fractures are a frequent result of falls in the elderly and account for more than 300,000 hospitalizations each year. Twenty percent of those experiencing hip fractures will require nursing home placement and nearly half will not regain full mobility or their previous independence and quality of life (National Safety Council, 2005). In addition, the economic impact of falls in the elderly population is enormous. In 2000, the direct medical costs for fatal falls equaled $200 million and $19 billion for non-fatal falls. By 2040, these costs are projected to reach $240 billion (CDC, 2007).

The State of Wisconsin has consistently ranked second in the nation in deaths due to falls and, consequently, has made falls prevention efforts a priority. In 1999, the Wisconsin Department of Health and Family Services (WI- DHFS) implemented a falls prevention initiative (WI-DHFS, 2002). This was a collaborative effort between the WI-DHFS, the University of Wisconsin, gerontologists, and staff from local falls prevention clinics, public health professionals, long term care professionals, and community groups, to develop and sustain successful falls prevention programs. This collaborative effort led

to a Statewide Falls Prevention Initiative in 2002, as well as a statewide Falls Prevention Conference in 2005, aimed at establishing community-based falls prevention programs (Centers for Disease Control and Prevention & the Merck Company Foundation, 2007).

Healthiest Wisconsin 2010 emphasizes falls prevention initiatives with short-term and long-term goals (WDHFS, 2002). Short-term goals include: (a) providing statewide education to increase knowledge and awareness of the impact of falls and falls prevention; (b) increasing training for public health and healthcare professionals; (c) increasing community partnerships to improve access to assessment, screening, intervention materials, training, resources, and identification of best practice models; (d) establishing a statewide falls prevention advisory group; and (e) improving access and reporting of falls related data. Long-term goals include: (a) "falling off" the CDC's Top Ten List of states with the most fall-related deaths, (b) establishing at least one interdisciplinary falls clinic per WI-DHFS region, (c) establishing a comprehensive falls prevention program in each county, (d) establishing model curricula regarding falls risks and prevention in higher learning centers, (e) establishing availability of balance and strengthening programs for older adults in each of the five WI-DHFS regions, (f) establishing a web-based query system for falls data, and (g) reducing injury and mortality from falls in the state (WI-DHFS, 2002).

From the aforementioned goals related to falls prevention initiatives, there appears to be a strong interest in alleviating the impact of falls on elderly residents. The dilemma is in determining which programs are successful and how these programs can be implemented for maximum benefit of the elderly population. Since the mid-1990's, many studies have been conducted regarding falls prevention. Several programs have been conducted on the effect of exercise programs in reducing the number of falls in

community dwelling older adults (Barnett, Smith, Lord, Williams, & Baumand, 2003; Day et al., 2002; Li et al., 2005; Lord, Menz, & Tiedeman, 2003; Wolf, 2003). While some of these studies have noted improvement in balance, Gardner, Buchner, Robertson, and Campbell (2001) stated that a program consisting of progressive, moderate intensity strength and balance exercises seems to provide the greatest success in falls reduction.

Other studies (Bischoff-Ferrari et al., 2004; Johnson, Buckley, Harley, & Elliott 2007; Lamoureux et al., 2008) have investigated the relationship of medications, vision, environment, vitamin D intake, hospitalizations, footwear, and physical performance measures in relation to falls. While some falls have a single cause, most falls stem from a combination of long-term and short-term predisposing factors, interacting along with short-term precipitating factors in a person's environment (Tinetti et al., 1994). For this reason, Tinetti stated that a multi-factorial prevention program that includes gait training, review of medications, exercise programs with balance training, treatment of postural hypotension, modification of environmental hazards, vision correction, assessment of cognition, and depression screening, might be beneficial in reducing falls among the elderly.

The American Geriatrics Society (AGS), British Geriatrics Society (BGS), and the American Academy of Orthopaedic Surgeons (AAOS) have issued a joint recommendation stating that all older persons should be asked at least once a year about falls by their caregivers. Those who present with one or more falls in the previous year should have a falls evaluation performed. For community-dwelling older persons living in their own homes, this should consist of a multi-factorial assessment that includes gait training, review of medications, exercise programs with balance training, treatment of postural hypotension, modification of environmental hazards, vision

correction, assessment of cognition, and depression screening (AGS, BGS, & AAOS, 2001).

Based on the components recommended by the AGS, BGS and AAOS (2001), Mahoney et al. (2007) conducted a multi-factorial falls prevention program from 2002 to 2004, in a primarily urban setting in Wisconsin, to determine if the intervention decreased falls in the elderly population. The sample included 349 adults, aged 65 years and older, with either two falls in the previous year or one fall in the previous 2 years, and with injury or balance problems. The sample of elderly was randomized into intervention and control groups. The intervention group (174 participants) received two in-home visits from a nurse or physical therapist, which assessed risk factors for falls. Assessments included demographic information, activities of daily living function, independent activities of daily living function, Mini-Mental State Examination (MMSE) score, short Geriatric Depression Scale (GDS) score, prior history of falls, use of assistive device, history of impaired vision, co-morbid medical conditions, number of prescribed medications and psychotropic medications, current exercise, and self-perceived health.

Interventions included recommendations to the participant and their primary physician, referrals to physical therapy and other providers, 11 monthly follow-up phone calls, and a balanced exercise plan. The control group (175 participants) received only a home safety assessment. While the results of the study did not show an overall statistically significant difference in the rate of falls between the intervention and the control groups, it did show a significant difference in participants with a MMSE score of 27 or less, who lived with a caregiver (Mahoney et al., 2007).

The results from Mahoney's multi-factorial study facilitated the *Sure Step* Falls Prevention (SSFP) study; nurses, physical therapists, and occupational therapists throughout Wisconsin were trained by county-specific Aging and Disability Resource Centers (ADRC) to implement SSFP among their patients and clients. The interventions for both studies were the same, and the sample was comprised of elderly who were 65 years or older with a history of falling. Other suggested criteria included those who (a) had a MMSE of 27 or below or who expressed problems with memory, (b) had a caregiver or someone who assisted them regularly, (c) were at risk for falls, and (d) were unable to participate in a classroom setting.

Evaluation of the SSFP program is currently ongoing. In order to explore the program's effectiveness on risk factors for falls, number of falls, and emergency use in the 6 months prior to the intervention, participants are asked to complete a questionnaire, both at baseline and 6 months after the intervention. While dissemination of the SSFP has been ongoing throughout the state of Wisconsin since 2006, evaluation of the program's effectiveness on elderly fall rates has not been completed (Mahoney et al., 2007).

In the study discussed above, Mahoney et al. (2007) explored the effectiveness of implementing a falls prevention program in the primarily urban elderly. However, there are no studies exploring the effectiveness of a falls prevention program in the rural elderly population. The population in rural areas tends to have a higher proportion of elderly, lower total income, higher unemployment, lower educational levels, poorer housing, increased levels of poverty, and decreased access to healthcare (Encyclopedia of Public Health, 2002). Hence, this study proposed to use a subset of the sample from

the ongoing SSFP study, mainly, the rural elderly, to determine the effectiveness of the falls prevention program in the rural elderly population.

The SSFP is suitable for study in the rural elderly population because it addressed many access problems that are present in the rural setting. First of all, an in-home falls assessment is provided in rural areas, where falls prevention programs do not currently exist. This assessment includes baseline eye, balance, mental, and depression evaluations. Often these evaluations are difficult to obtain in rural settings because of lack of available resources. The SSFP recommendations for participants included appropriate referrals to sources, such as local ADRC, to help alleviate problems with transportation and costs of services, which may serve as impediments to success of the program.

Significance to Nursing

Since Wisconsin has consistently ranked second in the nation in deaths due to falls in the elderly population, falls prevention will need to be a major focus for advanced practice nurses (APN) and nurse educators alike. The APN must be aware of the recommended guidelines and effective falls prevention programs available for the elderly population, especially if they are practicing in one of the 42 counties in Wisconsin designated as Health Professions Shortage Areas (HPSA) (Wisconsin Primary Health Care Association, 2006). Furthermore, because of limited healthcare resources, the APN might be the only healthcare provider seen by these patients, with the responsibility for assessing for falls risk along with appropriate interventions to eliminate falling.

Nurse educators must also become aware of effective falls prevention programs in order to educate future healthcare providers, patients, and fellow healthcare

practitioners. The nurse educator must become familiar with existing studies in order to advance research in this area.

Statement of the Problem

Research has been conducted on single factors related to falls prevention. Tinetti et al. (1994) stated that a multi-factorial approach is needed for falls prevention, since no single factor is considered solely responsible for falls. While multi-factorial prevention programs have been studied in the urban elderly (Clemson et al., 2004; Day et al., 2002; Mahoney et al., 2007; Nikolaus & Bach, 2003; Tinetti et al., 1994), little research has been conducted in the rural elderly population, which may have its own distinctive set of factors related to prevention and health promotion programs. These factors include lack of local resources, lack of public transportation, long distances between rural and urban communities (where health providers are more accessible), and a shortage of specialists, primary health providers, and prevention programs in rural communities.

Purpose of the Study

The purpose of this study was to evaluate the effectiveness of a multi-factorial falls prevention program in decreasing the rate of falls in the rural elderly in Wisconsin. Data from the SSFP program were used to evaluate the effectiveness of the program.

Research Question

What is the effectiveness of a falls prevention program on the rate of falls in the rural elderly population?

Definitions of Terms

Conceptual Definitions

Effectiveness: Ability to produce the intended or expected result (American Heritage Dictionary of the English Language, 2000).

Falls prevention program: An intervention program that includes gait training and advice on use of assistive devices, review and modification of medication, exercise programs with balance training as a component, treatment of postural hypotension, modification of environmental hazards, and treatment of cardiovascular disorders (AGS, BGS, & AAOS Panel on Falls Prevention, 2001).

Rate of falls: The rate ratio (RR) defined as the number of falls per patient per year (Mahoney et al., 2007).

Rural: According to the U.S. Department of Agriculture (USDA), rural is defined as all territory outside of urbanized areas and urban clusters. An urbanized area or cluster is one with an urban nucleus of 50,000 or more people (USDA, 2003). The Rural-Urban Continuum Codes (Beale codes) classification determines that counties qualify as rural if they have a Beale code of six or higher, which means they have a population of less than 20,000 and may or may not be adjacent to a metropolitan area. This constitutes 40 counties in Wisconsin (USDA, 2004).

Elderly population: The U.S. Census Bureau (2008) defines elderly as citizens aged 65 or older.

Operational Definitions

Effectiveness: A Cochrane Collaboration meta-analysis of 13 trials with multi-factorial interventions found a significant 33% reduction in fall rates (Gillespie, Gillespie,

& Cumming, 2000). This rate of reduction was utilized for assessing effectiveness in this study.

Falls prevention program: In this study, defined as the Sure Step Falls Prevention Program developed at the University of Wisconsin, Madison, School of Medicine and Public Health. The program consists of one initial in-home clinical assessment of risk for falls using a detailed algorithm, which includes an evaluation of medications, risky behaviors, home environment, vision, cognition, balance, gait, and Vitamin D and calcium intake. A second in-home visit, which provides written recommendations for the participants, written recommendations for the participant's primary care provider, and written recommendations for any treating therapists, followed by nine phone calls over the course of 1 year (monthly for the first 6 months, then bi-monthly for the next 6 months) to monitor their progress and encourage adherence to the recommendations (Mahoney, Shea, Schwalbe, & Cech, 2006).

Rate of falls: As reported by the participants as number of falls per person per 6 months, from data collected at: (a) baseline, which is referred to as pre-intervention for this study, and (b) 6-month follow up, referred to as post-intervention for this study.

Rural: As reported by participants on the demographic questionnaire as rural farm (over 10 acres) or small town or village.

Elderly population: Defined as those persons aged 65 or older, who had volunteered to participate in the SSFP, and had a history of two or more falls in the past year (with either one fall with injury in the past year or one fall with gait or balance problems in the past year). Data collected were from 125 participants in the SSFP. Data from a subset of 67 participants who provided completed pre-intervention and post-intervention questionnaires were utilized for this study.

Assumptions

Major assumptions in this study included:

1. Participants volunteered to participate in the program.
2. Participants or their caregivers assist to decrease the participant's rate of falls.
3. Participants honestly report their frequency of falls.
4. If a caregiver is present, the caregiver is willing to assist the participant with following the program's recommendations.
5. Behavior and other risk factors related to falling can be modified.

Summary

Falls prevention is a major concern on both the national and state level because of the financial impact and the decrease in independence and quality of life in the elderly population. It has been suggested that an intervention program, which addresses multiple factors related to falls, is most effective in decreasing the rate of falls for community-dwelling older persons (Tinetti et al., 1994; AGS, BGS, & AAOS Panel on Falls Prevention, 2001). The purpose of this study was to evaluate the effectiveness of a falls prevention program, specifically the SSFP, in decreasing the rate of falls in the rural elderly. In this chapter, conceptual definitions, operational definitions, and assumptions related to this question were presented.

CHAPTER II

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

Introduction

The purpose of this study was to evaluate the effectiveness of a multi-factorial falls prevention program in decreasing the rate of falls in the rural elderly in Wisconsin. Pender's Health Promotion Model (1996) was utilized as the theoretical framework for this study (Figure 1). A case study is presented to illustrate Pender's Health Promotion Model, followed by a review of literature on single and multi-factorial components of falls prevention in the elderly population.

Theoretical Framework

Pender's Health Promotion Model first appeared in the literature in 1982 and served as a framework for integrating nursing and behavioral science theories on health behavior influences. It was further revised in 1996 and provides a strong framework for health promotional research (Pender, Murdaugh, & Parsons, 2006). Pender described individual characteristics and experiences which affect subsequent actions. These consist of prior related behaviors (such as, previous behaviors in similar circumstances or habitual behavior) and personal factors. Prior related behaviors are important determinants of subsequent behaviors. If a benefit was perceived from the prior behavior, then a person is likely to repeat that behavior. If a barrier was perceived, then a person is not likely to engage in that behavior in a similar situation. Personal factors include biologic factors (age, body mass index, strength), psychological factors (self-

esteem, self-motivation, perceived health status), and socio-cultural factors (race, ethnicity, education).

The two variables, prior related behaviors and personal factors, influence a person's behavior-specific cognitions and affect, which are at the core of Pender's Model, since they include variables that can be modified through nursing actions. The variables include perceived benefits of action (personally valued benefits increase commitment to action), perceived barriers to action (impede commitment to action), perceived self-efficacy (increases the likelihood of commitment to action and decreases perceived barriers to action), activity-related affect (increases perceived self-efficacy), interpersonal influences (families, peers, and healthcare workers can act as positive or negative influences to the plan of action), and situational influences (external influences can increase or decrease commitment to a plan of action). By modifying these factors, a commitment to a plan of action and subsequent health promoting behaviors is achieved.

The SSFP program is aimed at modifying behaviors and eliminating barriers in order to decrease participant's rate of falls. Behavior modification includes compliance with vitamin D and calcium recommendations; primary care follow up to address medications, depression, vision problems, orthostatic hypotension; use of appropriate footwear; and adherence to balance and muscle strengthening programs. Behavior modification is also reinforced by interpersonal influences, such as support of identified caregiver and monthly follow up phone calls from the SSFP healthcare provider to reinforce compliance with the prevention plan. The participant's primary care provider is also apprised of the participant's falls prevention plan and asked to address this plan at office visits with the participant.

The SSFP program attempts to eliminate barriers to action by providing in-home assessments and by coordinating with local ADRCs to help provide funding and transportation for recommended services. The goal is that by improving falls prevention behaviors and eliminating potential barriers, participants will experience fewer falls.

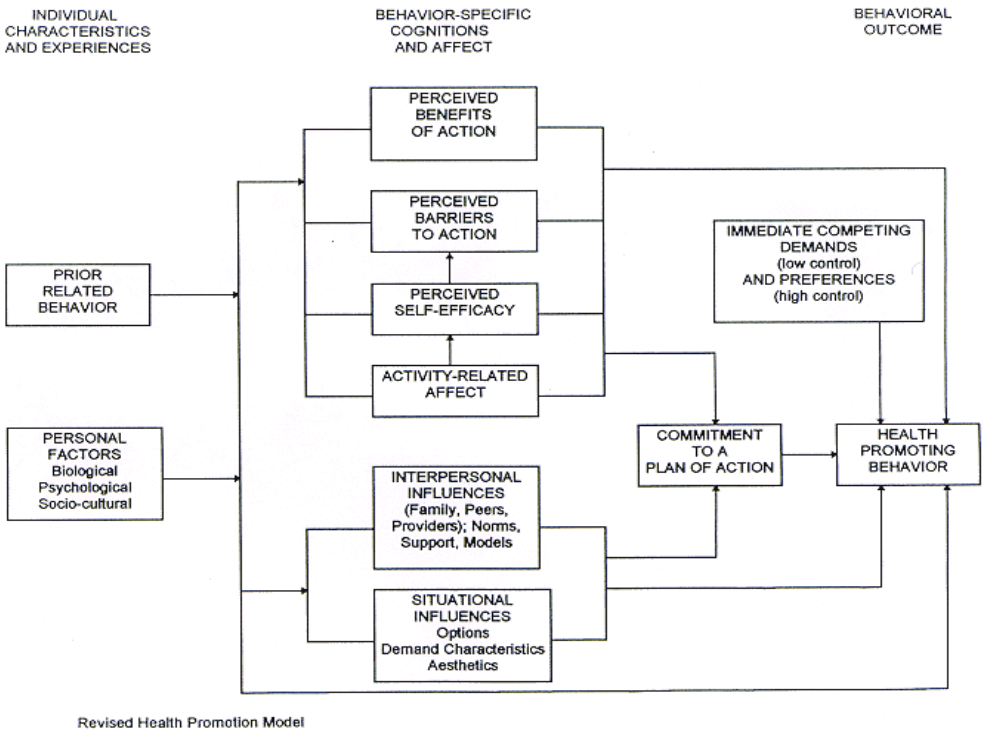

Figure 1. Pender's Health Promotion Model (Revised) (Pender et al., 2006).

Case Study With Application of Theoretical Framework

C.C. is a 79-year-old White female with a history of five falls in the past year -- one resulting in a left wrist fracture 6 months ago. C.C. related that most falls have occurred outside when she trips over obstacles in her path. She currently lives in a single-story home with her 55-year-old daughter, who is employed as a full-time teacher. Because of her history of falls, C.C. has volunteered to participate in a falls prevention program offered through her local ADRC. C.C. was excited to begin the program, since she fears that repeated falling will put her at risk of a hip fracture and nursing home placement. Her goal is to remain in her own home for as long as possible.

C.C.'s evaluation revealed that her balance was poor, but she continued to ambulate with a cane because a walker made her "look old." Her vision was significantly decreased in her left eye, and she related that she had been diagnosed with a cataract the previous year. She had previously been active in a gardening club, but had stopped attending meetings because of fear of falling while out in public. She also admits that she has become more forgetful in the past few years and often relies on her daughter to remind her to do things. She scored 27 on the MMSE. C.C. admitted she had never talked to her APN about falls prevention and was unsure about his attitude toward her participation in this program.

The evaluating registered nurse recommended physical therapy for balance exercises, gait training with a walker, and exercises to reduce falling and fear of falling. An appointment was scheduled with C.C.'s ophthalmologist for discussion of cataract removal. Home safety modifications were suggested to C.C. and her daughter. An open discussion regarding assistive device use, public perception, safety issues, and goals of this program was carried out with C.C., her daughter, and the evaluating

registered nurse. Both C.C. and her daughter agreed that a walker was the safest assistive device for her and that it would allow her to participate in the outside activities she enjoyed. A letter delineating the recommendations was forwarded to C.C.'s family doctor, and monthly follow-up phone calls with this patient were scheduled.

C.C.'s daughter was very supportive of her participation in this prevention program and was willing to modify the house in whatever means necessary to ensure C.C.'s safety. She has also agreed to reinforce the plan of care suggested to C.C. as a result of this falls prevention program. Both C.C. and her daughter admitted this reinforcement was necessary due to C.C.'s cognitive problems. Her daughter also agreed to arrange for transportation to therapy and exercise classes that were suggested. C.C.'s daughter was present during the initial evaluation and during the follow up visit.

The first concept of Pender's model is *Individual Characteristics and Experiences*, which purports that prior behavior and experiences influence future action, is composed of two variables -- prior related behaviors and personal factors. In this case study, C.C.'s pattern of falling is a predictor that she will continue with this behavior unless appropriate modification is undertaken. Pender's model also predicts that C.C. will continue to walk with a cane instead of a walker, because she experienced negative feedback about looking old in the past. This behavior would change if the perceived benefits (decreased falling and positive public image) outweigh the perceived barriers (negative public reaction).

The *Personal Factors* variable of this model includes biological, psychological, and socio-cultural factors. In C.C.'s case, biological factors, such as advanced age and decreased mobility and balance, may be contributing to her falls. She is self-motivated

to participate in this program. Other psychological factors include self-esteem and perceived health status. The socio-cultural factors outlined in this model include race, ethnicity, acculturation, education, and socioeconomic status.

The second major concept of Pender's model is *Behavior-Specific Cognitions and Affect.* The first variable is P*erceived Benefits to Action*. In this case study, both a decrease in falls and resumption of outside interests are mentioned as perceived benefits to participation in the program. The next variable is *Perceived Barriers to Action*. The evaluating registered nurse in this study identified C.C.'s unwillingness to been seen in public with a walker as a barrier to action. C.C.'s memory problems also pose a barrier to action. The third variable, P*erceived Self-Efficacy*, discusses a patient's ability to believe that one can modify their behavior. Although this was not specifically addressed in the case study, an underlying assumption is that C.C. believed that she had the ability to change her fall behavior and that is why she volunteered for participation in the fall prevention program. The fourth variable stated in the model is A*ctivity-Related Affect*. This variable describes feeling states that occur prior to, during, and after an activity. In C.C.'s case, her repetitive falling has caused a fear of falling when out in public. She carries this fear with her as she attempts new activities and deals with new environments. In order for this prevention program to be successful, attempts must be made to alleviate this fear. These four variables are interrelated and have a direct effect on the individual's commitment to a plan of action and adoption of health promoting behaviors.

Two additional variables are identified, which also influence commitment to a plan of action. The first consists of *Interpersonal Influences* (family, peers, and providers), norms, support, and models. In this case, C.C. has strong support from her

daughter related to the falls prevention program. She has agreed to modify their home environment in any way necessary and to provide moral support for her mother. Her daughter's reinforcement of the proposed interventions will also help to overcome the barrier of cognitive impairment. C.C. was unsure of the support from her primary care provider, since she had not discussed fall prevention with him. An effort was made to include him in this support system by means of a letter outlining the recommendations of the program. A peer role model (someone who had successfully completed the fall prevention program) may have been helpful in promoting behavioral change.

The final variable discusses *Situational Influences,* such as options, demand characteristics, and aesthetics. C.C. could have been presented with several options for environmental safety changes which may have blended into her home environment. This makes changes easier to adopt. It may also have been helpful for her to realize that several members of her gardening club ambulate with walkers and that this is readily accepted as normal by the other members. This would have promoted the adoption of a walker as her assistive device of choice.

The final subtheme identified as influencing health promoting behavior is *Immediate Competing Demands and Preferences*. In competing demands, the individual has relatively low control. In C.C.'s case, this may have included her daughter's work schedule, which could have interfered with transportation to physical therapy appointments. With competing preferences, the individual has a high level of control. This may have included refusal to undergo cataract surgery, even though it was strongly recommended to improve her vision.

As this case study illustrates, Pender's Health Promotion Model is useful in evaluating the perceived benefits and barriers of a fall prevention program in the rural

elderly population. There is little research, however, utilizing Pender's Health Promotion Model to study health promotion in cognitively impaired individuals. One qualitative study (Galik, Resnick, & Pretzer-Aboff, 2009) interviewed seven geriatric nursing assistants who worked with moderate to severe cognitively impaired residents in a nursing home setting in order to explore facilitators and barriers to engaging these residents in functional activities and exercise. Three themes were identified: (a) knowing what makes them tick (which included knowing the residents past), (b) teamwork and utilizing resources (including other medical staff and the residents' families), and (c) barriers to restorative care (which included fear of injury and unrealistic family expectations). These three themes correlate with several aspects of Pender's Health Promotion Model, including prior related behavior, personal factors, perceived barriers to action, and interpersonal influences.

Another study compared anti-hypertension medication compliance in mildly to moderately cognitively impaired elderly participants (Salas et al., 2001). The authors studied 1,979 participants in the Rotterdam Study who had two consecutive MMSE assessments between 1991 and 1997 and had received three or more consecutive antihypertensive prescriptions for at least 6 months. The researchers compared those with an MMSE of less than 25 to those with an MMSE greater than 25 on both assessments. The authors found that overall, the risk of noncompliance was twice as high in persons with impaired cognitive function as compared to the risk in those with normal cognitive function. In those cognitively impaired participants that lived with a partner, relative, or spouse, however, there was not an increased risk of noncompliance. Comparatively, the risk increase in cognitively impaired persons living alone was higher (risk = 2.9).

The Salas et al. (2001) study supports the interpersonal influences portion of Pender's Health Promotion Model for influencing a commitment to action with subsequent health-promoting behavior. In the above case study, C.C.'s daughter displayed emotional and physical support for her mother's attempt at adopting the falls prevention interventions. According to Pender's model, this influence supports adoption of health-promoting behaviors.

Review of Literature

Research regarding falls prevention has been completed both internationally and in the U.S. Studies on both single factors and multiple factors related to falls have been completed.

Risk Factors for Falls

Health Evidence Network (HEN) and the World Health Organization (WHO) compiled a synthesis of research regarding risk factors for falls (Todd & Skelton, 2004). These risk factors were separated into two categories, intrinsic risk factors and extrinsic risk factors. Intrinsic factors, which increase the risk for falling include history of falls; increased age; female gender (but only for the "older old," otherwise gender did not increase risk of falls); living alone; White; medications, such as psychotropics or persons taking four or more medications; medical conditions, such as circulatory disease, chronic obstructive pulmonary disease, depression, or arthritis; impaired mobility and gait; sedentary behavior; fear of falling; nutritional deficits; impaired cognition; visual impairments; and foot problems (Todd & Skelton, 2004).

Extrinsic risk factors include environmental hazards, such as poor lighting, slippery floors and uneven surfaces; inappropriate footwear and clothing; and

inappropriate assistive devices (Todd and Skelton, 2004). Research has been aimed at eliminating or decreasing these factors.

Single Factor Research

One of the most frequently researched factors related to falls prevention is exercise and its use in decreasing falls. In New Zealand, Gardner et al., (2001) developed a successful in-home exercise program for falls reduction. In four separate controlled trials involving over 1,000 people age 65 years and older, the researchers implemented an exercise program consisting of balance, strength, and endurance exercises. The program was found to be effective in reducing falls and moderate injuries in persons 80 years and older. The program was of moderate intensity (starting point of exercises at 8 to 10 good quality repetitions before fatigue and 30 minutes of walking per day) and was progressive in nature (increasing the duration, frequency, and weight). It also included monthly phone calls to encourage compliance. While this study showed positive effects of exercise on falls reduction, it did not address the elderly in the 65 to 80 year age range. It did, however, stress the importance of monthly follow up for increased compliance.

Barnett et al. (2003) studied the effectiveness of a community exercise program in reducing falls in Australia. The researchers used a randomized controlled trial of 163 elderly people with a history of falling to study the effect of a weekly community-based exercise program. Subjects attended a weekly structured exercise group led by an accredited exercise instructor. Moderate intensity exercises, comprising stretching, balance, aerobic, and muscle strength, were performed for 1 hour weekly (a total of 37 in 1 year). The exercise group was also given information on practical strategies for avoiding falls. The control group was given the same information but was not involved in

the exercise activity. Physical performance and general health measures were measured at baseline, 6 months, and 12 months using a postal survey. The researchers found balance to be improved, and the rate of falls to be 40% lower in the intervention group, as compared to the control group, within the 12-month trial period. While this study showed the effectiveness of moderate intensity exercise in improving balance and reducing falls, it did not address the need for an in-home exercise program for those elderly who could not attend a community-based program. Another limitation is that subjects with cognitive impairment or those with degenerative conditions, such as Parkinson's disease, were excluded from the study.

The use of Tai Chi as a falls prevention exercise program has met with mixed results in the literature. Lin, Hwang, Wang, Chang, and Wolf (2006) studied approximately 1,200 subjects from six rural villages in Taiwan. Using a non-randomized controlled study, an intervention group that participated in tai chi exercise was compared to a control group that did not participate in the exercise. All villagers received education on falls prevention, which included posters and pamphlets on exercises, use of walking aids, and environmental improvements. Injurious falls (those falls that required medical care) were documented via telephone interviews every 3 months over a 2-year period. Additionally, gait, balance, and fear of falling were assessed in two follow-up visits. While there was a decrease in injurious falls in the intervention group (45.8 per 1,000 person years), this was not statistically significant from the control group (24.3 per 1,000 person years). The researchers felt this may have been due to the falls prevention education that both groups received. The researchers recommended further study of this factor.

In a contrasting study on Tai Chi, Li et al. (2005) conducted a randomized controlled trial of 256 physically inactive adults aged 70 to 92 years in Portland, Oregon. The researchers compared an intervention group, who attended Tai Chi classes three times per week, to a control group, who participated in a stretching class only. The researchers found that the intervention group had a 55% lower risk of multiple falls following the intervention. Again, while this showed some promise as far as a falls prevention exercise program, it may be difficult for elderly persons with a history of falling to attend a community-based program. Furthermore, Tai Chi programs may have limited availability in rural settings.

Impaired vision and risk for falls have also been studied extensively in the literature. Lamoureux et al. (2008) analyzed the data from the Singapore Malay Eye Study, which examined 3,280 Malay adults aged 40 to 80 years. Besides visual acuity, details about any fall in the previous 12 months were collected. They found that severe impairment in one eye significantly increased the risk of falling by 60%. Mild and moderate vision impairment was not significantly associated with falls (Lamoureux et al.). In the U.S., Coleman et al. (2007) and Freeman, Munoz, Rubin, and West (2007) studied the effect of visual field loss and risk for falls, the primary vision component that increases the risk for falls.

Johnson et al. (2007) studied the use of single-vision glasses versus multi-focal lenses in relation to negotiating a raised surface, such as wearing bifocal or trifocal lenses when attempting to climb stairs. A study of 19 multi-focal eyeglass wearers was performed. Forty-five randomized, controlled trials varying step height were conducted. Using standard motion analysis techniques, the researchers found that when habitual wearers of multi-focal lenses switched to single-vision lenses, their control of foot

placement when negotiating a raised surface (steps of varying heights) was significantly better. While this was a small study (19 elderly participants) and it did not directly correlate control of foot placement and falls risk, it purported that wearing multi-focal lenses affected the ability to negotiate steps, contributing to falls.

Another factor related to falls prevention studied in the literature is the effect of vitamin D. Bischoff-Ferrari et al. (2004) performed a meta-analysis of five double-blind randomized controlled studies of vitamin D in elderly populations. They found that vitamin D reduced the odds ratio of falling by 22% compared with patients receiving calcium or placebo. They recommended further study in regards to dosage and duration.

While each of these single factors is linked to falls risk, modification of a single factor will only be beneficial if there is only one factor causing falls in the elderly. Since many elderly persons have co-morbidities, often the elderly have multiple factors causing falls. Many researchers propose that a multi-factorial intervention program is needed for preventing falls.

Multi-Factor Studies of Falls Prevention

Tinetti et al. (1994) published the landmark article on a falls prevention program, which showed that the number of fallers decreased by 31% when a multi-factorial approach was used on elderly who were most at risk of falling. The study included 301 community-dwelling, cognitively intact older adults with at least one risk factor for falls. The multi-factorial approach included exercise, medication review, education, and elimination of environmental hazards. Participants in the intervention group received approximately eight home visits to target and modify identified risk factors for falling. At 1-year follow up, 35% of the intervention group had falls as compared to 47% of the

control group. Since then, several other researchers have looked at the effectiveness of multi-factorial prevention programs with different components and in different subgroups of the elderly population.

Day et al. (2002) used a randomized controlled trial of 1,090 persons aged 70 and older in Australia to test the effectiveness of group exercise, home hazard management, and vision improvement. Three interventions (group based exercise, home hazard management, and vision improvement) were delivered to eight groups. The researchers found that a combination of these three interventions was most effective, with an estimated 14% reduction in the annual rate of falls.

Clemson et al. (2004) studied the effectiveness of Stepping On, a 7-week multi-factorial community program aimed at elderly persons with a history of falling. The participants attended small-group classes weekly, which included instruction on improving lower-limb balance and strength, improving home and community environmental and behavioral safety, encouraging regular vision screening, making adaptations to low vision, and encouraging medication review. The results showed a 31% reduction in falls in the intervention group. While this program was shown to be effective, the elderly participant had to be able to attend a community program. However, this program was unsuitable for the home-bound elderly who are at risk for falling.

Nikolaus and Bach (2003) studied the effectiveness of using a home intervention team (HIT) using a multi-factorial approach for decreasing falls. They conducted a randomized controlled trial with a 1-year follow up of 360 subjects. The intervention group received a comprehensive geriatric assessment as an inpatient, prior to hospital discharge. This was followed by a diagnostic home visit and home intervention,

consisting of an assessment of environmental hazards, advice about modifications, and training in the use of technical and mobility aids. The control group received a comprehensive geriatric assessment followed by the usual home care recommendations without a home assessment. The intervention group had 31% fewer falls than the control group. Of importance is that the researchers also found the intervention was most effective in the subgroup having two or more falls during the previous year.

Mahoney et al. (2007) used a randomized controlled trial of 349 persons aged 65 years and older with a history of falls to study the effectiveness of an in-home multi-factorial falls prevention program. Baseline data on the rate of falls was collected during the initial in-home assessment and then monthly. Follow up data on the rate of falls were collected utilizing telephone interview or postcards for 1 year. While there was no significant difference in the rate of falls between the intervention and control groups as a whole (rate ratio (RR) = 0.81; p = 0.27), there was significant difference in the rate of falls (RR = 0.55; p = 0.05), hospitalizations (RR = 0.44; p = 0.05), and nursing home days (7.5 versus 58.2; p = 0.008) in the elderly with a MMSE of 27 and below. Subjects in the intervention group with an MMSE of 27 or below, who lived with someone, had a lower rate of falls than subjects in the control group (3.10 versus 6.92). The rate of falls was similar in the intervention and control groups for subjects with an MMSE of 27 or below who lived alone. Further research involving this subgroup was recommended.

There is a dearth of research on falls prevention programs in the rural elderly population. Casteel, Peek-Asa, Lacsamana, Vazquez, and Kraus (2004) tested the effectiveness of the No More Falls! Program, a non-randomized multi-factorial prevention program conducted on 950 older adults in two rural California counties. The program consisted of efforts to eliminate domestic environmental hazards, management

of medication and alcohol use, development of lower limb strength and balance, and identification and treatment of existing hearing and vision deficits. The intervention was conducted by trained public health nurses. Data were obtained by direct assessment interviews at baseline and at 1 year. Results showed that the intervention group was 20% less likely to fall than the comparison group. The main limitation of this study was that the control group was comprised of elderly persons who were not offered the intervention or who did not meet the criteria for the No More Falls! Program. While this research study provided a basis for the study of multi-factorial falls prevention programs for the rural elderly, more research must be undertaken to address the issue of falls prevention in the rural elderly.

A review of the literature revealed that while some falls prevention programs are successful in reducing the rate of falls, study samples may not have included the elderly with decreased cognitive functioning, the home-bound elderly, or the elderly living in rural areas. Further research is needed on a multi-factorial falls prevention program which addresses the rural population.

Summary

In this chapter, a discussion Pender's Health Promotion Model as the theoretical framework for addressing falls prevention programs was provided, along with the application of the model through a case study.

The literature review revealed studies dealing with modifiable risk factors associated with falls, along with single factor and multi-factorial falls prevention programs. As discussed, there is a literature gap on research related to falls prevention programs in the rural elderly.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this study was to evaluate the effectiveness of a multi-factorial falls prevention program in decreasing the rate of falls in the rural elderly in Wisconsin. In this chapter, the methodology used in the study will is presented.

Design

A pre-post design was used to evaluate the effectiveness of an ongoing falls prevention program, the SSFP program, since data were collected pre-intervention and post-intervention. Both baseline data and data at 6 months post-intervention were compared to determine the effectiveness of the program on risk factors for falls, number of falls, and emergency use in the 6 months prior to the intervention.

Population, Sample, and Setting

The target population was elderly persons with a history of falling. The accessible population was elderly persons with a history of falling who lived in Wisconsin. Data were collected from 125 participants in the SSFP program. A subset of 67 participants (54%), who provided completed baseline (pre-intervention) and 6-month post–intervention questionnaires, was utilized for this study. This subset was a convenience sample of 67 elderly persons who (a) had agreed to participate in the SSFP program, (b) had a risk of falling, and (c) were adults who had agreed to complete the baseline and 6-month follow-up questionnaire.

The sample for the current and ongoing SSFP study was recruited through ADRCs in the state; through fliers, newspaper advertisements, and radio advertisements; through healthcare providers; and through snowball sampling. The setting for the study was rural Wisconsin, as designated by Part II, Section B, Question 1 of the Questionnaire for *Sure Step* Participants (Appendix A).

Data Collection Instruments

Two data collection instruments were used from the existing data set. The first was a demographic questionnaire, which includes one question related to the number of falls in the previous 6 months and another question on whether the elderly person was seen in the emergency room for injuries sustained in a fall in the previous year (Appendix A). This questionnaire was administered at baseline (face-to-face during the initial falls assessment) and at 6 months (via telephone or mail). At the 6-month contact, a compliance addendum was added to the original questionnaire asking nine questions related to discussions with their primary healthcare provider, optometrist/ophthalmologist, physical therapist, medications, calcium and vitamin D intake, assistive devices, and benefits of the fall prevention program (Appendix B).

The second instrument was The Falls Behavioral (FaB) Scale for the Older Person (Appendix C) developed by Clemson, Cumming, and Heard (2003). This assessment tool evaluated behaviors that help reduce falls during daily activity using ordinal measurements. This scale has a high content validity (0.93). Construct validity was identified as (a) history of falling associated with more protective behaviors ($t = 2.48$; $p < 0.05$), and (b) more protective behaviors associated with increasing age, reduced mobility, and frequency of leaving home. Reliability measures included internal

consistency alpha = 0.84 and test-retest internal consistency = 0.94 ($p < 0.01$) (Clemson et al., 2003).

Data Collection Procedures

Since participants from an existing data set were used, information for those participants who met the inclusion criteria for this study was obtained from the larger data set. This included participants who completed the baseline and 6-month questionnaires administered through the SSFP program. Questionnaire responses from the SSFP participants were collected by healthcare providers as part of the SSFP program. This information was sent via mail to Jane Mahoney, MD and the research staff at University of Wisconsin School of Medicine and Public Health. Information was compiled on an Excel spreadsheet and transferred to this researcher for secondary analysis via computer file, without participant indentifying information.

Human Protection

Approval from the University of Wisconsin Oshkosh Institutional Review Board, Protection of Human Participants Committee was obtained prior to accessing the existing data. Since the existing data set was obtained from the University of Wisconsin Madison School of Medicine and Public Health, approval was also obtained from University of Wisconsin Health Sciences Institutional Review Board. All data were accessed without participant identifying information for protection of participant confidentiality. Data were also stored on a password encrypted computer, only accessible to this researcher.

Data Analysis

The data for this study were analyzed using the Statistical Package for Social Sciences (SPSS) using descriptive and inferential statistics. Paired t-tests and ratios for mean rate of falls were completed for comparison of pre-intervention and post-intervention data within groups for each category. Repeated measures ANOVA testing was utilized for comparisons between groups within a category.

Limitations

The limitations of this study included limited generalizability due to the small sample size. Selection bias was also a factor, since it is a convenience sample. Data analysis was limited to the information obtained from the existing data set that was utilized for this study. Recall bias was also a limitation, since participants reported falls for the previous 6 months. Since no control group was used for comparison, results should be interpreted with caution. Regression to the mean may also have been a limitation, since participants represented a non-randomized, high risk group who might have improved with any intervention.

Summary

The purpose of this study was to determine the effectiveness of a multi-factorial falls prevention program in the rural elderly population in Wisconsin. The population, sample, and setting were outlined along with the data collection methods. Data were analyzed using descriptive and inferential statistics. Limitations, including limited generalizability, selection bias, information limited to the original data set, recall bias, lack of a control group, and regression to the mean were presented.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The purpose of this study was to evaluate the effectiveness of a multi-factorial falls prevention program in decreasing the rate of falls in the rural elderly in Wisconsin. This chapter begins with a description of the demographic characteristics of the participants. Information regarding falls rates in rural and non-rural groups is included. Demographic variables and the effects of these variables on falls rates are further explored. An analysis of the data and discussion of the findings pertinent to the purpose of the study are also presented.

Demographic Characteristics

Data were collected from 125 participants in the SSFP program. Data from a subset of 67 participants (54%), who provided completed baseline (pre-intervention) and 6 month post-intervention questionnaires, was utilized for this study. Demographic data from these participants is outlined below.

Location of Residence

Of the 67 participants who completed both the baseline and 6-month questionnaires, 27 lived in a rural area and 40 were non-rural.

Age

Regarding age, participants were categorized into three groups – 69 years of age or less, 70 – 79 years of age, and 80 years of age or older. Of the 67 participants, 10

were 69 years of age or less, 23 were 70 – 79 years of age, and 34 were 80 years of age or older.

Gender

Of the 67 participants, the majority was female (64%).

Marital Status

The majority of participants were widowed (n = 27; 40%), 10 were single, 17 were married, and 10 were divorced. Three participants responded "I don't know," and subsequently, their responses to this question were eliminated from the statistical analysis for this variable. Thus, a total of 64 responses for this variable were analyzed.

Ethnicity

Of the 67 participants, the majority were White (99%). Since only one participant was non-White, statistical analysis was not completed.

Table 1

Demographics

	n	Percent
Location		
Rural	27	40
Non-rural	40	60
Age		
< 69	10	15
70-79	23	34
80 or >	34	51
Gender		
Male	24	36
Female	43	64
Marital status		
Single	10	15
Married	17	25
Divorced	10	15
Widowed	27	40
I don't know	3	5

Additional Variables

In addition to the above demographic characteristics, several other variables relating to falls were included in the baseline and 6-month questionnaires. One additional variable -- who the participant lives with -- was studied to determine if this variable was a significant factor in reducing falls. Sixty-four participants responded to this question. The options under this heading included, alone, with spouse/long-term partner, with other relatives, with other non-relatives, with paid help, or unknown. The data was further subcategorized into three categories for analysis: (a) alone, (b) family, and (c) non-family. Twenty-eight participants were categorized as living alone, 28 were categorized as living with family, and 8 participants were categorized as living with non-family. The majority were either living alone (44%) or living with family (44%).

A second additional variable identified -- who provides care. Sixty-seven participants responded to this question. These options included spouse in home, child in home, other family in home, other in home, child out of home, other family out of home, other out of home, or unknown.

A third variable identified the number of initial falls (occurring during the 6 months prior to the intervention) and the relationship of this variable on falls rates. Data from 67 participants were categorized into three groups: (a) two or less falls occurring in the 6 months prior to the intervention, (b) three to ten falls occurring in the 6 months prior to the intervention, and (c) 10 or more falls occurring in the 6 months prior to the intervention. Of the 67 participants, 45 had two falls or less in the 6 months prior to the intervention, 18 had three to 10 falls in the 6 months prior to the intervention, and four had 10 or more falls in the 6 months prior to the intervention. Because there were only four participants in the 10 or more falls category, this variable was further categorized

into two groups: (a) two or less falls occurring in the 6 months prior to the intervention, and (b) three or more falls occurring in the 6 months prior to the intervention.

The last variable that was analyzed was number of participants that had a falls-related emergency room visit occurring in the 6 months prior to the intervention, as compared to the number of participants who had a falls related emergency room visit occurring in the 6 months after the intervention. Sixty-four participants responded to this question pre-intervention, and 66 participants responded to this question post-intervention. Thirty of the 64 participants (45%) who responded pre-intervention had been seen in the emergency room for a falls-related injury. This compares to 17 of the 66 participants (25%) who responded that they had been seen in the emergency room for a falls-related injury post-intervention.

Table 2

Additional Demographic Variables

	n	Percent
Who participant lives		
Alone	28	44
With spouse/long-term partner	17	27
With other relatives	11	17
With other non-relatives	6	9
With paid help	2	3
Who provides help		
Spouse in Home	15	24
Child in Home	6	10
Other Family in Home	6	10
Other in Home	6	10
Child out of Home	6	10
Other Family out of Home	11	18
Other out of Home	12	18
Number of falls in 6 months prior to intervention		
2 or less	45	67
3 or more	22	33

Results

Rural Versus Non-Rural

Research indicated that rural participants, as well as non-rural participants, had a significant reduction in the mean rate of falls 6 months pre-intervention to post intervention. This mean rate of falls was compared within the rural group, pre-intervention and post-intervention, using paired t-tests, followed by comparisons of rural and non-rural mean falls rates.

The rural group had a pre-intervention mean falls rate of 2.22 falls. This group had a post-intervention mean falls rate of 0.78 falls. The mean falls rate reduction from pre-intervention to post-intervention was 1.44 less falls ($p = 0.000$; 95% CI = 0.783, 2.106). The percentage of mean falls rate reduction was computed by dividing the mean falls rate reduction by the mean falls rate pre-intervention. In the rural group, there was a mean falls rate reduction of 65% post-intervention.

The non-rural group had a pre-intervention mean falls rate of 4.78 falls. This group had a post-intervention mean falls rate of 2.38 falls. The mean falls rate reduction from pre-intervention to post-intervention was 2.4 less falls ($p = 0.001$; 95% CI = 1.097, 3.703). In the non-rural group, this was a mean falls rate reduction of 50% less falls post-intervention.

When the mean falls rate reduction was compared between the rural and non-rural groups using paired t-tests, there was no significant difference in mean falls rate reduction ($p = 0.272$) from pre-intervention to post-intervention between the two groups. This analysis suggests that there was a significant reduction in mean falls rates in both the rural and non-rural groups following the SSFP program, and that there was no significant difference in the reduction of mean falls rates between the two groups.

Table 3

Rural Versus Non-rural Mean Falls Rate Reduction

Category	n	Baseline mean	Post-intervention mean	Mean reduction	95% Confidence Interval Lower	Upper	Sig.
Rural	27	2.22	0.78	1.44	0.783	2.106	0.000
Non-rural	40	4.78	2.38	2.40	1.097	3.703	0.001

Age

Paired t-tests revealed that participants aged 69 years or less had a 2.90 mean falls rate reduction when comparing mean falls rate pre-intervention to post-intervention; however, this was not a significant mean falls rate reduction ($p = 0.15$; 95% CI = -1.21, 7.01). Since the number of participants was 10, there may not have been sufficient power to detect significance. Those participants aged 70 years to 79 years had a 2.52 mean falls rate reduction per 6-month post-intervention as compared to pre-intervention, which was a significant mean falls rate reduction ($p = 0.01$; 95% CI = 0.79, 4.26). Participants aged 80 years and older had a mean falls rate reduction post-intervention as compared to pre-intervention of 1.41 falls per 6 months, which was also a significant mean falls rate reduction ($p < 0.01$; 95% CI = 0.95, 1.88).

Table 4

Age and Mean Falls Rate Reduction– Comparison Within Groups

Category	n	Baseline mean	Post-intervention mean	Mean reduction	95% Confidence Interval Lower	Upper	Sig.
≤ 69	10	10.50	7.60	2.90	-1.209	7.009	0.145
70 -- 79	23	3.48	0.96	2.52	0.788	4.256	0.006
≥ 80	34	1.94	0.53	1.41	0.948	1.875	0.000

Comparisons of the mean falls rate reduction from pre-intervention to post-intervention between the three groups revealed a significant difference in mean falls rates reduction between two of the three groups. There was significant mean falls rate reduction difference between participants ages 69 years or less and those aged 70 – 79 years ($p = 0.01$; 95% CI = 1.43, 12.23; mean falls rate reduction difference = 6.83). This mean falls rate reduction from pre-intervention to post-intervention was also statistically significantly different in participants aged 69 years or less compared to those aged 80 years and over ($p < 0.01$; 95% CI = 2.68, 12.94; mean falls rate reduction difference = 7.81). There was no significant difference noted in the mean falls rate reduction from pre-intervention to post-intervention in participants aged 70 – 79 years compared to those aged 80 years and over ($p = 0.61$; 95% CI = -4.83, 2.87; mean falls rate reduction difference = 0.98).

Table 5

Age and Mean Falls Rate Reduction Difference – Comparison Between Groups

		95% Confidence Interval		
Category	Mean reduction difference	Lower	Upper	Sig.
≤ 69 versus				
70 – 79	6.83	1.43	12.23	0.014
≥ 80	7.81	2.68	12.94	0.003
70 – 79 versus				
≤ 69	-6.83	-12.23	-1.43	0.014
≥ 80	0.98	-2.87	4.83	0.612
≥ 80 versus				
≤ 69	-7.81	-12.94	-2.68	0.003
70 -- 79	-0.98	-4.83	2.87	0.612

Gender

Paired t-tests showed a significant reduction in mean falls rate pre-intervention to post-intervention in male participants ($p < 0.01$; 95% CI = 1.48, 5.69; mean falls rate

reduction = 3.58) and in female participants ($p < 0.01$; 95% CI = 0.74, 1.54; mean falls rate reduction = 1.14). There was no significant difference in mean falls rate reduction when comparing the mean falls rate from pre-intervention to post-intervention between these two groups ($p = 0.68$).

Table 6

Gender and Mean Falls Rate Reduction – Comparison Within Groups

						95% Confidence Interval		
Category	n	%	Baseline mean	Post-intervention mean	Mean reduction	Lower	Upper	Sig.
Male	24	36	5.04	1.46	3.58	1.478	5.689	0.002
Female	43	64	3.02	1.88	1.14	0.739	1.540	0.000

Marital Status

Paired t-tests showed a significant reduction in mean falls rate pre-intervention to post-intervention in participants who were married or had a long-term partner ($p < 0.01$; 95% CI = 1.02, 2.98; mean falls rate reduction = 2.00), participants who were divorced or separated ($p < 0.01$; 95% CI = 0.50, 2.31; mean falls rate reduction = 1.40), and participants who were widowed ($p < 0.01$; 95% CI = 0.70, 1.58; mean falls rate reduction = 1.15). There was not a significant mean falls rate reduction pre-intervention to post-intervention in participants who were single ($p = 0.07$; 95% CI = -0.29, 7.70; mean falls rate reduction = 3.70). Since the number of participants in both the single and divorced groups was 10n or less, this lack of significance may not be meaningful, since there was not adequate power from a small sample size to detect significance.

Table 7

Marital Status and Mean Falls Rate Reduction – Comparison Within Groups

Category	n	%*	Baseline mean	Post-intervention mean	Mean reduction	95% Confidence Interval Lower	Upper	Sig.
Single	10	15	4.80	1.10	3.70	-0.291	7.691	0.065
Married / long-term partner	14	25	2.71	0.71	2.00	1.021	2.979	0.001
Divorced / separated	10	15	2.70	1.30	1.40	0.495	2.305	0.007
Widowed	27	40	1.67	0.52	1.15	0.700	1.597	0.000

*5% “I don’t know” responses.

Repeated measures ANOVA showed that there was a significant difference in mean falls rate reduction between single and widowed participants ($p < 0.01$; 95% CI = 0.52, 3.19; mean falls rate reduction difference = 1.86). There was no significant difference in mean falls rate reduction when comparing the remaining marital status groups, however. Again, the number of participants in both the single and divorced groups was 10 or less, so this lack of significance may not be meaningful because of the small sample size.

Table 8

Marital Status and Mean Falls Rate Reduction Difference – Comparison Between Groups

Category	Mean reduction difference	95% Confidence Interval Lower	Upper	Sig.
Single versus				
Married / long-term partner	1.24	-0.20	2.68	0.089
Divorced / separated	0.95	-0.67	2.57	0.244
Widowed	1.86	0.52	3.19	0.007
Married / long-term partner versus				
Single	-1.24	-2.68	0.20	0.089
Divorced / separated	-0.29	-1.73	1.15	0.684
Widowed	0.61	-0.51	1.73	0.277
Divorced / separated versus				
Single	-0.95	-2.57	0.67	0.244
Married / long-term partner	0.29	-1.15	1.73	0.684
Widowed	0.91	-0.43	2.24	0.180
Widowed versus				
Single	-1.86	-3.19	-0.52	0.007
Married / long-term partner	-0.61	-1.73	0.51	0.277
Divorced / separated	-0.91	-2.24	0.43	0.180

Who the Participant Lives With

Paired t-tests revealed that there was a significant reduction in mean falls rate pre-intervention to post-intervention in the 28 participants who lived alone ($p < 0.01$; 95% CI = 0.97, 1.74; mean falls rate reduction = 1.36), participants that lived with a spouse or long term partner ($p < 0.01$; 95% CI = 1.02, 2.98; mean falls rate reduction = 2.00), and participants who lived with other relatives ($p = 0.04$; 95% CI = 0.07, 2.10; mean falls rate reduction = 1.09). There was no significant mean falls rate reduction pre-intervention to post-intervention in participants who lived with other non-relatives ($p = 0.06$; 95% CI = -0.10, 2.77; mean falls rate reduction = 1.34) or in participants who lived with paid help ($p = 0.37$; 95% CI = -76.94, 100.94; mean falls rate reduction = 12.00). The latter two groups had a small number of participants, however (six and two). Even though 28 of

the participants lived alone, they still had someone who provided care for them, as a requirement for participation in the SSFP program.

Table 9

Who Participant Lives With and Mean Falls Rate Reduction – Comparison Within Groups

						95% Confidence Interval		
Category	n	%	Baseline mean	Post-intervention mean	Mean reduction	Lower	Upper	Sig.
Alone	28	44	2.18	0.82	1.36	0.974	1.741	0.000
Spouse / long-term partner	17	27	2.71	0.71	2.00	1.021	2.979	0.001
Other relatives	11	17	1.91	0.82	1.09	0.074	2.108	0.038
Other non-relatives	6	9	2.17	0.83	1.34	-0.100	2.767	0.062
Paid help	2	3	12.50	0.50	12.00	-76.940	100.94	0.336

The above participants were further categorized into three groups (alone, family, and non-family). The group in the alone category had a significant mean falls rate reduction pre-intervention to post-intervention, as mentioned. The group in the family category also had a significant mean falls rate reduction from pre-intervention to post-intervention ($p < 0.01$; 95% CI = 0.95, 2.34; mean falls rate reduction = 1.64). Participants in the non-family group did not have a significant mean falls rate reduction from pre-intervention to post-intervention ($p = 0.17$; 95% CI = -1.27, 9.27; mean falls rate reduction = 4.00). This research suggests that participants that live alone or with family members have a significant reduction in mean falls rates following participation in the SSFP program. Again this latter group had a smaller number of participants (eight as

compared to 28 in each of the other two groups); so, the relevance of this finding is unclear.

Table 10

Who Participant Lives With and Mean Falls Rate Reduction – Comparison Within Subgroups

						95% Confidence Interval		
Category	n	%	Baseline mean	Post-intervention mean	Mean reduction	Lower	Upper	Sig.
Alone	28	44	2.18	0.82	1.36	0.974	1.741	0.000
Family	28	44	2.39	0.75	1.64	0.949	2.337	0.000
Non-family	8	12	4.75	0.75	4.00	-1.269	9.269	0.116

Repeated measures ANOVA revealed there was not a significant difference in mean falls rate reduction when comparisons of mean falls rates per 6 months were made between these three groups, however.

Table 11

Who Participant Lives With and Mean Falls Reduction Difference – Comparison Between Subgroups

		95% Confidence Interval		
Category	Mean reduction difference	Lower	Upper	Sig.
Alone versus				
Family	-0.07	-1.07	0.92	0.886
Non-family	-1.25	-2.74	0.24	0.099
Family versus				
Alone	0.07	-0.92	1.07	0.886
Non-family	-1.18	-2.67	0.32	0.120
Non-family versus				
Alone	1.25	-0.24	2.74	0.099
Family	1.18	-0.32	2.67	0.120

Identified Help

Paired t-tests showed mixed results concerning reduction of mean falls rates pre-intervention to post intervention in “who provides help” categories. There was a significant mean falls rate reduction pre-intervention to post-intervention in participants who had help provided by a spouse ($p < 0.01$; 95% CI = 1.25; 3.28; mean falls rate reduction = 2.26), participants who had help provided by other family members who lived in the home ($p = 0.01$; 95% CI = 0.48, 2.19; mean falls rate reduction = 1.33), participants who had help provided by a child who lived out of the home ($p < 0.01$; 95% CI = 0.74, 1.59; mean falls rate reduction = 1.16), participants who had help provided by other family who lived outside the home ($p = 0.01$; 95% CI = 0.29, 2.07; mean falls rate reduction = 1.18), and participants who had help provided by other non-family not living in the home ($p < 0.01$; 95% CI = 0.46, 3.22; mean falls rate reduction = 1.84). Significance of mean falls rate reduction pre-intervention to post-intervention was not demonstrated in those participants who had help provided by a child who lived in the home ($p = 0.34$; 95% CI = -1.20, 2.87; mean falls rate reduction = 0.83) and participants who had help provided by other non-family who lived in the home ($p = 0.24$; 95% CI = -3.80, 11.80; mean falls rate reduction = 4.00). Several of these categories, however, had only six participants per category (child in home, other family in home, other non-family in home, and child out of home).

Table 12

Identified Help and Mean Falls Rate Reduction – Comparison Within Groups

						95% Confidence Interval		
Category	n	%	Baseline mean	Post-intervention mean	Mean reduction	Lower	Upper	Sig.
Alone	15	24	2.93	0.67	2.26	1.250	3.280	*p<.01
Child in home	6	10	1.83	1.00	0.83	-1.203	2.870	0.341
Other family in home	6	10	1.83	0.50	1.33	0.476	2.190	0.010
Other in home	6	10	4.33	0.33	4.00	-3.797	11.797	0.240
Child out of home	6	10	1.33	0.17	1.16	0.738	1.590	0.001
Other family out of home	11	18	1.82	0.64	1.18	0.290	2.074	0.014
Other out of home	12	18	2.67	0.83	1.84	0.460	3.220	*p<.01

Repeated measures ANOVA of mean falls rate reduction between groups of identified help revealed no significant difference in mean falls rate pre-intervention to post-intervention between groups according to who provided help.

Table 13

Identified Help and Mean Falls Rate Reduction Difference – Comparison Between Groups

		95% Confidence Interval		
Category	Mean reduction difference	Lower	Upper	Sig.
Spouse in home versus				
Child in home	0.38	-1.12	1.88	0.611
Other family in home	0.63	-0.87	2.13	0.401
Other in home	-0.53	-2.03	0.97	0.479
Child out of home	1.05	-0.45	2.55	0.166
Other family out of home	0.57	-0.66	1.81	0.356
Other out of home	0.05	-1.15	1.25	0.934
Child in home versus				
Spouse in home	-0.38	-1.88	1.12	0.611
Other family in home	0.25	-1.54	2.04	0.781
Other in home	-0.92	-2.71	0.88	0.310
Child out of home	0.67	-1.13	2.46	0.459
Other family out of home	0.19	-1.39	1.77	0.811
Other out of home	-0.33	-1.89	1.22	0.669
Other family in home versus				
Spouse in home	-0.63	-2.13	0.87	0.401
Child in home	-.0.25	-2.04	1.54	0.781
Other in home	-1.17	-2.96	0.63	0.198
Child out of home	0.42	-1.38	2.21	0.643
Other family out of home	-0.06	-1.64	1.52	0.939
Other out of home	-0.58	-2.14	0.97	0.455
Other in home versus				
Spouse in home	0.53	-0.97	2.03	0.479
Child in home	0.92	-0.88	2.71	0.310
Other family in home	1.17	-0.63	2.96	0.198
Child out of home	1.58	-0.21	3.38	0.082
Other family out of home	1.11	-0.47	2.68	0.165
Other out of home	0.58	-0.97	2.14	0.455
Child out of home versus				
Spouse in home	-1.05	-2.55	0.45	0.166
Child in home	-0.67	-2.46	1.13	0.459
Other family in home	-0.42	-2.21	1.38	0.643
Other in home	-1.58	-3.38	0.21	0.082
Other family out of home	-0.48	-2.05	1.10	0.546
Other out of home	-1.00	-2.55	0.55	0.202
Other family out of home versus				
Spouse in home	-0.57	-1.81	0.66	0.356
Child in home	-0.19	-1.77	1.39	0.811
Other family in home	0.06	-1.52	1.64	0.939
Other in home	-1.11	-2.68	0.47	0.165
Child out of home	0.48	-1.10	2.05	0.546
Other out of home	-0.52	-1.82	0.77	0.423
Other out of home versus				
Spouse in home	-0.05	-1.25	1.15	0.934
Child in home	0.33	-1.22	1.89	0.669
Other family in home	0.58	-0.97	2.14	0.455
Other in home	-0.58	-2.14	0.97	0.455
Child out of home	1.00	-0.55	2.55	0.202
Other family out of home	0.52	-0.77	1.82	0.423

Number of Initial Falls

Paired t-tests demonstrated a significant reduction in mean falls rate pre-intervention to post-intervention in the group who reported two or less initial falls pre-intervention on the baseline questionnaire ($p < 0.01$; 95% CI = 0.57, 1.16; mean falls rate reduction = 0.87). There was also a significant reduction in mean falls rate pre-intervention to post-intervention in the three or more initial falls group ($p < 0.01$; 95% CI = 2.18, 6.55; mean falls rate reduction = 4.37). Comparison of the mean falls rate reduction between the two groups revealed a significant difference in mean falls rate reduction ($p < 0.01$). This research suggests that a higher mean falls rate reduction can be expected following the SSFP program in participants that report a number of initial falls as three or more.

Table 14

Number of Initial Falls and Mean Falls Rate Reduction – Comparison Within Groups

						95% Confidence Interval		
Category	n	%	Baseline mean	Post-intervention mean	Mean reduction	Lower	Upper	Sig.
2 or less	45	67	1.36	0.49	0.87	0.569	1.164	0.000
3 or more	22	33	8.64	4.27	4.37	2.176	6.551	0.000

Emergency Room Visits

When participants were asked if they had been seen in the emergency room for a falls related injury, 64 participants responded in the baseline questionnaire (pre-intervention) and 66 participants responded in 6-month questionnaire (post-intervention). Thirty of these 64 participants (45%) responded “yes” pre-intervention, and 17 of the 66 participants (25%) responded “yes” post-intervention. Chi-Square non-parametric

analysis showed a significant reduction in participants who reported being seen in the emergency room for a falls related injury in the 6 months following the SSFP intervention.

Table 15

Emergency Room Visit for Falls Related Injury – Chi-Square Analysis

	Observed n	Expected n	Residual	Chi-Square	df	Asymp. Sig.
Pre-intervention				0.250	1	0.617
No	34	32	2.0			
Yes	30	32	-2.0			
Total	64	64				
Post-intervention				15.515	1	0.000
No	49	33	16.0			
Yes	17	33	-16.0			
Total	66	66				

Discussion

The purpose of this study was to determine the effectiveness of a falls prevention program on the rate of falls in the rural elderly population. Data analysis revealed that there was a significant reduction in the mean rate of falls in both the rural and non-rural groups post-intervention. The rural group had a 65% reduction in the mean rate of falls pre-intervention to post-intervention, and the non-rural group had a 50% reduction in the mean rate of falls pre-intervention to post-intervention. Gillespie et al. (2000) stated a 33% reduction in rate of falls constituted an effective intervention from a Cochrane meta-analysis. Both the rural and non-rural group met and surpassed the 33% reduction rate for effectiveness of a falls intervention. When compared to Clemson's et al. (2004) research on a multi-factorial community-based falls prevention program, the reduction in

falls rate in this SSFP in-home study was higher than that found by Clemson et al., which reported a 31% reduction in falls.

In addition, the results of this study showed there was no significant difference in the reduction of mean rate of falls between the rural and non-rural groups. One would expect that the reduction in rate of falls from an intervention program in the rural elderly population would be lower than that of the non-rural population because, namely, the rural areas have a higher proportion of elderly, lower total income, higher unemployment, lower educational levels, poorer housing, increased level of poverty, and decreased access to healthcare (Encyclopedia of Public Health, 2002). Other barriers to preventative healthcare in rural populations include longer travel distances, disproportionately older people, and difficulty disseminating preventative recommendations (National Opinion Research Center [NORC], 2007). The lack of a significant difference in reduction of mean rate of falls in this study may be explained in a variety of ways. First of all, the intervention, as described earlier, has been tailored to overcome some of these factors. For instance, an in-home prevention intervention by a healthcare provider helps to overcome the lack of access to healthcare, longer travel time, and difficulty of dissemination of a prevention program. Utilization of existing community resources, such as the ADRC, helped to overcome resource and travel barriers. Coordination of the plan of care by the in-home assessor, which included the participant's primary care provider, the family, and physical or occupational therapists, supported the participant's compliance with the program and improved dissemination of this falls prevention program.

It is unknown if the rural participants in this study faced the same impediments to healthcare as previously described in the literature. Further research is needed to

support the effectiveness of the SSFP in addressing the needs of the rural elderly in Wisconsin.

When looking at age as a factor, this study found that there was a significant difference in reduction of falls rate between the group aged 69 years or less and the other two groups (70 -- 79 years and 80 years and over). The group aged 69 years and less was the only group in this study which did not have a significant reduction in falls rate. The group aged 69 years and less had a higher initial number of falls (mean = 10.50), as compared to the group aged 70 -- 79 years (mean = 3.48) and the group aged 80 years and over (mean = 1.94). The group aged 69 years and less also only had 10 participants, as compared to 23 in the group aged 70 -- 79 years and 34 in the group aged 80 years and over. Further research is needed to determine whether this trend remains with a larger number of participants. Further research is also needed to determine why participants aged 69 years or less have a higher initial falls rate.

This study revealed that gender did not have a significant influence on the effectiveness of this falls prevention program. There was a significant reduction in the rate of falls in both the male ($p < 0.01$; $n = 24$) and female ($p = 0.01$; $n = 43$) participants. However, there was no significant difference in the reduction of falls rate between the two groups ($p = 0.68$).

Marital status was another factor assessed in this study. The single group was the only group which did not have a significant reduction in falls rate ($p = 0.07$). Comparisons of falls rate reductions between groups showed that the most notable difference in the reduction in falls rates was between single participants and widowed participants ($p = 0.01$). The sample sizes for each group varied from 10 in the single group to 27 in the widowed group. Since the number of participants in both the single

and divorced groups was 10 or less, this lack of significance may not be meaningful because of the small sample size used to detect significance. In addition, since there were a large number of comparisons in this category, significance may also have been due to chance. With more comparisons, there is increased likelihood that significance may be due to chance. Further research is needed with a larger sample size to determine whether this finding remains significant. Additional research is also needed to determine why the single group did not have a significant reduction in falls rate. Potential factors for further study include income level, types of housing, and social support.

Another factor addressed in this study was who the participant lived with. The participants were divided into three groups for analysis: (a) alone, (b) family, and (c) non-family. There was a significant reduction in falls rate in the alone group ($p < 0.01$) and the family group ($p < 0.01$), but not a significant reduction in falls rate in the non-family group ($p = 0.12$). The sample size for the non-family group was much smaller ($n = 8$) as compared to the other two groups ($n = 28$ in each group). This may account for the lack of significant reduction in falls rate. Further research is needed with a larger sample size in each group to determine if this is a meaningful finding.

Mahoney's et al. (2007) Kenosha County study suggested that the participants with an MMSE of 27 or below had a lower rate of hospitalizations, nursing home admissions, and nursing home days if they lived with someone. Living with someone did not affect the falls rate in Mahoney's study, however. For this reason, "who provides help" was an additional factor assessed in this present research study. Analysis showed that a significant reduction in falls rate was found in those participants that had help provided by: (a) a spouse ($p < 0.01$; $n = 15$), (b) other family members living in the home

($p = 0.01$; $n = 6$), (c) a child living outside the home ($p = 0.01$; $n = 6$), (d) other family living outside the home ($p = 0.01$; $n = 11$), and (e) other non-family living outside the home ($p < 0.01$; $n = 12$). There was no significant reduction in falls rate for those participants who had help provided by a child who lived in the home ($p = 0.34$; $n = 6$) or by non-family who lived in the home ($p = 0.24$; $n = 6$). Several of these groups had a sample size of only six participants. Therefore, the significance of these findings is debatable. In addition, since there were a large number of comparisons in this category, significance may also be due to chance. With more comparisons, there is increased likelihood that significance may be due to chance. Further research on this variable is needed to determine if significance is due to chance or due to the "who provided help" variable.

Another variable addressed in this study was the impact of the number of initial falls on the reduction of falls rate. Participants' responses to this question were divided into two categories -- two or less initial falls and three or more initial falls. Analysis showed that each group had a significant reduction in falls rate ($p < 0.01$ in both groups). There was a significant difference in the reduction of falls rate between these two groups, however ($p < 0.01$). This finding may be due to regression to the mean, which might predict that the variation in the findings of a high number of initial falls may be due to chance. When data are collected at a later date, the reported number of falls may be closer to the mean (just by correcting the effects of chance). The decrease in mean falls rate may not be attributed to the intervention in this case; it may have been a result of correcting the spuriously high initial reading. Further research is needed to determine why this difference exists between these two groups and whether this finding can be used as a predictor of effectiveness of the falls prevention program.

The last factor assessed in this study was whether the participant reported being seen in the emergency room for a falls-related injury in the prior to the intervention. This research showed a 20% decrease in participants who reported an emergency room visit for a falls-related injury post- intervention. This is a significant decrease ($p < 0.01$) in the number of participants who reported being seen in the emergency room for a falls-related injury post-intervention. This represents at least 13 less emergency room visits post-intervention for this sample of 67 rural and non-rural participants. Mahoney's et al. (2007) study assessed hospitalizations and hospital days, but not falls-related emergency room visits and, hence, cannot be used as a basis for comparison. In this study, participants were not asked to report the number of emergency room visits related to falls, but only if they were seen in the emergency room for a falls-related injury. Further research is needed to quantify the number of emergency room visits related to falls. This information will be valuable for projecting the amount of healthcare savings that can be attributed to the falls prevention intervention.

Summary

Results of this study demonstrated that the SSFP program had a significant reduction in falls rate in both the rural participants and in the non-rural participants. Also, results showed no significant difference in reduction of falls rate between the two groups.

In addition, results showed a significant reduction in falls rate for persons aged 70 years and older. Gender did not influence the reduction in rate of falls in this study. Marital status showed a significant reduction in falls in every category except single participants. The sample size of the groups in the "who the participant lived with" and "who provided help" categories were too small to determine if it was significant. This

study also showed a significant difference between groups with initial falls of two or less and those participants with three or more initial falls. Further research is needed with a larger sample size to validate the results of this study. Lastly, there was a significant decrease in the number of participants who reported going to the emergency room for a falls-related injury post-intervention. The reduction in actual emergency room visits was not quantified, however.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter presents the study summary and conclusions derived from the research findings. In addition, study limitations, relevance of the theoretical framework, implications for practice, and recommendations for further research are discussed.

Summary

The purpose of this study was to evaluate the effectiveness of a multi-factorial falls prevention program in decreasing the rate of falls in the rural elderly in Wisconsin. A review of literature showed a dearth of research regarding falls prevention in the rural elderly. The sample consisted of 67 participants in the SSFP program who filled out baseline (pre-intervention) and 6-month post-intervention questionnaires. The questionnaires included demographic data, including location of residence, age, gender, marital status, who the participant lives with, who provides care to the participants, and number of initial falls. In addition, participants were asked questions pertaining to number of falls pre-intervention and post-intervention, and whether they had been seen in the emergency room for a falls-related injury pre-intervention and post-intervention.

Findings of the study revealed that there was a significant reduction in the rate of falls in both the rural and non-rural groups. The rural group had a 65% reduction in the mean rate of falls post-intervention. The non-rural group had a 50% reduction in the mean rate of falls post-intervention. Gillespie et al. (2000) stated a 33% reduction in falls

rate constituted an effective intervention. Both the rural and non-rural group met and surpassed the 33% rate.

In addition, the results of this study revealed there was no significant difference in the reduction of mean rate of falls between the rural and non-rural groups, despite a lack of healthcare resources available to the rural elderly, as described in the literature. A qualitative descriptive study, asking rural participants to describe the difficulties they may encounter when adopting a falls prevention program, would have been helpful prior to implementing this falls prevention program. Further research is needed to determine the effectiveness of the SSFP in addressing the needs of the rural elderly in Wisconsin.

Regarding age as a factor, the results indicated that there was a significant difference in reduction of falls rate following the SSFP program between the group aged 69 years or less and the other two groups (70 – 79 years and 80 years and over). The group aged 69 years and less was the only age group studied which did not have a significant reduction in falls rate. This group had a higher pre-intervention mean number of falls (10.50) when compared to the group aged 70 – 79 years (mean = 3.48) and the group aged 80 years and over (mean = 1.94). The group aged 69 years and less also had only 10 participants when compared to those aged 70 -- 79 years (n = 23) and those aged 80 years and over (n = 34). Further research is needed to determine if age has any effect on the mean number of falls pre-intervention.

The findings of this study revealed that gender did not have an influence on the effectiveness of the falls prevention program. There was a significant reduction in the rate of falls in both the male ($p < 0.01$; $n = 24$) and female ($p = 0.01$; $n = 43$) participants. However, there was no significant difference in the reduction in mean falls rate between these two groups ($p = 0.68$).

The findings related to marital status showed that those who were single did not have a significant reduction in falls rate ($p = 0.07$). Comparison of reduction of falls rates between marital groups showed that the most significant difference in reduction of falls rates was between single and widowed participants ($p = 0.01$). The sample sizes for each group varied from 10 (single) to 27 in the widowed group.

Findings of this study regarding who the participant lived with showed that when the participants were divided into three groups for analysis: (a) alone, (b) family, and (c) non-family, there was a significant reduction in falls rate in the alone group ($p < 0.01$) and the family group ($p < 0.01$), but no significant reduction in falls rate in the non-family group ($p = 0.12$). The difference may be due to the sample size for the non-family group ($N=8$) when compared to the family and non-family groups ($n = 28$ in each group).

The question of "who provides help" was an additional factor assessed in this research study. Findings showed that a significant reduction in mean falls rate was found in those participants that had help provided by: (a) a spouse ($p < 0.01$; $n = 15$), (b) other family members living in the home ($p = 0.01$; $n = 6$), (c) a child living outside the home ($p = 0.01$; $n = 6$), (d) other family living outside the home ($p = 0.01$; $n = 11$), and (e) other non-family living outside the home ($p < 0.01$; $n = 12$). There was no significant reduction in falls rate for participants who had help provided by a child who lived in the home ($p = 0.34$; $n = 6$) or by non-family who lived in the home ($p = 0.24$; $n = 6$). The significance of these findings should be interpreted with caution due to the small sample size in the non-significant groups.

Another variable addressed in this study was the effect of the number of initial falls pre-intervention on the reduction of falls rate post-intervention. Participants' responses to this question were divided into two categories -- two or less initial falls and

three or more initial falls. Analysis showed that each category had a significant reduction in falls rate post-intervention ($p < 0.01$). There was a significant difference between the reduction of falls rate between participants with two or less initial falls and participants with three or more initial falls, however ($p < 0.01$). Further research is needed to determine why this difference in reduction in falls rates exists between these two groups with varied initial falls and whether the number of initial falls can be used as a predictor of effectiveness of the falls prevention program.

The last factor assessed in this study was whether the participant reported being seen in the emergency room for a falls-related injury pre-intervention and post-intervention. Forty-five percent of the participants responded "yes" pre-intervention, and 25% responded "yes" post-intervention. This showed a 20% decrease in participants who reported being seen in the emergency room for a fall-related injury following the intervention. This is a significant decrease ($p < 0.01$) in participants who were seen in the emergency room for a falls-related injury post-intervention. In this study, participants were not asked to report the number of emergency room visits related to falls, only if they were seen in the emergency room for a falls-related injury. Further research is needed to quantify the number of emergency room visits related to falls. This information will be valuable for projecting the amount of healthcare savings that can be attributed to this falls prevention intervention.

Relevance of Theoretical Framework

Pender's Health Promotion Model was used as the theoretical framework for this study. Findings of this study suggest that the SSFP program was effective in reducing rate of falls in the rural elderly population. Since the SSFP program was aimed at

modifying behaviors and eliminating barriers in order to decrease participant's rate of falls, this study supports Pender's Health Promotion model.

While this model has been studied extensively in health promotional literature, little research has been done using this model to study health promotion in the cognitively impaired person. This is an important consideration, since a recommendation for inclusion in the SSFP program was a MMSE score of 27 or below or an abnormal clock draw result (both indications of cognitive decline). One component of Pender's Health Promotion Model that makes it applicable to studies of the cognitively impaired is the aspect of interpersonal influences. As demonstrated in the case study from Chapter II, the influences of family, peers and healthcare providers can be beneficial in establishing a commitment to action and establishing health-promoting behavior. This notion is supported in literature which studies medication compliance in the elderly. The Rotterdam Study of compliance with anti-hypertensive medications in the cognitively impaired elderly found that participants who lived with a partner, relative, or spouse had no increased risk of noncompliance (Salas et al., 2001). Those cognitively impaired elderly who lived alone had a noncompliance risk of 2.9. Further research on interpersonal influences and other components of Pender's Health Promotion Model in the cognitively impaired and in falls prevention is needed.

Conclusions

1. The Sure Step Falls Prevention program had a significant reduction in mean falls rate in both rural and non-rural participants.
2. Results showed no significant difference in reduction of falls rate between the rural and non-rural groups.

3. Results showed a significant reduction in falls rate for persons aged 70 years and older.
4. Gender did not influence the rate of falls in this study.
5. Marital status showed a significant reduction in falls in every category except for those who were single.
6. The sample size of the groups “who the participant lived with” and “who provided help” categories were too small to determine if the significance noted was meaningful.
7. There was a significant difference in reduction of falls rates post-intervention between groups of participants with initial falls of two or less and participants with three or more initial falls.
8. There was a significant decrease in the number of participants who reported going to the emergency room for a falls related injury from pre-intervention to post-intervention.

Limitations of the Study

1. Limited generalizability, due to the small sample size in categories ‘who the patient lives with’ and ‘who provides care’.
2. Limited generalizability, due to the homogeneity of the group. All but one participant was White.
3. Selection bias was a factor, since it was a sample of convenience.
4. Data analysis was limited to the information obtained from the existing data base that was utilized for this study.

5. Recall bias was a limitation because participants had to report falls experienced in the previous 6 months.
6. The lack of a control group for comparison.
7. Regression to the mean may have been a limitation, since participants represented a non-randomized, high risk group who may have improved without this intervention. A control group was not used for comparison, which might have controlled for this phenomenon.

Implications for Nursing

Primary Health Care Nursing

Falls are a major concern in the elderly population because of the negative impact on health status and quality of life. Falls in the elderly population also cause a financial drain on our healthcare system. Advanced practice nurses can have a positive impact on lessening the burden of falls on the elderly by questioning patients regarding their falls history and by implementing multi-factorial falls prevention programs. Tinetti et al. (2008) studied the dissemination of evidence about falls prevention, coupled with interventions to change clinical practice on the rate of falls-related injuries in elderly persons in Connecticut. The authors found that the rate of serious falls-related injuries in the intervention geographical region was 9% lower than in the usual-care geographical region. The rate of falls-related use of medical services was 11% lower in the intervention region. This study demonstrated the positive influence primary health providers can have on falls rates if they are informed of falls prevention programs, and if providers incorporate these interventions into practice.

It is important for primary care providers to investigate whether prevention programs are appropriate for their rural patients, as well. This study demonstrated that multi-factorial falls prevention programs are as effective in the rural elderly population as it is in the non-rural population.

This study also has demonstrated financial implications for the healthcare system. Results showed a significant decrease in participants who reported a falls-related emergency room visit post-intervention. When further research is performed to quantify this decrease in emergency room visits, the results can be used to explore the potential savings of falls prevention programs. When financial gain is demonstrated, public and private funding may increase for falls prevention programs.

Nurse Educators

Nurse educators can utilize the results of this study to design and implement falls prevention programs for use by the rural healthcare provider. Dissemination of the results of this study to primary care providers and elderly patients may increase awareness of the success of falls prevention programs and encourage providers and patients to participate in falls prevention programs. The results of this study may also spawn further research in this area.

Indications for Further Research

Falls prevention programs have multiple implications for advanced practice nurses and nurse educators. Additional research is needed to explore and identify effective falls prevention programs.

1. Replicate the study with the same population using a larger sample size.
2. Replicate the study using a more heterogeneous population.

3. Study the lived experience of rural elderly and impediments to healthcare and access to prevention programs.
4. Investigate the rate of falls and contributing factors to falling in participants aged 69 years or less.
5. Investigate if single elderly participants have a similar rate of falls reduction from a falls prevention program as non-single participants.
6. Investigate if the effectiveness of a falls prevention program is decreased if the participant lives with paid help. Assisted living facilities may be an appropriate setting for this research.
7. Replicate the study with a larger sample size to investigate the effects of who provides care and the number of initial falls on the reduction of falls rates.
8. Investigate the factor of initial number of falls on effectiveness of a falls prevention program.
9. Conduct a study on the effectiveness of a falls prevention program on the reduction of the number of falls related emergency room visits.
10. Conduct a study utilizing Pender's Health Promotion Model on the cognitively impaired to determine if this model reflects influences on health promotional behaviors in this population.
11. Investigate the effects of alcohol related activities on falls rates and falls prevention programs.
12. Investigate the contribution of neurological deficits on initial rate of falls.

Summary

In this chapter, a summary of the results of a multi-factorial falls prevention program on reduction of falls rates in rural and non-rural elderly was provided. Usefulness of Pender's Health Promotion Model in studying falls prevention in cognitively impaired elderly was explored. Implications of falls prevention on advanced practice nurses and nurse educators were summarized. And finally, implications for further research were identified.

APPENDIX A

Questionnaire for *Sure Step* Participants

Questionnaire

For *Sure Step* Participants

PART I: For office use only (To Be Completed by Sure Step Assessor. *Note to assessor: Please fill in Participant ID# on each page of questionnaire*).

Participant ID: _____

Name of Sure Step Assessor: _____

Location of Sure Step (sponsoring organization, city and county): _____

Questionnaire Type:

____ Baseline ____ 6 months

Who completed the questionnaire?

a._____ Person receiving the falls prevention program alone.

b._____ Family member (caregiver) who lives with person.

c._____ Falls assessor with participant.

d._____ Falls assessor with family member (caregiver) who lives with person.

PART II: To be completed by Sure Step Participant

This questionnaire is being done with participants in the Sure Step Program. The information will be used to help evaluate programs to prevent falls for people over age 65. All of the information you provide will be held confidential and a number will be used instead of your name. You are free to discontinue the questionnaire at any time and for any reason.

Date Completed: _____

A. Age and Gender

1. Age: _____65-69
_____70-74
_____75-79
_____80-84
_____85-89
_____90 and over

2. Gender: _____Male
_____Female

B. Other information

1. Location of residence

a. _____ Rural farm (over 10 acres)
b. _____ Small town or village
c. _____ City/suburb of city

2. When you need some help with things around the house, do you have someone you can count on to help?

____No (IF NO, SKIP TO QUESTION 3)
____Yes (IF YES, PLEASE ANSWER 2A) ____Don't Know

2A. Who provides the ***most*** help for you? Please mark ***only one*** answer.

a. ____ Spouse in home
b. ____ Child in home
c. ____ Other family in home
d. ____ Other in home
e. ____ Child out of home
f. ____ Other family out of home
g. ____ Other out of home _____Don't Know

3. What is your marital status?

a._____ Single (never married)
b._____ Married/long-term partner
c._____ Divorced/separated
d._____ Widowed _____Don't Know

4. Who lives here with you?

a._____ Alone
b._____ With spouse/long-term partner
c._____ With other relatives
d._____ With other non-relatives
e._____ With paid help (includes free room) _____Don't Know

5. At the present time, do you use a cane, walker, wheelchair, or other type of walking aid ***more than half*** of the time for ***indoor walking***?

____No (IF NO, SKIP TO QUESTION 6)
____Yes (IF YES, PLEASE ANSWER 5A) _____Don't Know

5A. What type of aid do you use most often? Please mark only one answer, for the one you use most often indoors.

a. ____ Cane
b. ____ 4 Prong Cane
c. ____ Hemi-walker (Side Stepper)
d. ____ Standard Non-wheeled Walker
e. ____ Wheeled Walker
f. ____ Wheel chair-sit in _____Don't Know

6. Do you have a regular doctor who you can call on whenever you have a health problem?

_____No
_____Yes _____Don't Know

For questions 7 & 8, please answer "yes" if you have received the particular service in reference in the *past 6 months*. If not, answer "no".

7. Have you seen your regular doctor in the past 6 months?

_____No _____Don't Know
_____Yes

8. Have you been in an emergency room as a patient in the past 6 months?

_____No
_____Yes _____Don't Know

9. What racial or ethnic group do you belong to?

a. ____Caucasian
b. ____Hispanic
c. ____African American
d. ____African American/Hispanic
e. ____Asian or Pacific Islander
f. ____Hispanic/Latino
g. ____American Indian/Native American
h. ____Other_____ _____Don't Know

10. Which of the following kinds of health insurance coverage do you have? Please check all that apply:

a. _____ Medicare-Part A (pays hospital bills)

b. _____ Medicare-Part B (pays doctor bills)

c. _____ Supplemental insurance (Blue Cross, other)

d. _____ Medicaid

e. _____ HMO

f. _____ Veterans Administration

g. _____ Wisconsin Partnership Program

For Question 11, only choose one number. If you can only remember the approximate number of falls, that is ok. Try to enter a number as close to your number of falls as you can remember.

11. How many times have you fallen in the past 6 months?

_____ # of falls _____Don't Know

11A. Did you have any injuries from a fall in the past year where you had to be seen by a physician or emergency room?

_____ No
_____ Yes _____Don't Know

APPENDIX B

Compliance (6-Month Questionnaire Only)

Compliance (6 months questionnaire only):

1. Did you discuss your falls risk with your doctor?

____No
____Yes ____Don't Know

2. Did you see an ophthalmologist or optometrist in the last 6 months?

_____No
_____Yes _____Don't Know

IF YES, 2A. If you saw ophthalmologist, was any change made? (check all that apply)

_____Vision correction made for distance glasses
_____Change from multi-focal to single distance lenses
_____No change made
_____Cataract surgery or other change
_____Don't Know

3. Was outside physical therapy recommended for you?

____No
____Yes _____Don't Know

IF YES, 3A. Did you see an outside physical therapist?

____No
____Yes ____Don't Know

4. Did you cut back on any over-the-counter medication you take for sleep as a result of falls program?

____No ____ Not applicable
____Yes ____Don't Know

5. Did your doctor change any prescribed medication as a result of falls program?

____No ____ Not applicable
____Yes ____Don't Know

6. Did you increase Calcium and D intake as a result of falls program?

____No
____Yes ____Don't Know

7. Did you get a new assistive device as a result of the falls program?

____No
____Yes ____Don't Know

8. If you already used an assistive device, do you use it more frequently as a result of the falls program? (Check “not applicable” if you didn’t already use an assistive device).

____No ____Not Applicable
____Yes ____Don’t Know

APPENDIX C

The Falls Behavioral (FaB) Scale for the Older Person

The Falls Behavioral (FaB) Scale for the Older Person

The FaB Scale is a list of 30 statements that describes things we do in our everyday lives. Please read each statement carefully.

Circle how much each statement describes the things you do in your daily life. For example:

Never	Sometimes	Often	Always	Doesn't Apply

Only circle '*Doesn't Apply'* if the situation is something to which you are not exposed (for example, if you do not have a phone).

Would this describe the daily things you do in your life?	Circle which one applies				
1.When I stand up I pause to get my balance.	Never	Sometimes	Often	Always	
2. I do things at a slower pace.	Never	Sometimes	Often	Always	
3. I talk with someone I know about things I do that might help prevent a fall.	Never	Sometimes	Often	Always	
4. I bend over to reach something only if I have a firm handhold.	Never	Sometimes	Often	Always	Doesn't Apply
5. I use a walking stick or walking aid when I need it.	Never	Sometimes	Often	Always	Doesn't Apply
6. When I am feeling unwell I take particular care doing everyday things.	Never	Sometimes	Often	Always	Doesn't Apply
7. I hurry when I do things.	Never	Sometimes	Often	Always	
8. I turn around quickly.	Never	Sometimes	Often	Always	

Now, these are things you do indoors

Would this describe the things you do in your daily life?	Circle which one applies				
9. To reach something up high I use the nearest chair, or whatever furniture is handy, to climb on.	Never	Sometimes	Often	Always	Doesn't Apply
10. I hurry to answer the phone.	Never	Sometimes	Often	Always	Doesn't Apply
11. I get help when I need to change a light bulb.	Never	Sometimes	Often	Always	
12. I get help when I need to reach something very high.	Never	Sometimes	Often	Always	
13. When I am feeling ill I take special care of how I get up from a chair and move around.	Never	Sometimes	Often	Always	Doesn't Apply
14. When I am getting down from a ladder or step stool I think about the bottom rung / step.	Never	Sometimes	Often	Always	Doesn't Apply

Now, these are about lighting and eyesight

15. I notice spills on the floor.	Never	Sometimes	Often	Always	
16. I use a light if I get up during the night.	Never	Sometimes	Often	Always	
17. I adjust the lighting at home to suit my eyesight.	Never	Sometimes	Often	Always	
18. I clean my spectacles.	Never	Sometimes	Often	Always	Doesn't Apply
19. When wearing bifocals or trifocals I misjudge a step or do not see a change in floor level.	Never	Sometimes	Often	Always	Doesn't Apply

Now, these are about shoes

Would this describe the things you do in your daily life?	Circle which one applies				
20. When I buy shoes I check the soles to see if they are slippery.	Never	Sometimes	Often	Always	
21. When I walk outdoors I look ahead for potential hazards.	Never	Sometimes	Often	Always	
22. I avoid ramps and other slopes.	Never	Sometimes	Often	Always	
23. I go out on windy days.	Never	Sometimes	Often	Always	
24. When I go outdoors I think about how to move around carefully.	Never	Sometimes	Often	Always	
25. I cross at traffic lights or pedestrian crossings whenever possible.	Never	Sometimes	Often	Always	Doesn't Apply
26. I hold onto a handrail when I climb stairs.	Never	Sometimes	Often	Always	Doesn't Apply
27. I avoid walking about in crowded places.	Never	Sometimes	Often	Always	
28. I keep shrubbery and plants trimmed back on the pathways to my front / back doors.	Never	Sometimes	Often	Always	Doesn't Apply
29. I carry groceries up the stairs only in small amounts.	Never	Sometimes	Often	Always	Doesn't Apply

And, finally, these are about medications

Would this describe the things you do in your daily life?	Circle which one applies				
30. I ask my pharmacist or Dr. about side effects of my medications.	Never	Sometimes	Often	Always	Doesn't Apply

Thank you for completing the *SURE Step* Questionnaire. You do not need to fill out the following page.

APPENDIX D

UW Health Sciences MR-IRB

Application for Exemption Review Determination
UW Health Sciences MR-IRB

Protocol Number: M-2008-1496
Principal Investigator: Jane Mahoney
Study Title: Evaluation of a Falls Prevention Program for the Rural Elderly
PI Address: 2870 University Ave., Suite 106 Madison, WI 53706
Point of Contact: Vicki Gobel
Staff Reviewer & Contact Information: Sheralyn Holcomb; ssholcomb@medicine.wisc.edu; 608-263-42

The MR-IRB has reviewed the study indicated above for exemption and its determination is indicated below. Please review this determination and any additional guidance provided by the IRB. If you have any questions regarding this determination, please contact the staff reviewer listed above.

☐ IRB review is not required because, in accordance with federal regulations, your project does not:
- ☐ constitute research as defined under 45 CFR 46.102(d)
- ☐ involve human subjects as defined under 45 CFR 46.102(f)

Guidance:

☒ Your study qualifies for exemption under category: 45 CFR 46.101(b)(4). Although your study is exempt from federal regulations, UW Human Research Protection Program policy requires that all human subjects research be conducted in accordance with the highest ethical standards/Belmont Report. **Please contact the MR-IRB before making any changes to your research as these may affect the exempt status of your study.**

Guidance:

☐ Although your study qualifies for exemption under category _____, it also requires review by the MR-IRB for the reasons outlined below.

Guidance:

☐ Your study involves the use and/or disclosure of PHI and therefore, HIPAA regulations apply. The following are approved by the IRB:
- ☐ HIPAA Authorization Form
- ☐ Application for Waiver of Authorization
- ☐ Other:

☐ Your study does not qualify for exemption. You must submit an initial review application for the reasons outlined below. This application is available on the Health Sciences IRBs website at www.medicine.wisc.edu/irb .

Guidance:

Staff Reviewer Signature

1/28/09
Date

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