Pre-program Assessment for Fall-Related Hip Fracture Prevention in a Rural Community

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PRE-PROGRAM ASSESSMENT FOR FALL-RELATED HIP FRACTURE PREVENTION IN A RURAL COMMUNITY

A Capstone Experience/Thesis Project
Presented in Partial Fulfillment of the Requirements for
the Degree of Exercise Science with
Honors College Graduate Distinction at Western Kentucky University

By
Katryn I. Steenbergen

*****

Western Kentucky University
2013

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____________________
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ABSTRACT

In the elderly, hip fractures from falls often result in decreased quality of life, independence, or functional mobility. Such injuries may lead to hospitalizations, skilled nursing facility admissions, and healthcare costs, yet can be minimized by addressing risk factors of falls. Health education models indicate that assessment of the target population is important prior to the development of an effective program. PURPOSE: To determine among rural adults self-identified learning needs, interest and preferences for fall injury prevention. METHODS: A survey was administered to senior citizens in a rural community. RESULTS: One hundred thirty (n= 130) older adults completed this survey. Paired t-tests and analysis of variance were conducted on demographic variables and perceived learning needs. Significant differences were found between 1) men and women in their interest in an instructional DVD (p = .047), 2) place of residence (rural vs. semi-rural) and preferred instructional method (p = .015), and 3) age groups in their preferences for internet instruction (p < .001), pamphlet instruction (p = .003), and highest educational level (p < .001), respectively. ANOVA revealed significant differences in perceptions in injury prevention education needs (p = .016) based upon educational level and preferred instructional method (p = .001). CONCLUSION: These results indicate that variables such as sex, place of residence, age, and educational level influence fall risk learning needs among rural adults. These findings suggest health care
workers should consider such factors in their target population when developing community-based education programs for older adults.

Keywords: Physical Therapy, Fall Prevention, Injury Prevention, Hip-Fracture Prevention, Rural Health, Community-based Program
Dedicated to my mother
ACKNOWLEDGEMENTS

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Finally, I would like to thank my friends and family who gave me the confidence and perseverance to complete my project. Thanks to the subjects for being participants and volunteering their time.
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CHAPTER 1

INTRODUCTION

Each year, one out of three older adults falls.\(^1\) Falling is the greatest risk factor for fractures in older adults and the primary reason among senior citizens for hospital admission.\(^2\) Falling causes over 95 percent of hip fractures, resulting in a major cause of disability as well as health care burden and cost.\(^3\) Extensive support exists for fall injury prevention at the national, state, and local levels.\(^4,5,6\) The Center for Disease Control (CDC) lists reducing deaths due to falls and reducing the incidence of hip fractures as national health priorities.\(^7\) Physical therapists, occupational therapists, exercise professionals and nurses can address preventable risk factors to help reduce these fall-related musculo-skeletal injuries.

The effectiveness of fall injury prevention programs varies and can be impaired because of the lack of adherence to the exercise regimens for reducing falls. Therefore, the Health Belief Model, which has been shown to increase compliance with prescribed exercises,\(^8\) can be used to help improve and sustain fall injury prevention health behaviors. Although fall prevention is routinely a component of patient education services offered through hospitals, skilled nursing facilities and home health agencies, multidimensional fall injury prevention efforts are needed at the community level to help meet the greater need, especially in rural communities where increased distance to medical care can increase the impact of a disabling injury. The objective of this
exploratory pilot study was to determine among rural adults essential information needed prior to planning an injury prevention program. Specifically, information was sought related to health behavior change (perceived susceptibility, perceived severity, cues for actions, health behaviors) and information related to learning (self-identified learning needs, interest, readiness, venue preferences, and mode/media preferences) for a community health education program related to prevention of hip fracture injury due to falls by certain sub-groups of senior citizens in the target area. The broader goal of this project was to begin the process of helping to decrease these debilitating injuries due to falls in the elderly that result in decreased quality of life, loss of independence, pain, mobility limitations, hospitalizations, skilled nursing facility admissions, healthcare costs, and personal care costs. The study developed and used an assessment tool based on principles from the Health Belief Model and Knowles’ Adult Learning Theory that can be used as a first step in gathering data as part of developing a multidimensional program that meets the needs of the community.
CHAPTER 2

REVIEW OF THE LITERATURE

Incidence, Prevalence, and Impact of Falls and Fall-Related Musculoskeletal Injuries

Twenty percent of hip fracture patients die within a year of their injury. Women have 75 percent of all hip fractures’ and up to 25 percent of independent living adults remain in a nursing home at least a year after a hip fracture. Incidence of hip fractures and falls are expected to increase in the coming decades as the population in the United States grows proportionally older: researchers estimate that the number of fractures will exceed 500,000 by the year 2040. According to Stevens and Rudd, there were over 250,000 hospital admissions for hip fractures among people aged 65 and older in 2010. Most hip fractures can be prevented by preventing falls.

In 2000, the total direct cost of all fall injuries for people 65 and older exceeded $19 billion dollars. In 2010, falls among older adults cost the U.S. health care system $30 billion in medical costs and is expected to reach $54.9 billion by the year 2020. Over ten years ago, Medicare costs for hip fractures were estimated to be about $2.9 billion. As shown over a ten year span, this cost to treat fall injuries has already increased significantly and will continue to increase as the population in the United States continues to grow and age. Locally, for the area assessed in the pilot study, falls caused
30 percent of non-fatal accidents admitted to the emergency room department in Barren County, Kentucky.\textsuperscript{13}

<table>
<thead>
<tr>
<th>Description – Type of Injury</th>
<th>Number</th>
<th>Percent</th>
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<tr>
<td>Falls</td>
<td>4,451</td>
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</tr>
<tr>
<td>Struck, caught, cut</td>
<td>3,098</td>
<td>21.1%</td>
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<tr>
<td>Motor Vehicle Crash</td>
<td>2,039</td>
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</tr>
<tr>
<td>Overexertion/Straining</td>
<td>934</td>
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</tr>
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<td>Adverse Reaction to Meds</td>
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<td>6.4%</td>
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Table 2.1: Overview of Emergency Department Injuries in Barren County, Kentucky (2003-2005).\textsuperscript{14}

Etiology and Risk Factors Related to Fall Musculoskeletal Injuries

Falls are the leading cause of death due to unintentional injury among older adults;\textsuperscript{15} deaths and injuries can be prevented by addressing risk factors. Review of the literature indicates that several risk factors are preventable and therefore knowledge and health behaviors related to these risk factors should be part of a multidimensional fall injury prevention program. In this vein, osteoporosis prevention, adequate nutrition, gait training and regular exercise to strengthen bones and muscles and improve balance, gait training as well as proper instruction about the risks and environmental hazards are all essential components that can help reduce the increasing rate of musculoskeletal injuries from falls in the elderly. In Linda Nazarko’s article on fall prevention, the factors
identified and treated in the study were poor balance and strength, osteoarthritis of knees and thumbs, inadequate pain control, uncorrected poor vision, unsuitable footwear, and unsuitable walking aids.\textsuperscript{16}

**Muscle Weakness and Poor Balance**

Researchers report that the typical adult experiences a 40\% loss of muscle mass and 30\% decrease in strength by age 70.\textsuperscript{17} Strong leg muscles are important to help maintain balance and mobility for activities of daily life among older adults, such as walking, picking things up, climbing stairs, standing up out of a chair and off the commode, as well as helping to prevent a temporary stumble from turning into a fall or rising up after a fall. Sense of balance also typically deteriorates with advancing age, particularly for individuals who do not continue regular activities or situations that require balance. Balance exercises help maintain the brain’s capacity to quickly activate appropriate muscles for the task. Balance exercises three to four days per week and only 10 minutes a day can be beneficial in maintaining functional mobility.\textsuperscript{18}

In an exercise program for the elderly conducted by Luukinen et al., home exercises improved hip, thigh, and ankle muscles, which are essential to balance.\textsuperscript{19} A review of 14 strength and balance training programs in patients with high risk for falls also found substantial evidence that proper strength and balance training is safe and effective for reducing falls.\textsuperscript{20} Efforts to improve balance, however, appear to have a greater impact on fall reduction than does improving strength. Results from a systematic review by Sherrington et al indicate that poor balance is a greater fall risk factor than is weak muscles and that balance training was also found to have a greater effect on decreasing the fall rate.\textsuperscript{21} In another review of balance and fall research literature,
Schubert also concluded that moderate to high intensity balance exercise appeared to be “one of the most effective interventions to prevent falls” for community-dwelling older adults.\(^{22}\)

Noticeably missing in the physical therapy research are studies on upper body muscles and their relationship to fall prevention and fall injury prevention. No studies were found that focused on strengthening upper body muscles to prevent a fall (muscles for grasping, holding on, pulling up, pushing away, holding oneself up) and muscles to reduce severity of injuries (muscles that would help slow a fall, avoid obstacles while falling, reduce the impact and maintaining proper body alignment during a fall). Ninety percent of hip fractures are caused by falling sideways onto the hip,\(^{23}\) showing that improved upper body strength could be a big factor relating to the severity of a fall. In a study by Mansfield et al, a small component of this issue was addressed. In their work on stepping and grasping reactions, the researchers determined that motion platform balance training improved the subject’s ability to keep from falling when they lost their balance.\(^{24}\)

**Osteoporosis**

The risk factor of osteoporosis is a major cause of fractures in older adults. According to Perry and Downey, osteoporosis is a condition wherein bones become more porous, acquire a lower bone mineral density value, and lead to fragility fractures.\(^{25}\) Risk factors leading to osteoporosis include decreased physical activity, as well as deficiencies of Vitamin D and Calcium.\(^{26}\) As people age, their bones become more brittle and lose calcium; osteoporosis prevention is important as it affects the majority of the older population. According to the National Osteoporosis Foundation, more than 10 million people over the age of 50 have osteoporosis.\(^{27}\)
Several studies relate to the prevention of osteoporosis in order to help prevent hip fractures. Research by Kai et al. reported that “estimated lifetime risks for wrist, hip, and vertebral fractures of around 15 percent.” These authors argue that prevention is the best way to address osteoporosis. The consequences of osteoporosis can result in hip and spinal fractures, or even death.

**Lack of Weight Bearing Exercise**

Older adults are the most sedentary population in the United States. Moderate exercise two to three times per week for at least 30 minutes produces multiple health benefits. Ni Maoshing stated in his book *Secrets of Longevity* that no matter how much calcium and Vitamin D supplements people take, without activities that exert weight on the bones, it will prove useless. Study results by Kai et al. showed that exercise not only improves bone health, but it also increases muscle strength, coordination, balance, flexibility and leads to better overall health.

Research by Kai et al. noted the importance of weight bearing exercise in keeping bones strong. The authors state that regular physical exercise places physical stress on the body and helps stimulate bone growth and preserve bone mass. Walking, aerobic exercise, and T’ai chi are listed as the best forms of exercise to stimulate this bone formation and to strengthen the muscles that help support bones. In a study comparing the effectiveness of Tai Chi to the conventional physical therapy exercise, the authors found that supervised T’ai Chi exercises were more effective in protecting frail older adults from incidence and severity of falls. Moashing claimed that even moderate weight bearing exercises such as walking are sufficient to help restore calcium to the bones. In a recent meta-analysis of 13 cohort studies, the researchers found that
moderate to vigorous physical activity is associated with hip fracture reduction of 45 percent in men and 38 percent in women.\textsuperscript{32}

**Environmental Hazards.**

Environmental risks are an extremely significant factor in the occurrence of falls; more than half of deaths related to falls occur within the home.\textsuperscript{33} As elderly people tend to spend most of their time at home, most falls occur in that environment. While 85 percent of fractures occur at home, 25 percent of those fractures are caused by environmental hazards within the home.\textsuperscript{34} According to physiologist Mike Ross, tripping hazards come in three basic categories: clutter (i.e., clothes, trash), hazards that are part of a house (i.e., rugs, electrical cords), and improper lighting. By making a simple plan to go through a house and rearrange or repair these hazards, the chance of falling at home can be decreased.\textsuperscript{18}

In the American and British Geriatrics Society’s guidelines for prevention of falls in older persons, a strong emphasis is placed on environmental risks leading to falls.\textsuperscript{35} They provided lists of actions that can be taken in each individual room of the house. Suggestions like installing hand rails, grabs bars, and proper lighting as well as avoiding throw rugs were among appropriate actions to take. Environmental risks are an extremely significant factor in the occurrence of falls; more than half of deaths related to falls occur within the home.\textsuperscript{33}

**Multidimensional Community Fall Injury Prevention Programs**

**Community Based Studies.**

Although many studies were described as “community-based”, large components of these programs were typically directed at individuals and required large time
investments by the professionals conducting these programs. No studies were found that treated the community as the client rather than the individual. Such limitations greatly limit the practical use for communities at large, as highly-individualized programs can be cost-prohibitive on a community wide scale.

There is a lack of studies that address injury prevention needs of rural older adults. According to the U.S. Census, rural areas are those locations outside cities of 50,000 or more people and their associated urbanized areas. Rural areas are also referred to as all counties outside metropolitan in another description.\textsuperscript{36} Few studies were found that addressed community-based fall injury prevention in the United States that specified they were in rural areas.

**Multidimensional Program Studies.**

Studies suggest that multidimensional fall injury prevention programs including a maintenance component are generally more effective than exercise programs alone. A study by Sze et al showed a 74 percent decrease in falls, a 43 percent decrease in fall injury, and a significant improvement in balance scores following program implementation aimed at at-risk elderly that involved balance training, home hazard and fall prevention education, home visits and exercise program as well as a maintenance component.\textsuperscript{37} In a review of 50 randomized controlled trials, both singular and multidimensional, Rose noted a reduction in falls if an exercise component was included as part of a program, but noted a greater reduction in fall risk if balance and gait activities were included in the exercise component of the intervention.\textsuperscript{38} However, even in multidimensional fall injury prevention programs, long-term effectiveness is not assured: a program involving more than 600 participants achieved no reduction in fall rates among
the control and study group one year after the intervention.\textsuperscript{39} This indicates that efforts may need to be made to address other factors, such as those that help increase motivation and learning or address health beliefs and health behaviors.

**Open Educational Fall Injury Prevention Programs.**

The Center for Disease Control has extensive fall injury prevention educational materials available online for the public, as well as information for those interested in planning and conducting educational programs. In addition, numerous government and public agencies and organizations at national, state, and local levels have educational material and resources available online such as the American Physical Therapy Association,\textsuperscript{5} University of Kentucky Cooperative Extension Service,\textsuperscript{40} National Council on Aging,\textsuperscript{41} Mayo Clinic,\textsuperscript{42} American Geriatrics Society,\textsuperscript{43} National Institute of Health,\textsuperscript{44} and the Center for Disease Control and Prevention.\textsuperscript{4} However, the Disability Statistics Center reports that elderly people with disabilities are particularly unlikely to make use of these web-based educational materials: approximately two percent of elderly people with disabilities and approximately nine percent of non-disabled elderly use the Internet.\textsuperscript{45} These percentages are likely to be even less in rural areas such as the one targeted area in this study, based on the below average educational level and literacy rates in rural Kentucky for this age group (43 percent of persons over 65 years old in Barren County, Kentucky have not completed a high school education).\textsuperscript{46}
Models for Health Belief, Health Behavior Change and Adult Learning

Health Belief Model and Related Survey Questions.

The Health Belief Model (HBM), is the primary model used in health behavior and health promotion and has been around for over 50 years. The HBM theory was originally developed to understand why people were neither using preventive measures for disease nor getting screened for conditions.\textsuperscript{47} This theory can be used to improve individual compliance following participation in healthcare programs.\textsuperscript{48,49} The HBM includes key factors that can affect the likelihood of taking preventive behaviors; (a) a person’s perception of his/her severity of the disease/injury, (b) a person’s perception of his/her susceptibility to the disease/injury, (c) a person’s perception of the benefit of the recommended action, and (d) a person’s perception of the barriers to the recommended action as well as the modifying factors of (1) self-efficacy, person’s belief in his/her own ability to make the behavior change, and (2) “cues to action” or triggers which motivate the individual.\textsuperscript{50} In a review of 29 published HBM-related research studies, Janz and Becker found that the HBM factors of “perceived barriers” and “perceived susceptibility” were the most strongly related to preventive health behaviors.\textsuperscript{51}

A person’s lack of motivation and lack of perceived benefit can be part of the reason s/he does not follow through with the prescribed fall-preventive health behaviors.\textsuperscript{8} According to Chapman and Fratianni, physical therapists should first provide education about the perceived threat and benefits of the health behavior change as well as promote the person’s self-efficacy [prior to the health education].\textsuperscript{52}

Use of the HBM was noted in several studies for small, individualized groups and case studies, but no studies were found in the physical therapy literature focusing on
community health settings relating to programs and research conducted inside the United States. Fall prevention studies using the HBM ranged from minor inclusion of essential concepts on assessments,\textsuperscript{53} to full integration of the HBM into the educational framework of a physical therapy case.\textsuperscript{54} There were also extensive efforts to improve perceptions in each of the key factors in the HBM in a research study on a osteoporosis program for over 300 participants in order to improve the quality of teaching, patient understanding, adherence to desired health behaviors, and general outcomes of the programs.\textsuperscript{50}

Bellamy recommends using a written survey to administer the HBM components and use the answers to help design the educational intervention.\textsuperscript{49} Samples of pre-program and post-program questions based on the HBM are available in the research literature. Although Hill et al used five-point Likert scale survey questions in a fall prevention program to elicit pre and post-intervention information on three HBM factors,\textsuperscript{53} and Gammage and Klentrou used five-point Likert scale survey questions related to seven HBM areas on an osteoporosis prevention program involving 510 participants,\textsuperscript{48} these authors question the validity of the results due to the “leading” nature of the questions.

**Fear of Falling and Awareness.**

The important issues of “fear of falling” and “awareness” can be viewed in the context of the HBM, as a key component for success in lowering hip fracture rate is awareness. In turn, awareness can increase the “perception of susceptibility” and “severity” and increased awareness by older adults of what causes these fractures can help increase cautions [health behaviors] to avoid risk. An assessment of the Fall Risk Awareness Questionnaire (FRAQ) concluded that higher test scores indicated a higher
awareness of risk for fall.\textsuperscript{55} Test scores were significantly higher for adults who had previously fallen; thereby indicating a higher awareness [in these cases higher “perceived susceptibility and severity” “cues for action”] compared to those who had not fallen.\textsuperscript{55} In contrast, in the case of falls, excessive “perception of susceptibility” can be counterproductive and can actually lead to decrease in health behaviors that improve balance as well as muscle and bone strength. For example, in an article by Banez et al., reducing the fear of falling in seniors with a history of falls was a major goal. Fear of falling is common in elderly persons and is associated with decreased quality of life, increased frailty, and recent experience with falls and can even lead to decreased mobility and social activities.\textsuperscript{56} Fear of falling is part of an often crippling cycle that leads to decreased balance sensing activities, which leads to decreased balance ability which leads to further decrease in activity level.\textsuperscript{20}

\textbf{Figure 2.1: The Fall Cycle}\textsuperscript{57}
Adult Learning Theory.

Knowles’ Adult Learning Theory (ALT) can be used to enhance the effectiveness of health education which targets older adults and should be considered when developing a pre-program assessment or educational program in a community. According to a study on ALT by Mitchell and Courtney, the six basic components of this model are (a) establishing/recognizing a “need to know” (b) a “responsibility for one’s own learning”, which entails involvement in the learning process and should include identifying one’s own learning style and preferences (c) “past experience”, (d) “readiness to learn and ability to apply the information to one’s own life” and (e) “motivation to learn” as well as (f) “problem centered learning with real-life problems.”58 The researchers found that efforts to provide information before giving the participant the educational material helped heighten their interest and the perception of relevance to what they needed to know, thereby improved their ability to learn.58 No studies were found in the physical therapy literature that noted using principles from Knowles’ Adult Learning Theory in a pre-assessment. (Application of the Adult Learning Theory and Health Belief Model to each individual survey question can be found in Appendix C)

Implications Derived from Review of the Literature

Hip fractures result in disability, loss of independence, and a lowered quality of life as well as troublesome financial cost for treatment, rehabilitation, and care. Most risk factors associated with hip fractures are preventable. Increasing awareness of preventable risk factors to elderly and caregivers can be accomplished through educational programs and workshops. There is much information available to the public on the risk factors of osteoporosis, but little specific information about strengthening upper body muscles,
balance and weight bearing exercises for reducing these risks, as well as how to move in a fall to minimize hip injuries. Although there is much information related to risk factors for hip fractures from falls on the Internet, this may not be the best source of educational information for many elderly people. The elderly are less likely to access information available from Internet sources relating to causes and ways to help prevent fractures. Also, disabled elderly have been shown to be less able to navigate through web-based sites.  

Educational programs are needed that are easily accessible to the elderly, use instructional methods proven to be appropriate for the elderly, accessible and effective for rural as well as urban elderly populations, and focused on physical exercises to help strength muscles, bones, and balance. It is my hypothesis that rural community residents will prefer an education mode of digital video discs and that those who are not exercising properly also have less concern of falling and do not feel they are susceptible. Last, those who are not involving themselves in adequate exercise will show more self-identified learning needs.

Consistent with the Health Belief Model and Knowles’ Adult Learning Theory (refer to Appendix B for content summary), the community group should be assessed prior to developing an educational program in order to better meet the education needs of the group. Based on this previously discussed research, several components should be included in the development of a pre-program assessment for a fall hip injury prevention program for a rural community. First, principles should be used from Knowles’ Adult Learning Theory to include questions that indicate the community member’s readiness to learn, preferences and self-identified learning needs for self-directed learning, and
include life experiences. Second, principles from the Health Belief Model should be used as indicators “perceived susceptibility” and “perceived severity” and “cues to action” in order to determine if efforts need to be made to address and heighten these factors prior initiating a program. Third and fourth, the survey should include questions regarding whether or not there is an interest or learning need as well as current health behaviors relating to the following identified risk factors, (a) strengthening upper body muscles to prevent falls and fall injuries (b) strengthening lower body muscles, (c) improving balance, (d) strengthening bones and (e) decreasing environmental hazards.
CHAPTER 3

METHODS

Sample and Setting

This study was descriptive in nature, identifying a sample of convenience of older adults residing in a nearby rural community. The participants were 45 years of age or older and comprised of individuals residing in Barren County, Kentucky, which is categorized as rural according to the guidelines described by the United States Census in the 2010 urban and rural classification criteria. Surveys were distributed through community organizations and individual settings (i.e., churches, home health therapy, and several local clubs and organizations) within Barren County, Kentucky.

Permission from WKU’s Human Subjects Review Board was obtained prior to survey distribution. Various community organizations serving seniors were approached prior to distribution of the surveys.

Survey Development, Content, and Format

Data for this study were gathered using a pencil and paper format. The format and content of the survey was developed using principles from geriatrics, the Adult Learning Theory, and the Health Belief Model. Additional content of the survey was based on information on relevant risk factors and prevention identified in current literature relating to prevention of injuries from falls. Special efforts were made to create a survey appropriate for the educational level, special needs, and limitations of the target group as
indicated by census and demographic data of the area as well as consideration of elderly issues and time limitations.

The survey was designed with the primary goal of acquiring information relevant to community health education planning. In accordance with the Adult Learning Theory and Health Belief Model, questions aimed to elicit responses that helped identify the participants’ perception of their educational needs and personal and social experience with a selected effect of hip fractures, (theoretically a factor related to motivation to learn), and current behaviors with regard to the prevention of hip fractures due to falls. The survey used questions to determine interest in specific components of a fall prevention program, preferred mode and venue for instruction and readiness for a community-based fall prevention program. Only minimal demographic information essential to community health education program planning was elicited, i.e., sex, race, general age group from two broad age range choices, and description of residence as within or out of city limits. The survey instrument used in this study is shared in Appendix A.

In order to evaluate the data collection tool itself, a question was included that collected the participants’ opinions about the clarity, format, ease of use, and length of the survey. This question was formatted to also provide a small measure of reliability. In addition, surveys were coded as to the source and setting of the survey, i.e., rural, urban, or semi-rural setting in addition to whether the survey was distributed individually or through an organization.
Analysis.

Data were analyzed using Excel and SPSS 21.0 with significance set at an alpha level of 0.05. Paired t-tests and ANOVA were used to compare numerous demographic variables and perceived learning needs.
CHAPTER 4

RESULTS

One hundred thirty (n= 130) older adults completed this survey. One hundred percent of the participants identified themselves as Caucasian, while 68% were females. Of the older adults surveyed, 36% were between the ages 45 to 65, and 64% were over the age of 65. There were also more women than men in the older age group (p = .036). There were several significant differences found between age, sex, self-identified learning needs, venue and media preferences, education and current injury prevention behaviors.

Venue and Media Preferences

There were several significant differences in venue and media preferences when comparing between the different demographic variables. Significant differences were found between men and women in their interest in an instructional video/DVD to watch at home in order to learn more about injury prevention exercises (p = .047). Additionally, place of residence (rural vs. semi-rural) influenced preferred instructional method (p = .015). Significant differences were also found between participants below 65 years of age and those above 65 years of age as the older participants were less likely to prefer learning via web (p ≤ .001) and more likely to prefer learning via book or pamphlet (p = .003).
Figure 4.1: Venue/Media Preferences.
Preferences of the top four venue/media on total participants surveyed.

Figure 4.2: Preferences in DVD/Video.
Preferences for a DVD instructional method between males and females.

Figure 4.3: Preferences within Age Groups
Preferences between website and pamphlet instructional method between the two age groups.
Educational Level

Results indicated that education levels varied between the age groups, as the age group above 65 showed that they had significantly less formal education ($p \leq .001$). Highest education levels reported from some of the older age participants were as low as 4th grade. ANOVA also revealed significant differences in perceptions in injury prevention education needs ($p = .016$) based upon educational level and preferred instructional method. Participants with a college degree had a higher preference for internet instructional method than those who only completed high school ($p \leq .001$).

Figure 4.4: Self-identified Learning Needs Related to Educational Level.

Number of self-identified learning needs on fall injury prevention that were reported out of five based on the participant’s highest education level.
**Paired t-tests**

Sex

<table>
<thead>
<tr>
<th>Location</th>
<th>SD, p &lt; .001 *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4A; video/DVD</td>
<td>SD, p = .047 *</td>
</tr>
<tr>
<td>Q9; age group</td>
<td>SD, p = .036 *</td>
</tr>
</tbody>
</table>

Age (+/-)

<table>
<thead>
<tr>
<th>Location</th>
<th>SD, p = .006 *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4C; internet</td>
<td>SD, p &lt; .001 *</td>
</tr>
<tr>
<td>Q4D; pamphlet</td>
<td>SD, p = .003 *</td>
</tr>
<tr>
<td>Q11; education level</td>
<td>SD, p &lt; .001 *</td>
</tr>
</tbody>
</table>

Place of Residence

| Q4E; DVD as gift | SD, p = .015 * |

**Table 4.1:** Summary Analysis of Paired t-test Data Report. * Significant difference at 0.05 level

**ANOVA**

Education level

<table>
<thead>
<tr>
<th>Location</th>
<th>SD, p = .016 *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4C; internet</td>
<td>SD, p = .001 *</td>
</tr>
<tr>
<td>Q9; age group</td>
<td>SD, p = .001 *</td>
</tr>
<tr>
<td>Q12; race</td>
<td>SD, p = .014 *</td>
</tr>
</tbody>
</table>

**Table 4.2:** Summary Analysis of ANOVA Data Report. * Significant difference at 0.05 level

**Current Injury Prevention Behaviors.**

About 65% reported no, or an insufficient level of, injury prevention exercises. The responses from the participants show that the majority are concerned and interested in fall injury prevention; however, they are not reporting adequate fall injury prevention behaviors.
Figure 4.5: Prevention Behaviors.

The amount of adequate exercise currently being done by participants to prevent fall injuries.

Figure 4.6: Fall Injury Concern

The perceived susceptibility reported on the risk of a fall-related injury.

Results of evaluation of the data collection tool component of the study.

More than 95 percent of the participants reported that the format of the survey was easy to understand, easy to read, had clear answer choices, was not confusing, and had a manageable length. Participants were very cooperative and very willing to take the survey. Community groups and individuals were willing to distribute the survey and all groups approached agreed to allow their members to participate.
Figure 4.7: Evaluation of Survey Format.

Summary of the participants’ opinions about the clarity, format, ease of use, and length of the survey.
CHAPTER 5

DISCUSSION

The results of the study indicate that (a) the sample of this rural community as a whole appears ready and interested in learning about exercises and activities that can help reduce injuries related to falls, (b) particular sub-groups within the sampled community are ready and interested in such a program, (c) optimal factors related to behavioral change already exist within a sub-group, (d) subject areas the adult learners in sub-groups identified as educational needs (e) how members of a sub-group prefer to receive information (the preferred venue and mode for learning) and (f) strengths, weaknesses, and challenges in the data collection process and tool (survey) itself.

Based on the results of this study, there is an interest, readiness, and need for a community-based fall injury prevention program in this rural community. These results indicate that variables such as sex, place of residence, age, and educational level influence self-identified injury-prevention learning needs, behaviors, susceptibility, and preferred learning modes among rural older adults. Assessing and using strategies derived from the Adult Learning Theory and the Health Belief Model is crucial to a successful health behavior change program. These findings suggest healthcare professionals should consider such factors about prevention of injuries from falls when developing community-based education programs for rural older adults.
The overall results served as indicators of selected health beliefs, learning needs and behaviors in the community group and sub-groups surveyed. These trends and patterns were assessed for the purpose of identifying issues that need to be considered or addressed in a community prior to planning fall-related injury prevention efforts. In contrast, existing research on fall injury prevention focuses primarily on health beliefs, knowledge, and/or behaviors of individuals at the time of onset and after completion of a specific injury prevention program for the purpose of measuring the effectiveness of a particular program.

**Venue and Media Preferences**

The results indicate that a variety of media should be used to meet the needs of a greater amount of people residing in a rural environment. Since the majority of males prefer a DVD for educational mode, developing a DVD should be considered to effectively reach this segment of the rural population. The DVD may be preferred because it allows for different learning styles of the participants and is consistent with the principle of adult education that a combination of visual and auditory educational modes may be more effective.60

These results support findings from several studies that indicate DVD-based health education may be more appropriate for older adults. However, there is little research that has compared approaches for providing health information to older adults and none in the context of fall prevention and there is no published research addressing such needs among rural adults.60 A study using the Health Belief Model by Hill et al., found that educating via DVD helped increase perceptions of susceptibility more than education through a written document.60 No studies were found that compared the
effectiveness of different modes of educational material in reducing fall injuries.

As only five percent of participants over age 65 reported that they would use the internet, programs should steer away from relying on computer use to relay information to prospective prevention program participants. This may be an especially important issue for health professionals working in rural areas, as rural inhabitants also may have lesser access to internet connectivity. In the future, this suggestion may revolve as the population ages and becomes more familiar with technology.

**Current Injury Prevention Behaviors**

Although the majority of participants in this rural sample indicated concern and interest in fall injury prevention, only about 65% reported no, or insufficient level of, injury prevention behaviors aimed to (a) improve balance, (b) strengthen upper and lower extremity muscles and (c) strengthen bones. This result is alarming considering that the relationship between fall related injuries and (a) poor balance,\textsuperscript{21,22,24} (b) muscle weakness,\textsuperscript{19,20,28} and (c) osteoporosis\textsuperscript{28} has been well documented. These responses indicate that a fall injury prevention program is clearly needed in this rural community and measures need to be taken to increase empowerment, awareness of problem and benefits of exercises for fall injury prevention. The women differed substantially in their health behaviors which is consistent with findings in research.\textsuperscript{61} The author stated that it is crucial that current behaviors be assessed before a prevention program as indicated.

**Perception of Severity, Susceptibility & Cues to Action**

About fifty percent of the participants reported that they had experience with a disabling fall-related injury of self, friends and family. Of the participants surveyed, ninety four percent stated that they were concerned about falling and causing an injury.
However, only thirty five percent of participants admitted they performed adequate exercise to prevent these injuries. In the literature, there is ample evidence supporting that the factors of perceived severity, perceived susceptibility and cues to action, derived from the Health Belief Model, are critical to address when trying to persuade people to maintain and/or change health behavior.\textsuperscript{48,49,51} Implications of these results support the notion that education is needed to increase awareness of severity and prevalence of problem.

This study served to assess selected health beliefs, at the community level, from the Health Belief Model to determine whether patterns exist indicating whether (a) individuals are aware of their risk for falls, (b) interest and readiness for fall injury prevention activities in the community exist, and (c) community education might be needed to increase community awareness of the prevalence and impact of fall-related injuries. In contrast, past research using the HBM focuses on measuring pre- and post-health beliefs of programs to evaluate the effectiveness of the program on their beliefs.

Based on the findings of this study, a need exists to increase risk of fall awareness via community education on prevalence and impact of fall injuries, thereby helping to increase interest and readiness for fall injury prevention activities in the rural community.

**Self-identified Learning Needs**

One hundred percent of the participants identified learning needs related to fall injury prevention, which includes exercises aimed to improve balance, increase upper and lower body muscle strength and to increase bone strength. Non-high school graduates identified more learning needs related to fall injury prevention. Implications of these results indicate that there is interest and readiness to learn about strengthening bones and
muscles and improving balance to prevent fall-related injuries.

In the research literature on injury prevention, no evidence was found that participants were given the opportunity to identify what they wanted to learn regarding the issue. This finding is surprising, considering the relationship of empowerment, interest, and motivation in (a) active participation, (b) long-term adult learning, and (c) behavior change. However, in many of the research studies on fall injury prevention, knowledge, rather than interest, of the participants was assessed for effectiveness.

**Evaluation of Data Collection Tool (Survey)**

The data collection tool was successful in eliciting essential information on readiness, interest, preferences and behaviors relating to fall injury prevention. For the group of participants in this study, the survey took little time to complete (about 2 to 3 minutes). Additionally, the survey appeared simple enough to understand as community members were receptive to filling it out and willing to participate in the survey. Leaders of clubs and organizations within this rural community were willing to cooperate with distribution to community groups and stated that they had no difficulty administering the survey independently.

**Strengths and Limitations**

The survey was quick and easy to understand by rural citizens and simple to administer by individuals not directly involved with the study. Data obtained can be easily analyzed, interpreted, and applied for practical use in planning group fall prevention activities.

In interpreting the findings of this study, there are several limitations that should be noted. First, survey research relying on self-reported data is a limitation, especially
self-reported health behaviors. However, for the purposes of this study, precise measurement of exercise frequencies and durations was not the goal. Rather, the objective was to identify patterns and trends related to selected groups of fall prevention exercises to help identify rural community learning and motivational needs for fall prevention education.

A future survey should consider including a question on weight bearing exercises due to its importance in maintaining bone mass. The survey assesses muscle exercises but does not specifically address weight bearing, impact, and resistance activities that are important to bone health.

Research studies assessing perceptions of susceptibility and severity consistently use a 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5). Although this type of scale would increase the precision of the results, it would have been inappropriate for this target population of elderly people in a rural Kentucky community with lower than average educational levels who might be unfamiliar with Likert-type scale questions. Since this is an initial study, generalizability is limited to older adults living in Kentucky.

**Further Research Needed**

The data collection tool from this study should be used in future studies encompassing a greater number of participants in community groups and subgroups, especially non-Caucasian groups and males, which were underrepresented populations in this study. Review of the resources indicates that there is national support for a program of geriatric fall prevention (referred to on page 9). Future investigations should determine if the target population would be more responsive to information being presented by a
celebrity, a local health professional or local elderly people. The resources available in the community – whether it is urban or rural – should also be evaluated to determine and elicit support for the program.

**Significance**

This quick and easily understood survey can be used in many rural communities to help collect information on community readiness, interest, and preferences in order to address these issues, increase awareness of fall injury prevention, garner support for prevention activities, and prepare for programs in rural communities.

Results and recommendations from this study can be an initial step in the process to develop rural community-based education programs, either for specific sub-groups or community wide by healthcare professionals, focused on exercise and activities that help prevent fall-related injuries. Information collected with this survey may help rural-based program planners develop an educational experience for a specific group that better meets their needs, is in their preferred setting, and uses preferred educational media. Rural-based program planners may use recommendations to develop a larger study involving multiple counties. Responses from the section of the survey addressing current behaviors can be used as a pre-measure for the community prior to a program and compared with responses to the same questions from a community survey after a program (aimed to increase exercises levels and physical activities) in order to help determine whether a program was effective in the rural community. Continued work in this area can also be used to develop a data collection tool with increased reliability and validity.

Results from this study can help support efforts to increase awareness within rural communities of the prevalence and impact of fall-related injuries and thereby help
increase interest and readiness for upcoming fall injury prevention programs in the community. These results can also be used to help acquire funding, foster participation, guide educational content, and determine proper program location and methods of instruction for a community-based educational program to help decrease fall-related injuries in the Barren County elderly population. Results from this study, and larger similar studies, can also help determine whether there is a need to develop a motivational and instructional video/DVD, specifically for senior citizens, on exercises and activities that can help decrease fall-related injuries. Future planners of a rural-based community educational program aimed to change behavior should note the evidence indicating that a particular sub-group has deficits in interest, readiness, perception of educational needs, or motivation to change behavior related to fall injury-prevention exercises. According to Adult Learning Theory and the Health Belief Model, program developers should use measures to first improve these factors as part of their program.\textsuperscript{50,58}

In addition, the findings from this study can be used as a beginning step in the development of a community-wide, multi-disciplinary program to decrease injuries from falls. This program could also include other fall-related factors including nutrition, home safety, and medications. Such a comprehensive health education program could involve professionals in occupational therapy, nutritionists, pharmacists, orthopedists, and community educators. This type of program would be aimed to help decrease debilitating injuries in the elderly resulting in decreased quality of life, loss of independence, pain, mobility limitations, healthcare costs and personal care costs.
CHAPTER 6

CONCLUSION

Hip fractures result in disability, loss of independence, and a lowered quality of life as well as troublesome financial cost for treatment, rehabilitation, and care. Most risk factors associated with hip fractures are preventable.\textsuperscript{16} Increasing awareness of preventable risk factors to older adults, and caregivers, can be accomplished through educational programs and workshops.\textsuperscript{55} There is a large amount of information available to the public on the risk factors of osteoporosis,\textsuperscript{27,26} but little specific information about strengthening, balance and weight bearing exercises for reducing these risks, as well as how to move in a fall to minimize hip injuries. Although there is a large amount of information related to risk factors for hip fractures from falls on the internet,\textsuperscript{4,35} it is not the best source of educational information for many elderly people. The elderly are less likely to access information available from internet sources relating to causes and ways to help prevent fractures. Additionally, disabled elderly have been shown to be less able to navigate through web-based sites.\textsuperscript{45}

These findings can be used to help plan, fund and guide educational content, modes and venues for: a) larger studies on fall injury prevention education programs in rural communities, b) fall injury prevention programs by healthcare professionals, and c) community-wide, comprehensive, multi-disciplinary fall injury prevention programs.
Educational programs are needed that are easily accessible and effective for both rural and urban elderly populations, focused on appropriate instructional methods for the elderly, and focused on physical exercises to help strengthen muscles and bones, and improve balance. It is my hypothesis that a program should consider using video discs and written educational material dispersed to the elderly population in the community through people they may recognize and trust. I believe involving family members, using locally well-known orthopedic surgeons, locally well-known physical therapists, and elder leaders in the community to provide educational information on the video, would be an effective means to educate the rural local elderly population in specific physical exercises aimed to reduce hip fractures from falls.
REFERENCES


Appendix A: Data Collection Tool

Preventing Broken Hips of Senior Citizens from Falls

Community Survey

Your completion of this survey implies your consent.

(Please check the box next to your answer(s))

1. Are you concerned that you, a friend, or a member of your family will have a broken bone in the future because of a fall?
   □ not concerned    □ somewhat concerned    □ very concerned

2. Have you, a friend, or a member of your family ever lost some ability to live independently because of an injury from a fall?    □ No    □ Yes

3. Which, if any, of the following areas do you need to learn more about and are interested in learning about?
   (Please check all you are interested in learning)
   □ Exercises and activities that help improve balance
   □ Exercises to strengthen muscles that help prevent falls
   □ Exercises that strengthen muscles to help prevent injuries if one does fall
   □ Exercises and activities that help strengthen bones to help prevent broken bones
   □ Ways to make the home environment less likely to cause falls

4. Which way(s) would you prefer to receive this information?
   (Please check all that apply)
   □ On a video/DVD to watch on my television at home
   □ As a class held in my community
□ On an internet website     □ Video/DVD to give as a gift
□ In a booklet or pamphlet    □ Other: _______________________

Please continue survey on next page........

Please check the box next to your answer for the following questions

5. How often do you do exercises or activities that are specifically aimed to help improve balance?
□ None, or Less than 10 minutes twice a month or “not sure”
□ 2 to 4 times a month lasting at least 10 minutes
□ More than 4 times a month lasting at least 10 minutes

Please continue survey on next page........

6. How often do you do upper body exercises or activities that are aimed to help decrease injuries from falls?
□ None, or Less than 10 minutes twice a month or “not sure”
□ 2 to 4 times a month lasting at least 10 minutes
□ More than 4 times a month lasting at least 10 minutes

7. How often do you do lower body exercises or activities that are aimed to help decrease injuries from falls?
□ None, or Less than 10 minutes twice a month or “not sure”
□ 2 to 4 times a month lasting at least 10 minutes
□ More than 4 times a month lasting at least 10 minutes

8. Your Sex?       □ Male       □ Female
9. Your Age Group? □ 40-65 years old       □ Over 65 years old
10. Your Place of Residence? □ I live within the city limits of

________________________________________
□ I live outside the city limits of

________________________________________
11. Your Highest Educational level?
   □ Some high school  □ High school graduate
   □ College graduate  □ Trade school graduate

12. Your Race?
   □ White  □ Black or African American
   □ American Indian or Alaska Native  □ Asian
   □ Native Hawaiian or Other Pacific Islander  □ Other

Please let us know how you feel about this survey (please check all that apply)

Questions were easy to understand  □ Yes □ No
Survey took too long to complete  □ Yes □ No
Answers choices were clear  □ Yes □ No
Check boxes were confusing  □ Yes □ No
Size of print was easy to read  □ Yes □ No

Other comments or suggestions: ____________________________________________
Appendix B: Community Survey and the Application Adult Learning Theory and Health Belief Model

Survey Questions #1 AND #2:

Are you concerned that you, a friend, or a member of your family will have a broken bone in the future because of a fall?

Have you, a friend, or family member ever lost some ability to live independently because of an injury from a fall?

USES ADULT LEARNING THEORY

(A) Helps assess learner’s “past experience”
(B) Helps support the “problem centered approach”

USES HEALTH BELIEF MODEL

(A) Serves as strategy to help activate their readiness (HBM)
(B) Serves as strategy to help increase the perception of severity, susceptibility, and benefits of action

Survey Question #3:

Which, if any, of the following areas do you need to learn more about and are interested in learning about?

USES ADULT LEARNING THEORY

(A) Supporting the adult learner’s need to be self-directed

USES HEALTH BELIEF MODEL

(A) Helps assess learner’s “readiness to learn”
(B) Serves as strategy to help increase the perception benefits of action

Survey Questions

Survey Question #4:

Which way(s) would you prefer to receive this information?

USES ADULT LEARNING THEORY

(A) Supporting the adult learner’s need to be self-directed
(B) Helps learner relate to what learning media/venue they are comfortable with in prior experience.

Survey Questions #5, #6, #7

*How often do you do exercises or activities that are specifically aimed to help improve balance?*

*How often do you do upper body exercises or activities that are aimed to help decrease injuries from falls?*

*How often do you do lower body exercises or activities that are aimed to help decrease injuries from falls?*

**USES ADULT LEARNING THEORY**

(A) Helps assess life experience/past experience related to their behavior

**USES HEALTH BELIEF MODEL**

(A) Helps assess self-efficacy and confidence in one’s ability to take action

Demographic Questions:

1. Serve to help identify patterns among variables
2. Helpful in Health Education Program Planning
   a) Helps identify best media, venue, content for different demographic sub-groups
   b) Helps identify where work on readiness, perceptions and health beliefs need to be done in a community before education of a sub-group
APPENDIX C: Knowles Adult Learning Theory and the Health Belief Model

Knowles “Adult Learning” Theory

CONCEPTS

- Self-directed
- Life experience
- Readiness to learn
- Problem-centered time perspective

Need to assess the learner’s readiness to learn, what they want to learn, their life experience with the subject and have the subject problem focused

Health Belief Model

Health Belief Model is a value-expectancy theoretical framework that describes beliefs that affect the willingness of people to maintain and change health behavior.

Assessing and using strategies aimed to address these beliefs are crucial to a successful health behavior change program.

The model considers the following concepts:

(a) Perceived susceptibility or chance of getting a condition
   a. For example, the likelihood of a person doing a healthy behavior change like exercising would increase if they believe they will actually get an injury if they don’t

(b) Perceived severity
   a. If they believe the consequences of not doing the action are severe, then they might be more likely to do the behavior that helps prevent the health problem

(c) Perceived benefit of the action
   a. If they believe there are benefits of the action, they might be more likely to do the healthy behavior

(d) Perceived barriers and costs of the action
   a. If they believe the barriers are too much, they are less likely to change the behavior

(e) Cues to action or “strategies to activate ones readiness”

(f) Self-efficacy or “confidence in one’s ability to take action
   a. Need to build on Previous success
   b. If a person has not been able to use exercise before to deal with a health issue they might be less likely to change their behavior.