ASSESSMENT OF FALL RISK IN COMMUNITY-DWELLING OLDER PERSONS

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DEDICATION

I wish to dedicate this research project to the memory of my father and to improving the health and welfare of elderly people worldwide.

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ABSTRACT

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This three-study project was developed in collaboration with a local senior services agency to investigate fall risk in community-dwelling elders.

The purpose of Study One was to investigate relationships among medication, dementia, and falls in community-dwelling elders with polypharmacy receiving home healthcare services from the agency. Medical information of 147 clients specifically their medication, diagnoses of dementia, and records of recent falls were obtained from clinical records. Chi-square tests were used to compare the use of psychotropic drugs between elders with and without dementia. A logistic regression was performed to test the hypothesis that psychotropic drugs and dementia predicted falls in this population. No significant differences were found in any type of psychotropic drug use between elders with and without dementia. Neither psychotropic drugs nor dementia predicted falls in this population.

The purpose of Study Two was to determine the psychometric properties of the agency's Fall Risk Screening Form (FRSF). Content validity was evaluated on the basis of relevance, clarity and ease of use, and completeness of each item on the FRSF, as rated

by 5 experts using a content response form. Rater consistency was evaluated by percentage agreement between two raters using the FRSF to assess 5 clients' fall risk. In a retrospective study of 100 clients' records, an ordinal coefficient alpha was used to assess the FRSF's internal consistency, and a Spearman's correlation was used to examine convergent validity between the FRSF and the Fall Risk Assessment Form (FRAF). Results showed that it was reasonable to use the FRSF for fall risk assessment, but there is room for improvement.

The purpose of Study Three was to gather information on the procedures of fall risk screening, which involves collaboration between agency components and outreach workers. A semi-structured interview was used to gather feedback from geriatric care workers on what was needed for universal fall risk screening. Results indicate that integrating 8 fall-risk categories to a universal form improves the completeness of the form used in different agency components. However, to increase the utility of the fall risk screening, integrating service plans with each screening procedure needs to be developed.

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CHAPTER I

INTRODUCTION

BACKGROUND

The elderly population in the United States, aged 65 years and older, is projected to rise to 71 million by 2030, equaling 20% of the total population. One of the most serious problems faced by the elderly is the problem of falling. It is estimated that falls occur in 30-60% of the elderly population each year, and that 10-20% of these falls result in injury, hospitalization, and/or death.[1-3] The treatment of these fall-related injuries incurs a heavy social burden in terms of medical expenditures. The United States Center for Disease Control (CDC) reports that fall-related healthcare costs totaled $15.1 billion in 2002.[4] This figure is to increase to $32.4 billion by 2020.[5]

With the growth of the elderly population and fall-related healthcare costs, many healthcare professionals have focused increasingly on the prevention of falls as a method of reducing medical costs and improving the quality of life of their patients. In particular, the prevention of fall-related injuries through multi-factorial intervention strategies has the potential to provide significant benefit to the lives of the elderly.[6-8] The success of these strategies depends heavily on reliable and valid methods to assess and mitigate the fall risk factors of individual elders.

The problem of assessing fall risk is well studied, yet very challenging. Many fall risk factors have been identified, and many risk factor based interventions have been

shown to reduce falls.[9,10] However, the quantity of risk factors, the interactions between risk factors, and the complications introduced by environment and behavior make accurate assessment of fall risk in community-dwelling older persons difficult. As an example, for active elders, fall risk tends to be related to mobility status, exposure to hazardous environments and risk-taking behavior.[11] In contrast, for elderly receiving home healthcare, fall risk tends to be related to acute and chronic illness, and associated disability.[12]

To further investigate fall risk in community-dwelling elders, collaboration with a local senior services agency was developed. This agency is known for providing a wide range of services to elders, from a daytime activities center to home care. It is also known for its experience in dementia care, specifically. This project focused on three fall issues that were not only important to the agency, but the resolution of which also benefited fall risk prevention as a whole.

The first issue concerned the current method of determining fall risk by fall history and whether the fall risk of the home health population of interest, especially the dementia population, was able to be identified through commonly used outcomes found in the Outcomes and Assessment Information Set (OASIS) documentation.[13] The second issue concerned the lack of validation of a new instrument recently developed by the agency to enhance the recognition of fall risk in their home health clients. The last issue concerned the need for a common instrument that can be used by all the different service components of this agency that would simplify reporting and encourage communication.

BRIEF LITERATURE REVIEW

Assessment of the potential risk for falls should focus on determining the circumstances of previous falls and on identifying risk factors. A Cochrane Review of assessment tools for fall risk, consisting of 23 tools tested in 14 studies, has documented sensitivity results ranging from 14 to 94%, specificity results ranging from 38 to 100%, and reliability and validity results ranging from moderate to good.[11] However, several fall risk assessment tools that have been published in the literature focus on institutional settings with little attention to tools tested in community settings.[14-16] Other studies have included community-dwelling elderly in their investigations but only focus on tools for the assessment of functional limitations in gait, strength, and balance.[17-25] Even though a fall risk assessment tool is available for utilization in homebound older adults, the scoring of the instrument is dichotomous, which fails to detect varying levels of fall risk.[26]

Falls are considered to be multi-factorial, i.e., they are caused by a combination of intrinsic factors such as polypharmacy, dementia, lower-extremity weakness, balance disorders and visual deficits;[27-31] and extrinsic factors such as environmental hazards, inadequate equipment, and activity-related events.[32,33] Recently, widespread concerns have been raised about medication use and falls among the elderly,[34] particularly polypharmacy and specific types of medications such as psychotropic drugs.[27,35] Polypharmacy has been defined as the use of multiple medications,[27,36-38] but some researchers have defined it as the use of excessive or unnecessary drugs.[39-41] Polypharmacy is also defined as the concomitant use of over four medications.[27,42] The

use of psychotropics, including anxiolytic, antidepressant, sedative/hypnotic and anti-psychotic drugs, is associated with an increase in the risk of falls.[43] A study on the comparison of fall rates among nursing home elders found that dementia is an independent risk factor for predicting falls. These elders with dementia were nearly twice as likely to fall as those without dementia.[33] In addition, the use of psychotropic drugs in elders with dementia is more common than in elders without dementia.[34]

An epidemiological study has identified that previous falls, urinary incontinence, and visual impairment are the strongest predictors for falls and recurrent falls.[42] Elderly who have prior histories of falls have higher chances of experiencing another fall, and many of them fall repeatedly.[44] Moreover, a prospective observational study has reported that history of falls and gait abnormalities are independent risk factors for falls in elderly outpatients.[45] The association between urinary incontinence and falls has been examined among ambulatory women receiving long-term care. Results show that women who have urinary incontinence are three times more likely to fall than those without.[46] Additionally, having visual impairments doubles the risk of falls.[47]

PURPOSES

The purposes of this investigation were: (1) to study a population that demonstrates polypharmacy, use of psychotropic drugs, dementia, and history of falls in community-dwelling elders receiving home health services; (2) to determine the content validity, rater consistency, internal consistency, and convergent validity of a new fall risk instrument, the Fall Risk Screening Form (FRSF), developed by the collaborating agency;

and (3) to use focus groups to gather feedback on what is needed for a universal fall risk screening form.

HYPOTHESES

To investigate medication use, dementia and history of falls in community-dwelling elders receiving home healthcare, it was hypothesized that: (1) psychotropic drugs would be used more often in elders with dementia than those without dementia; (2) use of psychotropic drugs and dementia would independently predict fall risk in the elders who had polypharmacy.

To validate the FRSF, it was hypothesized that: (1) the FRSF would demonstrate high relevance, clarity and ease of use and completeness of the items with a content validity index (CVI) score equal to or larger than 0.8, as assessed by experts; (2) the FRSF would have at least 80% agreement on each item between two raters; (3) the FRSF would have high internal consistency with an ordinal coefficient alpha equal to or larger than 0.8; and (4) the FRSF would be highly correlated with another fall assessment tool, the Fall Risk Assessment Form (FRAF) embedded in the OASIS-based form, with a Spearman's correlation equal to or larger than 0.75.

METHODOLOGY

For Study One and Study Two, we obtained a permission letter from the administrator of the senior healthcare agency to access their clients' records. The primary investigator (PI) transferred the clients' record data to an electronic file for analysis, with names encoded as numbers to protect the clients' identities.

Study One: Assessment of impact of medication use and dementia on fall risk in clients receiving home healthcare

Medication information was obtained from 147 community-dwelling older persons who were prescribed four or more medications. The information on prescribed medication use including the name of the drug, dose, form and frequency was collected from medical records. Diagnoses were recorded from the physician's medical reports. The initial OASIS forms were reviewed regarding the elders' demographics and history of falls.

Descriptive statistics were used for the demographic data, the number of prescribed medications use of psychotropic drugs, and fall history. Categorical variables were summarized by percentages, and continuous variables were summarized by means and standard deviations for all variables. Chi-square tests were conducted to examine the differences in the use of psychotropic drugs in the two groups, those with and without dementia. A logistic regression was performed to test the hypothesis that use of psychotropic drugs and dementia predicted the fall risk in elders who had polypharmacy.

Study Two: Assessment of the fall risk screening form—FRSF for elders at risk for falls

The FRSF that the local senior agency used for their home healthcare program was an assessment instrument designed for the clinical staff to evaluate the likelihood of falls in community-dwelling older adults. This screening form consists of seven fall risk sections, (i.e., fall history, medications, blood pressure, vision, elimination, mentation, and mobility), and a total of eleven items, each item consisting of 2-4 levels. In addition,

the scoring of four of the fall risk sections (vision, elimination, mentation, and mobility) is based on the OASIS data collected during the initial assessment. The total possible score over all items of the FRSF is 33. A total score < 5 is considered low risk, 6 – 12 is considered moderate risk, and > 12 is considered high risk. The maximum time needed for completing the assessment and recording of the FRSF is approximately 15 minutes.

Five experts consisting of 4 content experts and 1 lay expert were recruited to assess the content validity of the FRSF. They were selected by other experts in the field of geriatric fall risk and were contacted by the PI via email. The CVI was used to quantify the agreement on the relevance of FRSF items among the experts. The CVI was defined as a proportion of items given a score of 3 or 4 by the experts.[48] Greater CVI indicates higher experts' agreement on the usefulness of the factors on the FRSF in screening for fall risk.[48] To achieve the CVI value, the PI totaled the number of items that were rated a 3 or 4 on the response form by the experts and divided that number by the total items which were scored.

A prospective study was conducted to assess the FRSF scoring agreement between two raters. A physical therapist of the agency and the PI separately scored 5 home health clients for risk of falls using the FRSF. The target population was elders who were within 14 days of their discharge from a hospital, rehabilitation facility, skilled nursing home or other nursing home; or within 14 days of a medical or treatment regimen change. The percentage agreement was calculated to measure the degree of correspondence and agreement between the two raters.

Additionally, the FRSF scores of 100 older adults aged 65 or older, who received home healthcare services provided by the agency, were analyzed retrospectively to assess the instrument's internal consistency and convergent validity. These reviewed medical records were about elders who received home health visits for various medical conditions, and the elders were assessed by either a nurse or a physical therapist, using the FRSF at their initial evaluation and prior to treatment intervention. Descriptive statistics were used for the demographic data, the total scores of the FRSF and the FRAF. Ordinal coefficient alpha was used to assess the internal consistency of the FRSF that is formatted with four Likert response items. Finally, the relationships between the FRSF and the FRAF were examined with a Spearman correlation.

Study Three: Qualitative assessment of component-specific, fall-risk screening procedures to create a fall risk screening from

This third study was qualitative, using a semi-structured interview. The study population was 13 adult men and women of any race with an age range of 27-65 who worked for the following four components of the local senior agency: (1) Day Center, (2) Case Management, (3) Home Care, and (4) Outreach to Potential Clients.

Participants were divided into three groups according to each individual's available working schedule. Each participant attended only one group interview with a researcher who asked each group the same several questions. The questions posed by the researcher were designed to explore the group's opinions on the content and features an ideal fall risk screening form and the associated screening procedures. The conversations

of all participants and the researcher during the interviews were recorded with a tape recorder and then were transcribed into a computer verbatim to preserve the language of the participants by the PI. In addition, field notes were used to record observations of the participants' behaviors and reactions. The total time for each interview was about 1 to 2 hours.

Data collected in the interviews were described. The data analysis was inductive for the transcripts of interviews and field notes. The PI read the transcripts of the three interviews and identified emerging themes from the interviews and then organized them into categories. To establish the reliability of the emerging themes identified from the interviews, triangulation was used. A third person who did not participate in the interviews also independently reviewed the transcripts to identify emerging themes. Moreover, the transcripts were reviewed by the researcher who participated in the interview to assure final agreement on the accuracy of themes and categories. These categories were then compared to the existing features of the local senior services agency's FRSF to determine what additional categories need to be added to a universal fall risk screening form to improve the completeness of the form used by different agency components. Moreover, service plans were integrated with the screening procedures to increase the utility of the fall risk screening.

CHAPTER II

REVIEW OF THE LITERATURE

EPIDEMIOLOGY

Incidence of Falls in Older Persons

The population of older persons is increasing in the United States. In 1970, twenty million people in the United States (U.S.) were over age 65. By 2000, this number had increased to 35 million, representing 12.4% of the U.S. population.[49] By 2020, this number is projected to increase to sixty million, according to the U.S. Department of Health and Human Services (USDHHS). The growth rate of the elderly population is significantly higher than the overall U.S. population growth. Consequently, the percentage of the U.S. population over the age of 65 has tripled over the past century.[50]

Falling is one of the major health problems faced by older persons, as the effects of advanced age are associated with an increased risk of falls.[1,3,51-53] From the age of 65, it is estimated that the chances of a fall increase by 4% per year of age.[54] A criterion-based analysis including 14 studies found that approximately 30% of older persons over the age of 65 years fell at least once a year, and 15% of them fell repeatedly.[3] Forty-five percent of older persons between ages 70 and 79 had fallen at least once, and 27% of them fell three or more times.[51] The reported rate of falls averaged once every two years for those over 80 years, with many of these (61%) happening in the home.[1] A cohort

study reported that approximately 60% of adults over 90 years, living in healthcare assisted housing or in the community, fell at least once a year.[52]

While the frequency of falls rose steadily with age, the incidence of falls varied by gender, although results seemed to be mixed in the literature. A study using a sample of elders living in the community in Canada showed that the percentage of falls was highest among the youngest (age 65-69) and oldest (age 80-92) women, 53.3% and 54.9%, respectively. The fall rates were 24.9% for the youngest and 54.9% for the oldest men. In general, women (33.5%) fell more often than men (21.7%).[55] A separate study found that being female was a significant predictor (OR: 5.65; 95% CI: 2.61-12.24) for falls among elders living in the community.[56] Another study on Medicare recipients found that incidence of recurrent falls was more related to advanced age and being female.[57] However, these results are contradicted by an earlier study which reported that men receiving home care services in Canada were 1.31 times more likely to be at risk for a fall and 1.45 times more likely to be at risk for recurrent falls than women.[58] Other studies found no differences in the incidence of falls and recurrent falls between men and women.[59,60] A longitudinal cohort study of Dutch community-dwelling elders over the age of 65 showed that the incidence of recurrent falls was similar for women (24.9%) and men (24.4%) who were followed prospectively for three years.[44]

The indicated cause of falls also varied between men and women. One study indicated that the reason men fell was mostly due to slips (38%), while the reason women fell was mostly due to trips (39%). In addition, men fell most often just outside the home

(46%), whereas women fell most often in the home (30%).[60] Therefore, age, gender, type of care, and location are potential confounding factors which may affect the risk of falls. This information should be taken into consideration while studying predictors of falls in community-dwelling elders.

Table 2.1 shows the results of various prospective cohort studies on fall incidence for elders, age 60 and older, living in the community. These studies were published between 2001 and 2010, and span several different countries, including Australia, Belgium, Canada, China, England, France, Italy, Japan, the Netherlands, Norway, and the United States. The incidence of falls varied from 20% to 50%.

Table 2.1. Fall Incidence in Different Countries

Country	Age (years)	Participants (Total number)	Fall incidence (%)	Fall within months
Australia [61]	≧ 65	1,000	29%	12
Belgium [56]	≧ 60	263	33.5%	12
Canada [62]	≧ 65	868	31%	6
China [63]	≧ 65	1,517	19.3%	12
England [64]	≧ 65	510	25.3%	6
France [65]	≧ 65	1,618	21%	18-36
Italy [66]	Mean 77	5,570	35.9%	3
Japan [67]	≧ 65	1,053	20.8%	12
The Netherlands [42]	≧ 65	1,285	33%	12
Norway [68]	≧ 75	307	50.5%	12
The United States [18]	≧ 65	99	42.4%	12

Consequences of Falls

Falls heavily impact the quality of life of elders, and they place a burden on healthcare providers and the families of elders. A longitudinal study reported that falls in Amsterdam's community-dwelling elders, ages 65 or older, resulted in physical injury (68.1%), functional decline (35.3%), social activity limitation (16.7%) and physical activity limitation (15.2%). Consequences of a fall included difficulties with climbing stairs, taking strolls, using public transportation, and visiting church and friends. A decline in functional or social activities after a fall was observed more often with increased medication use.[69]

Many other studies corroborated this result, with over 50% of falls leading to injury among elders living at home.[51,55,70] In a study of fall-related injuries, balance, function, medication, illness and other health status for women over age 75 living at home, falls resulted in 51% of elders experiencing fall-related injuries, 24% of elders experiencing serious injuries, and 13% experiencing upper or lower extremity and rib fractures. The risk of serious fall related injury (OR: 2.2; 95% CI: 1.2-4.3) and fracture (OR: 13.6; 95% CI: 1.2-30.7) increased with the number of falls during the six month follow-up.[70] Other studies reported that 10-25% of elders required medical help after falling,[60,69] and 46% of elders sustained minor injuries such as bruises, sprain, and abrasions.[71] Those suffering injuries caused by falls were older on average than those who fell but were not injured.[60]

The severity of fall-related injuries can lead to death. Falls accounted for the majority of deaths related to unintentional injuries, which were the fifth leading cause of death in older persons.[72] In the U.S., 13% of the population over the age 65 years accounted for approximately 75% of deaths caused by falls.[6] According to the Centers for Disease Control and Prevention (CDC) in 2005, 15,802 older people died in the U.S. as a result of injuries caused by a fall.[73]

The World Health Organization (WHO) identified fall-related injuries as the third leading cause of disability.[44] Each year, falls caused at least 10% of the elderly to have serious injuries such as fractures, joint dislocation, brain injury, and soft tissue injury requiring medical attention.[2,71] Nearly one-third of elders who sustained fall-related injuries required help with activities of daily living as a result.[74] Moreover, 50% of the elders who have repeated falls admit to restricting their activities to avoid falls.[51] According to the National Health Interview Survey, falls are the largest single cause of restricted activity days among older persons, accounting for 18% of restricted days.[72]

About 1% of all falls result in hip fractures, which are the most common injury requiring hospitalization in the elderly. A case control study for identifying risk factors for fractures due to falls was carried out in Brazil. The researchers have reported that the femur (72%) was the most fractured bone followed by the arm/forearm (19%) and vertebra (2.7%).[75] Approximately one fifth of hip fracture patients lost functional ability and required long-term nursing care.[76] A study of 1,003 older persons age 60 or over receiving home care services in Canada reported that increased risk of hip fracture was

associated with falls (OR: 1.28; 95% CI: 1.12-1.46).[77] The same study also estimated that the mortality rate within one year after hip fracture was over 20%. An investigation of fall risk for patients with a recent fracture concluded that 1.8% of those patients suffered a new fracture within three months.[78] In addition, elders who have recurrent falls are more likely (OR: 3.8%; 95% CI: 2.3-6.1) to have a fall-related fracture than those who don't have recurrent falls.[44]

Fall-related injuries accounted for 40% of hospital admissions of older persons, and 50% of those hospitalized were discharged to nursing homes.[79] Among elders who had previously fallen and had been admitted to an emergency department as a result, within one year after discharge from the hospital, 47.6% of them fell at least once and 29.1% of them fell two or more times.[80]

In 2000, direct medical costs for fatal and non-fatal falls were 19.2 billion dollars. For people ages 65-74, and ages 85 and over, the medical costs for non-fatal falls were 4 billion and 7 billion, respectively. Medical expenditures were 2-3 times higher for women (14 billion) than for men (5 billion).[74] In 2005, fall-related injuries incurred $27 billion dollars in healthcare expenses.[81] In 2006, fall-related injuries accounted for 6% of all medical expenditures for older persons age 65 and over.[72] By 2020, fall-related healthcare costs are projected to reach $32.4 billion dollars in the U.S.[5]

Even non-injurious falls could cause psychological difficulties for the elderly,[82] including fear of falling, emotional trauma, loss of self-confidence in the ability to perform routine daily tasks, loss of self efficacy, self-imposed activity restrictions, social

withdrawal, and depression.[55] A cross-sectional study of 2,300 community-dwelling elders receiving home care services in Canada examined the factors associated with the restriction of activity caused by fear of falling. Results showed that 41% of elders limited their outdoor activities due to fear of experiencing another fall. Being female, having visual impairment, living alone, gait deficit, and previous falls significantly increased the incidence of fear of falling.[83]

Despite the serious impact of falls on elders and the risk of recurrence, only 34% of elders receive fall evaluation and less than half (48%) of the elders reported talking to healthcare providers following a fall.[84,57] Both outreach and education on fall prevention measures are needed to prevent falls in older persons living in the community.

DEFINITION OF A FALL

There are several definitions of a fall event. A fall event was defined as a person landing on the floor or a surface below knee level that was not caused by a severe blow, unconsciousness, paralysis or seizure.[85,86] It was also defined as an unexpected event when the person fell to the ground from the same level or from an upper level, such as taking a fall on stairs and taking a fall onto a piece of furniture into account.[87] A fall was defined as an unintentional event that causes a person to come to rest on the floor or a lower level and no longer bearing weight.[44,88]

HOME HEALTHCARE

Home healthcare agencies generally provide services to elderly people for a number of days after discharge from a hospital, rehabilitation facility, skilled nursing home

or other nursing home; or after a medical or treatment regimen change. Fall prevention is critical to elders receiving home healthcare and to the agency providing their care. For elders participating in home healthcare, falls may result in mortality, morbidity, disability, and financial burden, and they may culminate in admission to a nursing home. For a local senior agency certified by the Centers for Medicare & Medicaid Services (CMS), fall prevention is one of Medicare's quality indicators, and it is an important part of controlling medical costs.[89]

The incidence of falls in elders receiving home health services varied in different studies. One study observed that patients aged 70 years and over who initiated home healthcare had a higher rate of falls (20.2%) within the first month after hospitalization than other discharged patients (8.4%).[90] It was concluded that elders receiving home health services had greater risk of falling. A retrospective study examined risk factors for falls by reviewing 2,304 elders' assessment records (aged over 65 years) completed by home care professionals in Canada. Results showed that 27% of those elders fell at least once and 10% of them fell more than twice.[58] The proportion of fall incidence was similar to the results (29%) of an Australian prospective study.[61] Even the incidence of recurrent falls among community-dwelling elders receiving home care services (11.4%) was in close agreement with the Canadian findings.[62] A longitudinal study on elders age 65 and over receiving home care services in Quebec reported a higher fall incidence (47%) and recurrent falls (27%). Among those who fell, 44.4% had injuries, 25.2% had activity limitation, and 5.6% were hospitalized.[91]

In general, elders receiving home healthcare shared the same risk factors for falls as other community-dwelling elders, including acute and chronic diseases, previous falls, medication use, visual impairment, urinary/bowel incontinence, cognitive impairment, mobility problems, and environmental hazards.[92] A study comparing the risk factors among elders receiving home care services found that significant risk factors for falls include being male, impaired gait, home hazards, impaired cognition, having Parkinson's disease, and poor health status.[58] Compared to elders in long-term care facilities, elders receiving home healthcare had similar risk factors including muscle weakness, gait abnormalities, and balance disorders.[93] The difference is that elders receiving home healthcare live in their own homes, with less supervision in their living environment.

A retrospective study reviewed data from the Outcomes and Assessment Information Set (OASIS) in order to compare the characteristics of elders who fell while receiving home health services to the characteristics of elders who received the same services during the same time but did not fall. The details of the OASIS instrument are discussed in the next section. The study found that the profile for elders with falls include the following items: (1) experienced more falls during the three month period prior to receiving home health service, (2) took antipsychotic phenothiazines and tricyclic antidepressants, and (3) had comorbidities of neurological and cardiovascular impairment.[94]

INSTRUMENTS

Outcomes and Assessment Information Set (OASIS)

OASIS is a group of data items organized into several categories, including socio-demographic, health status, support system, behavioral status, functional status, environment and health services.[95] Each category contains several measurement outcome (MO) items that include questions, answers, and rating scales. For example, in the functional status category, the transferring ability item, MO690, has a score from 0 to 5 based on the prior and current status. OASIS plays a central role in programs to develop a patient-centered system of outcome measures and outcome improvement methods for home healthcare.[96] It also serves as the basis for prospective payment to home healthcare agencies participating in Medicare.[97] As part of a comprehensive assessment for adult home care patients, these agencies are required to collect and submit OASIS data for patients at initial care, at recertification, when significant changes in the patient's condition occur, and at discharge.[97]

As a consequence of the important role which OASIS plays in home healthcare, the psychometric properties of the OASIS have been widely reported in the literature, with mixed results. One such study concluded that OASIS items have substantial to excellent inter-rater reliability: a weighted kappa of 0.85 for vision impairment (MO390), 1.00 for urinary incontinence (MO520), 0.73 for bowel incontinence (MO540), 0.63 for cognitive function (MO560), 0.79 for current transferring (MO690), and 0.87 for current ambulation (MO700).[98]

However, a separate inter-rater reliability study which evaluated each patient with delayed (24-72 hours apart) and simultaneous OASIS assessments reported different results: 65% of the OASIS items have poor inter-rater reliability with delayed assessment and 29% of the 66 items have poor inter-rater reliability with simultaneous assessment. Moreover, the poor convergent validity was found comparing OASIS to the Centers for Medicare and Medicaid Services (CMS) 485 instrument. The inconsistencies between OASIS and CMS 485 suggested that the OASIS might not truly reflect the patient's condition.[97]

More recently, a study of the sensitivity and responsiveness of the OASIS to the effects of home healthcare nursing interventions concluded that the OASIS was not responsive to clinically discernable changes in patient outcomes. OASIS did not show certain outcomes deemed important by home healthcare nurses in the care of cardiac patients at home, including the effects of medication, knowledge, and illness management behavior.[99]

Fall Risk Assessment Form (FRAF)

The FRAF which was derived from the OASIS-based form serves as a screening instrument covering several domains such as fall history, sensory, age, mentation, mobility, elimination, cardiovascular/respiratory disease, blood pressure, medications, alcohol use, and environment.[13] It consists of a simple questionnaire with sixteen yes/no questions. Each yes answer is assigned a score of 5 except for the "history of falls in the past three months", which is assigned a score of 15. This weighting strategy for fall

history is similar to that used by the FRSF. The details of the FRSF instrument are described in the next section. The total possible score over all items of the FRAF is 90. The time for completing the recording of the FRAF is approximately 10 minutes.

Developmental History of the Fall Risk Screening Form (FRSF)

FRSF was a modification of an existing fall risk assessment tool developed by Christiana Care Visiting Nurse Association (VNA) which was based on the Schmid Fall Risk Assessment Tool and OASIS.[32] The Schmid tool was used in a study comparing the characteristics of 102 in-patients who fell with those of another 102 in-patients, matched by age and length of stay, but did not fall. The study concluded that mobility, mentation, elimination, prior fall history, and current medication had statistically significant differences between the two groups of patients. In the group of patients who had fallen, a higher percentage needed assistive devices for ambulation, had confusion, needed assistance with toileting, experienced a previous fall, and took more anticonvulsants and hypnotic, tranquilizer, or psychotropic medications as compared with the group which had not fallen.[100]

In the development of the VNA tool, the Christiana Care Health System established a fall prevention team, which was made up of members practicing in acute care, long-term care, and home care settings. Representatives from these settings included nurses, physical and occupational therapists, a pharmacist, a physiatrist, and geriatricians. The team performed a 6-month record review of inpatients who had fallen, documented with the Schmid tool. They concluded that the Schmid tool had high inter-rater reliability in

inpatients[100] but yielded many false-negatives in the home care elders.[32] Consequently, the team determined that home care required a different assessment tool for accurate prediction of fall risk.

In developing the VNA tool for home care, the Schmid categories including mobility, mentation, elimination prior fall history, and current medication were incorporated, but responses were scored based on the OASIS items. According to the risk factors identified on the 6-month record review, OASIS items urinary incontinence (MO520), bowel incontinence (MO540), ability to dress lower body (MO660), current transferring (MO690), and current ambulation (MO700) were selected for the best measurement of patients' functional mobility. In addition, vision impairment (MO390) was also included because vision is important to safe mobility. The validity of the VNA tool was assessed by using a retrospective study. The records of 20 patients who had fallen and 28 patients who had not fallen were reviewed, yielding a tool sensitivity of 93% and a specificity of 72%. The development of Christiana Care VNA tool was completed in 2003.[32]

The FRSF has a content and scoring system very similar to the VNA fall risk assessment tool. The FRSF has seven fall risk sections, which are fall history medications, blood pressure, vision, elimination, mentation, and mobility, and there are eleven items with each item consisting of 2-4 levels. Each level is assigned a score of 0, 1, 2, or 3, based on the presence or absence and severity of a risk factor. The only exception is fall history which is heavily weighted; it is assigned a score of 13 if falls occurred during the last three

months or during the home health service. This is in contrast to the VNA fall risk assessment tool, which assigns a fall history score of 1 if falls occurred within 3 months before admission or the history of falls is unknown.

CAUSES AND RISK FACTORS FOR FALLS

Falls are a complex phenomenon resulting from interactions between multiple risk factors, both intrinsic (patient-related) and extrinsic (environment-related).[32,101] Prior studies on falls and fall risk have identified several factors that could increase the risk of falling. Intrinsic risk factors include advanced age, chronic diseases, medication use, muscle weakness, cognitive impairments, visual deficits, gait impairments, and balance disorders. Extrinsic factors include environmental hazards or hazardous activities. Several of these factors are considered modifiable, e.g., use of medication, muscle weakness, and impairments in vision and gait.[2,33,42,102]

A prospective cohort study (n=1,285) constructed a fall-risk model for the prediction of falls and concluded that risk factors differ among community-dwelling older men and women. For women, previous falls and visual impairment were the strongest predictors for recurrent falls. For men, previous falls, visual impairment, urinary incontinence, functional limitations, and low level of physical activity were the strongest predictors for recurrent falls.[42]

The high incidence of falls in the elderly can be attributed to a combination of a high prevalence of diseases and age-related physiological changes.[72] Aging is associated with changes in visual and other sensory systems that slow down the person's ability to

explore the environment safely.[61] Medical conditions associated with advanced age such as dementia, stroke, and Parkinson's disease also increase the risk of falls.[102] In addition, medications used to treat medical conditions can cause adverse effects including impaired alertness, unsteadiness, hypotension, and dizziness, which are also risk factors for falling.[103] Finally, age-related changes in muscle strength and postural control increase the risk of losing balance and falling.[29]

Studies on falls and fall risk used a variety of combinations of risk factors for assessing falls. Outcomes varied in number of falls, fallers, recurrent fallers, and fall related injuries. Twenty-four selected articles published from 2000 through 2010 related to falls in the older persons living in the community were reviewed. These articles published data on the odds ratio (OR) of individual fall risk factors with a 95 percent confidence interval (95% CI). The higher value of OR indicated that the factor contributed independently to the risk of falling or experiencing a fall injury.

All risk factors identified by the 24 studies are presented in Table 2.2. The risk factors from most to least commonly identified were: having a history of previous falls (9 studies); balance impairment (8 studies); medication (6 studies); gait impairment (5 studies); being female, visual impairment, and cognitive impairment (4 studies); muscle weakness, impaired functional status, urinary incontinence, and depression (3 studies); mobility limitation, fear of falling, environmental hazards, and foot problems (2 studies); and other factors such as hearing problems, arthritis, confusion, dizziness, co-morbidity, postural hypotension, and advanced age. The ORs of these risk factors were

quantitatively reported, ranging from 1.13 to 13.80. An OR that is greater than 1 indicates greater chance of falling if the factor is present. Higher values of OR imply a greater risk of falling.

Table 2.2. Risk Factors for Falling among Community-dwelling Elders

Risk factors	References	Number of Studies	Range of OR
Previous falls	44, 65, 42, 70, 88, 91, 104, 105, 106	9	1.24-13.80
Balance disorder	56, 18, 72, 104, 106, 22, 107, 108	8	1.83-5.97
Medications	56, 61, 65, 42, 75, 105	6	1.29-2.60
Gait deficit	58, 66, 72, 109, 107	5	2.13-5.30
Female	61, 56, 65, 18	4	1.62-5.65
Visual impairment	42, 72, 105, 47	4	1.46-2.80
Cognitive impairment	58, 70, 72, 75	4	1.13-3.60
Muscle weakness	44, 72, 104	3	1.74-4.90
Impaired functional status	44, 70, 72	3	1.70-3.00
Urinary incontinence	42, 75, 110	3	1.60-3.10

Table 2.2. (continued)

Risk factors	References	Number of Studies	Range of OR
Depression	66, 89, 104	3	1.53-2.2
Mobility limitation	72, 106	2	2.50-2.64
Fear of falling	56, 44	2	1.40-3.25
Environment hazards	58, 66	2	1.35-1.50
Foot problems	66, 102	2	1.20-1.80
Others			
Hearing problems	56	1	4.16
Arthritis	70		3.80
Low BMI	75		3.30
Bowel Incontinence	89		2.68
Parkinson's disease	58		2.47
Confusion	66		2.38
Dizziness	44		2.16
Co-morbidity	89		1.95
Postural hypotension	72		1.90

Table 2.2. (continued)

Risk factors	References	Number of Studies	Range of OR
Others continued			
Living alone	65		1.75
Advanced age	88		1.70
Anxiety	105	1	1.56
Male	61		1.54
Back pain	58		1.50
Health status	58		1.35

R: Odd ratio

Th e findings can be compared to a prior review of 14 tudies, which found that ●gniti e impairment balance and gait disorder the use of edative and hypnotics, a hi tory of troke, advanced age and arthritis of the knee are the most frequently mentioned ri k factors in the articles.[3]

Th percentage of elderly experiencing falls increased dramatically with the number of ri k factors from 8% with no risk factors to 78% with four or more risk factors.[102] A Dutch study found that elderly outpatients with recurrent falls had more risk factors (median: 4) than those did not have recurrent falls (median: 3).[111]

Fall Hi tory

Histor of previou falls is the most common risk factor in able 2.2 and it is the

item weighted most heavily in assessing fall risk by the FRSF and FRAF instruments previously described. Indeed, fall history is well-established as one of the important predictive variables for falls among both younger and older populations.[51,68,105] The experience of having a fall was associated with more falls both indoors and outdoors.[68] Elders who have prior histories of falls had a higher risk of experiencing another fall.[91] The odds of having multiple falls increased by 2.4 times for elders that had fallen more than three times in the previous year.[51] A prospective cohort study showed that history of two or more falls in the previous year was one of the main determinants for the prediction of recurrent falls.[104] A study of elderly home-dwelling individuals concluded that a history of current falling was an independent risk factor for subsequent falls.[105] A Chinese cohort study reported that a previous history of falls was an independent predictor for falls and recurrent falls.[63] In a study of elderly women living at home, having experienced more than one fall was one of the strongest independent predictors for fall related fractures.[70]

A study of elders living in the retirement community found that those who fell during the prior year were more than twice as likely to fall in the subsequent year. However, the same study also found that a combination of history of balance difficulty or dizziness, together with abnormal mobility exam, was a better predictor of future falls than fall history. Moreover, fall history combined with all of these other factors together differentiated those with falls from those without falls better than any single risk factor alone.[106]

Medications

Polypharmacy, or the use of a high number of medications, has been shown to be associated with risk of falling and hospital admission for community dwelling older persons.[27,112] In the literature, polypharmacy has been defined as (1) the use of multiple, excessive or unnecessary drugs,[113] or more simply (2) the use of at least a certain number of medications, ranging from 2 to 5.[36] This current study defines polypharmacy as the concomitant use of four or more medications.[27,42]

The incidence of polypharmacy has generally increased with age and time. Approximately one-third of community-dwelling persons in the United Kingdom over 74 years of age used three or more prescribed medications.[114] The proportion of people with polypharmacy has increased to 60% among persons 75 years old in Denmark.[115] An epidemiologic study investigated the use of prescription medication and polypharmacy in Finland.[36] Two cross-sectional surveys were carried out among community-dwelling elders aged 64 years and over, the first in 1990-91, and the second in 1998-99. Results showed that medication use were more common in the later survey, where 25% of the elders used more than five medications, two-thirds of polypharmacy users were women, and the average of medication use was 6.8 for women over 84 years of age. A recent study of elderly outpatients found that those with a medication risk factor, i.e., using more than three medications sedatives, psychoactives, antihypertensives, or diuretics, were more likely to have other fall-related risk factors as well ($p=0.006$).[111]

Several studies in the literature have documented the association of polypharmacy with falls and fall risk. Among elders living the community, polypharmacy was a significant predictor (OR: 1.29; 95% CI: 1.08-1.55) for falls.[56] In a Swedish study, the number of prescribed medications was higher among elders who had fallen (7.3) than those who did not fall (6.5).[71] In a study of women with recent fractures, polypharmacy was identified as a predominant risk factor for falls.[78]

A prospective cohort study examined the association between risk factors and falls in 7,983 people over the age of 55. Results revealed that polypharmacy was a significant risk factor for falling after adjustments were made for a large number of comorbid conditions and disability. The risk of falling increased significantly with the number of drugs used per day.[27] However, people with dementia or unknown mental state were excluded from this investigation.

Cognitive Impairment and Dementia

Older persons with cognitive impairment have a higher risk of falls than those without cognitive impairment.[102] A cross-sectional survey used data obtained from the assessment and management of 15,051 community elders who were aged 75 years and older in the United Kingdom. The survey indicated the prevalence of cognitive impairment among older females. Elders with cognitive impairment were more likely to have had two or more falls in the previous 6 months (OR: 1.40; 95% CI: 1.20-1.70).[116] Cognitive impairment has also been linked to increased risk of recurrent falling (OR: 1.13; 95% CI: 1.02-1.25).[58]

Cognitive impairment is an important indicator of the early stage of dementia.[116] Dementia is defined as a progressive disease with general impairment of intellect, memory, and personality but without damage of consciousness.[117] Several studies have identified dementia as an important risk factor of falling among community-dwelling older persons, with 40% of those with dementia having experienced fall-related injuries.[28,118] The prevalence of dementia increases with age and time. According to the 2000 United States census, there are 4.5 million people with dementia.[119] About 5% in people aged over 65 and 15% in those aged over 80 have dementia in the western countries.[120] The number of people with dementia is increasing rapidly worldwide; it's expected to rise to 42 million worldwide by 2020.[121]

The treatment of dementia is often associated with the use of drugs which affect the central nervous system (CNS), such as antipsychotics, anxiolytics, antidepressants, antiparkinsonian medications, Alzheimer' disease medications, anticonvulsants, opioid analgesics and narcotics, and benzodiazepines.[81] According to the data from the 2004 National Nursing Home Survey (NNHS), approximately one-third of nursing home elders with dementia received antipsychotic medications.[119] Use of CNS-active drugs has been linked to increased risk of falls and fractures in older persons. In a retrospective study of elders with dementia living in the community, 79% of them were prescribed at least one CNS-active medication, and within 45 days of receiving a prescription, the most frequent drug-related problems were falls and fractures.[122] Another study of persons with dementia linked the use of psychotropic drugs to increased risk of falls and fractures.[123] A

Canadian study found that community-dwelling elders taking narcotic, anti-convulsant or antidepressant medications were more likely to suffer from an injurious fall that required emergency department treatment, regardless of their age, gender, income, previous hospitalization and medical condition. Among elders with dementia, 6% experienced an injurious fall requiring a visit to the emergency department, and only 1% experienced a non-injurious fall.[124] A systematic review of 17 prospective cohort studies concluded that multiple drugs, antidepressants and anti-anxiety drugs increased fall risk among elders with dementia living in nursing homes.[125]

The increase in fall risk associated with dementia and the use of CNS-active medication cannot be attributed simply to an increase in drug use. A study of community-dwelling older persons reported no significant differences between the number of prescription medications used by those cognitively impaired as compared to those cognitively intact.[126] Another study of community-dwelling older persons reported that the average number of medications used by those with dementia as compared to those without dementia is 4.6 and 4.8, respectively.[34] Elders with dementia took fewer cardiovascular or analgesic medications but more CNS medications than either cognitively impaired or cognitively intact elders.[126] A retrospective study conducting outpatient data analysis with veterans aged over 65 found that elders with a healthcare encounter for a fall used more CNS medications than elders in the age and sex matched comparison group.[81] A study of elders living in an residential care facility found that elders who used antidepressants were four times (OR: 4.66; 95% CI: 1.23-17.59) more

likely to have falls than those who did not.[127] Use of hypnotics or anxiolytics and use of antidepressants were associated with an increased risk of falling even after adjustment for chronic disease status.[128]

Some studies have presented different results on polypharmacy and use of CNS-active medications. A 2003 study of elderly women living in the community concluded that neither the number of medications nor any specific medication were independent risk factors for falls.[68] A following study found the use of antihypertensive drugs but not the use of any other classes of drugs was significantly related to serious fall related injury.[70] However, only focusing on the female population may affect the external validity and reduce the generalizability of those studies. In a study of elders living in rural communities, use of prescription painkillers, tranquilizer medication, and high blood pressure medication was positively correlated with the probability of falling.[54] However, data in the study were gathered via a telephone interview, so there may be a recall bias as respondents were asked to remember past events. In addition, the cause and effect relationships between prescribed medications and falls could not be established by the use of correlation.

Visual Impairment

A person's potential for interaction with the environment highly relies on his or her capacity to receive and respond to information obtained through the senses.[129] For the elders who are visually impaired, the simple task of walking can become very difficult, because the visual neurological, vestibular, and musculoskeletal systems are critical to

postural control.[130] Consequently, elders with visual impairments tend to walk slowly, have a short stride length, have a wide base of support, and spend more time in doubled stance during walking. These gait characteristics are similar to individuals who have fallen. Moreover, individuals with vision loss are more susceptible to reductions in strength of the lower extremities.[131]

Many studies of elders' risk of falling have included measures of visual impairment as a possible risk factor. In research studies, visual impairments including reduced visual acuity, impaired depth perception, visual field loss, and poor contrast sensitivity have been shown to be associated with falls.[31,132] Elders with good vision in one eye and only moderate or poor vision in the other eye and those with moderate or poor vision in both eyes fall more often than those with normal sight.[132] Other researchers found that having poor vision in one eye and moderately good vision in the other doubles the risk of falls.[47]

Researchers have shown that decreased visual acuity is a significant predictor of falls, recurrent falls and injurious accidents in community-dwelling elders.[133,134] Elders with poor visual acuity were at higher risk of suffering recurrent falls.[51] Poor depth perception was an important risk factor for hip fracture in white women.[135] The risk of hip fracture increased by 40% in elders with poor visual acuity.[136] A population-based study showed that severe visual impairment significantly increased the risk of falling (OR: 1.6; 95% CI: 1.1-12.3) after adjustment for gender, age, body mass index, history of angina, heart attack, stroke, hypertension, diabetes, and self-rated health.[47] In addition,

vision loss leading to chronic disease is associated with inactivity. Elders with visual impairment tend to have more health problems including lower bone density, depression, and diabetes than those without.[131]

Presbyopia (age-related farsightedness), cataracts, and glaucoma can be impediments to effective communication, especially for elders with dementia.[129] In addition, elders with Alzheimer's disease and dementia with Lewy bodies walked with incongruent visual information, which may have increased their postural sway or instability because of their executive dysfunction.[137] A study of visual abilities and fall risk found that elders with dementia with a lower Visual Spatial Score (VSS of 5 or lower) were three times more likely to have fallen than elders with a high VSS (9 or higher).[138]

Urinary/Bowel Incontinence

Urinary incontinence is a widespread condition in elderly people. It affects 15-30% of elders living in the community and more than half of those living in nursing homes in the United States.[139,140] The aging process can alter bladder function, and it can make getting to toilet in a timely manner difficult. Menopause and obesity may cause hypertrophic smooth muscle and fibrosis of the bladder, and reduced muscle tone in the internal and external sphincters and pelvic floor muscles. Consequently, older women are twice as likely to develop urinary incontinence as men.[139]

Urinary incontinence is classified as urge, stress, functional, overflow, and mixed.[139] It can cause urinary tract infections or pressure sores; it can lower the quality of life, or cause depression or social withdrawal.[139,140] Additionally, urinary incontinence

may lead to a higher risk of falling as the sense of urgency to avoid incontinence induces a rush to the bathroom.[141,142]

The relationship between urinary incontinence and falls has been documented in prospective studies. A cross-sectional study examined the relationship between urinary incontinence and falls in older Australian women above 75 years of age by questionnaire.[110] Researchers have concluded that urge-related urinary incontinence was more common among older women who had fallen (46.5%) than those who did not fall (30.8%). Moreover, urge urinary incontinence (OR: 1.76; 95% CI: 1.29-2.41) was one of the independent risk factors for falling among the elderly women after adjusting for age, CNS drugs, and cardiovascular drugs. The risk of falls and fractures increases in women with weekly or more frequent urge urinary incontinence.[142] A case-controlled study in hospitalized patients found that urinary or stool incontinence was significantly associated with an increased risk of falling (OR: 2.3; 95% CI: 0.99-5.6).[143] Furthermore, a study in home healthcare elders has shown that bowel incontinence was one of the predicting factors for adverse falls.[89]

Mobility Impairment

An expert panel on falls prevention pointed to muscle weakness, gait deficits and balance deficits as risk factors for falls in the elderly.[6] Impaired mobility, as measured by impairments in balance and gait, was shown to be associated with falls.[29] Approximately 10-25% of all falls have been attributed to poor balance and gait deficits.[144] An Australian study investigated factors for occasional and multiple falls among 1,000 elders

aged 65 years and older living at home. Mobility impairment was found to be one of the independent predictors for multiple falls. Loss of balance was the most frequently self-reported reason for falling in elders.[61]

Balance is a complex skill that is based on the interaction of dynamic sensorimotor processes and is dependent on the goal of the movement task as well as the environmental context.[145] The ability to control balance involves using strategies to stabilize the body's center of gravity over its base of support during quiet standing or active movement i.e., static or dynamic balance.[146] The functional base of support declines about 16% per decade beyond age 60. Forward and backward leaning abilities also decline significantly after age 60, as that population on average retains only 66% of the forward leaning ability and 34% of the backward leaning ability of those under age 60.[147] A prospective study of the elders in the Netherlands found that mediolateral sway with eyes open was the strongest associated factor with recurrent falling in older persons after adjusting for age, sex, physical activity, fear of falling and depression.[107]

Physical strength is required to maintain and control the balance while shifting the body's center of gravity, especially in the lower extremities. Hip extensors, knee extensors and flexors, and ankle plantar flexors play a major role for controlling the limit of stability in the anterior-posterior direction.[148] Impairment in the muscle strength of the lower extremities had been shown to negatively affect balance.[145] A study of community-dwelling older persons indicated that there was a significant relationship (Pearson $r = -0.37$) between decreased lower extremity strength and balance.[29] In a study comparing

the neuromuscular performance of older women, those who fell had lower muscle strength scores in dorsiflexion (DF) and plantarflexion (PF), as well as 19% lower peak torque and 29% longer motor time in lower-extremity muscle groups than those who did not fall. The DF and PF muscles are important for maintaining balance and for performing the walking gait. In addition, those who fell also reported arthritis and chronic pain in the legs more often than those who did not.[149]

Impaired gait was also found to be associated with an increased risk of falls (OR: 2.5; 95% CI: 2.05-3.07) and recurrent falls (OR: 2.8; 95% CI: 2.01-3.89) among elders receiving home care.[58] A retrospective study on risk factors for falls among 5,570 older Italians receiving home care concluded that gait problems (OR: 2.13; 95% CI: 1.81-2.51) doubled their risk of falls.[66]

Environmental Hazards

The presence of environmental hazards is an important consideration in the prevention of falls. Hazards such as poor lighting, uneven floor surface, and lack of grab bars in the bathroom may increase risk of falls.[66] A summary of 12 retrospective studies reported that environment-related factors were the most frequently cited (mean 31%) cause of falls among elders living in a variety of settings.[72] Another study investigated the risk factors for falls among elders receiving home care services by using data from an assessment completed by healthcare providers in Canada. Environmental hazards accounted for 12% of all risk variables and independently predicted falls and recurrent falls.[58] A later study found that number of home hazards was one of the significant

predictors of falls in home care setting.[91] A study comparing the predisposing factors for the occasional and recurrent falls in older Australians living at home found that two-thirds of the most serious recurrent falls occurred at home and more of these falls occurred outdoors than indoors.[61]

The risk of falling from environmental hazards can be reduced through interventions that modify the environment. One study assessed the efficacy and cost effectiveness of a home safety program and a home exercise program, which were designed to reduce falls in persons aged 75 or older with severe visual impairment in New Zealand. Elders receiving the home safety program had 41% percent fewer falls than those who did not. In contrast, elders receiving the home exercise program had 15% more falls than those who did not. As a result, it was concluded that the home safety program was more cost effective than the home exercise program.[150]

The predictive validity and responsiveness of a Home Falls and Accidents Screening Tool (HOME FAST) were evaluated among 727 Australians aged 70 years and over living in the community. Home hazards were assessed using the HOME FAST to establish a baseline and were assessed again in a 3-year follow-up. Results showed that falls were significantly related to the baseline HOME FAST score (OR: 1.01). Moreover, 52.5% of the participants had improvement in their HOME FAST scores at the final follow-up.[88]

ASSESSMENT TOOLS FOR FALL RISK

The guidelines for the prevention of falls in older persons recommended that effective interventions should be focused on the people who are at higher risk for falls.[6] Elders receiving home healthcare from acute illness or treatment changes may go through a period of high transient risk with mobility difficulties and cognitive impairment. What distinguishes home healthcare from hospital settings and long-term care facilities is living in an open, less controlled environment. Home healthcare services may involve an inherent risk of falls because elders are encouraged to reestablish their functional independence.

The first step in preventing falls is the accurate identification of those elders at risk of falling, so that appropriate measures can be taken in response. A reliable and valid assessment tool is an indispensible instrument for healthcare providers to identify at risk elders and to guide intervention strategies to target specific fall-risk factors. Numerous clinical screening instruments for identifying older persons at high risk of falling have been proposed in studies, ranging from self report, single-task performance tests to multiple-task performance measures.[20,21,80] These instruments can be classified as two types: functional mobility assessments (FMA) and multi-factorial assessment tools (MAT). Although the assessment tools have been tested for validation in many published studies, there is no strong evidence that any specific screening tool is effective in diverse settings.[11]

Identifying elders receiving home healthcare who are at high risk of falls is a complex task, and fall risk assessment tools developed for acute hospital settings often cannot be used for the home healthcare population. The focus of this review was on fall risk assessment tools administered by a wide variety of healthcare providers and settings in the past 10 years.

Functional Mobility Assessment (FMA)

The main focus of FMA is the assessment of task performance that relates to functional or physiological domains including balance, gait and muscle strength. This type of tool is used in outpatient or acute care settings by physical therapists or physicians.[11] A Mobility Interaction Fall (MIF) chart has been developed by Swedish researchers for the identification of elders over 65 years of age living in residential care who are at high risk of falling. The MIF chart is used by physical therapists to evaluate elders' walking behaviors including "Stops walking when talking" and the "different Timed Up and Go" (diffTUG). The diffTUG was the combination of the "Timed Up and Go" (TUG) and a second task that was to carry a tumbler containing 0.5dl of water. Elders who had difficulties in walking and talking simultaneously or had a diffTUG of more than 4.5 seconds were indicated as having a high risk of falling. The positive predicative value (PPV) and the negative predictive value (NPV) for the MIF chart in distinguishing elders with high and low risk of falling were 78% and 88%, respectively. The test-retest scores of the MIF showed 80% agreement between raters.[151]

The validity of the Tinetti balance scale for predicting falls among 225 elders living at home during a one year follow-up was assessed in a prospective study.[24] The Tinetti balance scale had outcomes of 70% for sensitivity and 53% for specificity with a cut-off score of 36 or less. However, there were elders who fell with high scores on the test scores (37-40 out of 40). To explain this outcome, it was conjectured that some important fall-related risk factors such as vision and environment were not included in the test. As a result, this test may be useful for screening elders at risk of falling but not for preventive interventions.

Another study examined the prediction of falls using five balance tests combined with health factors (number of medications, dizziness, and vision) and demographic factors (fall history, use of assistive device, physical activity level, sex, and age) among community-dwelling elders who were independent. However, results showed poor ability to predict falls from these combined balance tests and health factors. Researchers conjectured that new assessment tools might be necessary for active community-dwelling elders.[18]

A prospective study used nine physical performance measures which were floor transfer, 5-step test, tandem stance, Performance-Oriented Assessment of Mobility-Balance subscale (POAM-B), functional reach (FR), 5-min walk, the penny pick-up, turn, and 50-ft walk to predict falls among community-dwelling elders aged 60 years and older. Results of a discriminant-function analysis revealed that using an equation which combined the floor transfer and the 50-ft walk correctly predicted falls in 95.5% of

elders.[20] A prospective study of community-dwelling older Taiwanese compared the psychometric properties of the TUG, one-leg stand (OLS), FR, and Tinetti balance (TB) measures. The four balance measures had excellent test-retest reliability with the intraclass correlation coefficient (ICC) scores ranging from 0.93 to 0.99 and they had excellent discriminant validity with area under the receiver operating characteristic (ROC) curve ranging from 0.50 to 0.63. However, the effect size for each balance measure was small; 0.12 for the TUG, 0.10 for the OLG, 0.04 for the FR, and 0.19 for the TB.[152]

A cohort study used numerous domains including gender, medication, psychological assessment, postural control, sensory testing, and physical assessment for the prediction of recurrent falls among elders. Results of a logistic regression showed that the combination of measuring handgrip strength and physical performance which screened for balance, endurance, mobility, and coordination deficits was the best predictive model for recurrent falls among elders living in the community for a follow-up period of one year.[56] Tiedemann et al.[153] examined the comparative ability and clinical utility of eight mobility tests which were the sit-to-stand test with one (STS-1) and five (STS-5) repetitions, the pick-up-weight test, the half-turn test, the alternate-step test (AST), the six-meter-walk test (SMWT) and stair ascent and descent tasks for predicting multiple falls in community-dwelling elders. Researchers concluded that elders with multiple falls performed significantly worse in the STS-5, the AST, the half-turn test, the SMWT and the stair-descent test. The risk of multiple falls also increased in elders who had poor performances in two of those mobility tests. However, those tests demonstrated

a wide variety of sensitivity ranging from 11-78% and specificity ranging from 20-93% in identifying elders at risk of multiple falls.

Multiple-factorial Assessment Tools (MAT)

A multi-factorial fall risk assessment which includes various factors of falls such as fall history, physiological status, sensory deficits, medication use, mental status, elimination, and mobility function is an essential component of effective intervention to prevent falls.[8] The assessment tool usually consists of a scoring system designed to reflect the cumulative effect of present risk factors to identify those elders at risk for falls. In the "Gold Standard Criteria" for Quality of Risk Assessment Tools, prospective validation, used sensitivity and specificity analyses, with good face validity and inter-rater reliability, tested in various populations, and easily used by healthcare providers are the characteristics of a high-quality risk-assessment tool.[154] A systematic review of 39 papers on fall risk assessment tools used for hospitalized patients concluded that while assessment tools have been characterized for sensitivity and specificity, they would need to be tested in different geriatric settings.[16]

St. Thomas Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY) has been assessed in different settings and countries. This tool was originally developed for predicting falls among elderly hospital in-patients in the United Kingdom.[155] The STRATIFY tool is comprised of five sections that were found to be significant predictors for falling. They were fall history, mental impairment (confusion, disorientation or agitation), visual deficits, difficulties in transfers and mobility. Following the initial

development and testing, the instrument was used to predict patients who were likely to fall and be injured in rehabilitation in Canada. The predictive validity of the STRATIFY tool had a low specificity in predicting those who would fall (47%) and those who would fall and injure themselves (45%), with a cut-off score of 2 out of 5.[156] In a later study, the STRATIFY tool was tested for predicting the chance of falling in 620 older in-patients during a 6-month period. The scoring system of STRATIFY was modified by weighing each single section score with beta coefficients from a multivariate logistic regression model. The modified STRATIFY tool had good inter-rater reliability (ICC=0.78), high sensitivity (91.2%), and moderate specificity (60.2%) with a cut-off score of 9 out of 30. However, the model of the ICC was not reported. From the results of the multivariate logistical regression, mental status was the most significant predictor (OR: 4.06; 95% CI: 1.81-9.16). Visual impairment (p=0.82) was the only non-significant predictor in the model.[157]

Two risk assessment tools (fall risk assessment tools 1 & 2) were compared to nurses' clinical judgment for in predicting falls among hospitalized patients (age range 41-98; mean age=85) in Australia. The two assessment tools consisted of the following domains: fall history, mental status, medication, elimination, and mobility. Both assessment tools and nurses' clinical judgments had positive predictive values for falls, but poor specificity meant that many patients who did not fall were identified as at high risk for falls. It was conjectured that all three methods were not accurate for predicting falls because the study could not control for the effects of prevention interventions.[158]

The Morse Fall Scale (MFS) covered six sections: fall history, secondary diagnosis, ambulation aids, gait, intravenous therapy, and mental status. Validation of MFS has been performed in various clinical settings and cross countries.[159-161] In Hong Kong, MFS has been assessed for its reliability and validity in predicting falls in rehabilitation hospitalized patients, ages 17-100. The patients were evaluated for risk of falling using the MFS on admission and after changed medical conditions. For the reliability test, the scale demonstrated an excellent inter-rater reliability (ICC=0.98) but a low internal consistency (Cronbach's alpha=0.26) and a low to moderate item-total correlation (r=0.30-0.56). The type of ICC was not reported. For its predictive validity, the scale had a low sensitivity (31%) and a high specificity (83%) at a cut-off score of 45. Experts reviewed the content of the MFS for of relevance and representativeness of the items but the degree of experts' agreement of the MFS was not reported.[160]

In Australia, a study was conducted to test the ability of predicting falls of the MSF among hospitalized patients, ages 38-102. The MFS had a sensitivity of 83%, a low specificity of 29%, and a low PPV of 18% with a cut-off score of 45. The study concluded that the validity of the MSF was still questionable when used in hospital settings.[161] In Singapore, a study compared the reliability and validity of the MFS and STRATIFY to a third tool, the Hendrich II Fall Risk Model (HFRM), in identification of inpatients at high risk for falls. The HFRM includes seven items: mental status (cognition/disorientation/impulsive), depression elimination, dizziness, gender (male), medication (use of anti-epileptics or benzodiazepines), transferring (standing up from a

chair). Finding revealed that all three tools had good inter-rater reliability; the HFRM with a cut-off score of 5 had a sensitivity and specificity of 70% and 61.5%, respectively. In contrast, MFS had poor specificity (48.3%) at a cut-off score of 25 and STRATIFY had poor sensitivity (25%) at a cut-off score of 3.[159] A comparison of STRATIFY, MFS, and HRM as reported by various studies is shown in Table 2.3.

Table 2.3. Summary of Fall Risk Assessment Tools Tested in Hospital Settings

Authors	Tool	Reliability	Sensitivity	Specificity	PPV	NPV	Cut-off score
Coker et al.	STRATIFY	NR	65.8%	46.7%	29.9%	79.8%	2 out of 5
Kim et al.	STRATIFY	0.80	55.0%	75.3%	2.4%	99.3%	2 out of 5
Kim et al.	STRATIFY	0.80	25.0%	91.1%	3.0%	99.1%	3 out of 5
Papaioannou et al.	STRATIFY	0.78	91.2%	60.2%	60.2%	91.2%	9 out of 30
Chow et al.	MFS	0.98	31.0%	83.0%	NR	NR	45 out of 125
O'connell	MFS	NR	83.0%	29.0%	18.0%	NR	45 out of 125
Kim et al.	MFS	0.80	88.3%	48.3%	1.9%	99.7%	25 out of 125
Kim et al.	MFS	0.80	55.0%	91.2%	6.4%	99.5%	51 out of 125
Kim et al.	HFRM	0.80	70.0%	61.5%	2.0%	99.5%	5 out of 7

PPV: Positive predictive value

NPV: egative predictive value

TRATIFY: t. homa Risk Asses ment Tool in Falling lderly Inpatients

MF : Morse Fall Scale

HFRM: Hendrich II Fall Risk Model

: Not reported

A large cohort study of 1,285 community-dwelling elders in Netherlands found that previous falls, visual impairment, urinary incontinence and functional limitation were the most significant predictors in the model for recurrent falls.[42] A Fall Risk Assessment (FRA) tool consisting of 16 fall-risk items has been developed to assess homebound elders who are at risk for falls. The score of eight items on the FRA was based on the OASIS data collected during the initial assessment. The FRA tool demonstrated good internal consistency with Kuder-Richardson (KR)-20 of 0.98, moderate criterion-related validity ($r = -0.74$) while compared with the Performance-Oriented Mobility Assessment (POMA) good intra-rater reliability ($ICC_{3,1}=0.83$), and moderate to high percentage agreement between raters (range from 77.78-94.74%). Two fall-risk items that had less than 80% agreement: decreased independence in transfers and decreased balance.[26] Even though the FRA tool is available for utilization in homebound older adults, the scoring of the instrument is dichotomous, which fails to detect varying levels of fall risk.

A Fall Risk for Older People in the Community assessment tool (FROP-Com) has been developed to identify high risk of falling during one year follow-up in elders who presented to an emergency department because of falls.[80] The FROP-Com consisted of 13 fall-related risk factors in 26 questions which were scored with ordinal (0-3) or dichotomous. The concurrent validity and predictive accuracy of the FROP-Com were examined and compared to the TUG and FR. For the concurrent validity, the FROP-Com had moderate correlation with the TUG ($\rho=0.62$) and FR ($r=0.50$). For the predictive accuracy, the area under the ROC curve (AUC) was calculated. The FROP-Com

(AUC=0.68) had better ability for the prediction of falls than the TUG (AUC=0.63) and FR (AUC=0.60). In addition, the FROP-Com demonstrated high inter-rater reliability (ICC=0.81) and moderate predictive validity with acceptable sensitivity (71.3%) and specificity (56.1%).

Furthermore, an abbreviated FROP-Com screening tool was developed using a combination of three factors from the full FROP-Com assessment tool: number of falls in the past 12 months, observation of balance, and assistance required to perform domestic ADLs.[162] Each factor was assigned a score from 0 to 3, for a total score of 9. For predictive validity, the abbreviated FROP-Com had sensitivity of 80.49% and specificity of 49.44% at a cut-off score of 3. For inter-rater reliability, the ICC for the abbreviated FROP-Com was 0.89. All participants in those studies were community-dwelling older people presenting to an emergency department after falling, so the external validity was limited to populations with similar high fall risk profiles.

In the Netherlands, another study targeted elderly outpatients visiting an emergency department after falls to identify risk factors for recurrent falls with a newly developed self-assessment instrument, CAREFALL Triage Instrument (CTI), a self-administered questionnaire.[111] Six risk factors included in the CTI, i.e., balance and mobility, fear of falling orthostatic hypotension, mood, osteoporosis, and impaired vision were correlated with recurrent falls. Test-retest reliability was poor for fear of falling; fair for orthostatic hypotension, impaired vision, and urinary incontinence; moderate for balance, mobility, and mood; and substantial for medication and osteoporosis. Clinical

validity was assessed with the agreement between the CTI and the Fall Prevention Clinic (FPC) ranging from fair to substantial.

A Fall Risk Assessment Tool (FRAT) was developed based on a review of 9 prospective cohort studies for predicting falls in primary care in England. After analysis with logistic regression for each study, five risk factors were selected for inclusion in the FRAT: history of previous falls, taking more than four medications, a diagnosis of Parkinson's disease or stroke, impaired balance, and inability to stand up from a chair without using arms. The predictive validity of the FRAT was tested by a mail-in questionnaire survey to 345 elders living in the community followed for six months. The FRAT had sensitivity of 42%, specificity of 92%, PPV of 57%, and NPV of 86% while three or more risk factors were present.[64]

In Japan, another cohort study including 1,053 community-dwelling elders was conducted to assess a 21-item Fall Risk Index (FRI) for the prediction of falls during a one year follow-up.[67] The FRI had moderate predictive value with sensitivity of 67.7%, specificity of 76.4%, PPV of 42.9%, and NPV of 89.8% at a cutoff score of 9 out of 10. However, the rating system of each of the 21 open-ended questions on the FRI was not defined clearly in the paper.

More recently, a prospective study evaluated clinimetric properties of four fall risk assessment tools in the detection of the risk of falls in elders receiving residential aged care in Australia.[163] The clinimetric properties included inter-rater agreement, test-retest agreement and predictive, evaluative, and discriminate validity. The inter-rater

agreement of the four tools was variable with a k between 0.21 to 0.84, and test-retest agreement was moderate, with k> 0.68. The sensitivity and specificity ranged from 0.52 to 0.80 and 0.32 to 0.80, respectively, and none of the four tools had high predictive accuracy. However, over half (43-66%) of the items on all tools were not fall-related risk factors. Therefore, the sum of the overall risk scores was not an appropriate method for representing the levels of fall risk as items were not generally measuring one construct.

A cohort study examined the predictive validity of fall risk screening tools among 1,946 elders who were and were not able to stand without assistance living in residential aged facilities in Australia.[164] Stepwise logistic regression was used to analyze the results. For those who could stand independently, four risk factors were identified as significant predictors: resident of a nursing home, impaired balance, a history of falls in the past year, and urinary incontinence. This model had the sensitivity of 57% and specificity of 73% for predicting falls. In addition, the likelihood of having a fall was more than three times higher (OR: 3.55; 95% CI: 1.87-6.75) for elders who could stand without assistance but had poor balance. For elders who could not stand independently, three risk factors were identified as significant predictors: resident of a hostel, previous fall in past year, and using more than 9 medications. This model had the sensitivity of 87% and specificity of 29% for predicting falls. In addition, the likelihood of having a fall was two times higher (OR: 2.09; 95% CI: 1.13-3.85) when any one of these risk factors was present.

Based on this review of the literature, some instruments have demonstrated potential to serve as screening tools to identify elders at risk for falls. However, each

instrument has demonstrated weakness in reliability and validity, in its scoring system, or in the scope of its target population. Some instruments, such as the FRAT and FRI, have not been validated for reliability. For other instruments, such as the CTI, where reliability has been assessed, the reliability varied from poor to substantial. Some instruments showed weaknesses in the scoring system: the scoring system of the FRI was not defined clearly, and the scoring system of the FRA could not capture different levels of fall risk. Finally, each instrument was targeted for a specific population. FROP-Com and CTI targeted elders who need emergency care. MFS, STRATIFY, HFRM & FRAT targeted hospitalized patients. FRI targeted the most general elderly population, which normally lives in the community. The choice of population is significant because the results of studies reviewed in this chapter have shown that the characteristics of a population correlate with actual fall risk.

A recent systematic review of the accuracy of screening instruments has concluded that no single screening test can be recommended for routine clinical use and no strong evidence exists that any one screening tool is adequate for predicting falls.[165] Table 2.4 contains a comparison of the various fall risk assessment tools and the risk factors which they cover. A few risk factors are common among all the tools, such as fall history, mentation, and mobility, but there are substantial differences in the selection of risk factors to include with each tool. Much work still needs to be done to characterize and improve upon the tools needed to identify community-dwelling older persons receiving home healthcare that are at risk for falls.

Table 2.4. Comparisons of Fall Assessment Tools by Risk Factors

Assessment tools/ risk factors	VNA	FRSF	FRAF	STRATIFY	MFS	HFRM	FRA	FROP-Com screening	CTI	FRAT	FRI
Fall history	✓	✓	✓	✓	✓		✓	✓		✓	
Medication	✓	✓	✓			✓	✓			✓	
Blood pressure	✓	✓	✓						✓		
Vision	✓	✓	✓	✓			✓		✓		✓
Elimination	✓	✓	✓			✓	✓				
Mentation	✓	✓	✓	✓	✓	✓	✓				✓
Mobility	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hearing			✓								✓
Age			✓								
Cardiovascular/ respiratory disease			✓								
Dizziness			✓			✓					✓
Alcohol use			✓								
Environment			✓				✓				✓
Secondary diagnosis					✓						

Table Continued

Assistive device					✓		✓				✓
Intravenous therapy					✓						
Depression						✓					
Male						✓					
Recurrent falls							✓		✓		
Injury							✓				
Fear of falling							✓		✓		✓
ADLs							✓	✓			
LE strength							✓				
LE ROM							✓				
Mood									✓		
Osteoporosis									✓		
Parkinson's disease/ Stroke										✓	
UE strength										✓	✓
Knee pain											✓

VNA: Visiting Nurse Association
FR F: Fall Risk creening Form
FRAF: Fall Risk Assessment Form
STRATIFY: t. Thomas Risk Assessment Tool in Falling Elderly Inpatient
MFS: Morse Fall Scale
HFRM: Hendrich II Fall Risk Model
FRA: Fall Risk Assessment
FROP-Com: Fall Risk for Older People in the Community
TI: CAREFALL Triage Instrument
FRAT: Fall Risk Assessment Tool
FRI: Fall Risk Index

CHAPTER III

ASSESSMENT OF IMPACT OF MEDICATION USE AND DEMENTIA ON FALL RISK IN CLIENTS RECEIVING HOME HEALTHCARE

INTRODUCTION

Medications are commonly used by older persons for the treatment of chronic diseases and up to 65% of older Americans suffer from two or more chronic diseases.[166] Consequently, about 25% of community-dwelling older persons over the age of 64 years use multiple medications.[36] This number increases to 60% for adults over 75 years.[115]

Concerns have been raised about the link between medication use and falls among older persons. However, this link is particularly difficult to characterize. On one hand, the use of medication can be considered an intrinsic factor, because it is specific to the individual. On the other hand, it can be considered an extrinsic factor because it can be modified by medical professionals.[167] In addition, medication use is associated with the treatment of an underlying disease, which may itself be a fall risk. Finally, multiple medications may interact with each other to increase fall risk.[123 168]

In particular, the use of multiple medications (polypharmacy) and the use of psychotropic drugs have been identified in the literature as fall risk factors.[27,35,43] After exposure to a fall prevention program, 77% of physical therapy providers including physical therapists and physical therapist assistants named polypharmacy as a risk factor for falls, and more than half (51%) of them rated polypharmacy a "very important" risk

factor for falls.[169] Elders who fell generally took more prescribed medications than those who did not,[71] and the use of more than four medications was found to be associated with an increase in the risk of falls.[27,42] Older institutionalized persons who took five to nine different types of medications have 4.3 times higher odds of falling, than those who took fewer medications.[167] The higher medication use increased not only the risk of falling, but also the risk of hospitalization.[27,71,112] However, as previously discussed, medication use is often correlated with the treatment of an underlying disease which may itself be a significant fall risk. A cross sectional study of women concluded that having multiple chronic diseases was a more important predictor of falling than polypharmacy.[128]

The association between psychotropic drugs and falls has been shown by several studies.[71,123,167,170] One such study found that community-dwelling elders taking any one of the following medications, benzodiazepines, sedative/hypnotics, neuroleptics, tricyclic antidepressants or opioid analgesics, increased risk of falls by 1.54 times.[170] Another study found that older women taking antidepressants had increased risk for falls (OR: 1.54; 95% CI: 1.14-2.07) and non-spine fractures compared with nonusers.[123] A study of elders in geriatric settings in Sweden found that using antidepressants (OR: 1.51; 95% CI: 1.19-1.91) was an independent factor associated with falls.[71] In particular, patients' initial use of a new psychotropic medication (benzodiazepines/antipsychotics) was found to greatly increase the risk of falling (OR: 11.4).[167]

A study of nursing home elders found that more than 60% of them receive psychotropic drugs on a regular basis.[171] One reason is that psychotropic drugs may be

prescribed as treatment for dementia, which itself has been identified as a high risk factor of falling among nursing home elders.[33] One study has shown that use of psychotropic drugs is more common among elders with dementia.[34] A study of older persons with dementia found that use of psychotropic drugs is associated with an increased risk of falls and fractures.[122,123]

Most of the studies in the literature concerning medication use, dementia, and falls focused on institutionalized elders. The purpose of this study was to investigate the relationships among medication use, dementia, and falls for community-dwelling elders recently discharged from hospitals or long-term care facilities. Specifically, this population was targeted because a vast majority of these home healthcare clients were known to have polypharmacy. This study examined a population of community-dwelling elders receiving home health services that demonstrated polypharmacy, used psychotropic drugs, had dementia, and had histories of falls. It was hypothesized that (1) psychotropic drugs were used more often in elders with dementia than those without dementia; and (2) the use of psychotropic drugs and dementia predicted fall risk in the elders who had polypharmacy.

METHODS

Research Design

This research was designed as a retrospective study. It used data from a convenience sample of community-dwelling elders who received home healthcare in a local senior service agency.

Participants

Study participants were currently receiving home healthcare in the Houston Metropolitan Area from a local senior home healthcare agency. The study used 3 years of the agency's clinical data from May 2006 to May 2009, including medical records and initial assessments of the Outcomes and Assessment Information Set (OASIS). These elders were within 14 days of their discharge from a hospital, rehabilitation facility, skilled nursing home or other nursing home; or within 14 days of a medical or treatment regimen change. This study excluded those under aged 65 years or those taking less than four medications, the minimum number of medications according to the operational definition of polypharmacy.[42] There were no other inclusion or exclusion criteria. This study received approval from the Texas Woman's University's Institutional Review Board before proceeding with review of the existing data set.

Definitions

The use of psychotropic medications was defined as use of any one of the following types of drugs: anxiolytic, antidepressant, sedative/hypnotic, and antipsychotic drugs.[171,172] A positive fall history was defined as a fall event that occurred within 3 months prior to admission to home healthcare, as documented on the Fall Risk Assessment Form (FRAF) embedded in the OASIS-based form.[13]

Data Collection

A retrospective chart review of all home healthcare elders was performed. The elders' diagnoses and the information on prescribed medication use including the name of

the drug, dose, form and frequency were collected from medical records. The initial OASIS forms were reviewed regarding the elders' demographics such as age, sex, race, and date of admission, as well health status. Physicians' medical diagnoses and the OASIS information were recorded by registered nurses or physical therapists who conducted the initial visit in the home when the older person began receiving home healthcare services.

The total number of prescription medications for each participant was determined as follows. For example, if a participant was taking two different types of arthritis drugs, each drug was counted as one medication. There are two exceptions: all vitamins and nutritional supplements, such as a protein shake, were counted as one medication; all types of nasal sprays, eyedrops, muscle sprays, and artificial saliva formulations were not counted.[112] Medications were categorized as psychotropic and non-psychotropic drugs according to the information from the U.S. National Library of Medicine.[173] The diagnosis of dementia was based on the physician's documented clinical evaluation and judgment. Medication assessment of elders in one group, those with dementia, and another group, those without dementia, included the average number of prescription medications taken and the percentage of those using psychotropic drugs. All information from the participants' record data was transferred to an electronic file for analysis, with data encoded by number to protect the participants' identities.

Data Analysis

Descriptive statistics were used for the demographic data, the number of prescribed medications, use of psychotropic drugs, and fall history. Categorical variables were summarized by percentages, and continuous variables were summarized by means and standard deviations for all variables. The assumption of homogeneity of variance (HOV) for those variables was tested. Welch t tests and chi-square tests were conducted to examine the differences in continuous and dichotomous measures of demographics and health status between the baseline characteristics of the two groups. All variables were compared between elders with dementia and those without dementia, such as age, number of prescription drugs, visual impairment, urinary incontinence, cognition, confusion, transferring problems and ambulation problems.

The assumptions of using a logistic regression were tested including independent sampling, measurement error and missing cases, multicollinearity, outliers, sample sizes, and sampling adequacy. A logistic regression was performed to test the hypothesis that use of psychotropic drugs and dementia predicted the fall risk in elders who had polypharmacy.

RESULTS

A complete review of charts from 161 home healthcare elders was performed. Of the 161 charts collected, 14 were excluded because they did not meet the study criteria: 9 were from clients under 65 years of age, and 5 were from elders who did not have polypharmacy. Medication information was obtained from the remaining 147 elders who

were 65 and older and had polypharmacy. Participant characteristics of the elders with and without dementia are shown in Table 3.1. Among the 147 elders, 56 (38%) were diagnosed with dementia. The age of elders with dementia was slightly older than those without dementia (p=0.004). The mean number of prescription drugs was 8 for elders with dementia and 9.75 for elders without dementia (p=0.002). Elders with dementia had more cognitive dysfunction (p<0.0005) and confusion (p<0.0005) than those without dementia. Additionally, elders without dementia had significantly more transferring problem compared to those with dementia (p<0.0005). No differences in other variables were found between elders with and without dementia. The proportion of falls within 3 months before admission was similar for elders with (32.1%) and without (39.6%) dementia.

Table 3.1. Characteristics in Participants with Dementia and Without Dementia

Variables	With dementia N=56 (38%)	Without dementia N=91 (62%)	*P*
Age* (range)	84.29 ± 6.00 (69-102)	80.77 ± 8.32 (65-98)	0.004†
Gender			
Male	24 (42.9%)	34 (37.4%)	
Female	32 (57.1%)	57 (62.6%)	
Race			
Caucasian	37 (66.1%)	67 (73.6%)	
African-American	13 (23.2%)	12 (13.2%)	

Table 3.1. (continued)

Variables	With dementia N=56 (38%)	Without dementia N=91 (62%)	*P*
Race continued			
Hispanic	4 (7.1%)	9 (9.9%)	
Asian	1 (1.8%)	3 (3.3%)	
Native Hawaiian	1 (1.8%)	0 (0%)	
Weight * 〔kg〕	67.69 ± 15.00	71.53 ± 20.91	
Height * 〔m〕	1.67 ± 0.11	1.66 ± 0.10	
Living alone	4 (7.1%)	21 (23.1%)	
No primary caregiver	1 (1.8%)	9 (9.9%)	
Number of prescription drugs*	8 ± 2.95	9.75 ± 3.89	0.002†
Health status			
Visual impairment (MO390)	22 (39.3%)	26 (28.6%)	
Hearing impairment (MO400)	23 (41.1%)	33 (36.3%)	
Urinary incontinence (MO520)	39 (69.6%)	52 (57.1%)	
Bowel incontinence (MO540)	12 (21.4%)	11 (12.1%)	
Cognitive impairment (MO560)	34 (60.7%)	14 (15.4%)	<0.0005‡
Confusion (MO570)	53 (94.6%)	39 (42.9%)	<0.0005‡
Transferring problems (MO690)	34 (60.7%)	79 (86.8%)	<0.0005‡

Table 3.1. continued)

Variables	With dementia N=56 (38%)	Without dementia N=91 (62%)	*P*
Health status continued			
Ambulation problems (MO700)	40 (71.4%)	76 (83.5%)	
Hypertension	25 (44.6%)	37 (40.7%)	
Diabetes	16 (28.6%)	23 (25.3%)	
Heart disease	20 (35.7%)	20 (22%)	
Arthritis	7 (12.5%)	16 (17.6%)	
Pulmonary disease	8 (14.3%)	8 (8.8%)	
Stroke	8 (14.3%)	11 (12.1%)	
Fracture	2 (3.6%)	13 (14.3%)	
Parkinson's disease	5 (8.9%)	5 (5.5%)	
Peripheral arterial disease	3 (5.4%)	4 (4.4%)	
Osteoporosis	3 (5.4%)	3 (3.3%)	
Cancer	4 (7.1%)	2 (2.2%)	
Co-morbidities*	3 (30.4%)	4 (25.3%)	
Fall history	18 (32.1%)	36 (39.6%)	

umber of participants

* Di played as means ± standard deviations

* Displayed as mode

' Welch t test

‡ hi- quare test

Table 3.2 compares the use of psychotropic drugs between elders with and ithout dementia. The u e of psychotropic drugs was high in both elders with dementia (67.9% and those without dementia (57.1%), and there was no statistically significant difference between these two groups (p=0.20). Elders with dementia tended to use more antidepres ants (50%) than elders without dementia (34%), but the difference did not reach stati tical significance (p=0.056).

Table 3.2. Ps chotropic u ed in Participants with Dementia and Without Dementia

Psychotropic drugs	With dementia n=56		Without dementia n=91		*P*
	Use	Non-use	Use	Non-use	
	N (%)		N (%)		
Any psychotropic	38(67.9%)	18 (32.1%)	52 (57.1%)	39 (42.9%)	0.20‡
Classes					
Anxiolytic	5 (8.9%)		6 (6.6%)		
Antidepressant	28 (50.0%)		31 (34.1%)		0.056‡
Sedative/hypnotic	3 (5.4%)		12 (13.1%)		
Antipsychotic	2 (3.6%)		3 (3.3%)		
Used two psychotropics	6 (10.7%)		2 (2.2%)		

N: Number of participants

‡ hi- quare te t

The assumptions of using a logi tic regression were tenable to determine the impact of p y hotropic drugs and dementia on fall hi tory. A shown in Table 3.3, results revealed that no statistically significant difference from 1 of the adjusted odds ratio for

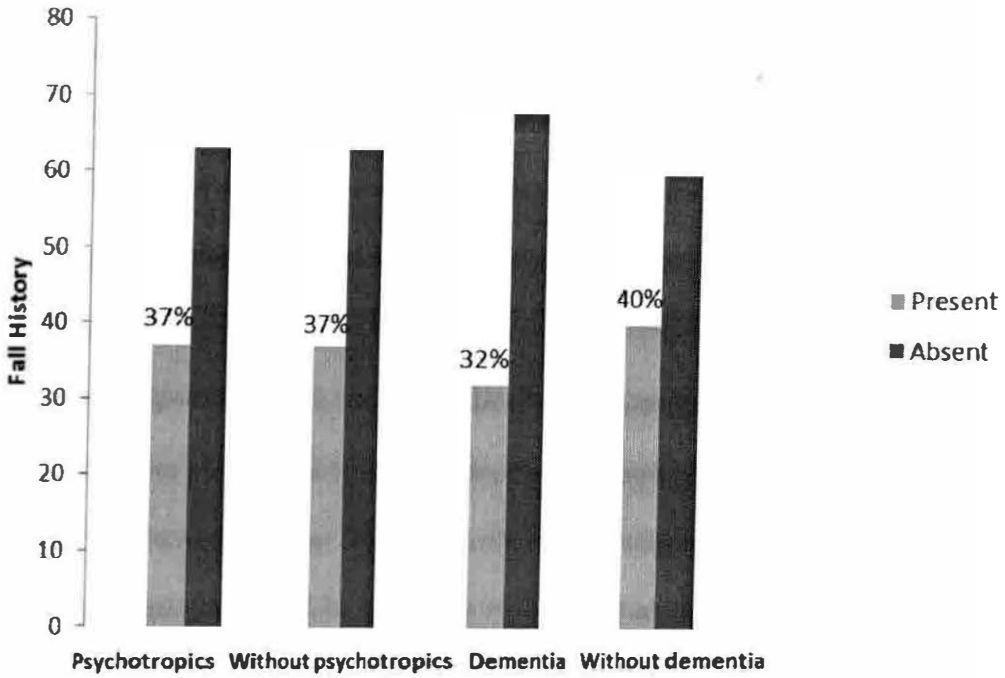
psychotropic drugs (p=0.90), dementia (p=0.39) and interaction (p=0.83) were found in this r search.

Table 3.3. Results of the Logistic Regression

Predictor	Regression Coefficient	Wald	Adjusted odds ratio	*P*
Psychotropic drugs	0.08	0.17	1.08	0.90
Dementia	0.38	0.73	1.47	0.39
Interaction	-0.16	0.05	0.85	0.83

Figure 1 compares the number of elders with fall history in each of the 4 groups: with psychotropic drug use without psychotropic drug use, with dementia, and without dementia. omparing elders with and without psychotropic drug use, 37% of both groups had histories of falls. This explain why the adjusted odds ratio for psychotropic drug use ı · very close to 1. Comparing elders with and without dementia, 32% and 40% re pectively had histories of falls. Although there is a small difference in these values, the difference does not translate to an adjusted odds ratio statistically significantly different from 1.

Figure 1. A Comparison of the Fall Histories in Elders Using Psychotropics, in Elders Without Using Psychotropics, With and Without Dementia



DISCUSSION

This study used a 3-year home healthcare sample of older persons who had polypharmacy to examine the relationships among use of psychotropic drugs, dementia, and falls. No significant differences were found in any type of psychotropic use between elders with and without dementia. Neither psychotropic drugs nor dementia was a predictor for the risk of falling among the elders. The research hypotheses were not supported.

The participants in this study differed in many ways from those of previous studies. These elders were entering home healthcare within 14 days of their discharge from a hospital, rehabilitation facility, skilled nursing home or other nursing home; or within 14 days of a medical or treatment regimen change. The home healthcare service was specifically designed to promote the independence of older persons. A major requirement of enrollment to the service was the need for assistance in transferring or dependence on another person for transportation. In addition, all participants in this study had polypharmacy.

The unique characteristics of this population were reflected in the characteristics of participants reported in Table 3.1. For example, the prescription drug usage was particularly high, averaging 8.0 drugs for elders with dementia and 9.8 for elders without dementia. This polypharmacy might be attributed to the fact that the elders were recently discharged from a hospital or healthcare facility, so their medication use was likely to be similar to those of hospitalized patients. A study of hospitalized patients found that they were more likely to be taking 7 or more medications.[112] The literature reports mixed results in comparing drug use between elders with and without dementia. Some report higher numbers of drugs used by those without dementia;[49,174] others report the opposite;[175] and still others report no significant differences.[34] Overall, the number of prescription drugs used seems to vary from population to population. Another interesting characteristic is the very high frequency (87%) of dependent transferring in elders without dementia which is likely to be related to the requirements of referral to the home

healthcare service. Difficulty transferring is also a known fall risk factor[72,106] and should be addressed in future studies.

Of the elders included in this study, 38% had dementia. Previous work on dementia prevalence found that 17% of non-institutionalized elders and 48% of elderly nursing home residents had dementia.[176,177] The figures on prevalence of dementia and high psychotropic drug use contrast sharply with data from many prior studies. A study of primary care patients reported significantly lower use of psychotropic medications, 24.9% for elders with dementia and 19.6% for elders without dementia.[49] The prevalence of depression, as measured by the use of antidepressants, also seems to be higher than in a prior study which reported that 26% of home healthcare elders suffered from depression.[89] A Swedish study of older community-dwelling persons also reported lower psychotropic use: 45% for elders with dementia, and 38% for elders without dementia. The same study also reported higher antipsychotic drug use for those with dementia (22%).[174] More recently, a study of elders in nursing homes reported that antipsychotic medications were taken by one-third of elders with dementia.[119] However, in this study we found that antidepressants but not antipsychotics were the most frequently used psychotropic drugs by elders with dementia. A study investigating the appropriateness of drug use in elders with and without dementia, reported that elders with dementia were more likely to use anxiolytics, antipsychotics, and antidepressants than those without dementia,[34] in contrast to this study which found no significant difference. Another study of community-dwelling elders observed a high proportion (79%) of elders with dementia

took psychotropic drugs but no prevalence of psychotropic use for those without dementia.[122] Variations in psychotropic drug usage do exist in diverse geriatric settings. One reason to explain why our findings are different from other studies' results might be because the home healthcare elders were recently discharged from hospitals or had significant medical changes. Although many of these elders were diagnosed with dementia, they were prescribed various types of medications for dealing with their medical conditions, and psychotropic drugs might not be the main medications affecting their health at that time.

For the population of home healthcare seniors with polypharmacy in this study, psychotropic drugs and dementia were not predictors of risk for falling. A previous study of older women living in the community concurs with this result, finding that neither the number of medications nor any specific medication was an independent risk factor.[68] In contrast, a previous study of nursing home elders concluded that elders with dementia fell more often than those without dementia, and elders with dementia using psychotropic drugs had significantly increased risk of falling.[33] In this study, few elders with dementia lived alone (7.1%) and even fewer did not have a caregiver (1.8%) prior to receiving homecare services. The assistance and supervision these elders received may have mitigated their risk of falls. In order to clearly understand the relationships between medication use and risk of falls, more research in controlling for potential confounders such as age, transferring, and living status is needed for this unique population in the future.

There are several limitations to this study. First, this study was based on chart reviews to assess medication use, which only covered the use of prescribed medications. Any nonprescription over-the-counter medications were not included. Second, the diagnosis of dementia was based on physician documentation, with definitive testing for dementia unreported. Only 61% of those diagnosed with dementia had cognitive dysfunction as recorded on OASIS items MO560 (cognition). Third, the fall histories were based on recollection of the elders and/or their caregivers and could not be independently verified. Fourth, a cause and effect relationship could not be established by the use of reviewed data. Fall history for the 3 months prior to entry to the home healthcare service was recorded, but the timing of drug prescriptions and diagnosis of dementia relative to the fall event was unknown. Finally, this study did not address other fall-related risk factors such as drug interaction and side-effects. Nevertheless, the unique population of this study has different characteristics from the population of community-dwelling older persons at large. This research study was the first known study to compare psychotropic drug use in a polypharmacy sample of elders with and without dementia in home healthcare.

CONCLUSION

This study found that over one in three older persons receiving home healthcare had dementia. The average of prescription drug usage was high (9 medications) for elders receiving home healthcare. More than half of the elders used psychotropic drugs, and the most frequently used type of psychotropic drugs was antidepressants. Although many

community-dwelling elders entering home healthcare services were diagnosed with dementia and used psychotropic drugs, no relationship with falls was found in this retrospective study.

CHAPTER IV

ASSESSMENT OF THE FALL RISK SCREENING FORM (FRSF) FOR ELDERS AT RISK FOR FALLS

INTRODUCTION

With the growth of the elderly population, many healthcare professionals have focused increasingly on the prevention of falls as a method of reducing medical costs and improving the quality of life of their patients. The first step in preventing falls is the accurate identification of those elders at risk of falling, so that appropriate measures can be taken in response. A reliable, valid, and easily administered screening tool for identifying those elders at risk of falls, designed for use by a variety of healthcare providers, is an indispensable instrument for fall prevention.[8,154]

Many screening tools for fall risk have been described and characterized in the literature. Some tools focus on the assessment of task performance that relates to specific functional or physiological domains, but they do not cover the breadth of risk factors required in a full falls risk assessment.[24,151,153] Other tools, such as the St. Thomas Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY), do assess multiple risk factors of falls, but they are designed for use in an acute hospital setting.[157] A few multi-factorial assessment tools for community-dwelling older persons have been developed, but the validation has demonstrated a wide range of reliability and validity.[26,67,111]

In 2007, a local home health agency for seniors in Houston developed the Fall Risk Screening Form (FRSF) as a screening instrument for use in preventive health assessment. It covers a broad set of fall risk factors, including history of falling, medication use, health status, and physical function.[11] Many of the items in it are adaptations of selected items from the "B" versions of the Outcomes and Assessment Information Set (OASIS), a measurement instrument required by Medicare for reimbursement of home health services.[13] The design of the FRSF is based on an earlier fall risk assessment tool developed by Christiana Care Visiting Nurse Association (VNA); furthermore, the VNA tool itself is based on the Schmid Fall Risk Assessment Tool.[32,100] The Schmid tool has been tested in hospital settings and shows high inter-rater reliability.[100] Additionally, the VNA tool has a sensitivity of 93% and a specificity of 72% for implementation in home care settings.[32] Although the components of the FRSF are well established in the literature,[42,65,72,104] the FRSF as a whole has not yet been systematically assessed for reliability and validity.

The importance of establishing the reliability and validity of the FRSF should not be underestimated. Without strong confidence in the reliability of a fall risk assessment, it becomes difficult to assess the impact of existing or novel fall prevention strategies. Moreover, the validity of any clinical assessment tool ensures that clients at risk are properly identified and referred to the appropriate preventive programs. So it is with some sense of urgency that we examine the usefulness of the tool in screening for fall risk, the consistency of healthcare professionals' administration of the tool, the homogeneity

of separate items within the tool, and the correlation of the tool with another similar fall risk measurement construct.

The purpose of this study was to determine the psychometric properties of the newly developed FRSF in a sample of community-dwelling elders receiving home healthcare services. The specific objectives were to determine the content validity, rater consistency, internal consistency, and convergent validity of the FRSF.

To validate the FRSF, it was hypothesized that the FRSF would (1) demonstrate high relevance, clarity and ease of use, and completeness of the items with a content validity index (CVI) score equal to or larger than 0.8, as assessed by experts; (2) have at least 80% agreement on each item between two raters; (3) have high internal consistency with an ordinal coefficient alpha equal to or larger than 0.8; and (4) be highly correlated with another fall assessment tool, the Fall Risk Assessment Form (FRAF) embedded in the OASIS form, with a Spearman's correlation equal to or larger than 0.75.

Assessment of the reliability and validity of the FRSF was conducted through a series of three separate studies. Study 1 was a prospective study on content validity which addressed hypothesis (1). Study 2 was a prospective study on rater consistency, which addressed hypothesis (2). Study 3 was a retrospective study on internal consistency and convergent validity, which addressed hypotheses (3) and (4). In the next section, the instruments used for these studies are described. Next, the design, participants, procedure, data analysis and results of each study are presented in order. The appropriate informed

consents were obtained from participants before starting each study. The last two sections contain the discussion of the results and the conclusion of this study.

INSTRUMENTATION

Fall Risk Screening Form (FRSF)

The FRSF is designed and used by the local senior agency for their home healthcare program as an assessment instrument for the clinical staff to evaluate the likelihood of falls in community-dwelling older adults. The purpose of the screening is to identify people at high risk of falling and to attempt to prevent the falls through various interventions. This screening form consists of seven fall risk sections: fall history, medications, blood pressure, vision, elimination, mentation, and mobility. The scores of four fall risk sections (vision, elimination, mentation, and mobility) are based on the OASIS data collected during the initial assessment.

OASIS is a group of data items organized into several categories, including socio-demographic, health status, support system, behavioral status, functional status, environment and health services.[95] Each category contains several measurement outcome (MO) items that include questions, answers, and rating scales. For example, in the functional status category, the transferring ability item, MO690, has a score from 0 to 5 based on the prior and current status.

The FRSF combines the following 8 OASIS MO items: vision (MO390), urinary incontinence (MO520), bowel incontinence (MO540), cognitive function (MO560), confusion (MO570), ability to dress lower body (MO660), transferring (MO690) and

ambulation (MO700), along with 3 additional fall risk items: fall history, medications, and blood pressure. Each item consists of 2 to 4 levels for which the subject is specifically evaluated. Each level is assigned a score of 0, 1, 2, or 3, based on the presence or absence and severity of the risk factor. The only exception is fall history, which is assigned a score of 0, 1, or 13: 13 if falls occurred during the last three months or during the provision of the home health service, 1 if fall history is unknown, and 0 otherwise. The total possible score over all items of the FRSF is 33. The maximum time for completing the assessment and recording of the FRSF is approximately 15 minutes. The FRSF is attached as Appendix A.

Content Response Form

To assess the content validity of the FRSF a content response form was developed by the primary investigator (PI). Each item on the content response form corresponds to an item of the FRSF and contains: (1) a detailed description of the FRSF item based on the information from the OASIS;[13] and (2) a four-point Likert scale for rating the item's relevance, clarity and ease of use, and completeness. These ratings are used to compute the overall CVI.[178]

To rate relevance, each item is given a score from 1 to 4 based on its relevance in assessing fall risk. The scoring criteria on the response form appear as follows, "1= Not relevant. Existing research has shown that this item is not relevant in assessing fall risk. 2= Somewhat relevant. Existing research has shown that this item may be a factor in assessing fall risk. However, the evidence is limited to a few specific populations or

based on small sample sizes. 3= Likely relevant. Existing research has shown that this item is likely to be a factor in assessing fall risk. The evidence comes from a wide variety of sources and populations. 4= Very relevant. Existing research has shown that this item is a highly relevant factor in assessing fall risk. The evidence comes from a controlled study based on the general population with a large sample size."

To rate clarity and ease of use, each item is given a score from 1 to 4 based on its clarity and ease of use by a physical therapist or nurse. The scoring criteria on the response form appear as follows, "1=Difficult to use. A nurse or physical therapist cannot evaluate this item without weeks of specialized training and experience. 2=Somewhat difficult to use. A nurse or physical therapist could evaluate this item, but only after days of mentored experience. 3=Easy to use. A nurse or physical therapist could evaluate this item with a few hours of specialized training. 4=Very easy to use. A nurse or physical therapist could evaluate this item with a brief introduction to the form."

To rate completeness, each item is given a score from 1 to 4 based on its completeness in scoring categories. The scoring criteria on the response form appear as follows, "1=Incomplete. This item is missing one or more key scoring categories. 2=Major revisions are needed. The scoring categories need to be revised to take an important factor into consideration. 3=Minor revisions are needed. The scoring categories are too broad or narrow, or the score value of a particular category needs to be modified. 4=Complete. All important scoring categories are represented. The score categories are

about right, and the score values make sense." The content response form is attached as Appendix B.

Fall Risk Assessment Form (FRAF)

The FRAF is a fall-risk screening form embedded in the OASIS form. It can also be used as a screening instrument for fall risk. The FRAF covers several fall risk factors, i.e., fall history, sensory, age, mentation, mobility, elimination, cardiovascular/respiratory disease, blood pressure, medications, alcohol use, and environment, using a simple questionnaire with sixteen yes/no questions. Each yes answer is assigned a score of 5. The only exception is "history of falls in the past three months", which is assigned a score of 15, three times larger than the other factors. This scoring strategy is similar to the "Fall History" score on the FRSF which is weighted more heavily than the other scores. The total possible score over all items of the FRAF is 90, and the time for completing it is about 10 minutes. No peer reviewed study has been published on the FRAF. The FRAF is attached as Appendix C.

STUDY 1: CONTENT VALIDITY

Study Design and Participants

To conduct a content validity study, the use of at least three experts has been recommended in published research.[179] In this study, five experts consisting of 4 content experts and 1 lay expert were recruited to assess the content validity of the FRSF prospectively. They were recommended by other experts in the field of geriatric fall risk assessment and had initial contact with the PI via an email containing a brief description of

the purpose of this study. The inclusion criteria for a content expert were (1) having had at least one publication in geriatric fall risk or (2) having had at least two years work experience in geriatrics. The inclusion criteria for a lay expert were (1) not being a content expert and (2) having knowledge of geriatric fall risk. In addition, all experts were able to read, comprehend, and write in English. These experts completed the response forms which constituted their informed consent to act as participants in the research.

Procedure

The following steps were used to assess the content validity of the FRSF. First, a panel of experts consisting of 4 content experts and 1 lay expert was selected based on the inclusion and exclusion criteria. A package including a cover letter, a content response form, a copy of the FRSF, and a stamped, self-addressed return envelope were mailed to each expert. These experts were asked to evaluate each item of the FRSF as listed on a response form, and to rate each item on a four-point scale according to their opinion on the relevance, clarity and ease of use, and completeness in assessing the fall risk of older community-dwelling adults. The content response form mailed to the experts to assess the FRSF can be found in Appendix B. The experts were also requested to provide their comments on the scoring system and the items as well as any additional comments about the whole FRSF. For the convenience of the experts, an electronic version of the response form was sent via email to the selected experts. To use the electronic version, the experts could enter the response form on their own computer and print a hard copy to send back. The experts were requested to mail their completed response forms to the PI within the

stamped self-addressed return envelope provided. Any electronic response forms were promptly deleted upon receipt. Finally, the CVI was calculated based on the experts' ratings on relevance, clarity and ease of use, and completeness of the items.

Data Analysis

The CVI was used to quantify the agreement on the relevance, clarity and ease of use, and completeness of the FRSF items among the experts. The CVI was defined as a proportion of items given a score of 3 or 4 by the experts.[48] Greater CVI indicates higher experts' agreement on the usefulness of the factors.[48] To compute the CVI for each item, the PI totaled the number of experts who rated the item as 3 or 4 on the response form and divided that number by the total number of experts.[179] The CVI for the overall FRSF was estimated by calculating the average CVI across the items.

Results

Of the five participating experts, one expert's response form was not completely filled out and did not address 1 assessment item on medication, 2 assessment items on confusion (MO570), and 3 assessment items on ambulation (MO700). Excluding the blank responses on six assessment items by the one expert, the CVI for each item ranged from 0.73 to 1. The resulting CVI was 1 for cognitive function (MO560); 0.93 for fall history and medication; 0.87 for blood pressure, urinary incontinence (MO520), bowel incontinence (MO540), and transferring (MO690); 0.85 for confusion (MO570); 0.83 for ambulation (MO700); and 0.73 for vision (MO390) and ability to dress lower body (MO660). The CVI of the FRSF as a whole was 0.86, indicating high expert agreement

on th usefulness of the factors on the ' R F in screening for fall risk.[48,178] The number of e perts ho rated the item as 3 or 4 and the CVI are listed in Table 4.1.

Table 4.1. Number of xperts Who Rated the FR F Risk Item as 3 or 4 and the CVI for Each Item and the FR F as a Whole

Fall risk sections	Relevance	Clarity	Completeness	CVI
Fall history	5	5	4	0.93
Medication	5	4	4*	0.93
Blood pressure	4	5	4	0.87
Vision (MO390)	4	4	3	0.73
Urinary incontinence (MO520)	4	5	4	0.87
Bowel incontinence (MO540)	3	5	5	0.87
Cognitive function (MO560)	5	5	5	1
Confusion (MO570)	4	3*	4*	0.85
Ability to dress lower body (MO660)	3	4	4	0.73
Transferring (MO690)	4	4	5	0.87
Ambulation (MO700)	3*	4*	3*	0.83
Total	0.81	0.90	0.86	0.86

* Based on 4 experts' scores

CVI: Content validity index

STUDY 2: RATER CONSISTENCY

Study Design and Participants

The initial study for assessing the rater consistency was a prospective study. A total of 30 participants were planned for the study. They were a convenience sample from the regular caseload for which physical therapy services were provided and were visited in their homes. They were to be recruited for the study by a physical therapist at the local home health agency when arrangements for a visit were being made. The inclusion criteria included (1) an age of 65 or older; (2) the need for physical therapy; and (3) the use of English as his or her primary language. Participants were excluded if they were unable to understand the consent form or had difficulties in communicating in English.

Procedure

To assess the rater consistency, the PI completed 8 hours of training and practiced the correct recording on the FRSF according to the standard training procedure of the agency before study data collection. Subsequently, the PI and the physical therapist went to clients' houses, as part of a normal fall risk evaluation using the FRSF. The PI had five years of physical therapy clinical experience and worked for a long-term care organization with adults for two years but was a novice in utilizing the FRSF. The physical therapist worked clinically for four years and had one and a half years of experience in utilizing the FRSF to assess the older community-dwelling adults. The physical therapist conducted the evaluation using the FRSF, while the PI observed and recorded the evaluation, independent of the physical therapist, using a second FRSF. The

parallel FRSF evaluation was done once for each client. In order to minimize any adverse effect influencing the independence of the rating, the raters did not speak or communicate with each other while the FRSF was being administered.

Data Analysis

Descriptive statistics were used for the demographic data including participants' age, sex, and race. The percentage agreement was calculated to measure the degree of correspondence and agreement between the two raters.[180]

Results

The recruitment of participants did not match the study design due to the unexpected disbanding of their home health services by the local agency. Five elders participated in the prospective assessment that was performed by the PI and a physical therapist to assess the rater consistency of the FRSF. Demographics of the participants are listed in Table 4.2. The percentage of agreement between the two raters was 100% for fall history, medication, blood pressure, vision (MO390), urinary incontinence (MO520), bowel incontinence (MO540), cognitive function (MO560), confusion (MO570), and ability to dress lower body (MO660); 80% for transferring (MO690); and 60% for ambulation (MO700). The percentage of agreement between the two raters for each item of the FRSF is listed in Table 4.3.

Tabl 4.2. Participants D mographics for Rater Consistency tudy

Characteristics	Participants (n=5)
Mean age (range)	84 (71-89)
Gender	
Female	5
Male	0
Race	
Caucasian	3
Black/African American	1
Hispanic	0
Asian	1

Table 4.3. Percentage of Rater Agreement with Scoring FRSF Items

FRSF items	Number of identical responses	Agreement (%)
Fall history	5/5	100
Medications	5/5	100
Blood pressure	5/5	100
Vision (MO390)	5/5	100

Table 4.3. (continued)

FRSF items	Number of identical responses	Agreement (%)
Urinary incontinence (MO520)	5/5	100
Bowel incontinence (MO540)	5/5	100
Cognitive function (MO560)	5/5	100
Confusion (MO570)	5/5	100
Ability to dress lower body (MO660)	5/5	100
Transferring (MO690)	4/5	80
Ambulation (MO700)	3/5	60

STUDY 3: INTERNAL CONSISTENCY AND CONVERGENT VALIDITY

Study Design and Participants

The FRSF and the FRAF scores of all persons who received home healthcare services provided by the local agency were analyzed retrospectively to assess the FRSF's internal consistency and convergent validity. The target population was elders who were within 14 days of their discharge from a hospital, rehabilitation facility, skilled nursing facility or nursing home; or within 14 days of a medical or treatment regimen change. These elders who received home health visits for various medical conditions were assessed by either nurses or a physical therapist, using both the FRSF and the OASIS forms at their initial evaluation and prior to treatment intervention. The FRSF and FRAF

scores were retrieved from the files of all men and women within the targeted population that were receiving healthcare from the local agency, were 65 years old or older, and were of any race or ethnicity. There were no other inclusion or exclusion criteria.

Procedure

A permission letter from the administrator of the local senior agency was obtained to access their client's records in order to assess their FRSF's internal consistency and convergent validity. The initial OASIS forms were reviewed regarding the elders' demographics such as age sex, race, and date of admission. All information on the FRSF and FRAF were collected. Each elder's records were completed by nurses or a physical therapist that were certificated in the administration of OASIS, using a standard procedure that consisted of history taking, observation of task analysis, and direct assessments. The elders' FRSF and FRAF data were transferred to an electronic file for analysis, with data encoded by numbers to protect clients' identity.

Data Analysis

Descriptive statistics were used for the demographic data including age, sex, and race, and each individual item of the FRSF, as well as the total scores of the FRSF and FRAF. Ordinal coefficient alpha was used to assess the internal consistency of the FRSF.[181] The FRSF was formatted with four Likert response items. Zumbo, Gadermann, & Zeisser reported that Cronbach's alpha may under-estimate scale reliability with Likert data.[181] These authors concluded that "Ordinal coefficient alpha are consistently suitable estimates of the theoretical reliability, regardless of the magnitude of the theoretical

reliability, the number of scale points and the skewness of the scale point distributions." Ordinal coefficient alpha was calculated from a factor analysis result using the following formula: $\alpha = [\, p/(p-1) \,]\ [\, 1-(1/\lambda) \,]$ p: items, λ: the largest eigenvalue. Similar to other reliability coefficients, this study applies the ordinal coefficient alpha in assessing the reliability of the FRSF.

Convergent validity, the relationship between the total score on the FRSF and the FRAF was examined with a Spearman's (ρ) correlation. [180]

Results

A chart review of a total of 132 home healthcare elders was performed. Thirty-two charts were excluded from the study. Nine did not meet the study's minimum age criteria of 65 years. There were twenty-three that had missing data on the FRAF. Therefore, the FRSF and FRAF scores of 100 elders aged 65 years and older were analyzed to assess the internal consistency and convergent validity. These 100 seniors included thirty-nine men and seventy-one women (age range 65-98; mean $\pm$ SD, 82 $\pm$ 7 yr) who were assessed using the FRSF at their initial evaluation and prior to treatment intervention. Demographic data for internal consistency and convergent validity studies are summarized in Table 4.4. The largest eigenvalue of 2.31 was obtained from a factor analysis. The ordinal coefficient alpha value of the FRSF was 0.62, demonstrating moderate internal consistency of this form.[181]

he median value for total scores of the FRSF and the FRAF was 10 (range: 2-29) and 30 (range: 10-65 respectively. The correlation coefficient for convergent validity was 0.76 ($p<0.0005$) demonstrating a good relationship between the FRSF and FRAF.[180]

Table 4.4. Demographic Data for Internal Consistency and Convergent Validity Studies

Characteristics	Participants (n=100)
Mean age (range)	82 (65-98)
Gender	
Female	71
Male	39
Race	
Caucasian	67
Black/African American	18
Hispanic	12
Asian	3

DISCU SION

The aim of this study was to examine the psychometric properties of the FRSF, which was used to identify the likelihood of falls in home healthcare through in e tigation of the reliability and validity. The results of this study sustained two r earch hyp these . As a screening t ol the FR F was found to be a useful and ubstantially reliabl instrument with good support for construct validity for fall risk in older home healthcare clients.

CVI is the most commonly used method of testing the validity of a measurement's content.[182] The panel of experts that evaluated the content of the FRSF provided constructive feedback about the quality of the FRSF. Results revealed that among the experts, there was moderate to high agreement on the usefulness of the FRSF factors in screening for fall risk. Davis indicated that "A CVI of at least 0.8 is considered to be a good criterion for accepting an item as valid."[183] As a whole, the FRSF had a CVI of 0.86, which supports the hypothesis that it is a valid tool for screening fall risks among the elderly.

Examining the validity of individual items on the FRAF, vision (MO390) and ability to dress the lower body (MO660) had the lowest CVI of 0.73, which is below the threshold of 0.8 for a good criterion. MO390 was given a low completeness rating, and the feedback from the experts in the comments for MO390 indicated that it was difficult to differentiate between *vision partially impaired* and *vision severely impaired* based on the description of the item provided. More guidance is needed to distinguish between these two categories. In addition, there is a typographical error for MO390 on the FRSF: the score of 2 is mislabeled as "3". MO660 was given a low relevance rating, and one expert recommended that upper body dressing should be addressed when assessing fall risks as well. Additionally, it is interesting to note that the item of ambulation (MO700) has lower relevance and completeness than clarity and ease of use. The newer "C" version of the OASIS has modified the content of this item.

For rater consistency, the overall agreement of 94.5% between the two raters indicated strong agreement in the FRSF tool as a whole. However, two FRSF items in the mobility section, transferring (MO690) and ambulation (MO700), yielded 80% and 60% agreement, respectively. The lower agreement in these scores was likely caused by rater confusion due to the inconsistent scoring scale between the OASIS and FRSF.

For each item on the OASIS included in the FRSF, the FRSF provides a table to convert OASIS scores to FRSF scores. For item MO690, the FRSF provides the conversion table from the OASIS score to the FRSF score, shown in Table 4.5.

Table 4.5. OASIS to FRSF Score Conversion Table for Item Transferring (MO690)

OASIS Score	FRSF Score
0 or 4 or 5	0
1	1
2	2
3	1

On the OASIS form, item MO690 is assigned a score of 0, 1, 2, 3, 4, 5, based on a person's ability to transfer, with the higher scores indicating greater transfer dependence. However, the FRSF rates the highest OASIS MO690 score of 4 or 5 with the lowest fall risk score of 0. The rationale behind this conversion is that if a person is so severely impaired in transferring that he requires the physical assistance of another person, he is less likely to fall because of the presence of that assistance. However, this switch is non-intuitive from a scoring perspective which can lead to rater errors. By comparing OASIS

scores to FRSF scores, it was clear that one rater mistakenly gave an FRSF score of 3 for an OASIS score of 3.

For item MO700, one discrepant score between the two raters was that they had different scores on an elder who *required human supervision to walk.* This item was scored as 1 by one rater who thought that the elder required human supervision only for stairs, steps, or uneven surface. However, it was scored as 2 by the other rater who thought that the elder required human supervision to walk at all times. Grading the ability to safely walk may be difficult to quantify. Finally, for item MO700, the FRSF does not provide guidance for converting an OASIS score of 3 or 4.

To minimize scoring confusion in converting OASIS assessment scores to FRSF fall risk scores, the development of an instruction manual that includes the conversion rationale and a standard protocol is required. Additional training to improve consistency in rater assessment for mobility is also needed. Furthermore, the FRSF should also be modified to avoid human errors in converting OASIS values to FRSF scores. One potential solution is the creation of a computerized form to automate this conversion.

Our findings on rater consistency for the FRSF were similar to results published for other fall risk assessment forms based on OASIS data. One study examined the rater consistency on the OASIS and a Fall Risk Assessment (FRA) tool, which used a dichotomous scale to assess clients. Although the name is similar, the FRA is not the same form embedded as part of OASIS previously mentioned. That study found less than 80% of rater agreement on decreased independence in transfers and decreased balance.

Furthermore, it reported that there was rater confusion in the definition of these two factors between the OASIS and the FRA tool.[26] Another study assessing OASIS inter-rater reliability reported that functional status such as MO660, MO690, and MO700 was where inconsistencies most commonly occurred.[97] Two other studies found that rater agreement with kappa values less than 0.8 for MO690.[98,184] In contrast, the inter-rater reliability of the Schmid tool, which was not based on scores of the OASIS, had 91% agreement for the mobility item.[100]

Internal consistency, a form of reliability, was examined for the homogeneity of the FRSF items with an ordinal coefficient alpha in this research. Reliability is one of the key elements for establishing a high quality assessment tool.[154] Strong internal consistency should only show moderate correlation among items, ranging from 0.7 to 0.9.[180] In this study, the ordinal coefficient alpha value of the FRSF was found to be 0.62, demonstrating moderate internal consistency for the tool. This shows that the FRSF is measuring the same construct but not overly redundant. The 0.62 ordinal coefficient alpha is slightly lower than the recommended range. A possible reason for not obtaining a higher internal consistency value is that the risk factors on the FRSF are not very homogeneous. The assessment of fall risk is a complex strategy that includes multiple factors, and each single factor may be an independent predictor of falls.[65,72,75,105]

The correlation value of 0.76 between the total scores on the FRSF and the FRAF demonstrates the good association between the two forms, thereby supporting construct validity.[180] It is interesting to note that *Fall history* is heavily weighted on the FRSF and

on the FRAF. It is assigned a score of 13 on the FRSF and 15 on the FRAF. Many studies show that history of falls is the most significant predictor in identifying older community-dwelling adults at risk for falls.[42,44,65,88,91,104] The weighting strategy for fall history on the FRSF and FRAF causes both forms to have the same emphasis. In contrast, this weighting does not exist in the VNA tool on which the FRSF is based. The VNA tool assigned a score of 1 for having a previous fall in past three months or history of falls unknown.

There are several strengths of this study. This is the first complete assessment of FRSF for reliability and validity. Although the VNA tool on which the FRSF was based was assessed for validity, it was not assessed for reliability.[32] In addition, there are significant differences in score weighting between the VNA and FRSF, in particular for the *fall history*. Content validity was quantified using CVI to measure agreement of the FRSF items among experts. Using this approach, this study was able to identify which items on the FRSF may need revision. This study adopted the ordinal coefficient alpha in examining internal consistency which has been shown to be well suited for estimating theoretical reliability of data formatted with Likert response items, as they are on the FRSF.[181]

There were several limitations to this study. In the rater consistency study, each participant was assessed by both raters in the same setting at the same time. This approach has the advantage that it minimized the possibility of rating discrepancies caused by changes in time and place. On the other hand, it introduced the possibility of

communication between the two raters. Although the raters did not communicate with each other while the FRSF was being administered, some risk of dependency still remained. Also in the rater consistency study, the small sample size only allowed for a rater percentage agreement statistic to be computed which does not correct for potential agreement by chance. Nonetheless, the high overall agreement of 94.5% was still a strong indicator of rater consistency. In the convergent validity study comparing the FRSF to the FRAF, although both forms used similar constructs, they did not use identical terminology, so exact matches were not possible for all constructs. This study targeted one specific population: older community-dwelling persons receiving home healthcare. The results may not generalize to hospitals or nursing homes; however, they are applicable to many home healthcare settings.

For future work, there is a need to explore the predictive validity of the FRSF, including sensitivity, specificity, positive predictive value, and negative predictive value of the FRSF to identify elders at high risk of falling in different geriatric settings.

CONCLUSION

In order to address the growing problem of falls in the elderly, it is important to develop a mechanism by which home healthcare providers can identify those at risk for future falls. The FRSF has the potential to serve as a universal screening tool for this purpose. However, the validity of the FRSF is only partially supported because of lack of strong reliability. This study identified specific areas for improvement in the FRSF.

CHAPTER V

QUALITATIVE ASSESSMENT OF COMPONENT-SPECIFIC, FALL-RISK SCREENING PROCEDURES TO CREATE A FALL RISK SCREENING FORM

INTRODUCTION

Due to the high prevalence and serious consequences of falls among the elderly, healthcare professionals focused increasingly on the prevention of falls as a method of reducing medical costs and improving the quality of life of their patients.[7] The American Geriatrics Society and the British Geriatrics Society recommended that multi-factorial risk assessment of falls be performed as a primary treatment strategy following the guidelines for prevention of falls.[6] A multiple risk factor intervention strategy could then be applied to reduce the risk of falling among elderly persons.[9,10,165] The cornerstone of this strategy is the fall-risk screening procedure that identifies an individual's risk factors for falls, so that these can be targeted with appropriate management.

Nonetheless, in clinical practice, only 34% of elders received fall-risk evaluation,[84] and less than half (48%) of the elders reported talking to healthcare providers following a fall.[57] In 2006, a qualitative study based on interviews of physicians found that barriers to integration of fall-risk assessment into clinical practice included time constraints as well as skill, knowledge, and experience deficits.[185]

Moreover, fall-risk assessment tools developed for one setting may not be reliable or valid for use in other settings. In 2008, a systematic review of existing screening tools

for assessment of fall risk among elders concluded that none of them can be applied reliably across different settings to accurately predict risk of falling.[165] Published tools developed for primary care settings do not cover pertinent risk factors for community-dwelling elders.[155,159,161] One such tool is the Morse Fall Scale (MFS) which includes intravenous therapy in fall-risk assessment, but intravenous therapy has not been reported in the literature as a risk factor for falls among older community-dwelling adults.[42,44,88,91,104] On the other hand, medication use is not included in the MFS, yet several studies have documented the association of medication use with falls among elders living in the community.[56,65,75,105] The primary challenge in screening community-dwelling elders for fall risk is the wide variety of settings where these elders live and spend their time. Consequently, each elder experiences a different risk exposure profile. To understand these differences, it may be helpful to consider the input of geriatric care workers who work with community-dwelling elders on a day-to-day basis.

At the local senior health agency in Houston, Texas that developed the Fall Risk Screening Form (FRSF) studied in Chapter IV, the Day Center, Case Management, and Home Care components of the agency each used different screening forms for assessing their clients for fall risk. They did not have a common, comprehensive fall risk screening tool that can be used across all components. A common instrument, easily administered by all components as part of their routine practice, would be helpful in systematically identifying elders at risk of falling. Intervention strategies could then be applied to reduce the risk of falling.

The purpose of this qualitative study was to gather information on the content and features which are most useful for fall screening, based on the needs of individual geriatric care workers in each component of the local senior health agency. This information could then be used to guide the development of an integrated fall-risk screening form and procedure for all workers at that agency and may be useful for similar agencies. The qualitative method was selected for its effectiveness in understanding how individuals perceive their own experiences within their surroundings.[180] Focus groups were convened and interviewed regarding the different fall-risk screening tools and procedures currently used by the various components of the agency. The interview was conducted as a group discussion located at the agency building. The goal was to gather the knowledge and opinions of highly informed geriatric care workers as to what features are essential to a comprehensive and universally applicable fall risk screening form. In the discussion section, comparisons were made to the existing features of FRSF, in order to derive ideas for future improvements.

METHODS

Research Design

This was a qualitative study, using a semi-structured interview.

Participants

The study population was 12 adult men and women of any race with an age range of 18-70 who worked for the following four components of the local senior agency: (1) Day Center, (2) Case Management, (3) Home Care, and (4) Outreach to Potential Clients.

These workers' names were given by an administrator of the agency, and they were approached to participate in this study by a researcher via phone or email. Two informed consents, one for the interview and another for the audio-taping, were obtained from all interviewees prior to their participation in accordance with the Institutional Review Board of the Texas Woman's University.

Data Collection

Geriatric care workers were divided into three groups according to each individual's available working schedule. Each geriatric care worker attended only one section of the group interview with a researcher asking each section the same several open-ended introductory questions, exploring different opinions of an ideal fall risk intake form. Before each interview started, the geriatric care workers filled out demographic information forms, which asked the geriatric care worker's age, gender, work title, duties and years of working experience. All geriatric care workers were asked for information about what they thought was important to include in a fall risk screening form. The excerpts of the interview script are listed in Table 5.1. No specific order was used for asking these questions. The conversations of all geriatric care workers and the researcher during the interview were recorded with a tape recorder and then were transcribed into a computer verbatim to preserve the language of the participants by the primary investigator (PI). In addition, field notes were used to record observations of the geriatric care workers' behaviors and reactions. The total time for each interview was 1 to

2 hour . The information obtained during the interview wa typed and coded to minimize any identification.

Table 5.1. cript Excerpts

What I want to do is to pick your brains totally about this intake form, so free association, whatever comes to your mind. We'll go through all the stuff that is said and pick out, is pertinent as far as the form. I'm first interested in is tell me a little bit about the intake forms that you use currently when clients come into the system.
Give me everything you can think of that you would want to report, you would want to know on the fall risk.
The form that you use, do you prefer check the box, or open ended like fill in the blank. Do you have a preference? Is what you have easy to use, and what another format be any different? Do you think the forms differentiate between someone who falls and someone who doesn't? What do you think?
Is something more important than the other, as far as building a picture in your mind about what is their risk for falls?
If you had a wish list of what you would want to fall risk screening, is there something that you really like the way it is right now and you would want to keep? Just talk to me about your ideal fall risk screening tool. Anything on your form that you know are wish list?

Data Analysis

Triangulation was used for establishing the reliability of identified emerging themes from the interview. Data coding was performed by the PI and a physical therapist who did not participate in the interview. Each person independently reviewed the transcripts of three interview sections with multiple readings to determine themes. An open coding technique to identify emerging categories and themes according to the constant comparative method of qualitative analysis was used.[186] Themes were compared across three interviews. The PI and the physical therapist reached consensus through discussion and at least two meetings. When no new codes or themes emerged from the interviews, data collection was stopped. The transcripts were also reviewed by two interviewees to assure final agreement on the accuracy. Furthermore, the themes reported here were those confirmed by the researcher who participated in the interview but not in data coding.

RESULTS

A total of 13 employees who worked for the senior agency were contacted to participate in the study. Twelve geriatric care workers were female and one was male. There were 3, 2, and 8 geriatric care workers for each interview group. Demographic data that include age, gender, agency components, and years of work experience of the geriatric care workers are summarized in Table 5.2.

Table 5.2. ummary of Geriatric Care Workers' Demographics

Characteristics	Participants (n=13)
Mean age (range)	46 (27-65)
Gender	
Female	12
Male	1
Agency components	
Day Center	2
Case Management	4
Home Care	3
Outreach to Potential Clients	4
Years of employment at the agency	< 1 to 18
Years of employment in areas of senior services	< 1 to 30

Two major theme emerged from the interviews: factors which are relevant in a es ing fall ri k and factors which affect the utility of the fall risk screening procedure. Under the theme of factors which are relevant in assessing fall risk are 6 categories: fall history physical function impairments medications mental and psychological status and home environment. Under the theme of factors which affect the utility of the fall ri k screening procedure are 3 categories: methods of gathering information for fall risk

assessment, features useful to a fall risk assessment form, and actions taken in response to fall risk assessment. Finally, each category contains specific items (codes) to be taken into consideration in the design of a fall risk screening form, as expressed by the workers interviewed. The codes, categories, and themes are listed in Table 5.3. An example is taken from the interview transcript to illustrate what each code represents.

Table 5.3. The Information on a Fall Risk Screening Form that Meets Different Geriatric Care Workers' Needs at the Senior Agency

Themes	Categories	Codes	Examples
Factors which are relevant for assessing fall risk	Fall history	Time frame	"I have to ask them, do they have history of falls? If they've had any previous falls, and a time frame for that."
		Frequency	"For me it would be the number of falls, because if I put 3 falls, I'm going to be saying, what's going on?"
		Causes	"If a client says that they have fallen, you may make a note of that and say, what happened?"

Table 5.3. (continued)

Themes	Categories	Codes	Examples
Factors which are relevant for assessing fall risk	Physical function	Assistive walking devices	"If they have a device (any cane, crutch, walker), they're a fall risk. Badge that they use any assistive walking devices, it's a fall risk."
		Ambulation	"The whole form (progress notes) about mobility again. Steady gait/unsteady gait. Can they walk long distance/short distance?"
		Transferring	"Being able to get in and out of bed; being able to get up and down off the commode; being able to get in and out of the house on the down the steps. Those things are very important."
		Daily activities	"We ask about functionality and how they are performing their ADLs and IADLs, which is tangential or close to the topic of falls, but a little bit removed."

Table 5.3. (continued)

Themes	Categories	Codes	Examples
Factors which are relevant for assessing fall risk	Impairments	Lower-extremity problems	"If they have had 2 knee replacements, 1 knee replacement, they've broke a bone, they've had a hip replacement, that they are at risk of falling."
		Dizzy	"Complications, if it makes them dizzy, or a little unstable on their feet."
	Medications	Types	"The form asks about the medication they're taking, like hypertension medication, seizure medications."
		Side effects	"Falling mostly at night because they are taking a sleeping pill."

Table 5.3. (continued)

Themes	Categories	Codes	Examples
Factors which are relevant for assessing fall risk	Mental and psychological status	Cognition	"We have one person who will sit down just anywhere, doesn't have to be a chair, could be just the perception of the chair."
		Behaviors	"Any verbal or physical combative behaviors, that's definitely on the form."
	Home environment	Fall hazards	"There is nothing specific related to falls, other than the kind of common sense things, and you see extension cords, and lots of throw rugs, and maybe missing steps."
		Handhold	"Grab bars is another big one. Often times they don't have them."

able 5.3. (continued)

Themes	Categories	Codes	Examples
Factors which affect the utility of fall risk screening procedures	Methods of gathering information for fall risk assessment	Direct observation of the client	"I would like for them to actually come in and tour the place with the family member. So you really can see."
		Questioning and reporting by clients or their caregivers	"I don't think I'd feel comfortable asking them what their diagnoses were ... I am not a medical professional ... They are going to say, "Who are you to ask me, and make an assessment of me?" ... I think it's an invasion of privacy on my part to ask them."
		Client records	"I usually go in and ask for their book and see what it is, because usually they have it written down what [assistive walking devices] they use."

Table 5.3. (continued)

Themes	Categories	Codes	Examples
Factors which affect the utility of fall risk screening procedures	Features useful to a fall risk assessment form	Scoring mechanism	"The Morse Fall Risk scale will give me a number, and if it falls in a certain number, then I'll know, this is something I need to talk to the family about, discuss what we need to do to address this."
		Free form	"Well with any form, there's going to be comments that you can make, that may not be covered on the form."
		Computerized (vs. Paper)	"Web based. I do everything on computers." "I prefer paper because I cannot imagine sitting in somebody's house, asking them questions and putting stuff in a computer."
		Form complexity, time to complete	"We just don't need another form." "I think we gather enough information. The trick is the time to input it."

T ble 5.3. (continued)

Themes	Categories	Codes	Examples
Factors which affect the utility of fall risk screening procedures	Actions taken in response to fall risk assessment	Intervention	"Somebody tells me that they've had a fall in the last three months or they told me they fell last week...then I start talking to them about interventions."
		Alert	"Before we go out, [someone] already told us that [the clients] are a fall risk, to make sure that they use their walker, make sure they use their cane."
		Education	"And if [the fall risk assessment] adds up to something, we do a follow up and give them an educational on fall risk prevention."
		Referral	"If there's a problem with a lot of falling and you educate or you make a referral, and we would make another referral for home health."

Factors which are Relevant for Assessing Fall Risk

Many respondents identified that there was a question "Have you fallen recently?" on their assessment forms. Even some respondents who did not use assessment forms had intentions of asking that question of their clients during the intake process. After asking clients if they had fallen recently, some respondents then asked clients about the number of falls, time frames, and the causes for falls.

In the category of physical function, many respondents reported that using assistive walking devices, ambulation, transferring, and the ability to independently perform daily activities were the most critical parts for assessing risk of falls among elders. Moreover, nearly all respondents felt that fall risk would increase if the client had an ambulation aid, i.e., a cane or a walker, but didn't use it.

In the category of impairments, respondents stated that lower-extremity problems or dizziness might be risks of falls. Especially, if clients had any surgeries on their hips, knees or even swollen ankles there would be a risk of falls.

Many respondents believed that some types of medications, i.e., medications that affect the central nervous system as well as side effects caused by medications, increased fall risks.

For assessing risk of falls, some respondents were also concerned about clients' mental and psychological status. The consistent use of assistive walking devices was linked to clients' cognition and behaviors. Clients might forget to or be unable to use or not willing to use their devices.

Some respondents usually went out to the clients' homes to do safety checks. Most concern focused on any fall hazards and the availability of handhold equipment in the home environment. Home environment related questions did exist on case management and home care assessment forms. Additionally, the staff in the Day Center mentioned that they would include some home environment questions in their assessments in the future.

Finally, fall history was the most frequently mentioned factor by many respondents, followed by the items of assistive walking devices and ambulation.

Factors which Affect the Utility of Fall Risk Screening Procedures

In the category of gathering information for risk assessment, feedback focused on gathering information via direct observation, gathering information via questions and reporting by clients and their caregivers, and gathering information from previous sources. In general, respondents felt strongly that direct observation was the most accurate and least intrusive of the methods of gathering information. Opportunities for direct observations are actively pursued, such as inviting the client for an on-site tour.

Respondents were less optimistic about relying on questions and reporting by clients and caregivers. Numerous anecdotes were cited where misleading or incomplete responses were given. In addition, some respondents expressed concern regarding the intrusiveness of the questioning process, and whether they were violating patient privacy.

Client records, in particular on assistive walking devices recommended by a physician, were cited as being helpful for interaction with clients.

In the next category, respondents had specific recommendations on features they found helpful in a fall risk screening form. Most respondents expressed a need for a scoring system, similar to the FRSF and the MFS. However, the primary concern about the scoring system was how to interpret the scores, and what response action to derive from the scores.

Most respondents favored a freeform comments or note section to be included in the form. The major reason cited for this was that it is not possible to cover all circumstances that may affect fall risk, so a freeform section is needed to complete the coverage.

Preference for computerized or paper form was decidedly mixed. Most concern focused on the level of user comfort with each format, as well as how adeptly each can be used, especially in the client's home environment. Flexibility in format may be the dominant factor here, as well as user training.

Tolerance for form complexity varied greatly between users, and most notably, the outreach workers favored the simplest form possible.

In the category of actions to take in response to fall risk assessment, feedback focused primarily on intervention, alerts, education and referral. In the area of intervention, common actions were to remind or encourage clients to use assistive walking devices, and to remove trip or fall hazards in the home environment. More aggressive interventions are useful, such as making changes to the home, or changing the patients' medications, but they require the skills of a physical therapist or skilled care,

such as that found in nursing homes. One respondent expressed concerns about her authority to make such interventions.

In the area of alerts, respondents generally found alerts for specific fall risk items useful, such as awareness of assistive walking devices. However, general "risk score" type alerts were less useful, because they did not know what action to take.

In all cases education was found to be an appropriate response. Most agreed that simple awareness of the severity of fall risk, and fall risk factors would be beneficial to clients and their caregivers.

Finally, referrals would be made to coordinate further care. Referrals would also be made if services could not be provided for further fall intervention.

DISCUSSION

The interviewed geriatric care workers described a set of factors which are relevant for assessing fall risk and preventing falls in their work with elderly living in the community. The risk factors identified by the interviewees, i.e., fall history, physical function, impairments, medications, mental and psychological status, and home environment, are supported by recent literature on fall risk and fall prevention.[44,56,58,65,66,70,72,75] Integrating all of these fall-risk factors into a single multi-factorial screening form is helpful for comprehensive assessment of fall risk.[8]

Comparing the fall risk factors and items identified in this study to the content of the FRSF, the common and different categories between the two are shown in Table 5.4. Five common categories are: fall history, ambulation, transferring, medications, and

cognition. Impairments and home environment categories are identified in the study but they are not on the FRSF. Elimination, blood pressure, and vision are categories which appear on the FRSF, but are not identified by this study. Within the category of fall history, the FRSF does not specifically consider frequency and cause of falls. Within the category of physical function, the FRSF considers assistive walking device as part of the ambulation item; in contrast, the workers interviewed spoke repeatedly about assistive devices as a key factor deserving attention. In the same category, daily activity does not appear on the FRSF. Instead, the FRSF identifies a specific daily activity, the ability to dress lower body. Within the category of medications, the FRSF does not include critical side effects relevant to fall risk, such as causing the urge to urinate. Instead, the FRSF considers elimination as a separate category. Within the category of mental status, the FRSF does not include specific behaviors which contribute to fall risk, such as sitting down on the floor without a seat nearby. It does, however, include confusion which could describe the same behavior in a more general way.

In addition, fear of falling has been identified as a factor of risk for falling among elders in the literature reviewed but it is neither identified by this qualitative study nor does it appear on the FRSF.[44,56]

Tabl 5.4. omparing the Fall Ri k Factors and Item in the Qualitative tudy to the R F

Factors/Items Qualitative study	Factors/Items FRSF	Factors/Items Common
Fall History	Fall History	✓
Time frame	Time frame	
Frequency	—	
Cause	—	
Physical Function	Mobility	
Assistive walking devices	—	
Ambulation	Ambulation	✓
Transferring	Transferring	✓
Daily activities	—	
—	Ability to dress lower body	
Impairments	—	
Lower-extremity problems	—	
Dizziness	—	
—	Blood Pressure	
—	Vision	

Table 5.4. (continued)

Factors/Items Current study	Factors/Items FRSF	Factors/Items Common
Medications	Medications	✓
Types	Types	
Side effects	—	
Mental and Psychological Status	Mental Status	
Cognition	Cognition	✓
Behaviors	—	
—	Confusion	
Home Environment	—	
Fall hazards	—	
Handhold	—	
—	Elimination	
—	Urinary incontinence	
—	Bowel incontinence	

✓: A common factor/ item on the qualitative study and FRSF

—: An absent factor/ item on either the qualitative study or FRSF

With the exception of home environment, the differences between the fall risk items identified in this study and the items on the FRSF can be largely attributed to emphasis and specificity. Whereas the FRSF is structured for convenient fall-risk assessment, allowing evaluators to extract information from the Outcomes and Assessment Information Set (OASIS) without asking questions or observing clients,[13] the interviewed workers wanted information that they could easily observe and act on in their respective domains. An example of this difference in emphasis is the use of assistive devices, especially the non-use of assistive devices prescribed to clients. From the point of view of assessment on the FRSF, this is simply scored as one risk factor among many; but from the view of the workers, this is an easily observable, concrete indicator of fall risk which they can directly mitigate through education and modifying patient behavior. Another example is medication. The FRSF addresses many of the side-effect symptoms of medications that can lead to fall risk, such as the urge to urinate, but this information is one step removed from what the workers can act on. They would still need a diagnosis as to the cause of the symptom, which are the properties of the medication itself. Instead, the workers want to know the specific fall risk of each medication their clients are taking, and what to do about it.

Items on the FRSF can be better aligned to the needs of the geriatric care workers; alternatively, geriatric care workers can be provided information on where the items of concern can be found on the FRSF. Specifically, assistive devices can be elevated as a key item on the FRSF and some consideration should be given to its weighting. The

category of fall history should be expanded as items relating to cause, frequency, and more detailed time frame, such as time of day. Finally, items on the FRSF may be annotated with additional information to address the needs of the geriatric care worker. A computerized database could even cross reference this list with actual medications from a patient's records. Strategies for coping with elimination problems as a fall risk factor could also be presented to the user using a separate guide, such as that found on the back of the FRSF form, or a computer hyperlink.

Items relating to home environment should be added to the FRSF, such as trip hazards and handholds. Effects of the home environment have been documented as a contributor to fall risk in several studies [58,66,91] and it is an item highlighted by the workers in this study.

On the FRSF, no extra space is given for a comment section. The workers generally felt that this was necessary to cover circumstances of fall risk missed by the form. If a comment section were added, a scoring system for the comments should be considered. A quick scoring system for summarizing results is needed, and this feature of the FRSF should be preserved.

The FRSF is a printed paper form, but it may be worthwhile to consider developing a computerized version. Some workers expressed a preference for a computerized form for fall risk screening. In addition to simple user preference, a computerized form would be able enable new features, such as real-time cross reference for medical records, provide alerts for assistive devices, and enable quick referrals for

coordinating care. In addition, a computerized form can easily carry over data from one form to another without error, and automatically score the result. For example, if the OASI form were computerized, the FRSF would not need to be filled in by a worker at all. A computer could copy over the data and print out an FRSF formatted result on paper, or on a web page. This type of automatic copying could be very helpful allowing data gathered by one worker, to be formatted differently to meet the needs of another worker.

To further illustrate the FRSF, as it is currently designed, is based on OASIS scoring and is used by workers in a senior home health agency to detect the risk of falls in elders who are disabled and already enrolled in the service, with a completed OASIS assessment. As such, the FRSF would not be appropriate for outreach workers to screen potential clients for fall risk because they lack of the authority, training, and skills to gather the OASIS information. However, the outreach workers may ask simple questions or make simple observations during initial contact with clients as a screening procedure for risk of falls. These questions should be aligned with the most heavily weighted items of the FRSF. A good, non-intrusive question could be "Have you fallen during the last three months?" Recent fall history is a well-established predictor for falls among community-dwelling elders.[42,65,68,104,105] A second question could be "Do you use any assistive walking devices such as a walker or a cane?" This is the other fall-risk issue of most concern to workers across different agency components. Moreover, the answer to the second question can be done through direct observation, bypassing any concerns with forgetfulness or misrepresentation. A third question could be "Are you afraid of

falling?" Researchers mentioned that fear of falling is not only the consequence of falling but also is an ongoing concern about falling.[187,188]

The importance of assistive devices correlating to fall risk is well documented in the literature. A previous study has reported that walker users have lower self-perceptions of physical function and general health than those who are not walker users.[189] Moreover, a recent study in 47,312 elders who received treatment in U.S. emergency departments has demonstrated that fall injuries are associated with walking aids.[190] That study found more than 87% of the fall injuries were associated with walkers and 12% with canes.

A quick screening using the three simple questions on fall history, assistive device use, and fear of falling would help outreach workers quickly alert to the risk of falls and make referrals as appropriate. This process can be automated through the use of a computerized form. The results could then be copied automatically into a comprehensive fall-risk assessment FRSF for follow-up. In addition, the workers can immediately use this information to educate clients on the risks of falling and how to prevent it. This strategy of using a simple, quick assessment form is supported by a recent survey of 1,317 elderly in Japan, which has indicated that physical function decrease, fall history, and device usage are more useful factors for screening fall risk in generally healthy elders living in the community, as compared to disease, disability, dosing of medications, and environment.[191]

In summary, the proposed fall risk screening procedure would work as follows in three general steps: (1) Initial contact and screening with an outreach worker using a

quick 3-question assessment. (2) Follow up with a more comprehensive fall risk assessment while receiving services from the Day Center, Case Management or Home Care. This assessment would cover multiple risk items including fall history, physical function, impairments, medications, mental and psychological status, home environment, health status, and fear of falling domains. A blank area for additional comments would be allowed for each item. (3) A " what-to-do " action is presented for each item based on the response to each question on a comprehensive form. A proposed universal form is attached as Appendix D.

Nearly all respondents expressed satisfaction with their current fall risk screening procedure and assessment forms. In combining their collective input, this qualitative study identifies the features that are essential to a comprehensive and universally applicable fall risk screening form. This study targeted a specific local senior agency so the results may not be appropriate for other agencies. However, the study sample covered a wide of variety workers in different areas of elder care. Insight gained from this study could be used to improve future efforts to develop an integrated fall risk screening form.

CONCLUSION

Adding fall-risk items identified in the study to the FRSF may improve the integrity of a form used by different agency components. However, factors which affect the utility of fall risk screening procedures should also be taken into consideration for the applicability of the form. Three simple questions on fall history, assistive devices, and fear of falling would help outreach workers quickly alert to the risk of falls during initial

contact with clients. A comprehensive fall risk assessment form that covers multiple risk factors would be in the follow-up with clients while they received services from the Day Center, Case Management or Home Care.

CHAPTER VI

SUMMARY OF FINDINGS

The goal of this dissertation was to study the assessment of fall risk in community-dwelling older persons through collaboration with a local senior services agency. This dissertation encompassed three studies relating to falls in the elderly. First, the impact of medication use and dementia on fall risk in home healthcare elders who had polypharmacy was examined. Second, the Fall Risk Screening Form (FRSF) as a screening tool for use in preventive health assessment was validated. Finally, opinions from diverse geriatric care workers of the senior agency to develop a universally applicable fall risk screening form were qualitatively studied. All findings would be of benefit to the agency's workers by improving their interaction with community-dwelling elders.

The first study showed that there were no differences in the use of psychotropic drugs between home healthcare receiving elders with and without dementia. Many elders were diagnosed with dementia and used psychotropic drugs; however, no relationships with falls were found. A possible explanation for these findings could be related to the characteristics of this unique population. These elders were discharged to home from hospitals or other facilities. And all had a recent medical change. Although many of them were diagnosed with dementia, psychotropic drugs might not be the main medications at that moment. The majority of elders with dementia had caregivers. Therefore, the

assistance and supervision these elders received might have mitigated their risk of falls. On the other hand, many elders without dementia were dependent on assistance in transferring. Further studies controlling for potential confounders, such as level of assistance and transferring to clarify the relationships among dementia, medication use, and falls are warranted.

In the validation study of the FRSF, findings sustained the two research hypotheses. One hypothesis was that there was high expert agreement on the FRSF as a whole as a useful tool for screening for fall risk among the elderly. However, low expert agreement was found on the completeness of the description of the vision impairment (MO390) of the client and the relevance of the ability to dress the lower body (MO660). These findings suggested that adding detailed conceptual definitions of the factors and including other items to the FRSF would be needed. The other hypothesis was that the FRSF demonstrated good correlation with the FRAF, thereby supporting its construct validity for fall risk in home healthcare elders.

The inter-rater consistency test showed lower agreements between raters on the items of transferring (MO690) and ambulation (MO700). Lower agreement in mobility scores indicated inconsistent scoring between the OASIS and FRSF. Therefore, modification of the scoring system and additional training would be needed to improve consistency in rater assessment for mobility. The moderate internal consistency for the FRSF indicated that this screening form included multiple factors and each single factor might be an independent predictor of falls. In summary, the validity of the FRSF is only

partially supported because of lack of strong reliability. More work needs to be done before physical therapists or nurses use the form to identify their clients at risk for falls in the home healthcare setting. There is room for improvement in the instrument.

In the qualitative study, two major themes emerged from the interviews: factors which are relevant in assessing fall risk, and factors which affect the utility of the fall risk screening procedure. Under the theme of factors which are relevant in assessing fall risk are 6 categories: fall history, physical function, impairments, medications, mental and psychological status, and home environment. Under the theme of factors which affect the utility of the fall risk screening procedure are 3 categories: methods of gathering information for fall risk assessment, features useful to a fall risk assessment form, and actions taken in response to fall risk assessment.

Comparing the fall risk factors and items identified in the qualitative study to the content of the FRSF, one finds that the factors of impairments and home environment are not included in the FRSF; furthermore the item of frequency and the item of cause are not included within the factor of fall history on the FRSF. Other items identified in this study, but not mentioned in the FRSF are assistive walking devices, daily activities, side effects of medications and elders' behaviors. In addition, fear of falling is identified as a factor of risk for falling among elders in the literature reviewed but it is neither identified by this qualitative study nor does it appear on the FRSF.

Although adding those fall-risk items to the FRSF may improve the integrity of a form used in different agency components, factors which affect the utility of fall risk

screening procedures should also be taken into consideration for the applicability of the form. Three simple questions: 'Have you fallen during last three months?", "Do you use any assistive walking devices such as a walker or a cane?", and "Are you afraid of falling?" would be arranged in the front of the form for quick screening. A 'yes' response to any of the questions would alert workers to note the risk of falls, to make referral to appropriate services, and to initiate fall-prevention intervention and education. This would be followed up by a comprehensive fall risk assessment form that covers multiple risk factors including fall history, physical function, impairments, medications, mental and psychological status, home environment, health status, and fear of falling domains while receiving services from the Day Center, Case Management or Home Care. Moreover, service plans should be integrated with each screening procedure to increase the utility of the fall risk screening.

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APPENDIX A

FALL RISK SCREENING FORM

APPENDIX A—FALL RISK CREENING FORM

Fall Risk Indicators	STATUS			Indicator Value	Patient Score
Fall History	No history of falls			0	
	Fall history is unknown			1	
	Fall during last 3 months or during current home health service			13	
MEDICATIONS	**Medications** include: anesthetics, antihistamines, anti-hypertensives, anticonvulsants, benzodiazepines, cathartics, diuretics, hypoglycemic, narcotics, psychotropics, sedatives				
	None of these taken within last 5 days			0	
	Change in medication and/or dose in last 5 days			1	
	Taken 1-2 of these within last 7 days			2	
	Taken 3-4 of these within last 7 days			3	
BLOOD PRESSURE	**Systolic BP**: Remains constant during sit to stand			0	
	SBP Drop < 20 mm Hg during sit to stand			1	
	SBP Drop >20 mm Hg during sit to stand			2	
	OASIS ITEM		**OASIS Answer**		
VISION	M0390	With corrective lens if patient usually wears them	0	0	
		Vision partially impaired	1	2	
		Vision severely impaired	3	3	
ELIMINATION	M0520	Urinary incontinence	0 or 2	0	
		Urinary incontinence	1	1	
	M0540	Bowel incontinence frequency	0 or 1	0	
		Bowel incontinence frequency	2, 3, 4, or 5	1	
MENTATION	M0560	Cognitive Functioning	0	0	
		Cognitive Functioning	1 or 2	1	
		Cognitive Functioning	3 or 4	2	
	M0570	When confused	0	0	
		When confused	1 or 2	1	
		When confused	3 or 4	2	
MOBILITY	M0660	Ability to dress lower body	0 or 3	0	
		Ability to dress lower body	2	2	
	M0690	Transferring	0 or 4 or 5	0	
		Transferring	1	1	
		Transferring	2	2	
		Transferring	3	1	
	M0700	Ambulation / Locomotion	0 or 5	0	
		Ambulation / Locomotion	1	1	
		Ambulation / Locomotion	2	2	
TOTAL SCORE					

APPENDIX B

FALL RISK SCREENING FORM RESPONSE FORM

APP IX B—FALL RI K CREE G RM RE PO E FORM

Fall Risk Indicators	STATUS			Indicator Value	Relevance Rating 1 – 4	Clarity and Ease of use Rating 1 - 4	Completeness Rating 1 - 4	Comments on the scoring and items
Fall History	No history of falls			0				
	Fall history is unknown			1				
	Fall during last 3 months or during current home health service			13				
MEDICATIONS	**Medications** include: anesthetics, antihistamines, anti-hypertensives, anticonvulsants, benzodiazepines, cathartics, diuretics, hypoglycemics, narcotics, psychotropics, sedatives							
	None of these taken within last 5 days			0				
	Change in medication and/or dose in last 5 days			1				
	Taken 1-2 of these within last 7 days			2				
	Taken 3-4 of these within last 7 days			3				
BLOOD PRESSURE	**Systolic BP**: Remains constant during sit to stand			0				
	SBP Drop < 20 mm Hg during sit to stand			1				
	SBP Drop >20 mm Hg during sit to stand			2				
	OASIS ITEM		OASIS Answer					
VISION	MO390	With corrective lens if patient usually wears them	0	0				
		Vision partially impaired	1	2				
		Vision severely impaired	3	3				

			OASIS Answer	Indicator Value	Relevance Rating 1 - 4	Clarity and Ease of use Rating 1 - 4	Completeness Rating 1 - 4	Comments on the scoring and Items
ELIMINATION	MO520	**Urinary Incontinence** 0-No incontinence or catheter (includes anuria or ostomy for urinary drainage) 2-Patient requires a urinary catheter (i.e., external, indwelling, intermittent, suprapubic)	0 or 2	0				
		1-Patient is incontinence	1	1				
	MO540	**Bowel Incontinence Frequency** 0-Very rarely or never has bowel incontinence 1-Less than once weekly	0 or 1	0				
		2-One to three times weekly 3-Four to six times weekly 4-On a daily basis 5-More often than once daily	2, 3, 4, or 5	1				
MENTATION	MO560	**Cognitive Functioning** 0-Alert/oriented, able to focus and shift attention, comprehends and recalls task directions independently.	0	0				
		1-Requires prompting (cuing, repetition, reminders) only under stressful or unfamiliar conditions. 2-Requires assistance and some direction in specific situations (e.g., on all tasks involving shifting of attention), or consistently requires low stimulus environment due to distractibility.	1 or 2	1				
		3-Requires considerable assistance in routine situation. Is not alert and oriented or is unable to shift attention and recall directions more than half the time. 4-Totally dependent due to disturbances such as constant disorientation, coma, persistent vegetative state, or delirium.	3 or 4	2				

			OASIS Answer	Indicator Value	**Relevance Rating 1 - 4**	**Clarity and Ease of use Rating 1 - 4**	**Completeness Rating 1 - 4**	**Comments on the scoring and items**
	MO570	**When Confused** 0-Never	0	0				
		1-In new or complex situations only 2-On awakening or at night only	1 or 2	1				
		3-During the day and evening, but not constantly 4-Constantly	3 or 4	2				
MOBILITY	MO660	**Ability to Dress Lower Body** 0-Able to obtain, put on, and remove clothing and shoes without assistance. 3-Patient depends entirely upon another person to dress lower body.	0 or 3	0				
		2-Someone must help the patient put on undergarments, slacks, socks or nylons, and shoes.	2	2				
	MO690	**Transferring** 0-Able to independently transfer. 4-Bedfast, unable to transfer but is able to turn and position self in bed. 5-Bedfast, unable to transfer and is unable to turn and position self.	0 or 4 or 5	0				
		1-Transfers with minimal human assistance or with use of an assistive device.	1	1				
		2-Unable to transfer self but is able to bear weight and pivot during the transfer process.	2	2				
		3-Unable to transfer self and is unable to bear weight or pivot when transferred by another person.	3	1				

			OASIS Answer	Indicator Value	Relevance Rating 1 - 4	Clarity and Ease of use Rating 1 - 4	Completeness Rating 1 - 4	Comments on the scoring and items
	M0700	**Ambulation / Locomotion** 0-Able to independently walk on even and uneven surfaces and climb stairs with or without railings (i.e., needs no human assistance or assistive device). 5-Bedfast, unable to ambulate or be up in a chair.	0 or 5	0				
		1-Requires use of a device (e.g., cane, walker) to walk alone or requires human supervision or assistance to negotiate stairs or steps or uneven surfaces.	1	1				
		2-Able to walk only with the supervision or assistance of another person at all times.	2	2				

Rating Criteria

Relevance	Clarity and Ease of Use	Completeness
1= Not relevant	1= Difficult to use	1= Incomplete
2= Somewhat relevant	2= Somewhat difficult to use	2= Major revisions are needed
3= Likely relevant	3= Easy to use	3= Minor revisions are needed
4=Very relevant	4= Very easy to use	4= Complete

Comments

APPENDIX C

FALL RISK ASSESSMENT FORM

PPE DIX C—FALL RI K A ESSME T FORM

Patient Factors	Score
History of falls (any in the past 3 months?)	
Sensory deficit (vision and/or hearing)	
Age (over 65)	
Confusion	
Impaired judgment	
Decreased level of cooperation	
Increased anxiety/emotional liability	
Unable to ambulate independently (needs to use ambulatory aide, chairboard, etc)	
Gait/ balance/coordination problems	
Incontinence/urgency	
Cardiovascular/respiratory disease affecting perfusion and/or oxygenation	
Postural hypotension with dizziness	
Medications affecting blood pressure or level of consciousness (consider antihistamines, antihypertensives, antiseizure, benzodiazepines, cathartics, diuretics, hypoglycemic, narcotics, psychotropics, sedatives/ hypnotics)	
Alcohol use	
Environment Factors	
Home safety issues (lighting, pathway, cord, tubing, floor coverings, stairs, etc)	
Lack of home modifications (bathroom, kitchen, stairs, entries, etc)	
Total points	

APPENDIX D

A UNIVERSAL FORM

Fall Risk Assessment: Quick Screening Form

No.	Interview Questions / Observation	Response (circle)	
1.	Have you fallen during last 3 months?	Yes	No
2.	Do you use any assistive walking devices? (Observation) Client has an assistive walking device.	Yes	No
3.	Are you afraid of falling?	Yes	No

If the response to any of the questions is **Yes**, alert the day center, case management, or home care that the client is a potential fall risk. A comprehensive assessment will be provided for further intervention or education.

Fall Risk Assessment: Comprehensive Assessment Form

Fall History

No.	Interview Questions / Observation	Response (circle)	
1.	Have you ever fallen during last 3 months?	Yes	No
2.	Have you ever fallen at night?	Yes	No
Comments			

Physical Function

No.	Interview Questions / Observation	Response (circle)	
3.	Do you use any assistive walking devices?	Yes	No
4.	Do you need someone's assistance for walking?	Yes	No
5.	Do you need someone's assistance for going to the bathroom?	Yes	No
6.	Do you need someone's assistance for dressing?	Yes	No
Comments			

Impairments

No.	Interview Questions / ●bservation	Response (circle)	
7.	Have you had surgery on your hips, knees, or ankles?	Yes	No
8.	Can you stand up from a sitting position on your own?	Yes	No
9.	Do you feel dizzy while standing up from a chair or getting out of the bed?	Yes	No
Comments			

Medications

No.	Interview Questions / Observation	Response (circle)	
10.	How many medications are you currently taking?	4 or more	Less than 4
11.	Are you taking any psychotropic drugs?	Yes	No
Comments			

Mental and psychological status

No.	Interview Questions / Observation (Caregivers)	Response (circle)	
12.	Has he/she been diagnosed with dementia?	**Yes**	No
13.	Does he/she have combative or aggressive behavior?	**Yes**	No
Comments			

Home environment

No.	Interview Questions / Observation	Response (circle)	
14.	Do you have rugs in your home?	**Yes**	No
15.	Do you have handholds in your bathroom?	Yes	**No**
Comments			

Health Status

No.	Interview Questions / Observation	Response (circle)	
16.	Can you get to the bathroom in time?	Yes	**No**
17.	Do you have visual problems?	**Yes**	No
Comments			

Fear of falling

No.	Interview Questions / Observation	Response (circle)	
18.	Are you afraid of falling?	**Yes**	No
Comments			

Any **bold underlined** response, please refer to response action matrix.

Fall Risk Assessment: Response Action Matrix

Fall History

No.	Interview Questions / Observation	Response	Component	Action
1.	Have you ever fallen during last 3 months?	Yes	Home care Case management	Education
2.	Have you ever fallen at night?	Yes	Home care	Education

Physical function

No.	Interview Questions / Observation	Response	Component	Action
3.	Do you use any assistive walking devices?	Yes	Home care	Education
4.	Do you need someone's assistance for walking?	Yes	Home care	Intervention
5.	Do you need someone's assistance for going to the bathroom?	Yes	Home care	Intervention
6.	Do you need someone's assistance for dressing?	Yes	Home care	Intervention

Impairments

No.	Interview Questions / Observation	Response	Component	Action
7.	Have you had surgery on your hips, knees, or ankles?	Yes	Home care	Intervention
8.	Can you stand up from a sitting position on your own?	No	Home care	Intervention
9.	Do you feel dizzy while standing up from a chair or getting out of the bed?	Yes	Home care	Intervention Education

Medications

No.	Interview Questions / Observation	Response	Component	Action
10.	How many medications are you currently taking?	4 or more	Home care Case management	Alert
11.	Are you taking any psychotropic drugs?	Yes	Home care Case management	Alert

Mental and psychological status

No.	Interview Questions / Observation	Response	Component	Action
12.	Has he/she been diagnosed with dementia?	Yes	Day center	Intervention
13.	Does he/she have combative or aggressive behavior?	Yes	Day center	Intervention

Home environment

No.	Interview Questions / Observation	Response	Component	Action
14.	Do you have rugs in your home?	Yes	Case management	Education
15.	Do you have handholds in your bathroom?	No	Case management	Intervention

Health Status

No.	Interview Questions / Observation	Response	Component	Action
16.	Can you get to the bathroom in time?	No	Home Care	Education
17.	Do you have visual problems?	Yes	Home Care	Intervention

Fear of falling

No.	Interview Questions / Observation	Response	Component	Action
18.	Are you afraid of falling?	Yes	Home care Case management	Education

APPENDIX E

INSTITUTIONAL REVIEW BOARD APPROVAL LETTERS

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Office of Research
6700 Fannin Street
Houston, TX 77030-2343
713-794-2480 Fax 713-794-2488

February 24, 2009

Dr. Sharon L. Olson
School of Physical Therapy
6700 Fannin Street
Houston, TX 77030

Dear Dr. Olson:

Re: "Investigation of a Fall Risk Screening Form (FRSF)utilized in home health care"

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was determined to be exempt from further review.

Any changes in the study must receive review and approval prior to implementation unless the change is necessary for the safety of subjects. In addition, you must inform the IRB of adverse events encountered during the study or of any new and significant information that may impact a research participant's safety or willingness to continue in your study.

Sincerely,

John D. Radcliffe

Dr. John Radcliffe, Chair
Institutional Review Board - Houston

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Office of Research
6700 Fannin Street
Houston, TX 77030-2343
713-794-2480 Fax 713-794-2488

November 2, 2009

Ms. Shu-Shi Chen
School of Physical Therapy – Advisor Olson
6700 Fannin Streeg
Houston, TX 77030

Dear Ms. Chen:

Re: Assessing the Inter-rater Reliability of the Fall Risk Screening Form (FRSR) for Seniors at Risk for Falls

Your application to the IRB has been reviewed and approved.

This approval lasts for one (1) year. The study may not continue after the approval period without additional IRB review and approval for continuation. It is your responsibility to assure that this study is not conducted beyond the expiration date.

Any changes in the study or informed consent procedure must receive review and approval prior to implementation unless the change is necessary for the safety of subjects. In addition, you must inform the IRB of adverse events encountered during the study or of any new and significant information that may impact a research participant's safety or willingness to continue in your study.

Remember to provide copies of the signed informed consent to the Office of Research, DHS 10110 when the study has been completed. Include a letter providing the name(s) of the researcher(s), the faculty advisor, and the title of the study. Graduation may be blocked unless consents are returned.

Sincerely,

John D. Radcliffe

Dr. John Radcliffe, Chair
Institutional Review Board - Houston

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Office of Research
6700 Fannin Street
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January 4, 2010

Dr. Peggy Gleeson
Texas Woman's University - Physical Therapy
6700 Fannin Street
Houston, TX 77030

Dear Dr. Gleeson:

Re: "Development of a Fall Risk Screeing Form"

Your application to the IRB has been reviewed and approved.

This approval lasts for one (1) year. The study may not continue after the approval period without additional IRB review and approval for continuation. It is your responsibility to assure that this study is not conducted beyond the expiration date.

Any changes in the study or informed consent procedure must receive review and approval prior to implementation unless the change is necessary for the safety of subjects. In addition, you must inform the IRB of adverse events encountered during the study or of any new and significant information that may impact a research participant's safety or willingness to continue in your study.

Remember to provide copies of the signed informed consent to the Office of Research, HS 10110 when the study has been completed. Include a letter providing the name(s) of the researcher(s), the faculty advisor, and the title of the study. Graduation may be blocked unless consents are returned.

Sincerely,

John D. Radcliffe

John Radcliffe, Chair
Institutional Review Board - Houston

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Office of Research
6700 Fannin Street
Houston, TX 77030-2343
713-794-2480 Fax 713-794-2488

April 6, 2010

Ms. Shu-Shi Chen
School of Physical Therapy - Advisor Olson
6700 Fannin Street
Houston, TX 77030

Dear Ms. Chen:

Re: "Investigation of a Fall Risk Screening Form (FRSF) developed by a home health agency"

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was determined to be exempt from further review.

Any changes in the study must receive review and approval prior to implementation unless the change is necessary for the safety of subjects. In addition, you must inform the IRB of adverse events encountered during the study or of any new and significant information that may impact a research participant's safety or willingness to continue in your study.

Sincerely,

John Radcliffe, Chair
Institutional Review Board - Houston