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Falls Prevention Training at New York Presbyterian Hospital: Does Education Regarding Fall Prevention Reduce Incidence of Falls after Discharge to Home from an Acute Rehabilitation Facility?

Yuning Chiu
Graduate Center, City University of New York

Michelle Frager
Graduate Center, City University of New York

Hyunseok Lee
Graduate Center, City University of New York

Solange Wong
Graduate Center, City University of New York

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Yuning Chiu

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A capstone project submitted to the Graduate Faculty in Physical Therapy in partial fulfillment of the requirements for the degree of Doctor of Physical Therapy (DPT).

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Suzanne R. Babyar Rothbart, PT, PhD

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Date   Chair of Examining Committee (Advisor)

Jeffrey Rothman, PT, Ed.D.

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_____   _____

Date   Executive Officer

Abstract

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Yuning Chiu

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Solange Wong

Advisor: Dr. Suzanne Babyar

The objective of this study was to determine the compared effectiveness of different instruction types for fall prevention training in an inpatient rehabilitation setting based on 6-month falls incidence. This study included 89 English-speaking patients aged 18-90 who participated in a fall prevention training program at New York Presbyterian Hospital's inpatient rehabilitation center. Patients were divided into two class types, a group or an individual class. Both classes were subdivided into with and without a caregiver. A 10-Meter Walk Test, the Montreal Cognitive Assessment (MoCA), and admission and discharge Functional Independence Measure (FIM™) scores were recorded for baseline comparisons among groups. MoCA scores less than 26 designated that a caregiver would be present during the training. Other patients had a caregiver present secondary to vision, speech/language, and hearing issues. Falls were measured over a 6-month follow-up period by phone interview. Results found no significant difference in age, gender, or cognition between fallers and non-fallers as well as no significant difference in fall incidence among different class types. These findings indicate that fall outcome was not affected by different types of training. However, the study did find that falls

prevention training prior to discharge was effective in decreasing overall falls rate (25%)

compared to previous studies (33%).

Acknowledgements

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Introduction

Unintentional falls are the number one cause of nonfatal injuries treated in hospital emergency departments for all age groups, with the exception of those aged 15-24 years, for which it is still ranked as the number two factor (Centers for Disease Control and Prevention [CDC], 2012). Worldwide, falls are the second leading cause of deaths by accidental injury and the third most prevalent cause of chronic disablement according to the World Health Organization (WHO) (Peeters et al., 2007; World Health Organization, 2012). As people age, they are increasingly at risk of falling and incurring fall-related injuries. One out of three adults aged 65 and older living in the community falls each year (Rubenstein & Josephson, 2006), and those who fall once are two to three times more likely to fall again (Todd & Skelton, 2004). Given the prevalence of falls in the older population and the considerable mortality, morbidity and suffering that accompanies them, the prevention of falls is important.

Because falls are associated with increased morbidity and reduced function, which can lead to premature nursing home placement; it not only has a direct impact on rising healthcare cost but also significant socio-psychological implications (Rowe, 2011). As the percentage of the population age 65 and older increases, the financial toll of falling on the health care system also rises. Data from the 2010 Census showed that 13 percent of the total population was age 65 and above (United States Census Bureau, 2011). One third of this population falls each year and up to 20 percent of falls cause serious injuries: it is estimated that the total cost of all fall-related injuries may reach upward of $85.4 billion by 2020 (Stevens & Sogolow, 2005; Koh, Manias, Hutchinson, & Johnston, 2007).

While considerable efforts have been devoted to the study of falls for the geriatric population, little research attention has been made to fall incidence in young and middle-aged adults. However, it is important to acknowledge that falls have significant socio-economic consequences regardless of age. Approximately one in four middle-aged adults falls at least once in two years (Talbot, Musiol, Witham, & Metter, 2007). According to the American Occupational Therapy Association, even less serious falls can negatively affect work performance (Chase, Mann, Wasek, & Arbesman, 2012). In addition, Talbolt et al. (2007) predicted that this age group would progressively start showing higher incidences of disease and medication use while engaging in a lower level of physical activity, predisposing middle-aged adults for higher risks of falls. Therefore, prevention of falls should be an important healthcare concern that spans wider age groups.

Fall incidence and severity of fall-related complications rise steadily from middle age and peaks at age 80 and older (Rao, 2005; Rowe, 2011). The risk of a serious injurious fall increases with age as well. The rate of fall injuries for age 85 and older was almost 4 times that of those aged 65 to 75 (WHO, 2008). After a serious fall, older adults may have difficulties performing activities of daily living (ADL) and instrumental activities of daily living (IADL), putting them at an increased risk of early death (Chase, Mann, Wasek, & Arbesman, 2012). This may also result in premature admission to nursing homes. Moreover, even after a fall without physical injury, older adults may develop a fear of falling that leads to decreased overall activity level in social, leisure, and physical aspects. This results in decreased strength and endurance that increases risk of falling in the future (Chase et al., 2012). Fear of falling may prompt further depression, feelings of helplessness and social isolation (Rubenstein & Josephson, 2006).

Definition of a Fall

Although most people understand what a fall is, they have difficulty finding the words to define it. Researchers have tried defining a fall since the 1980s. Kellogg International Working Group on the prevention of falls in the elderly (1987) defined a fall as "unintentionally coming to the ground or some lower level and other than as a consequence of sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in stroke or an epileptic seizure." (Zecevic, Salmoni, Speechley, & Vandervoort, 2006, p. 369). Due to the different aims and needs of various studies looking at falls, there still is not a universal definition. However, the Kellogg group's definition and similar variations of it have been more widely acceptable than others (Hauer et al., 2007). For our study, we defined a fall as unintentionally coming to rest on the ground, the floor, or another lower level but excluding coming to rest against furniture, a wall, or another structure (Buckner et al., 1993).

Risk Factors and Causes for Falling

A growing number of falls studies have led to a better understanding of risk factors for falling; more than 400 variables have been identified as potential risk factors (Gillespie et al., 2003). Risk of falling, especially in older adults, is influenced by a combination of both intrinsic and extrinsic factors. Intrinsic risk factors include gait and balance impairments, peripheral neuropathy, vestibular dysfunction, muscle weakness, vision impairment, medical illness, advanced age, impaired ADL, orthostasis, dementia, and drugs. Examples of extrinsic factors are environmental hazards, poor footwear, and restraints (Rubenstein & Josephson, 2006).

Studies show that as the number of risk factors increase, the risk for falling increases dramatically (Fox, Tonner, Stevens, Fineman, & Ross, 2010). Most falls occur due to the presence of multiple factors with the combination of interacting precipitating causes. The top

three causes of falls according to a summary of 12 studies are: accident and environment, gait

and balance disorders or weakness, and dizziness and vertigo (Rubenstein & Josephson, 2006).

 Accidental falls caused by an environmental hazard account for 25 percent to 45 percent of all

falls (Rubenstein & Josephson, 2002). One should note that environmental hazards alone do not

lead to falls, but there requires additional risk factors such as advanced age or vision impairment.

 Poor vision impairs balance and increases the risk of falls and fractures in older people; Lord

(2006) concluded that impaired vision was a significant independent risk factor for falls in the

older population.

Not only are there a large number of risk factors identified in the research, there is also a

discrepancy in perception of falls. The most frequent reasons for falling suggested by seniors are

balance deficits, weather, and inattention; by healthcare providers: medical conditions, balance

deficits, and medication; by researchers: muscle weakness, history of falls and gait deficit

(Zecevic et. al., 2006). Therefore, use of appropriate wording is important to ensure that both the

interviewer and the interviewee are clear as to what defines a fall and what causes a fall.

Falls Prevention Effectiveness

Exercise training, home-modifications, and interventions that address multiple factors are

the main types of fall prevention (Stevens, 2010). In addition, the Fall Prevention Center of

Excellence suggests that successful fall prevention involves three main strategies: balance

training and physical activity; medical management; and environmental/home modifications

(2014).

Exercise-based falls prevention studies are effective in reducing the rate of falling. One

study using weekly group exercise sessions found that participants were 40 percent less likely to

fall and one-third less likely to suffer a fall-related injury (Barnett, Smith, Lord, Williams, &

Baumand, 2003). Individually tailored home exercise programs, like the Otago Exercise

Program, also benefit potential fallers. This program consists of muscle strengthening and

balance-retraining exercises of increasing difficulty, combined with a walking program. Use of

this program reduced falls by 35 percent for community-dwelling women aged 80 years and

older (Campbell et al., 1997). In addition, several studies have examined the use of Tai Chi to

prevent falls. Community-dwelling adults aged 60 or older who participate in Tai Chi classes

experience fewer falls and fall-related injuries, and have a significantly decreased risk of falling

compared to those in the control group (Li et al., 2005; Voukelatos, Cumming, Lord, & Rissel,

2007; Wolf, Coogler, & Xu, 1997). Exercise programs designed to prevent falls also prevent

injuries caused by falls. This was shown in a systematic review and meta-analysis looking at the

effect of fall prevention exercise programs on fall induced injuries (El-Khoury, Cassou, Charles,

& Dargent-Molina, 2013). In addition to decreasing falls, exercise also reduces the fear of

falling. The Korea Falls Prevention Study looked at community-dwelling adults older than 60

years that had fallen in the previous year. This study showed that a 12-week exercise program

reduced participants' fear of falling, while improving their balance, flexibility, muscle strength,

and quality of life (Oh et al., 2013).

Home modifications are effective in decreasing falls. Several studies show that elderly

participants experience fewer falls and fewer injuries, following a home hazard assessment by an

occupational therapist, making home modifications and recommendations for behavioral changes

(Campbell et al., 2005; Cumming et al., 1999; Thompson, 1996). Furthermore, simply providing

written material about home safety to at-risk individuals can also reduce falls significantly

(Plautz, Beck, Selmar, & Radetsky, 1996).

Multifactorial interventions address multiple falls risk factors at the same time and are

effective at reducing falls. Small group sessions teaching fall prevention strategies showed a 30

percent reduction in fall rate (Clemson et al., 2004). Day and colleagues (2002) looked at the

effectiveness of group-based exercise when used alone or in combination with vision

improvement and/or home hazard reduction. They looked at a sample of subjects aged 70 years

and older who were living at home. When exercise was used alone, the fall rate decreased by 20

percent, but used in conjunction with vision improvement and home hazard reduction, the rate

dropped even more so; with those receiving all three interventions being one third less likely to

fall. The Study of Accidental Falls in the Elderly (SAFE) was a program of 4 group classes on

how to prevent falls. Subjects in SAFE were all 65 years or older living in the community.

 Classes were given weekly over a one-month period. Each hour and a half class included a slide

presentation on common household risks, discussions on behavioral risks, self-appraisal of home

hazards, and group activities to develop action plans. In addition, each class also included an

exercise component. The exercise component had a demonstration of fall prevention exercises,

after which participants practiced these exercises. They were also given a manual that described

the exercises. The home safety portion included a home inspection with guidance and assistance

in reducing fall hazards. During the 23-month follow-up period, 44 percent of those in the

control group reported at least one fall compared to 39 percent who received the intervention

(Hornbrook et al., 1994). In another study, the intervention strategy was tailored according to an

assessment of each participant's fall risk factors. Participants were community-dwellers at least

70 years of age. They were given either a combination of adjustment in their medications,

behavioral instructions, and exercise programs aimed at modifying their risk factors. For

example, those with postural hypotension received medication adjustment and behavioral

training, versus someone with a gait impairment, who received behavioral training and an exercise program. Furthermore, someone with an unsafe bathtub or toilet transfer received behavioral training, an exercise program, and home modifications. A nurse assessed medication risk factors, while physical therapists assessed impairments in gait, transfer skills or balance, and lower and upper extremity muscle strength or range of motion. During the 12-month follow-up period, researchers found that the multiple-risk factor intervention strategy resulted in a significant reduction in the risk of falling. Thirty-five percent of the intervention group fell, compared with 47 percent of the control group (Tinetti et al., 1994).

Most studies looking at fall prevention effectiveness are done in a community-setting or hospital-setting. Little hospital-based research exists about the efficacy of fall prevention programs for post-discharge. This is an important area of study given that hospital fall prevention programs are widely implemented across the country. Past research has mostly studied multifactorial interventions for senior residents in the long-term care setting and falls prevention for hospitalized patients while still in the hospital setting. One recent study conducted by Hill, Hoffmann, & Haines (2013) investigated fall incidences and related injuries in the six months after hospital discharge, with the focus on the circumstances of the falls. Our study was designed to investigate the effectiveness of falls prevention education and of different instructional types for a variety of living arrangements after discharge for a wider range of disabilities represented in our sample.

Cognitive Impairment

Increasing attention is being paid to mild cognitive impairment and dementia in number of fall studies with elderly patients. A fall is considered the major cause of morbidity and mortality in patients with dementia (Allan, Ballard, Rowan, & Kenny, 2009). Studies

introducing potential risk factors for falls show some relationship between the incidence rate of

fall-related injury and disease diagnosis such as dementia among the elderly population (Muir,

Gopaul, & Montero Odasso, 2012). Shaw & Kenny (2003) described, in a randomized

multifactorial intervention study, that the older population with dementia have twice the risk of

falling than their cognitively intact counterparts - with an annual incidence of approximately 60

percent. Incidence of fracture is three times the "age-adjusted figure for expected fracture

incidence" (Shaw & Kenny, 1988, pg. 7). Dementia patients are less likely to recover from falls-

related injury, with increased 6-month mortality of up to 71 percent; this rate is three times that

of cognitively intact elderly patients (Shaw & Kenny, 1988).

The effects of dementia alone are not directly the most significant intrinsic cause of falls.

However, behavioral changes in elderly patients with above disorders as part of the multifaceted

causes of fall incidence may contribute to a higher risk for falls (Harlein, Dassen, Halfens, &

Heinze, 2009). It is well known that a history of falling is associated with higher risk of future

falls (Wood, Bilclough, Bowron, & Walker, 2002). However, reports of fall from the elderly

patients with dementia are often unrecognized or incomplete due to decreased recall capability

(Shaw & Kenny, 1988). In fact, the majority of studies in long-term care facilities or hospital

settings dealing with cognitive impairment and cases of falls in the elderly showed that patients

complained about their worsening memory problem. In one study it was indicated that fallers

lack a unique cognitive processing - immediate memory (Hausdorff et al., 2006; Chen et al.,

2008). Some researchers defined this lack of cognitive processing as impaired performance and

stated that cognitive decline was independently associated with impaired performance of daily

living and future falls (Kim, Jo, Park & Cheon, 2008; Montero-Odasso, Wells, Borrie, &

Speechley, 2009).

The effect of mild cognitive impairment (MCI) in the elderly population is often disregarded. However, MCI affects mortality and morbidity due to its intricate association with other disease states and with other risk factors for falls (Makizako et al., 2013; Montero-Odasso et al., 2009). Smith, Gildeh, & Holmes (2007,) suggested that MCI is an "intermediate clinical state between normal cognitive aging and mild dementia" (p. 330). Progression to Alzheimer's Disease (AD) or senile dementia of Alzheimer's Type (SDAT) is common in MCI patients (Solfrizzi et al., 2004). Subtypes of MCI progress into different dementia disorders: amnestic MCI to AD; non-memory MCI to Lewy body dementia, frontotemporal dementia, Huntington's disease dementia and Parkinson's disease dementia (PD-D), all of which contribute to the increased mortality and morbidity rate of elderly fallers (Kim et al, 2008; Shaw & Kenny, 1998; Pettersson, Olsson & Wahlund, 2007). MCI-derived dementia such as SDAT and PD-D affect the walking speed and response time, making elderly patients more susceptible to greater risk of falls. This may directly or indirectly cause a substantial number of fall-related injuries, aggravating their ambulatory function dramatically. MCI is also related to the recovery of the patients who sustained fall-related injury. According to one study, impaired cognitive status at admission lowered the rehabilitation outcome of elderly patients with hip fracture – one of the most common causes of admission to the emergency room and the inpatient rehabilitation department. Heruti, Lusky, Barell, Ohry, & Adunsky (1999) suggested that cognitive impairment was strongly associated with functional gains in mobility that may decrease the risk of fall. The geriatric population was reported to have a higher incidence of mild cognitive impairment than the young, and was considered at risk with as much as a 40 percent chance of developing dementia within one year (Smith et al, 2007). This explains why screening cognitive impairment should be taken seriously when assessing fall-related injury among elderly patients.

Some of the established cognitive impairment screening tools, such as the Mini-Mental State Examination (MMSE), have been widely used to screen MCI and dementia. However, The Montreal Cognitive Assessment (MoCA) has a greater advantage over the MMSE in sensitivity and in specificity. The MoCA is administered in 10-minutes, using a 0 to 30 point scale (with higher scores indicating better performance) designed to screen for cognitive impairment and assist first-line healthcare professionals in the detection of MCI and dementia. Sweet, et al. (2011) observed that the MoCA is a better screening tool with a higher sensitivity than MMSE.

Smith et al. (2007) found, in a study done in a memory clinic setting, that MoCA is more sensitive in detecting MCI and dementia than MMSE. With a cut-off score of 26, the MMSE had a sensitivity of 17 percent to detect elderly subjects with MCI, whereas the MoCA detected 83 percent. The MMSE had a sensitivity of 25 percent to detect subjects with dementia, whereas the MoCA detected 94 percent. In patients already diagnosed with MCI, the MoCA helps identify those at risk of developing dementia at a six-month follow-up.

A recent study suggested that the MoCA was more sensitive to cognitive dysfunction followed by aneurysmal subarachnoid hemorrhage (aSAH) or other stroke-associated cognitive impairments than MMSE. Certain MoCA subtests are more sensitive to functional difficulties after aSAH (Schweizer, Al-Khindi, & Macdonald, 2012). Recent articles support the superiority of MoCA over MMSE because MoCA is shown to screen cognitive impairment or dementia associated with so-called elderly disorders such as SDAT, PD-D and vascular disease dementia with more sensitivity than MMSE (Nazem et al, 2009). Screening for MCI utilizing MoCA was considered an important part of our study because the cognitive status of the patient at admission determined whether the standard falls prevention training was given with or without a caregiver.

Phone Interview

Phone interview is an inexpensive and harmless form of research. It has been used in many research settings, from commercial to medical, and continues to be common research method. When used to find high risk fall groups, Korner-Bitensky and Wood-Dauphinee (2008) found phone interviews were effective data collection methods. Interviewees had a trend of reporting more falls as compared to a face-to-face interview, most likely due to a reduction in embarrassment. This study also looked at the ability of a lay person and a trained professional to conduct this phone interview. Both groups had similar results indicating that a well-trained lay person was capable of conducting phone interviews for this type of research (Korner-Bitensky & Wood-Dauphinee, 2008).

Purpose

Falls prevention is a major focus in the preventative care sector of health care. Especially in the hospital setting where patients go home in often a much different state then how they left their homes when they come to the hospital. They are not as mobile and able to negotiate their homes as they were before they went into the hospital. It is important to send patients home with the tools to proactively reduce their risk of falling.

As stated above, many different methods have been implemented within falls prevention education and many have been effective in reducing the number of falls over a wide span of ages. Current literature has mostly focused on multifactorial interventions for senior residents in the long-term care setting and falls prevention for the acute inpatients during their hospital stay. The purpose of our study was to determine the compared effectiveness of different instruction types (individual vs. group vs. caretaker-assisted) for fall prevention in an inpatient rehabilitation setting with regards to 6-month fall incidence post-discharge.

Method

This study was approved by the institutional review boards of Hunter College (City College of New York) and Weill Cornell Medical College.

Participants

Participants were recruited from English-speaking patients aged 18-90 YEARS who were admitted to the Inpatient Rehabilitation Center at New York Presbyterian Hospital/Weill Cornell Medical College where they received fall prevention training from October 2012 to August 2013. The patient must have also been able to complete a 10-Meter Walk Test (10MWT). All participants or their designated health proxy signed a Health Insurance Portability and Accountability Act (HIPPA) form and an informed consent form; a signed copy of the HIPPA form was given to the subject or the legally authorized representative. Exclusion criteria were inability to compete a 10MWT, non-English speaking, and age under 18 years.

Procedure

The following objective measures were obtained to determine participant eligibility for this study.

Mobility.

Mobility was assessed by administering the 10-Meter Walk Test (10MWT), which involved measuring the time required to walk 10 meters with additional distance of approximately 3 feet before and after the marker to minimize the effect of acceleration and deceleration. The subject walked at their preferred speed with or without an assistive device. Three trials were measured and the average of three times was used. The 10MWT can serve as a tool for examining gait capacity and a valid indicator of physical functioning (Cesari et al.,

2005; Peters, Fritz, & Krotish, 2013). Clinical tests have identified it as a predictor for risk of

falling (Persson, Hansson, & Sunnerhagen, 2011). It is a simple test that requires only one

administrator and no special equipment; it is time-efficient and cost-effective.

Cognition.

Patients with a questionable level of cognition as determined by the occupational

therapist received the MoCA version 7.1 test, administered by an occupational therapist as

described in Gagnon et al. (2013). A score of less than 26 out of 30 showed cognitive

impairment. Patients who scored lower than a 26 on the MoCA test were required to have a

caregiver attend fall prevention class with them to either the group or the one-on-one class.

Functional measurement.

The Functional Independence Measure (FIM™) was recorded at admission and at

discharge to indicate functional recovery. FIM™ is the most commonly used functional

assessment tool in the rehabilitation industry; its reliability and validity have been well

recognized. FIM™ was also considered to be least biased when compared with other tools

(Cournan, 2011).

Statistics.

All analyses were completed with SPSS™ statistical software, version 19.0. To detect

where the group differences occurred, we used the Kruskal-Wallis test because some of the

training groups had less than 20 subjects. Post-hoc comparisons were done with the Mann-

Whitney test to determine where the differences occurred between respective groups.

Falls prevention class.

Prior to discharge, patients admitted to inpatient rehabilitation received falls prevention

training in the form of a group or individual class. Certain topics were discussed in the class to

reduce the risk of falling. Topics included home modifications, such as adding additional

lighting; and, behavioral modifications, such as getting up slowly. This class was given in either

a one-on-one or a group setting. Whether patients received group or individual training was

dependent on their availability during the day and level of cognition.

Condition 1: Group Falls Prevention Class

The group falls prevention class was presented by a physical or occupational therapist

using a PowerPoint™ presentation with audience participation encouraged. Classes were held

twice a week with a class size ranging from three to six participants. Family members and

caregivers were encouraged to attend the class with the patient. At the end of the class, patients

received a handout (Appendix A) that included all of the information covered in the presentation.

 Patients with cognitive deficits, as measured by the occupational therapist, received education

with a caregiver. Other patients had a caregiver present secondary to vision, speech/language,

and hearing issues. The caregiver acted as a proxy and was typically a family member who was

caring for the patient upon discharge. Therefore, the Group Falls Prevention class was

subdivided into one group that included all patients who received a group class without a

caregiver (GrR) and a second group that included all patients who received the education with a

caregiver (GrC).

Condition 2: Individual Falls Prevention Class

Fall prevention education was given to another group of patients on a one-to-one basis,

instead of a group setting. Many of the patients were in the individual class because they were

unavailable to attend group class due to a scheduling conflict. The individual falls prevention

classes were given by the physical or occupational therapists working directly with the patients.

 Family members and caregivers were encouraged to attend as well. The physical therapist

utilized the handout (Appendix A) as a guide during the fall prevention education. Patients were

encouraged to ask personal questions and the therapist catered the education to the individual

patient. This group was also subdivided into two smaller groups, patient alone individual class

(InR) and individual class with caregiver (InC), based on need for caregiver due to decreased

cognitive status, vision, speech/language, or hearing ability of the patient.

   Phone interview.

   Phone interviews were conducted by the researchers, using a standardized script, six

months after the patient was discharged from the hospital. Patients were asked a series of

questions about their implementation of the fall prevention methods stated in the falls prevention

class and about the number of falls they have had in the six-month period since leaving the

hospital (Appendix B). Researchers continued to call until each participant or their family was

contacted.

Results

One hundred and twenty-three patients from the inpatient rehabilitation at New York

Presbyterian Hospital were recruited between October 2012 and August 2013. The demographic

characteristics of these 123 patients can be seen in Table 1. Of the 123 recruits, 89 fully

completed the 6-month follow-up phone interview and 1 person partially completed the

interview. Nine people declined to complete the 6-month follow-up phone interview; 5 were

deceased in the 6- month period; 3 were unable to consent; 1 was re-hospitalized; and, 14 were

lost to follow-up. Of the 89, 60 were in the GrR class, 10 were in the GrC class, 12 were in the

InR class and 7 were in the InC class. Table 2 depicts the characteristics of the participants.

Table 1. Demographic Characteristics of the Recruited Subjects

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval		Minimum	Maximum
						Lower Bound	Upper Bound		
Age as a Number	Group Class	77	66.8	17.0	1.9	62.9	70.7	24.	93.00
	Group Class with Caregiver	13	65.8	12.8	3.5	58.0	73.5	35.0	80.00
	Individual Class	17	63.2	19.3	4.6	53.2	73.1	21.0	89.00
	Individual with Caregiver	9	59.4	23.1	7.7	41.6	77.2	22.0	88.00
	Total	116	65.6	17.4	1.6	62.4	68.8	21.0	93.00
MoCA Numerical Score	Group Class	73	29.5	1.4	.16	29.1	29.8	22.0	30.00
	Group Class with Caregiver	12	18.1	5.0	1.4	14.9	21.4	11.0	30.00
	Individual Class	15	29.1	1.9	.50	28.0	30.2	24.0	30.00
	Individual with Caregiver	7	22.2	8.1	3.0	14.7	29.8	11.0	30.00
	Total	107	27.7	4.8	.46	26.7	28.6	11.0	30.00
Admission FIM™	Group Class	75	75.9	12.4	1.4	73.0	78.7	36	98
	Group Class with Caregiver	13	71.1	17.7	4.9	60.4	81.8	47	100
	Individual Class	17	80.1	11.2	2.7	74.3	85.9	63	105
	Individual with Caregiver	9	59.3	21.8	7.2	42.5	76.1	22	86
	Total	114	74.7	14.5	1.3	72.0	77.4	22	105
Discharge FIM™	Group Class	75	96.9	10.7	1.2	94.4	99.4	70	118
	Group Class with Caregiver	13	87.4	11.2	3.1	80.6	94.2	56	99
	Individual Class	17	98.6	9.6	2.3	93.6	103.6	78	115
	Individual with Caregiver	9	78.2	19.9	6.6	62.9	93.5	48	105
	Total	114	94.6	12.7	1.1	92.2	97.0	48	118

Table 2. Demographic Characteristics of the Participants Who Completed the Survey

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval		Minimum	Maximum
						Lower Bound	Upper Bound		
Age as a Number	Group Class	60	66.7	17.6	2.2	62.1	71.2	24.0	93.0
	Group Class with Caregiver	9	64.6	15.3	5.1	52.8	76.4	35.0	80.0
	Individual Class	12	62.5	22.4	6.4	48.3	76.8	21.0	89.0
	Individual with Caregiver	7	54.2	23.2	8.7	32.8	75.7	22.0	76.0
	Total	88	64.9	18.5	1.9	61.0	68.9	21.0	93.0
MoCA Numerical Score	Group Class	57	29.6	1.1	.14	29.3	29.9	25.0	30.0
	Group Class with Caregiver	8	18.3	3.2	1.1	15.6	21.0	14.0	23.0
	Individual Class	11	28.8	2.2	.67	27.3	30.3	24.0	30.0
	Individual with Caregiver	5	24.0	8.6	3.8	13.2	34.7	11.0	30.0
	Total	81	28.0	4.3	.47	27.1	29.0	11.0	30.0
Admission FIM™	Group Class	59	76.3	12.0	1.5	73.2	79.5	40	98
	Group Class with Caregiver	9	72.0	15.5	5.1	60.0	83.9	54	94
	Individual Class	12	79.3	10.2	2.9	72.8	85.8	63	99
	Individual with Caregiver	7	61.0	17.1	6.4	45.1	76.8	35	86
	Total	87	75.0	13.2	1.4	72.2	77.9	35	99
Discharge FIM™	Group Class	59	97.4	11.1	1.4	94.5	100.3	70	118
	Group Class with Caregiver	9	89.5	6.8	2.2	84.3	94.7	78	99
	Individual Class	12	96.9	9.6	2.7	90.7	103.0	78	107
	Individual with Caregiver	7	75.2	21.1	7.9	55.7	94.8	48	105
	Total	87	94.7	13.0	1.4	91.	97.5	48	118

Demographics

We analyzed the statistical differences of the demographic variables such as age, gender, MoCA, 10MWT, and discharge FIM™ scores among groups with different training types using Chi-square analysis.

Age.

A Chi-square analysis was used to compare difference in age among class types. There was no statistically significant difference in age among different class types ($\chi2 = 2.043$, $p = .564$). Chi-square analysis also showed that there were no statistically significant differences among age groups, with distribution by 5-year age increments, between non-fallers and fallers post-discharge ($\chi2 = 14.108$, $p = .442$).

Gender.

A Chi-square analysis was used to examine any gender differences between class types and it found that there was no statistically significant difference in gender between class types ($\chi2 = 3.406$, $p = .333$). Among 89 participants, 33 female participants did not fall and 14 female participants fell post discharge; 34 male participants did not fall and 8 participants fell post discharge. Chi-square analysis found no significant difference in gender and the fall incidence after discharge ($\chi2 = 14.956$, $p = .328$).

Mobility.

No significant difference was present between fallers and non-fallers in their scores on the 10MWT was discovered through *t*-Test analysis (p=.701). Using the Kruskal-Wallis Test, a significant difference ($p = .027$) in the 10MWT times was found between the class training types. The Mann-Whitney test was used for post hoc analysis. Significant differences between the

GrR and the GrC classes (p = .007) and between the GrC and InC classes (p = .034) were found

in 10MWT times.

Cognition.

Kruskal-Wallis test was used to analyze differences in MoCA scores between class types

of all patients recruited; a significant difference was found ($p <$ .001). Mann-Whitney tests

were used for post hoc analysis to compare different class types. There were no significant

differences between GrR and InR (p=.402) and between GrC and InC (p=.307). There were

significant differences between MoCA scores of: GrR and InC (p=<.001); GrC and InR (p=

<.001); and, InR and InC (p=.030). Again, the Mann-Whitey test was used to detect a difference

in MoCA scores between fallers and non-fallers. The analysis found no significant difference

(p= .157) in MoCA scores between fallers and non-fallers.

Discharge FIM™ score.

Kruskal-Wallis tests ($p <$ .005) showed the groups in different class types did not differ

for length of stay ($\chi 2$ = 3.974, p = .264) or admission FIM™ ($\chi 2$ = 6.205, p = .102) but their

discharge FIM™ scores were statistically significantly different ($\chi 2$ = 13.11, p = .004). Using

the Bonferonni correction ($p <$ .008), Mann-Whitney tests showed that the regular group training

class (n=59) had a significant difference from the individual training with caregiver (n=7)

present (p = .004). There were no significant differences between GrR and InR (p = .830), GrC

and InR (p = .059), and GrC and InC (p = .133). Two comparisons of discharge FIM™ scores

failed to meet the criterion of the Bonferonni correction for their mean rank differences: GrR

differed from GrC (p = .017); and, InR and InC (p = .028). When grouped by fall status,

discharge FIM™ score did not appear to have an impact on falls after discharge because there

was no significant difference between fallers and non-fallers (p = .111). Mean (Standard

Deviation) of discharge FIM™ scores for different training types between faller vs. non-faller

are shown in Figure 1.

Figure 1. Mean (Standard Deviation) of Discharge Functional Independence Measure (FIM™)

Scores, Comparing Individuals Who Fell (Fallers) to Those Who Did Not Sustain a Fall (Non-

Faller) After Discharge from Inpatient Rehabilitation
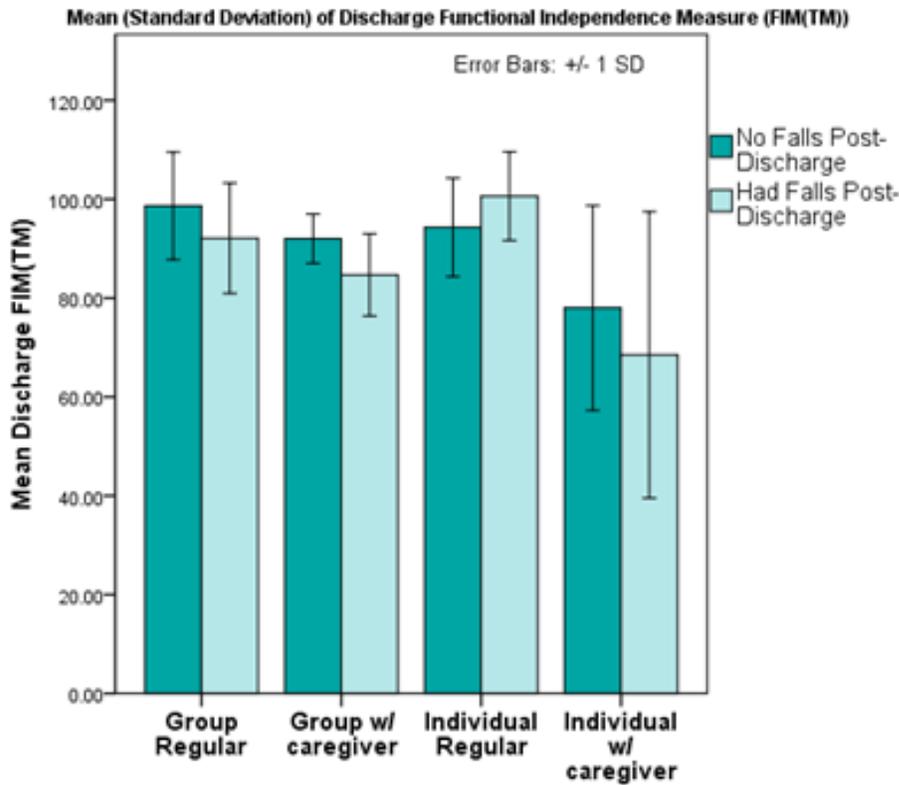
Falls

From the GrR class (n=60), 12 reported falling. From the GrC class (n=10), 3 reported

falling. From the InR class (n=12), 5 reported having falls. From the InC class (n=7), 2 reported

falling. Using Chi-square analysis, no significant differences ($\chi^2 = 2.276$, $p = .427$) were found

among class types in the occurrence of falls.

Phone Interview Results

The results from the phone interview are listed below in the following tables and figures. They are separated by two different comparisons, between subjects who fell after discharge and those who did not (Tables 3-5); and, between the four different class types (Tables 6-8). The tables are further divided between home modifications (Tables 3 and 6), behavioral modifications (Tables 4 and 7), and medical changes (Tables 5 and 8). There were three modifications and changes that were statistically significant between fallers and non-fallers as seen in Figures 2-4.

Fallers vs. Non Fallers.

Table 3. Fallers and Non-Fallers: Frequency Analysis of Home Modifications and Chi-Square

Analysis Results

Home Modification	Non –Fallers			Fallers			*p*
	% Yes	% No	% Not Applicable	% Yes	% No	% Not Applicable	
Used Night Lights	62.7	32.8	4.5	72.7	27.3	0	.496
Decluttered the house	41.8	41.8	16.4	68.2	31.8	0	.040
Repaired railings or put railings in	20.9	56.7	22.4	31.8	54.5	13.6	.477
Removed throw rugs	41.8	34.4	23.9	50.0	31.8	18.2	.769
Removed or clearly marked raised thresholds	12.1	50.0	37.9	27.3	50	22.7	.174
Installed nonskid surface on bathtub floor	55.2	37.3	7.5	59.1	40.9	0	.419
Installed grab bars near toilet and bathtub	50.7	41.8	7.5	591.	36.4	4.5	.760
Used a shower chair or tub transfer bench	69.7	30.3	0	90.9	9.1	0	.047
Installed handheld showerhead	59.7	35.8	4.5	54.5	45.0	0	.481
Used a longhandled reacher, shoehorn, or sponge	62.7	34.3	3.0	54.5	45.5	0	.499
Used a walking aid	77.6	22.4	0	77.3	22.7	0	.974
Repaired walking aid	13.6	32.2	54.2	27.3	22.7	50.0	.319

Figure 2. Home Modification: Decluttered Space: Fallers vs. Non Fallers
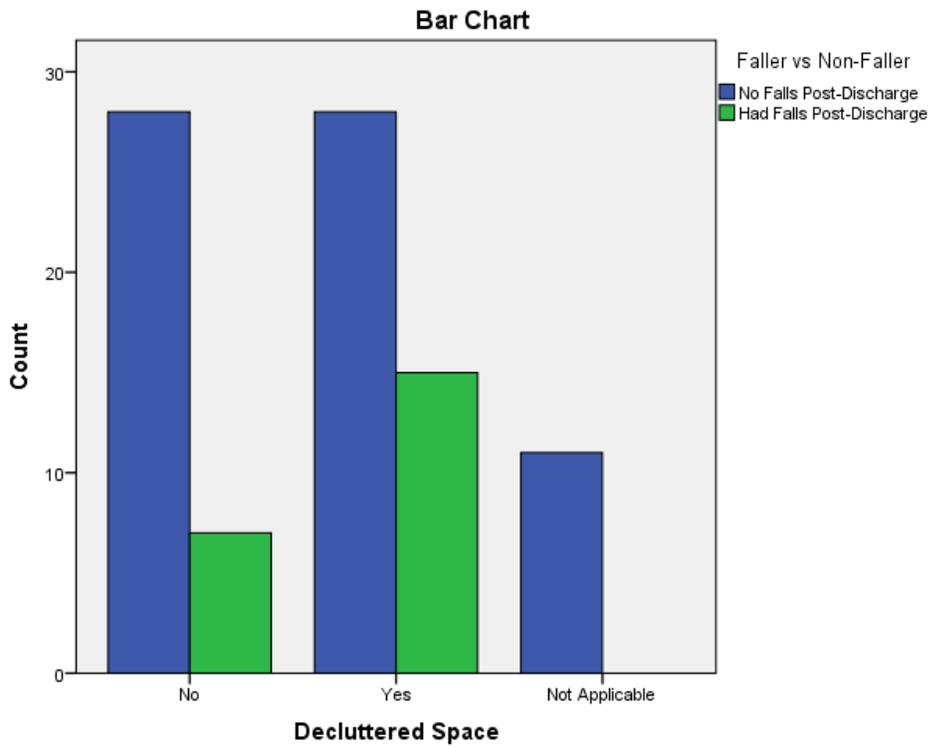
Figure 3. Home Modification: Used Shower Chair or Tub Transfer Bench: Fallers vs Non Fallers
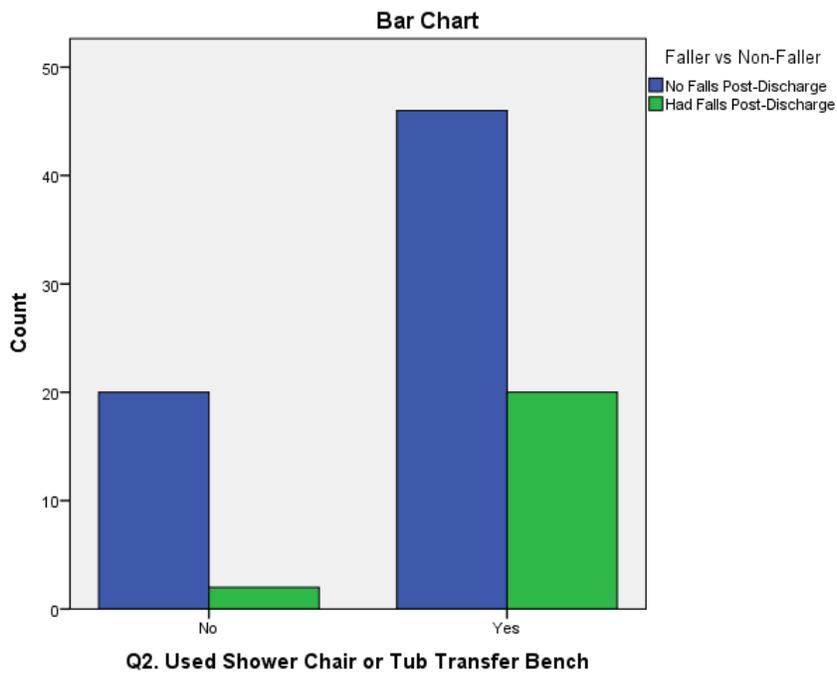
Table 4. Fallers and Non-Fallers: Frequency Analysis of Behavioral Modifications and Chi-

Square Analysis Results

Behavioral Modification	Non –Fallers			Fallers			p
	% Yes	% No	% Not Applicable	% Yes	% No	% Not Applicable	
Got up slowly to avoid dizziness	79.1	17.9	3.0	90.9	4.5	4.5	.297
Avoided rushing to answer the phone or door	87.9	10.6	1.5	90.9	0	9.1	.077
Wore supportive non-slip shoewear	73.1	25.4	1.5	59.1	31.8	9.1	.169
Avoided walking on wet surfaces	86.6	10.4	3.0	86.4	4.5	9.1	.928
Took breaks when performing ADLs	77.3	22.7	0	81.8	13.6	4.5	.156
Asked for help when needed	86.6	11.9	1.5	95.5	0	4.5	.177
Kept commonly used items within reach	95.5	4.5	0	95.5	0	4.5	.133

Table 5. Fallers and Non-Fallers: Frequency Analysis of Medical Changes and Chi-Square

Analysis Results

Medical Changes	Non –Fallers			Fallers			*p*
	% Yes	% No	% Not Applicable	% Yes	% No	% Not Applicable	
Diagnosis of a new disease or syndrome	19.7	80.3	0	40.9	59.1	0	.047
Change in medications since discharge	42.4	57.6	0	57.1	42.9	0	.238
Hospitalization since time of discharge	15.2	84.8	0	28.6	71.4	0	.167
A past medical problem not being controlled	9.2	90.8	0	14.3	85.7	0	.511
Decrease in mental status since discharge	9.1	90.9	0	28.6	66.7	4.8	.013

Figure 4. Medical Changes: Diagnosis of a New Disease or Syndrome: Fallers vs. Non-Fallers
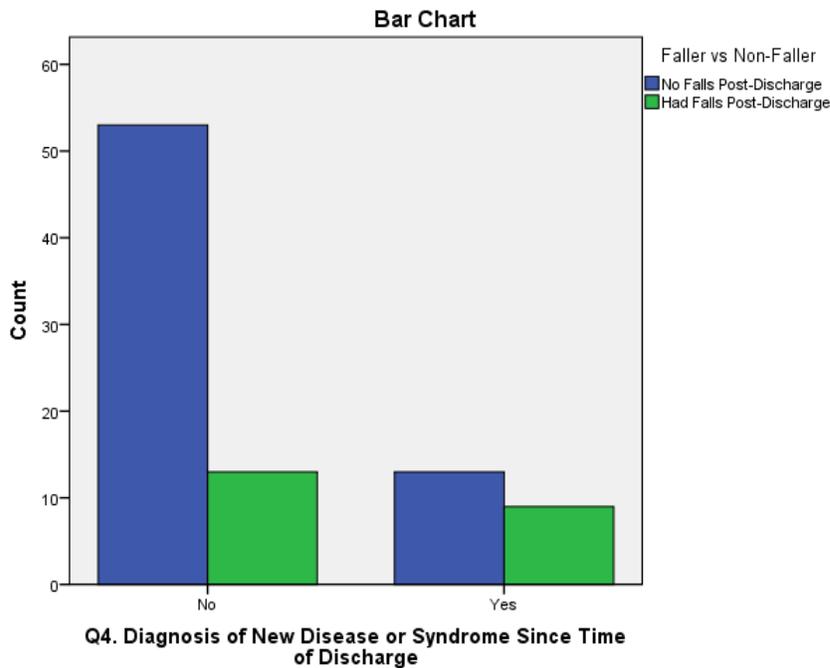
Differences Among Class Types.

Table 6. Class Type: Frequency Analysis of Home Modification and Chi-Square Analysis

Results

Home Modification	Group			Group with Caretaker			Individual			Individual with Caretaker			p
	% Yes	% No	% NA	% Yes	% No	% NA	% Yes	%No	% NA	% Yes	% No	% NA	
Used Night Lights	63.9	31.1	4.9	70.0	30.0	0	58.3	41.7	0	85.7	14.3	0	.79
Repaired railings or put railings in	21.3	50.8	27.9	40.0	60.0	0	25.0	66.7	8.3	14.3	71.4	14.3	.32
Decluttered the house	52.5	34.4	13.1	40.0	40.0	20.0	41.7	58.3	0	28.6	57.1	14.3	.53
Removed throw rugs	40.0	36.7	23.3	80.0	10.0	10.0	33.3	41.7	25.0	42.9	28.6	28.6	.37
Removed or clearly marked raised thresholds	16.7	46.7	36.7	20.0	20.0	60.0	18.2	72.7	9.1	0	85.7	14.3	.08
Installed nonskid surface on bathtub floor	56.7	35.5	8.3	70.0	30.0	0	50.0	50.0	0	42.9	57.1	0	.61
Installed grab bars near toilet and bathtub	53.3	40.6	6.7	60.0	30.0	10.0	50.0	41.7	8.3	42.9	57.1	0	.94
Used a shower chair/ transfer bench	78.0	22.0	0	70.0	30.0	0	66.7	33.3	0	71.4	28.6	0	.82
Installed handheld showerhead	61.7	33.3	5.0	50.0	50.0	0	58.3	41.7	0	42.9	57.1	0	.75

Used a longhandled reacher, shoehorn, or sponge	70.0	26.7	3.3	30.0	70.0	0	50.0	50.0	0	42.9	57.1	0	.12
Used a walking aid	78.3	21.7	0	60.0	40.0	0	83.3	16.7	0	85.7	14.3	0	.51
Repaired walking aid	18.5	27.8	53.7	25.0	12.5	62.5	0	41.7	58.3	28.6	42.9	28.6	.45

Table 7. Class Type: Frequency Analysis of Behavioral Modifications and Chi-Square Analysis

Behavioral Modification	Group			Group with Caretaker			Individual			Individual with Caretaker			p
	% Yes	% No	% NA	% Yes	% No	% NA	% Yes	%No	% NA	% Yes	% No	% NA	
Got up slowly to avoid dizziness	80.0	16.7	3.3	90.0	10.0	0	0	100	0	57.1	28.6	14.3	.29
Avoided rushing to answer the phone or door	89.8	6.8	3.4	90.0	0	10.0	91.7	8.3	0	71.4	28.6	0	.38
Wore supportive non-slip shoewear	70.0	26.7	3.3	70.0	20.0	10.0	66.7	33.0	0	71.4	28.6	0	.88
Avoided walking on wet surfaces	85.0	11.7	3.3	90.0	0	10.0	91.7	8.3	0	85.7	14.3	0	.76
Took breaks when performing ADLs	76.3	22.0	1.7	100.0	0	0	83.3	16.7	0	57.1	42.9	0	.48
Asked for help when needed	88.3	10.0	1.7	90.0	10.0	0	91.7	8.3	0	85.7	0	14.3	.44
Kept commonly used items within reach	96.7	1.7	1.7	100.0	0	0	91.7	8.3	0	85.7	14.3	0	.56

Table 8. Class Type: Frequency Analysis of Medical Changes and Chi-Square Analysis Results

Medical Changes	Group			Group with Caretaker			Individual			Individual with Caretaker			*p*
	% Yes	% No	% NA	% Yes	% No	% NA	% Yes	%No	% NA	% Yes	% No	% NA	
Diagnosis of a new disease or syndrome	25.4	74.6	0	10.0	90.0	0	33.3	66.7	0	28.6	71.4	0	.63
Change in medications since discharge	41.4	58.6	0	50.0	50.0	0	66.7	33.3	0	42.9	57.1	0	.43
Hospital-ization since time of discharge	15.5	84.5	0	20.0	80.0	0	33.3	66.7	0	14.3	85.7	0	.53
A past medical problem not being controlled	3.5	96.5	0	30.0	70.0	0	25.5	75.5	0	14.3	85.7	0	.02
Decrease in mental status since time of discharge	8.6	89.7	1.7	20.0	80.0	0	25.0	75.0	0	28.6	71.4	0	.59

Discussion

The results indicate that fall outcome at six months after discharge was not affected by type of training received. Training groups had similar baseline characteristics in major categories related to falls: age, gender, ethnicity, 10MWT scores, MoCA scores, and admission and discharge FIM scores. There was no significant difference in the occurrence of falls among class types. In addition, the proportion of falls and no falls was similar across the four training groups. This suggests that no training type was more effective than another in decreasing fall incidences. Consequently, we failed to reject the null hypothesis, which is that fall outcome is not affected by group instruction versus individual instruction. However, this study found that overall there were more non-fallers. Our study found that, at six months, only 25 percent of the participants fell. This figure is lower than the yearly rate of 33 percent of falls in adults aged 65 and older reported by the CDC. Therefore, the falls prevention class was effective in decreasing falls rate. Each training group had similar characteristics in major categories related to falls.

Demographics

Most research shows that fall incidence increases with age, but there is no consensus yet on gender and falls. Fall incidence and severity of fall-related complications rise steadily from middle age and peaks at age 80 and older (Rao, 2005; Rowe, 2011). Alamgir, Muazzam, & Nasrullah (2012) showed that falls mortality among all unintentional injury mortality increased with age (23.19% for 65-69 years and 53.53% for 85+ years), and the proportion of falls mortality was significantly higher among females than males. A study conducted by Rossat et al. (2010) concluded that the female gender is associated with the recurrence of falls. Stevens & Sogolow (2005) found that the rate for non-fatal, unintentional fall-related injuries for elderly

women is 40-60% higher than for men of comparable age. However, in a recent study done by

Pereira, Baptista, & Infante (2013), when factoring in the values for comorbidities, lean and fat

body mass, and balance equally, men had a higher probability of falling than women. Our study

found no significant difference in gender or age and the rate of fall post discharge. This could be

due to our limited sample size, with the most number of subjects in the 65-69 age group and less

than 6 subjects in each of the 65 and younger age groups. As mentioned earlier, prior research

studies were conducted in the inpatient setting, skilled-nursing facilities, or the general

population. Little research has been performed on our particular patient population, community-

dwelling subjects discharged from acute inpatient rehabilitation.

Mobility

Slower gait speed has been shown to be directly associated with an increased fall risk; in

a study done in 19-45 year-old subjects, a decrease in gait speed increases the odds of fall (Espy,

D., Yang, F., Bhatt, T., & Pai, Y, 2010). Verghese, Holtzer, Lipton, & Wang (2009) showed that

a gait speed less and 0.7m/s had a 1.5-fold increased risk for falls compared with normal speed in

the 70 and older population. In our study, the gait speed was measured by 10 MWT, which is a

reliable tool for collecting gait speed and has a high reliability and concurrent validity (Fritz &

Lusardi, 2009; Peters et al., 2013). Our results did not present any significant difference between

fallers and non-fallers in their scores on the 10MWT.

Cognition

Less research has examined the relationship between mild cognitive impairment and falls,

but a recent study conducted by Delbaere et al. (2012) suggested that the incidence of injurious

or multiple falls in people with mild cognitive impairment was nearly doubled when compared

with people who are cognitively intact. Tinetti, Speechley, & Ginter (1988) had also reported

that older adults with cognitive impairment were five times more likely to fall than those with impairment. Our results showed that MoCA scores for fallers and non-fallers among different training groups were similar except for the InC group, but there are too few cases in the InC group to establish a valid connection. Our analysis found no significant difference in MoCA scores between fallers and non-fallers. This could be due to the our small sample size and skewed distribution towards the cognitive-intact category, making it difficult to make a meaningful comparison.

Functional Status

Discharge FIM™ outcomes, particularly in the Transfer domain, have been linked to higher fall occurrence in a study conducted by Chin, Wang, Ong, Lee, & Kong (2013); FIM™ scores, in the Motor and Cognitive domains have also been tied to fallers in the inpatient setting according to Lee & Stokic (2008). Forrest et al. (2012) concluded that FIM™ score was inversely related to the rate of falls. But our study found no significant difference between discharge FIM™ score and the occurrence of falls among different training types. This is in concordance with a retrospective study conducted by Petitpierre, Trombetti, Carroll, Michel, & Herrmann, (2010); their study showed a non-linear relationship between FIM™ score and falls.

Home Modifications

A greater percentage of subjects fell despite making the following changes: decluttering the house (68.2% within Faller vs Non-Faller), and using a shower chair or tub transfer bench (90.9% within Faller vs Non-Faller). For both of these questions on the survey, the interviewer had difficulty in getting a definitive yes or no answer from the respondent. When asked about making these changes in their home, subjects were supposed to respond by saying yes, no, or not applicable. Even though 68 percent of participants reported decluttering their home, this figure

may have included those who decluttered their house prior to discharge, or never had clutter in

the first place. Furthermore, everyone's definition of clutter varies. Answers to this question

were too subjective and varied to measure with a simple yes, no, or not applicable. Ninety

percent of the fallers reported using a shower chair or tub transfer bench. Some participants

reported using this equipment, but only in the beginning after being discharged. Like the

question about clutter, it was hard to measure their response only using yes, no, or not applicable.

 It is possible that they stopped using the adaptive equipment prematurely. In addition, the

equipment might have been used incorrectly because there was no home assessment.

There were no differences between fallers and non-fallers whether or not they made the

following home modifications: used a night light; added or repaired railings; removed throw

rugs; removed or clearly marked raised thresholds; installed non-skid surface in bathroom;

installed grab bars near the tub and/or toilet; installed hand-held shower; used long-handled

reacher, shoehorn, or sponge; used walking aid; and, repaired walking equipment.

Personal Safety Modifications

Our findings indicate that the frequency of implementing behavioral changes to avoid

falls had no impact on falls rate. There was no significant difference between fallers and non-

fallers whether or not they did the following: getting up slowly to avoid dizziness; not rushing

to answer the phone or door; wearing supportive/nonslip shoe wear; avoiding walking on wet

surfaces; taking breaks when performing daily self-care routine; asking for help when needed;

and, keeping commonly-used items within reach.

Changes in Medical Condition or Medication

Our study found that changes in medical condition affected falls rate. Forty percent of

fallers had the diagnosis of a new disease or syndrome, and close to 30 percent experienced a

decline in mental status. This suggests that physical and mental health are factors to consider when assessing falls risk. Though not formally documented, a number of patients reported during the phone interview that they developed depression after leaving the hospital which was considered both a disease and a decrease in mental status. Perhaps these physical and mental health changes created an additional burden on the patient, thereby putting them at a higher risk for falls. Thus, it is possible that despite making the suggested home and behavioral modifications, subjects fell because of a change in their medical condition. Interestingly, the results from our study showed that a change in medications had no effect on falls rate. There was no significant difference between fallers and non-fallers whether or not they had a change in medications since time of discharge. Other research, however, has correlated the addition of medications with a significant increase in risk of falls in elderly patients, regardless of drug class (Freeland et al, 2012).

Limitations and Future Directions

Results from this study should be considered in light of several limitations. This study lacked a control group of subjects that did not receive falls prevention training. The number of completed phone interviews was less than anticipated, due to fewer subjects agreeing to participate and those lost to follow-up. Group size was uneven, with three of the four training groups consisting of less than 20 subjects.

Additionally, we were not able to recruit our original target sample size. Therefore, some of our analyses related to interaction effects were underpowered. With regards to the survey, we omitted questions regarding exercise and general physical health. This is an important aspect to consider given that previous fall prevention studies show exercise as an effective intervention (Barnett et al., 2003; Campbell et al., 1997; El-Khoury et al., 2013; Gardener et al., 2000). Other

changes to the survey include adding questions about fear of falling, falls history, where the falls

occurred, and vision changes. In the cohort study Hill et al. (2013) conducted, 68.5 percent of

falls occurred inside the home for their community-dwelling participants, with the bedroom

being the most frequent location. While the phone interviewers did not formally investigate and

document how and where the fall incidences occurred, a number of the participants volunteered

this information. An estimate showed that indoor falls were more frequent than those external to

the home environment.

Re-phrasing current questions for clarity and removing ones that are too subjective would

also improve the survey as a tool. In addition, we must consider the practicality and financial

feasibility of implementing certain home modifications. Along with making the home

modifications, a home assessment by a license professional would have ensured that the

equipment was not only installed correctly, but also being used properly. Other limitations

include reporting bias and the absence of visual cues in telephone interviews. The absence of

visual cues may prevent people from disclosing information deemed sensitive (Groves, 1990;

Novick, 2008). Some studies regarding the use of phone interviewing in research have shown

that they induce social desirability bias, which occurs when respondents want to show

themselves in the best light. As a result, desirable behaviors are over-reported, and undesirable

behaviors are under-reported (Moum, 1998; Bowling, 2005; Novick, 2008).

Instead of following up at six months from discharge, future studies can follow up with

patients at one year after discharge. Twelve months allows for all four seasons, giving a more

representative picture of falls incidence throughout the year. Another option is to follow up at

one month, so the time frame between receiving falls prevention training and follow-up

measurements is closer. It might be easier for subjects to recall the number of falls over one

month instead of six, especially if there are any memory issues. Furthermore, the falls

prevention class might be more recent in their minds when following up at one month after

discharge as opposed to six months. There is also the option to conduct monthly follow up over

the course of one year, because climate and season may influence fall rates for older adults

(Stevens, Thomas, & Sogolow, 2007). Future research should also include an economic

evaluation of falls prevention programs in an inpatient rehabilitation setting.

Implications

Patient education prior to discharge from inpatient rehabilitation appears to be effective

in fall prevention after discharge for patients with a wide variety of admitting diagnoses. Most

participants made some of the environmental, behavioral, and medical changes that were

appropriate to their situations. Physical and mental status deterioration were the issues that were

most frequently reported among people who fell after discharge. Thus, programs that only look

at specific interventions, like balance training or home-modifications, should include a patient

education component to increase effectiveness. Based on our findings, an interaction among fall

incidence and physical or mental deterioration might indicate that physician follow-up after

discharge from inpatient rehabilitation needs to play a role in fall prevention. A larger sample

size is needed in order to determine if training type (group versus individual training, with or

without a caretaker present) has an influence on fall prevention.

Appendix A - Falls Prevention Class Handout

NewYork-Presbyterian
The University Hospital of Columbia and Cornell

Fall Prevention at Home

Fall Prevention at Home

One-third of adults aged 65 and older fall each year. Falls are the most common cause of nonfatal injuries among older adults. Most fractures in older adults are caused by falls. Though very common, falls can often be prevented.

Most falls occur in the home setting. Common ways people fall at home include:

- Tripping over obstacles.
- Hurrying to answer the phone.
- Rushing to the bathroom.
- Getting out of bed too quickly.
- Standing up too quickly.
- Walking at night without a light.
- Getting in and out of a bathtub.
- Tripping over throw rugs or raised thresholds.
- Slipping on a wet or slippery surface.

What can increase your risk of falling?

- History of falling
- History of stroke
- Uncontrolled diabetes
- Parkinson's Disease
- Multiple Sclerosis
- Heart disease
- Osteoarthritis
- Medication side-effects
- Urinary urge
- Numbness in your feet
- Balance problems
- Vertigo or dizziness
- Difficulty with memory or concentration
- Muscle weakness
- Vision problems
- Fear of falling
- Fatigue/insomnia
- Recent illness

Many of these conditions can be managed by your doctor or your rehabilitation therapist to help prevent falls before they happen.

What can you do to prevent falls?

Medical Management:
Get regular vision check-ups. Vision changes can increase your risk of

falls. Always keep an up-to-date list of all of your medications:

- Bring the list to all of your doctors' appointments.
- Review the dosages and time of day that you are taking your medicines with your doctor.
- Discuss any side-effects and drug interactions with your doctor, especially if a new medicine has been added.
- Regularly check the expiration dates on your medicines.

Medical Management
(continued):

Ask your doctor which medicines can put you at risk for falling. Some medicines have side-effects which can include:

- Dizziness or lightheadedness
- Feeling extra sleepy
- Heart racing or skipping a beat
- Extra swelling in your legs
- Confusion, difficulty paying attention, or difficulty remembering things

Important: Call your doctor if you see any of these changes or notice anything unusual.

Daily Routine:
Make small changes to your habits and routines to help prevent falls. Some suggestions are:

- When getting out of bed, sit at the edge of the bed before standing to avoid dizziness.
- When getting up from a chair, make sure you have your balance before walking.
- Don't rush to answer the door bell or telephone.
- Wear supportive shoes with non-slip soles.
- Do not walk on wet or slippery surfaces.
- Pace yourself to conserve energy. Break up your tasks and take rest breaks.
- Know your abilities and your limitations. Ask for help when needed.

Home Safety:
Consider these home safety tips to reduce your risk of falls:

- Good lighting is necessary to keep your balance and move safely.
- Make sure all stairwells and walkways are well lit.
- Use nightlights in hallways, bedrooms and bathroom.

Home Safety *(continued):*

- Make sure staircases and railings are sturdy and in good repair.
- Remove clutter in order to have a clear walking path.
- Remove throw rugs. If you cannot remove them, tape down the edges with double-sided tape.
- Remove raised thresholds. If you cannot remove them, use brightly colored tape to make the threshold more visible.
- Make sure walking surfaces are smooth. Repair all cracks, raised tiles or loose boards.
- Store frequently used items within reach.
- Place a non-skid surface on the floor of the bathtub.
- Install grab bars near your toilet and bath tub. (Towel bars should not be used as grab bars.)

Adaptive Equipment:
Use different types of adaptive equipment to make your daily tasks easier.

- Sit on a shower chair when bathing if you feel weak or imbalanced.
- Install a handheld shower head.
- Use a raised toilet seat if you have a hard time getting up from a low seat.
- If you have difficulty bending or reaching, use long-handled adaptive equipment. These can include long-handled reachers, shoehorns, and sponges.
- Use your walking equipment as recommended by your therapist.
- Replace worn-down walker, crutch or cane tips.

Exercise

Make exercise part of your routine. Improving your fitness has been proven to reduce your risk of falling.

- Do basic strengthening and stretching exercises to keep your body strong and flexible.
- Perform balance exercises to improve your stability.
- Build up your endurance through aerobic exercise such as walking.

This will help you have the energy to do your activities safely with less fatigue.

Important: Check with your doctor and therapist before starting any new exercise.

Are You Afraid of Falling?

You are not alone. The fear of falling is very common after leaving the hospital.

• 73% of people who have fallen in the past year develop a fear of falling.
• Fear of falling can lead to balance problems and difficulty walking. It can also lead to less involvement in enjoyable activities.

Overcome your fear of falling:

• Be as active as possible in your home and community.
• Build up your confidence by moving around safely.
• Follow the advice of your rehabilitation therapist.
• Practice, practice, practice!

What else can I do?

• Keep a list of important phone numbers at key locations throughout your home, including near every telephone.
• Hip protectors can help to prevent hip fractures caused by falls, especially if you have osteoporosis. Talk to your rehabilitation therapist for more information.
• Personal emergency response systems allow you to call for help in an emergency at home. Life Alert is one example. Speak with your social worker for more details.

Appendix B - Phone Interview Questions

Falls Prevention Follow-Up Phone Interview

Hello my name is _____ and I'm calling from New York Presbyterian Hospital. I'm looking for _____ is this her? (If they say no then ask to speak with them and if they are not home then say "ok we'll call her back") When you were a patient back in _____ we started a study with you about falls prevention and received an informational brochure. Do you remember this? At the time we discussed a follow-up phone interview as part of the study and, now, this is it. It takes about 10 – 15 minutes to complete. You can skip over any question you do not wish to answer and all of your answers will be kept confidential. Is now a good time to do the survey? [If they say no, then ask what is a better time]
Ok, if at any point you do not wish to continue doing this survey you may stop.

Demographics
Are you living alone? Yes or No
      If "No"
            With whom do you live?
Does anyone help you with your day-to-day activities? Yes or No

In what type of home do you live?
- Apartment vs. Private house
- If Apartment:
  - Are there steps to enter the building? Rail?
  - Elevator?
  - Are there steps inside the apt? Rail?
- If Private house:
  - Are there steps to enter? Rail?
  - Are there steps inside? Rail?

Question 1: During falls prevention education, we discussed ways to make your home safe. Since leaving the hospital, what changes have you made in your home based on what you learned? Please Respond Yes, No, or Not Applicable to the following changes:
- Increased lighting in areas like stairways, hallways, and other areas around the home
- Used night-lights
- Repaired railings or put railing in.
- De-cluttered the house
- Removed throw rugs
- Removed raised thresholds or clearly marked them.
- Put a nonskid surface on the bathtub floor.
- Installed grab bars near your toilet and bath tub.

Question 2: During falls prevention education, we discussed the use of adaptive equipment such as long-handled shoe horn. Since leaving the hospital, have you used any of the following devices? Please Respond Yes, No, or Not Applicable to the following changes:

- Use of a shower chair or tub transfer bench.
- Installed a handheld shower head.
- Using a long handled reacher, shoehorn, or sponge.
- Using walking aid, such as a walker or cane
- Repairing walking equipment like your walker or cane if it becomes worn.

Question 3: During falls prevention educations, we discussed certain changes to your daily routine to help prevent falls. Since leaving the hospital, have you made any changes to your daily habits or routines? Please Respond Yes, No, or Not Applicable to the following changes:

- When waking up or standing up, getting up slowly to avoid dizziness.
- Not rushing to answer the phone or door.
- Wearing supportive, nonslip shoe wear.
- Not walking on wet surfaces.
- Taking breaks when performing your daily self-care routine
- Asking for help when needed
- Keeping commonly-used items within reach.

Question 4: Have there been any changes in your health status since you left the hospital? Please Respond Yes, No, or Not Applicable to the following changes:

- A diagnosis of a new disease or syndrome
- An increase or decrease in the number of medications you are taking.
- A trip to the hospital.
- A past medical problem not being properly controlled.
- Decrease in mental status.

Question 5: A fall is defined as unintentionally coming to rest on the ground, the floor, or another lower level. We do not count coming to rest against furniture, a wall, or another structure or person as a fall. In the past 6 months, how many falls have you had?

- 0
- 1
- 2
- 3
- 4
- more than 4

Question 6: If the patient answers more than 4 times- What was the frequency of these falls?

- once a month
- twice a month

- once a week
- multiple times a week

Question 7: What do you think caused your falls?
- Change in medical status
- slipped
- tripped over something
- lost balance
- knees buckled
- got dizzy
- fainting
- other, specify briefly: _____

Question 8: When your fall(s) occurred, were you using an assistive device (such as cane or walker)
Yes/No

Question 9: Can you please list for me your current medications?

Thank you so much for helping with this research. If you have questions about this study, you may call Dr. Suzanne Babyar at the Hunter College Doctor of Physical Therapy program 212-481-4469 or the other contacts listed on the consent document we gave you.

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