

The Development of Fear of Falling Among Community-Living Older Women: Predisposing Factors and Subsequent Fall Events

Susan L. Murphy,¹ Joel A. Dubin,² and Thomas M. Gill³

¹University of Michigan, Institute of Gerontology, Ann Arbor.

²Department of Epidemiology and Public Health, Yale University School of Medicine, New Haven, Connecticut.

³Dorothy Adler Geriatric Assessment Center, Yale University School of Medicine, New Haven, Connecticut.

Background. Fear of falling is a common and potentially modifiable health problem among older persons. However, relatively little is known about who develops fear of falling or why.

Methods. From a representative cohort of community-living persons aged 72 years or older, we evaluated 313 women who had no fear of falling. These participants underwent a comprehensive in-home assessment and were reassessed for fear of falling 1 year later. Fall events were ascertained monthly using a validated fall calendar.

Results. 84 (27%) participants developed fear of falling at 1 year and 77 (25%) participants experienced at least one fall event. The predisposing factors for developing fear of falling included age 80 years or older (adjusted relative risk 1.48; 95% confidence intervals 1.04–2.12), visual impairment (1.42; 1.01–2.00), a sedentary lifestyle (1.96; 1.35–2.84), and no available emotional support (2.64; 1.57–4.41). The occurrence of a subsequent fall event was also significantly associated with developing fear of falling (unadjusted relative risk 1.70; 1.18–2.45), although this effect was observed only among participants who had at least one predisposing factor.

Conclusions. Among community-living older women, fear of falling develops due to a combination of predisposing factors and subsequent fall events. Since many of the predisposing factors are related to fall risk, preventive efforts to reduce fear of falling may also decrease the likelihood of falling.

FEAR of falling is a common and potentially disabling problem among community-living older persons. Approximately 25% to 55% of older persons report having a fear of falling (1–7) and, among those who are fearful, between 20% and 55% report restricting their activity (4,8–10). This activity restriction may lead to reduced social interaction (2–4) and physical deconditioning (4,11,12), and is therefore a serious health threat to older persons. Although there is growing awareness of this problem among health care providers, additional research is needed about who develops fear of falling and why, so that improved preventive strategies can be developed.

The factors independently associated with fear of falling in cross-sectional studies include female gender (4,9), a previous history of falls or injurious falls (2,4,9), visual impairment (2), decreased physical function or mobility (2,9), poor mental health (2), decreased social contacts (4), disability in activities of daily living (ADL) (14), and a sedentary lifestyle (7). Only two longitudinal studies have examined the predictors (or predisposing factors) of fear of falling. In the first, Vellas and colleagues investigated older persons who had experienced a recent fall and found that female gender, gait abnormalities, lack of economic resources, and poor cognitive status were associated with fear of falling (6). Because study participants were recruited after they had fallen, however, it is possible that their fear of falling actually preceded their fall event. In the second study, Friedman and colleagues found that female gender, older age, history of self-reported falls within the preceding

year, use of 4 or more medications, and the presence of psychiatric disturbances were associated with the development of fear of falling (15). No study to date has examined the role of subsequent fall events on the development of fear of falling or the predisposing factors for fear of falling among women exclusively. Focusing on women is appropriate because, compared with men, they have higher rates of both fear of falling (2, 4) and serious fall injuries (16–18).

The goals of the current study were twofold: first, to identify the predisposing factors for fear of falling among a sample of community-living older women and, second, to evaluate the effect of subsequent fall events on the development of fear of falling.

METHODS

Sample

Participants in this study were members of the Project Safety cohort, a representative sample of noninstitutionalized persons, aged 72 and over, living in New Haven, Connecticut, in 1989 (16,19). Of this sample, 804 (73%) cohort members were women. Of the 405 women who reported no fear of falling at baseline, 21 died, 46 refused the 1-year follow-up interview, and 25 had incomplete data, leaving 313 participants in the analytic sample. As compared with these study participants, those who were excluded did not differ significantly in age, number of chronic conditions, or self-reported fall history, but they reported more disability in basic ADLs (chi-square [χ^2] = 5.41, p = .02)

and less participation in instrumental activities of daily living (IADLs) ($\chi^2 = 5.62$, $p = .02$).

Data Collection and Measures

A comprehensive in-home assessment was completed by trained research nurses at baseline and at 1 year. Fear of falling was measured by asking participants whether they were afraid of falling (yes/no). This assessment of fear of falling has been shown to have substantial test-retest reliability ($\kappa = .66$) (20).

Predisposing factors.—Potential predisposing factors were identified at baseline from the following domains: demographic, health status, physical function, and psychosocial function. Age was dichotomized at 80 years or older based on previous analyses of this cohort (10,21). Participants were asked if they had a history of the following chronic conditions: myocardial infarction, stroke, cancer, diabetes mellitus, previous hip fracture, other fractures since age 50, Parkinson's disease, amputations, or arthritis. The number of chronic conditions was summed, and a cut-off point of two or more was used (10,21). Previous history of falls was ascertained by asking participants to recall whether they had fallen in the past year. Medications were recorded directly from bottles and containers. A cut-off point of 5 or more medications was used (10,21). Near visual acuity was assessed with the Rosenbaum card and the percentage of visual impairment was calculated (22). Participants with a score of 50% or greater were considered to be visually impaired (10,21). Chronic dizziness was defined as having dizzy episodes within the past 2 months lasting at least 1 month (23). Cognition was assessed by the Mini-Mental State Examination (MMSE) (24); participants with a score of less than 24 were considered to be cognitively impaired (10).

Physical function measures included gait and balance, ADL disability, IADL participation, and sedentary lifestyle. Gait was measured by the evaluation of path deviation, turning, step continuity, and step symmetry over a 20-foot course. Balance was measured by examining steadiness during several standing maneuvers: feet touching, feet touching while being nudged, tandem stand, and one-leg stand. Gait and balance scores were combined into a composite that ranged from 0–22 (8). Participants with a composite score of less than 12 out of 22 were considered to have impaired gait and balance (21,25). Self-reported function in 6 basic ADLs was assessed by the modified Katz Index (26). Disability was defined as the need for human assistance or the inability to complete at least 1 ADL. Self-reported function in IADLs was assessed by ascertaining the frequency of participation in light and heavy housework, light and heavy yard work, heavy home repair, and driving. Responses were dichotomized as “participate” versus “do not participate”; a cut-off point of participation in fewer than 2 IADLs was used (10). Participants were considered sedentary if they reported no participation in any stretching exercises/calisthenics or any sports (e.g., running, swimming, tennis, skiing, golf, bowling, bocce, fishing, or other individually reported activities) within the previous month,

and in an average day, reported walking less than 1 city block and no stair-climbing (7).

Psychosocial variables included anxiety, depression, instrumental support, and emotional support. Anxiety was assessed by the Spielberger State-Trait Anxiety Index (27); participants with a score of 32 or greater were determined to have anxiety (21). Depression was assessed by the Center for Epidemiologic Study Depression scale (28); participants with a score of 16 or greater were determined to have depressive symptoms (19,21). Participants were asked whether anyone was available to help them with daily tasks (instrumental support) and whether anyone was available to talk over problems with or to help make a difficult decision (emotional support). Responses were coded as not available versus available or not needed.

Subsequent fall events.—Fall events were ascertained using a validated fall calendar with a 99% completion rate (16,29). Participants were asked to mail the calendars back at the end of each month and were contacted by phone if the calendar was not received or if they reported at least one fall event during that time period. Participants with one or more subsequent fall events were compared with those who reported no falls during the follow-up period.

Statistical Analyses

Chi-square tests were used to identify potential predisposing factors for the development of fear of falling and to evaluate the association between subsequent fall events and the development of fear of falling. In the multivariate analysis, binomial regression (30) was used to identify independent predisposing factors. All variables significantly associated with developing fear of falling at the level of $p \leq .15$ from the bivariate analysis were entered into the binomial regression model. Backward elimination was used for variable selection, with the requirement of $p < .15$ for a variable to remain in the model. The model was adjusted for housing type (age-restricted private, age-restricted public, or community) since residents of age-restricted housing had originally been oversampled (16). For the anxiety measure, a dummy variable was created to represent participants who had missing observations (6%) (10,29). Adjusted relative risks and 95% confidence intervals were estimated through binomial models using Generalized Interactive Modeling (30).

To evaluate the interrelationship of predisposing factors and subsequent fall events on the development of fear of falling, we used a cross-stratification technique. Rates of fear of falling were stratified by the number of predisposing factors and subsequent fall events. The Fisher exact test and chi-square test were used to analyze statistical differences in the rates of developing fear of falling. All analyses were conducted using SAS version 8.1 software (SAS Institute, Inc., Cary, NC).

RESULTS

The mean age of the 313 participants was 79.3 ± 5.0 years (range, 72–98 years); 84% were white, 81% lived alone, 41% had two or more chronic conditions, 7% reported disability in 1 or more basic ADLs, and 33% had

Table 1. Development of Fear of Falling According to Potential Predisposing Factors (*N* = 313)

Predisposing Factors	Fear of Falling Developed When Risk n/N (%)		<i>p</i> Value*
	Present	Absent	
Demographic			
Age ≥80 years	42/135 (31.1)	42/178 (23.6)	.14
Health Status			
≥2 chronic conditions	37/129 (28.7)	46/182 (25.3)	.50
Fall history within the previous year	34/102 (33.3)	50/211 (23.7)	.07
≥5 medications	30/111 (27.0)	54/202 (26.7)	.96
Vision ≥50% impaired	36/111 (32.4)	47/201 (23.4)	.08
Chronic dizziness	22/60 (36.7)	59/250 (23.6)	.04
Mini-Mental Status Exam <24	22/87 (25.3)	62/226 (27.4)	.70
Physical Function			
Balance gait score <12/22	37/109 (33.9)	45/198 (22.7)	.03
Disability in any IADLs	6/21 (28.6)	78/292 (26.7)	.85
Participation in <2 IADLs	9/30 (30.0)	74/282 (26.2)	.66
Sedentary lifestyle	22/52 (42.3)	60/251 (23.9)	.01
Psychosocial Function [†]			
Anxiety trait ≥32 STAI	39/114 (34.2)	39/180 (21.7)	.02
Depressive symptoms ≥16 CESD	15/43 (34.9)	62/245 (25.3)	.19
Instrumental support not available	7/15 (46.7)	75/296 (25.3)	.07
Emotional support not available	9/17 (52.9)	73/294 (24.8)	.01

Notes: * Significance testing was done using chi-square tests.

[†] Anxiety Trait was defined as a score of 32 or greater on the State Trait Anxiety Index (STAI).

Depressive symptoms were defined as a score of 16 or greater on the Center for Epidemiologic Study Depression Scale (CESD).

IADL = instrumental activities of daily living.

a history of 1 or more falls during the preceding year. The mean education and MMSE score were 9.9 ± 3.2 years and 25.0 ± 4.1 , respectively. Subsequent fall events were experienced by 77 (25%) participants. Eighty-four (27%) participants developed fear of falling at 1 year.

Table 1 shows the results of the bivariate analyses. The factors significantly associated with developing fear of falling at $p < .05$ included chronic dizziness, impaired balance and gait, a sedentary lifestyle, anxiety, and no available emotional support. The subsequent occurrence of one or more fall events was also significantly associated with developing fear of falling. Fear of falling developed among 39% of participants who sustained subsequent fall events as compared with 23% of participants who had no subsequent fall events (unadjusted relative risk = 1.70 [1.18–2.45]; $p = .01$).

Table 2 shows the results of the multivariate analyses for the potential predisposing factors. Of the nine factors entered into the multivariate model, two (impaired balance and gait and no available instrumental support) were dropped because they were no longer associated with the development of fear of falling at the level of $p \leq .15$. Four predisposing factors were statistically significant at $p < .05$: age 80 years or older, visual impairment, sedentary lifestyle, and no available emotional support.

Table 3 shows the interrelationship of predisposing factors and subsequent fall events on the rates of fear of falling. Subsequent fall events had no effect on the

Table 2. Predisposing Factors for the Development of Fear of Falling (*N* = 300)*

Predisposing Factors	Prevalence (%)	Adjusted RR (95% CI)
Age ≥80 years	42	1.48 (1.04–2.12)
Fall history within the previous year	31	1.37 (.97–1.94)
Vision ≥50% impaired	35	1.42 (1.01–2.00)
Chronic dizziness	19	1.43 (.97–2.11)
Sedentary lifestyle	17	1.96 (1.35–2.84)
Anxiety trait	35	1.41 (.97–2.05)
Emotional support not available	5	2.64 (1.57–4.41)

Notes: * Includes participants who had no missing data for any of the predisposing factors except for anxiety trait. All models were adjusted for housing type and for missing data on the anxiety trait measure (see Methods).

RR = relative risk; CI = confidence interval.

development of fear of falling among participants who had no predisposing factors. In contrast, participants who had one or more predisposing factors were significantly more likely to develop fear of falling if they experienced a subsequent fall event ($p = .02$).

To further explore the role of falls on the development of fear of falling, we compared the rates of fear of falling among participants with and without evidence of a recent or subsequent fall. Participants who reported 1 or more falls in the year prior to baseline or who experienced a subsequent fall event during the 1-year follow-up period were significantly more likely to develop fear of falling than participants with no fall history or subsequent fall events (35% vs 20%; $p = .004$).

DISCUSSION

In this population-based sample of community-living older women, we found that the development of fear of falling was attributable to a combination of predisposing factors and subsequent fall events. These findings provide important new information regarding the development of fear of falling in this population.

We identified four predisposing factors for the development of fear of falling: age 80 years or older, visual impairment, a sedentary lifestyle, and no available emotional support. Three of these factors are potentially modifiable and, hence, may serve as targets for preventive interventions. The high prevalence of predisposing factors suggests that many older women may potentially benefit from interventions designed to prevent the development of fear of falling.

We found that predisposing factors and subsequent fall events were closely related. Specifically, subsequent fall events increased the likelihood of developing fear of falling only among participants who were already predisposed. Furthermore, 85% of participants who experienced a subsequent fall event had at least one predisposing factor for fear of falling. In a recently published study, Friedman and colleagues (15) found that fear of falling and falls share a similar set of risk factors. Of note, two of the four predisposing factors identified in the current study for the development of fear of falling (age 80 years or older and visual impairment) were associated with an increased risk of sustaining an injurious fall in prior research (17,31).

Table 3. Development of Fear of Falling According to the Presence of Predisposing Factors and the Occurrence of Subsequent Fall Events (N = 302)*

	Subsequent Fall Events n/N (%)		
	None	One or More	Total
Baseline risk			
No predisposing factors [†]	16/83 (19)	2/11 (18)	18/94 (19)
≥1 predisposing factors(s) [‡]	37/146 (25)	26/62 (42)	63/208 (30)

Notes: * Includes participants who had no missing data for the statistically significant predisposing factors.

[†] $p = 1.0$ by the Fisher exact test.

[‡] $p = .02$ by the chi-square test.

The relationship between falls and fear of falling is likely bidirectional. Fear of falling has been identified as a risk factor for falls (15), and our study and others have shown that experiencing a fall increases the likelihood of developing fear of falling (4,15,32). Despite this complex relationship, fear of falling has been recognized as an important health problem distinct from falls. Indeed, in the current study, we found that 20% of participants without a recent or subsequent fall developed fear of falling over the course of 1 year. Other studies have reported even higher rates (32,33). Because activity restriction due to fear of falling may lead to an array of physical, psychological, and functional problems (2–4,11,12), fear of falling is an important target for intervention. Of note, many of the recommended interventions, including behavioral modification (5,13), assertiveness training (5,13), and management of anxiety and depression (4,10), are not commonly included in fall prevention efforts.

Some of our methods warrant discussion. The ascertainment of fear of falling using the one question approach ("Are you afraid of falling?") has been criticized for its lack of sensitivity and questionable relationship to behavior (1,20). In recent longitudinal studies, however, a positive response to the fear of falling question has been associated with several negative outcomes, including greater declines in gait (6), the occurrence of falls (15), and an increased risk of institutionalization (34). Although this fear of falling measure has been shown to be reliable over a short period of time (e.g., 5 days) (20), the stability of the measure over a longer period has not been tested. Fear of falling may fluctuate or resolve after recovery from a fall or reduction in fear-provoking activities. A recent study, however, found that the majority of older persons with fear of falling at baseline (68%) reported fear of falling 20 months later (15), suggesting that this fear often persists over time. Nevertheless, future longitudinal studies should include more frequent measurements of fear of falling, where, for instance, the development of fear of falling after a fall event may be more accurately measured. Our multivariable model included 8 outcome events per candidate predictor, which is a potential limitation since recent simulation studies have demonstrated that the validity of a predictive model is enhanced by having at least 10 outcome events per predictor (35,36). Finally, the relatively small number of men in the Project Safety cohort precluded a separate analysis for men. Hence, our results should be replicated in a larger sample of community-living older men.

Our study included high-quality data on several potential predisposing factors. A particular strength of our study was the monthly ascertainment of falls, which was 99% complete.

Summary

Fear of falling appears to develop due to a combination of predisposing factors and subsequent fall events. Because many of the predisposing factors are related to fall risk, preventive efforts to reduce fear of falling may also decrease the likelihood of falling. It may be prudent for health care providers to initiate discussions about fear of falling and its negative consequences, since older persons are often hesitant to discuss their fear and fall events with others (37) and may avoid activity because of fear of falling (2,4,6).

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Address correspondence to Susan L. Murphy, ScD OTR/L, Institute of Gerontology, University of Michigan, 300 N. Ingalls Street, Ann Arbor, MI 48109-2007. E-mail: sumurphy@umich.edu

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