

# Fear of falling and restriction of mobility in elderly fallers

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## Abstract

**Objectives:** to identify the characteristics of elderly persons who develop a fear of falling after experiencing a fall and to investigate the association of this fear with changes in health status over time.

**Design:** a prospective study of falls over a 2-year period (1991–92). Falls were ascertained using bimonthly postcards plus telephone interview with a standardized (World Health Organisation) questionnaire for circumstances, fear of falling and consequences of each reported fall. Each participant underwent a physical exam and subjective health assessment each year from 1990 to 1993.

**Setting:** New-Mexico Aging Process Study, USA

**Subjects:** 487 elderly subjects (> 60 years) living independently in the community.

**Main outcome measures:** fear of falling after experiencing a fall.

**Results:** 70 (32%) of 219 subjects who experienced a fall during the 2 year study period reported a fear of falling. Women were more likely than men to report fear of falling (74% *vs* 26%). Fallers who were afraid of falling again had significantly more balance (31.9% *vs* 12.8%) and gait disorders (31.9% *vs* 7.4%) at entry in the study in 1990. Among sex, age, mental status, balance and gait abnormalities, economic resource and physical health, logistic regression analysis show gait abnormalities and poor self-perception of physical health, cognitive status and economic resources to be significantly associated with fear of falling. Subjects who reported a fear of falling experienced a greater increase in balance ( $P = 0.08$ ), gait ( $P < 0.01$ ) and cognitive disorders ( $P = 0.09$ ) over time, resulting in a decrease in mobility level.

**Conclusion:** the study indicated that about one-third of elderly people develop a fear of falling after an incident fall and this issue should be specifically addressed in any rehabilitation programme.

**Keywords:** *falling, fear of falling, mobility*

## Introduction

Some elderly persons develop symptoms or behaviours in response to a fall, regardless of physical trauma [1–4]. They may express an enhanced or increased fear of falling that may result in deleterious emotional, psychological or social changes. While fear of falling is mentioned frequently as an adverse outcome of falling, little is known about it [2]. If individuals at risk of developing fear of falling can be identified and fear of falling proves to be an independent factor in functional decline, it may be possible to target clinical interventions to prevent or alleviate this fear and its consequences in elderly patients. The purpose of this study was to identify characteristics of elderly persons who develop a fear of falling and to

investigate the association of this fear with changes in self-reported physical, emotional, psychological and social well-being over time.

## Subjects and methods

The Albuquerque Falls Study [5, 6] is prospective investigation of falls in a cohort of elderly, community dwelling men and women that was initiated in 1990 as a adjunct to the New Mexico Aging Process Study [7, 8]. The present paper reports analyses of data collected during the first 2 years of follow-up.

Entry to the study was limited to persons over 60 years of age, living independently, who had no known serious medical conditions (i.e. without diagnosed

major medical conditions such as non-insulin dependent diabetes, coronary heart disease and uncontrolled hypertension). Four hundred and eighty-seven people were recruited. All subjects were volunteers and the study cohort does not represent a population-based sample. The mean age was  $74 \pm 6.7$  years at baseline. Fifty-nine percent of the cohort were women and 41% were men. Most of the study participants were married, well-educated and more affluent than the general elderly population. The study was not limited to any ethnic group, but 96% were white, 3% Hispanic and 1% other.

For the most part, subjects' perception of their health status was good to excellent (71.3% reported no physical disabilities or illnesses), 90% of the subjects could walk without help and could do their own shopping upon entry into the study. The mean number of prescribed drugs was 1.51 per person. The cognitive status of this population was generally good [mean Folstein's Mini Mental State (MMSE) =  $29 \pm 2.1$  in 1990].

Eighty-two subjects were lost to follow-up, leaving a study population of 405. Of these, 247 had one or more falls during the 2 year study period and were classified as 'fallers'. Twenty-eight of the fallers did not complete follow-up assessments in 1993, leaving data for 219 subjects available for the present analyses.

All participants underwent baseline and follow-up examinations to assess physical and cognitive status and completed a self-administered questionnaire which assessed their self-reported sense of physical, emotional, psychological and social well-being. Physical health status was ascertained using a standardized medical history questionnaire and interview, and a general physical examination by a trained research nurse [8]. Folstein's MMSE instrument was used to assess cognitive status [9]. Performance-based assessments of balance and gait were made using the instrument developed by Tinetti [10].

The Iowa Self-Assessment Inventory (ISAI) was also administered. This is a 56-item self-administered questionnaire and appears to be a reliable and valid instrument for grading self-perceived sense of well-being in population studies [11, 12]. Responses on the ISAI are subdivided into seven scales: economic resources, emotional balance, physical health, trusting others, mobility, cognitive status and social support. Scores range from 8 to 32, with higher scores indicating favourable, positive or healthy self-assessments.

The participants were instructed to report to the study co-ordinator all falls meeting the definition of "an event which results in a person coming to rest inadvertently on the ground or other lower level and other than as a consequence of the following: sustaining a violent blow; loss of consciousness; sudden onset of paralysis, as in a stroke and an epileptic seizure" [5]. Each subject was interviewed as soon as possible after each reported fall in order to review the circumstances of the incident and

determine whether the incident reported by the participant met the study definition of a fall. If the event met the study definition of a fall, a World Health Organisation falls questionnaire [5] was completed by the study co-ordinator while interviewing the subject via telephone. The questionnaire provides detailed information about the context and circumstances of a fall. Fear of falling was defined as a participant answering yes to the question "Are you worried about falling again?" after at least one fall in the 2 year period. To ascertain unreported falls, participants were sent stamped postcards bimonthly [5]. If a response was not received in 15 days, a second card was sent.

Fallers who expressed fear of falling after any fall during follow-up were compared with those who did not express this fear with regard to values above or below selected cutpoints on the baseline characteristics, and logistic and multiple logistic regression methods used to estimate odds ratios ( $\pm 95\%$  confidence limits; OR  $\pm 95\%$  CI). For the ISAI subscales, the percentages in each group below the median score were compared. For balance and gait, ORs compared percentages with one or more abnormalities. Variables that were statistically significant (where OR CIs did not include 1.0) were included in a multiple logistic regression equation estimating ORs for each variable while simultaneously controlling for all other variables in the model. Numbers and percentages of subjects whose score was worse in 1993 than 1990 were compared, by fear of falling status, using a  $\chi^2$  test.

## Results

### Description of falls

Seventy of the 219 subjects (32%) reported a fear of falling after at least one fall during the 2 year study period. One hundred and twenty-one of the 219 subjects (55%) reported a single fall during the 2 year study period. Twenty-six of these 121 subjects (21.5%) expressed fear of falling again subsequent to their reported fall. Of the remaining 98 subjects who had multiple falls, 54 reported no fear of falling after any fall (55%) and 31 reported fear of falling after at least one fall (32%); the remaining 13 subjects (13%) reported fear of falling after every fall. For the present analyses, the 31 subjects with multiple falls who expressed fear of falling after at least one fall were grouped with those who expressed fear of falling after all falls.

Table 1 compares subjects who expressed fear of falling after at least one fall with those who did not for baseline characteristics. Fallers who expressed fear of falling were significantly older ( $76.3 \pm 6.6$  years *vs*  $73.6 \pm 6.1$  years) and somewhat more likely to be female (OR = 1.84, 95% CI 0.98 to 3.44). Fallers with one or more balance abnormalities at baseline were significantly more likely to express fear of falling

Table 1. Baseline characteristics in 1990 of fallers by fear of falling status (reported fear of falling after at least one fall during 1991–92)

	Reported fear of falling		Crude OR (95% CI)
	Yes	No	
Total (n)	70	149	
Age (mean and SD)	76.3 (6.6)	73.6 (6.1)*	
Gender (female)	52 (74.3%)	91 (61.1%)	1.84 (0.98, 3.44)
Balance (one or more abnormality)	22 (31.9%)	19 (12.8%)	3.18 (1.61, 6.28)
Gait (one or more abnormality)	22 (31.9%)	11 (7.4%)	5.87 (2.80, 12.32)
Mini Mental State evaluation (< 30)	43 (62.3%)	65 (43.9%)	2.11 (1.18, 3.78)
Iowa Self-Assessment Inventory scores <sup>b</sup>			
Economic resources (< 32)	48 (66.6%)	76 (51.0%)	2.10 (1.16, 3.80)
Emotional balance (< 28)	39 (55.7%)	75 (50.3%)	1.24 (0.70, 2.20)
Physical health (< 27)	45 (65.2%)	67 (45.0%)	2.30 (1.28, 4.13)
Trusting others (< 32)	36 (51.4%)	67 (45.0%)	1.30 (0.73, 2.29)
Mobility (< 32)	41 (58.6%)	73 (49.0%)	1.47 (0.83, 2.61)
Cognitive status (< 26)	46 (65.7%)	66 (44.3%)	2.41 (1.34, 4.32)
Social support (< 32)	27 (38.6%)	57 (38.3%)	1.01 (0.57, 1.82)

\*  $P = 0.003$ ,  $t$ -test.

<sup>b</sup>No. and percentage of scores below the median values (as shown in parentheses).

OR, odds ratio; CI, confidence ratio.

(OR = 3.18, 95% CI 1.61 to 6.28), as were those who had one or more gait abnormalities (OR = 5.87, 95% CI 2.80 to 12.32). In addition, fear of falling was associated significantly with the development of balance ( $\chi^2 = 4.08$ ,  $P < 0.05$ ) and gait ( $\chi^2 = 16.94$ ,  $P < 0.001$ ) abnormalities during follow-up in those who did not have balance or gait problems at baseline.

Subjects who expressed fear of falling were significantly more likely to have baseline scores less than the median for the MMSE (OR = 2.11, 95% CI = 1.18 to 3.78) and the ISAI scales for economic resources (OR = 2.10, 95% CI 1.16 to 3.80), physical health (OR = 2.30, 95% CI 1.28 to 4.13; Table 1). Although not statistically significant, subjects who expressed fear of falling also tended to have lower scores on the ISAI mobility scale (OR = 1.47, 95% CI 0.83 to 2.61).

Table 2 shows results for multiple logistic regression analyses, including only those variables that were statistically significant in univariate analyses. Female gender, gait abnormalities, low economic resources and cognitive complaints remained significant risk factors for fear of falling after adjustment for all other variables. Having one or more gait abnormality at baseline was the strongest predictor of subsequent fear of falling (adjusted OR = 4.48, 95% CI 1.70 to 11.83).

Table 3 shows number and percent of subjects whose score in 1993 was worse than in 1990, by fear of falling status. The only statistically significant difference was for gait. Results are near to significance for balance and cognitive status. Subjects who reported fear of falling had greater mean percentage decreases in mobility scores than those who did not report this fear.

## Discussion

Few studies have examined risk factors and correlates of fear of falling in ambulatory, community-dwelling elderly groups. Arfken *et al.* [14] reported that the prevalence of fear of falling was greater in women, increased with age and was associated with decreased satisfaction with life, increased frailty and depressed mood. Because the Albuquerque Falls Study is based on a group of volunteers and not a population-based sample, the findings from this study cannot be extrapolated to a general population of elderly people. However, since the subjects were recruited from another study on nutrition and ageing they are not likely to have a particular concern about falls. There are

Table 2. Results of logistic regression for fear of falling

Variable <sup>a</sup>	Odds ratio	95% CI
Age	1.08	(0.71, 1.64)
Gender (female)	2.25	(1.08, 4.69)
Balance abnormalities (1+)	1.66	(0.70, 3.93)
Gait abnormalities (1+)	4.48	(1.70, 11.83)
Mental status (< 30)	1.67	(0.85, 3.28)
Economic resources (< 32)	2.36	(1.19, 4.70)
Physical health (< 27)	1.87	(0.95, 3.67)
Cognitive status (< 26)	2.26	(1.15, 4.44)

All apart from age were coded as 0 or 1, with the description in parentheses equal to 1. For age, 70 years and younger was coded as 0, 71–77 years as 1 and 78 years and older as 2.

Table 3. Number and percent of subjects whose score was worse in 1993 than in 1990, by fear of falling status (reported fear of falling after at least one fall during 1991–92)

	Reported fear of falling		<i>P</i> value <sup>a</sup>
	Yes	No	
Total ( <i>n</i> ) <sup>b</sup>	70	149	
Balance	39 (65.0%)	68 (51.5%)	0.08
Gait	33 (56.9%)	41 (30.1%)	0.00
Mini Mental State evaluation	25 (41.7%)	75 (54.7%)	0.09
Iowa Self-Assessment Inventory scores			
Economic resources	15 (25.4%)	26 (19.5%)	0.36
Emotional balance	25 (44.6%)	39 (30.5%)	0.06
Physical health	27 (49.1%)	70 (56.0%)	0.39
Trusting others	16 (27.1%)	31 (24.4%)	0.69
Mobility	27 (45.8%)	44 (33.8%)	0.12
Cognitive status	19 (32.8%)	61 (47.7%)	0.06
Social support	15 (23.8%)	28 (21.5%)	0.72

<sup>a</sup>  $\chi^2$  test.<sup>b</sup> Denominator is variable due to missing values.

few studies of falls in randomly selected samples of community-dwelling elderly and since response rates in studies of elderly populations tend to be low, the 'representativeness' of even randomly selected samples is questionable.

In the present study, we found that the expression of fear of falling subsequent to incident falls was associated with female gender, increased age, balance and gait abnormalities and poor self-assessed physical and cognitive health and economic resources. Taken together, these findings suggest that frail, elderly women are somewhat more likely to express fear of falling than men. Elderly, community-dwelling individuals who express fear of falling may be making a rational assessment of their personal risk of sustaining injurious falls and the associated consequences. Those who have poor self-assessed physical and cognitive health may be most afraid if they also have poor economic resources (e.g. health insurance) to deal with the financial consequences of a potential injury. Over time, this combination of factors may lead to further self-imposed limitations on physical activity.

We have shown in previous studies that balance and gait disorders are important risk factors for falls, as well as injurious falls, in our elderly cohort [13]. In addition, we found that subjective, self-assessed problems with balance and gait correlated highly ( $r > 0.70$ ) with objective performance based measures. Thus, elderly people appear to have a good perception of problems with their own balance and gait. If it is possible to improve gait proficiency in these participants, it may be possible to decrease their subsequent fear of falling and self-imposed reduction in activity, which is hypothesized to be associated with further increases in frailty.

An important conceptual issue is whether 'fear of falling' is a temporary state, closely related to having had a fall, or whether it is a more long-lasting condition which continues long after fall has occurred. The strengths of our study are that it is a prospective and that questions about fear of falling were asked immediately after any fall. The association between fear of falling and decrease of mobility and quality of life observed in this study and in some other elderly populations [14–17] confirms that fear of falling could be a long-lasting condition and that there is a need for interventional studies to prevent and limit the consequences of falls in elderly persons, in particular the development of fear of falling. However the psychological mechanisms responsible for 'fear of falling' are not necessarily consistent, and the associations between fear of falling and physical, psychological and functional state may well vary depending on whether the fear is a reasonable and understandable response to an injurious fall or an unrealistic and excessive reaction in someone who is subject to severe anxiety.

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## Key points

- One-third of independent healthy volunteers who fell developed a fear of falling.
- Fear of falling should be addressed in rehabilitation programmes.

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