

Screening for Risk of Falling in Community-Dwelling Elderly People May Increase Fear of Falling

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ABSTRACT

Purpose: (1) Determine if fear increased after a screening intervention intended to identify elders at high risk for a fall. (2) Analyze factors that might predict increased fear.

Methods: An intervention study was conducted among 152 community-dwelling elderly persons at health fairs. Fall risk was assessed using the Berg Balance Scale (cut point ≤ 45 points). An educational intervention was provided to reduce fall risk. During a 30-day follow-up telephone interview, participants were asked if they experienced an increased fear of falling since the screening. Logistic regression and latent class analyses were used to examine whether this dichotomous variable was predicted by the Berg Balance Scale score, age, gender, one-year fall history, and personal and environmental risk factors. **Results:** Persons whose Berg Balance Scale score indicated a high risk of a future fall had more than twice the odds of reporting increased fear of falling as those whose scores indicated low risk. Females were twice as likely as males to report increased fear. Associations could not be explained by controlling for latent classes of risk determined by other known fall risk factors. **Conclusion:** Identifying persons through screening who are at risk for falls, and providing strategies for mitigating risk, are important clinical and public health goals. Such efforts, however, should take into account the possibility that fear may be increased after screening.

Key Words: risk screening, falls, fear of falling, aging, balance

INTRODUCTION

Health care professionals who work in public health or community settings are often asked to participate in screening programs to identify community dwelling elderly at risk for future health problems. Screening activities are frequently completed in a community health fair setting or at a senior citizen's center as part of a 'health day' or an annual flu shot campaign. Depending on which screening activities they choose, participants are provided with general and/or specific health information. For instance, one 'screening station' may include general educational information that lists the risks for stroke and a measurement of blood pressure made

by a volunteer nurse. Another 'screening station' may include general nutritional information that promotes a calcium rich diet and a measurement of bone density made by a volunteer x-ray technician. Participants leave with useful general health information and a specific assessment of their own personal risk based on the results of the screening. These activities are a service to the community and seem to be a harmless and effective way to deliver health information to a large audience at a reasonable cost.¹⁻⁵

However, screening for future health care problems and delivering risk information to participants may itself involve risk. Screening programs are designed to prevent future disability or death and should have benefits that outweigh potential risks to the participants. In addition, the disease or detrimental health care event should be relatively frequent and have serious consequences or outcomes. Intervention should be available to treat the disorder during the presymptomatic stage, and should be more effective if implemented earlier rather than later. Participants should be informed of their results and directed to seek additional testing and/or appropriate interventions if the results of their screening test are positive.⁶ The screening test should not place the participant at risk of physical harm, nor should it impart an extreme fear of disease or disability so that it paralyzes the individual's ability to participate in everyday activities.⁷

The high risk for serious health consequences from injury in elderly persons justifies screening efforts to identify individuals who are at risk for falls and who may benefit from risk reduction strategies.⁸⁻¹⁰ Falls occur in approximately 30% of the community-living elderly population each year.¹¹⁻¹⁷ In Hennepin County, Minnesota, which includes the city of Minneapolis, falls among seniors are the leading cause of injury-related hospitalization (76%) and injury-related death (67%).¹⁸ Even a fall that does not result in trauma has potential consequences, most prominently the fear of a subsequent fall,¹⁹ which can seriously limit a person's daily activities.²⁰ Ironically, self-limiting mobility can increase an individual's risk for falls because inactivity leads to muscular weakness and decreased motor performance.²¹ Similarly, screening and educational activities related to fall risk may promote positive change, but may also unwittingly cause fear and result in decreased physical activity.²² As part of an evaluation component of a fall screening effort among community-dwelling elderly persons,²³ we: (1) assessed whether an increase in fear followed our intervention, and (2) analyzed factors that might predict such a response among participants.

METHODS

Subjects

As described elsewhere,²⁴ subjects in this study included 152 volunteers aged 65 years or older who participated in

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one of 5 screening events for fall risk in a senior citizen's center or housing complex. The project was approved by the Institutional Review Board at the University of Minnesota. Participants signed a consent form after investigators assured that they understood the study. Eligibility was further limited to those who could move from one chair to another chair independently, and stand for 10 seconds without the assistance of a person. Participants were allowed to use an ambulation aid, such as a cane or walker, if desired.

Procedures

Participants completed a questionnaire that asked them to provide demographic information prior to completing the screening assessment and were asked to provide information about risk factors for falls. Responses were recorded as either present or absent and categorized as follows:

- 1) Intrinsic personal risk factors (visual or hearing deficit, low blood pressure, 5 or more prescription medications, stress)
- 2) Functional risk factors (activity limitation, ambulation aid, specialized footwear)
- 3) Environmental risk factors (cluttered home, poor lighting inside home or immediately outside home, electrical cords in walkways, lacking handrails on steps to enter/exit home, steps inside or outside the home in disrepair)
- 4) History of fall in past year

Subjects were screened for risk of falls using the Berg Balance Scale, a 14-item measure of balance²⁵ with a total possible score of 56. Only participants with a score of 45 or less were told they were at risk for a fall.²⁶⁻²⁹ The Berg Balance Scale²⁵ appraises 2 dimensions of balance: a person's ability to (1) perform static activities to maintain a posture, and (2) execute dynamic activities that include movement. Each of the 14 individual items is scored on a 5 point (0-4) ordinal scale with a score of 0 representing the inability to complete the task and a 4 indicating independence. The Berg Balance Scale has high internal consistency (Cronbach's alpha = 0.96), high interrater reliability ($r = 0.98$), and high intrarater reliability ($r = 0.99$).²⁵

All participants were provided educational information on behavioral risk factors for falls. In addition, those who scored 45 or less on the Berg Balance Scale were given a letter to take to their physician that included their score, a description of the screening tool, and a suggestion that the participant be referred to an appropriate intervention program. As described previously,²⁴ the educational information consisted of a list (Figure 1) of tips to prevent falls based on a patient information excerpt from *American Family Physician*.³⁰ The original list (in English) was also translated so that Spanish and Hmong versions were available. Specific intervention program referrals were left to the discretion of the participants and their physicians. Approximately 30 days after the initial screening, participants were interviewed by telephone and asked, among other questions, if their fear of falling had increased since the screening event. The primary outcome measure was the participants' responses to this question, an assessment of self-perceived increased fear from the screening event to the telephone interview, rather than an empiri-

Tips to Reduce Risk of Falling

- Remove or secure throw rugs
- Cover wiring or lamp cords
- Exercise regularly
- Eat a calcium rich diet
- Have your medications reviewed by your physician
- Have your hearing checked
- Have your vision checked
- Limit your alcohol intake

Figure 1. Educational material.

cal measure of change in fear based on responses to baseline and follow-up questions about level of fear.

Statistical Analysis

We used 2 approaches to analyze the data. First, we calculated the odds ratios to assess the strength of the association between a self reported increased fear of falling and fall risk (Berg Balance Score ≤ 45), while adjusting for age and gender. Second, to determine underlying factors related to increased fear following screening, a latent class model³¹ was used to identify two classes of risk. Posterior probabilities for the 4 predictor variables (personal, functional, environmental risk, a fall during the past year) were used to determine membership in either the high- or the low-risk class. Latent classes are used to model concepts that cannot be observed directly, like risk of falling, or health related quality of life. In this study, variables thought to be influenced by the concept 'risk for falling' were measured. The posterior probabilities represent the likelihood that persons will report a particular factor (like fall history) given that they are in the conceptual 'high risk' or 'low risk' class. The class variable was then entered into a logistic model with age, gender, and the Berg Balance Scale screening category to see if the relation between a positive screening result and increased fear persisted or if it could be explained by membership in either the high- or the low-risk class.

RESULTS

The mean age of our participants was 79.8 (SD: 7.9, range: 65-99) years. Twenty-seven (18%) were male and 151 (99%) were Caucasian. Forty-eight individuals (31%) had a Berg Balance Score suggestive of fall risk (≤ 45). Overall, 85 (56%) of the persons in our convenience sample reported having increased fear of falling. Thirty-four (71%) of those with a Berg Balance Score suggestive of a fall risk (≤ 45), and 76 (61%) of the females reported an increased fear of falling. The relative odds of increased fear of falling, based on a model that includes age, gender, and a positive screening result are shown in Table 1. Participants whose Berg Balance Scale screening score indicated a high risk of a future fall had more than twice the odds of reporting an increased fear of falling than did those with a negative screening result. Females were twice as likely as males to report increased fear.

The number and percent of persons with each particular risk factor and the probabilities of having a particular risk factor based on classification into the 'high-' or 'low-risk' group are shown in Table 2. The latent class model fit well (chi-square = 3.26, $p = .77$) and determined that 20 of the 152

Table 1. Relative odds of reporting increased fear of falling after screening. (Model 1 includes screening result, age and sex; Model 2 includes screening result, risk class, age and sex.)

Variable	Model 1			Model 2		
	Odds Ratio	95 % CI	p	Odds Ratio	95 % CI	p
Berg Balance Score (≤ 45 vs >45)	2.26	1.1-4.8	.03	2.25	1.0-4.8	.04
Risk Score (high vs low)	NA	NA	NA	0.53	0.2-1.4	.21
Age (years)	1.04	1.0-1.1	.10	1.04	1.0-1.1	.09
Gender (female vs male)	2.68	1.1-6.7	.03	2.70	1.1-6.8	.03

Table 2. Number, percent and probabilities of having a particular risk factor based on membership in either the high- or low-risk class.

Risk Factor	Number (Percent) n=152	High-risk class probability n=20	Low-risk class probability n=132
Personal			
Yes	84 (55%)	0.85	0.48
No	68 (45%)	0.15	0.52
Functional			
Yes	73 (48%)	1.00	0.35
No	79 (52%)	0.00	0.65
Environmental			
Yes	45 (30%)	0.36	0.28
No	107 (70%)	0.64	0.72
Fall in past year			
Yes	18 (12%)	0.19	0.10
No	134 (88%)	0.80	0.90

patients were in the high-risk group. Discrimination into high and low risk groups was greatest for the functional risk factors, for which 100% of individuals in the high risk group, but only 35% of individuals in the low risk group, indicated having a functional risk factor. On the other hand, the environmental risk factors were the least discriminating with persons in the high and low risk groups having nearly the same chance of having an environmental risk factor (36% versus 28%).

The relative odds of increased fear of falling based on a model that includes latent classes of risk, age, and gender are also shown Table 1. As we hypothesized, even when taking into consideration common risk factors associated with falling by constructing latent classes of risk, the odds of heightened fear was greater in persons with a positive screening result when compared with those with a negative screening result. Also, following screening, women were more likely than men to report heightened fear.

DISCUSSION

Results from this study suggest that screening for falls among the community-dwelling elderly can induce a heightened sense of fear of falling. This is of concern because the prevalence of fear of falling in older adults ranges from 29-55%.³²⁻³⁴ Overall, 56% of our convenience sample reported having increased fear of falling during our 30-day follow-up interview. This increase in fear as the result of screening may have a significant impact on the already high prevalence of fall fear in older adults. A positive screening result was a strong predictor for heightened fear following fall screening, even when other risk factors for falls were taken into account.

Our findings also indicate an association between gender and increased fear and between increased fear and functional risk factors, the variable that best predicted high-risk class membership in our study. The association between gender and fear,¹⁵⁻¹⁹ and between functional risk factors and fear,^{12,15,32,35} have been reported in the literature; however, our study is the first to demonstrate an association between these variables and increased fear as the result of a screening event.

These results, however, should be considered within the context of several study limitations. Foremost is the fact that this was not a population-based study, and we cannot assess the generalizability of our study sample to that of the larger community-dwelling elderly population. Our study population was at a lower risk of falls than the general population, given that only 12% had a fall in the previous year. They also may have had a greater than average level of baseline fear. We did not measure this. We could not validate that the responses given by participants in the follow-up interview were related only to the screening. It is possible that the material received after the screening, or information received during consultation with the physician based on our recommendations, was as frightening as the screening result itself. Additionally, we did not include an evaluation of the sensitivity of the follow-up time to the reporting of increased fear. Heightened fear may have occurred 1 day, 7 days, or 29 days after the screening. Our study did not include a group of individuals who were not screened, or a control group that was asked about increased fear of falling without reference to the screening event.

Fear of falling can be mitigated by interventions that target multiple dimensions of risk,³⁶⁻³⁹ particularly if the intervention addresses self-efficacy and social dysfunction.^{35,39} Tennstedt et al⁴⁰ recommend a group style cognitive behavioral intervention that includes videotape, lecture, group discussion, mutual problem solving, role playing, exercise training, assertiveness training, home assignments, and behavioral contracting. These activities are designed to help individuals perceive falls and fear of falls as controllable perceptions, set goals to increase activity, modify their environments, and increase physical activities that promote strength and balance gains. In addition, fear of falling can be objectively evaluated to determine if it is the cause of activity restriction or the result of activity restriction;³⁴ allowing the intervention to be tailored to the elderly person's individual needs.

Identifying persons who are at high risk for falls, and providing education and strategies for mitigating risk, are impor-

tant clinical and public health goals. Such efforts, however, should take into account the possibility that fear, with unanticipated negative effects, may be introduced by the screening. If health care professionals are going to screen elderly persons living in the community for risk of falls, specific intervention programs to address risk should be identified a priori so appropriate referrals can be made. Referral for additional testing and for intervention should be emphasized with each 'at risk' participant, so that knowledge of risk is transformed into prevention rather than into a catalyst for fear and reduced physical activity.

REFERENCES

1. Bogin R. Health fair. *Colo Med*. 1993;90:440-441.
2. Gardner J. Health fair and CPR training: a successful community outreach, partnering and marketing opportunity. *J Cardiovasc Manag*. 1999;10:18-27.
3. Oase SJ, Tracy JP. Health fairs for older adults. The big day. *Geriatr Nurs*. 1982;3:174-175.
4. Werch CE, Schroeder DA, Matthews LL. The health fair as a health promotion strategy: effects on health risk behaviors and the utility of specific health fair activities. *J Am Coll Health*. 1986;35:74-79.
5. Serina M, Glove S. Health fairs bring wellness concepts to life. *Nurse Educ*. 1991;16:7-11.
6. Hennekens CH, Buring JI, Mayrent SL. *Epidemiology in Medicine*. Boston, Mass: Little Brown; 1997:327-347.
7. Marshall KG. Prevention. How much harm? How much benefit? Influence of reporting methods on perception of benefits. *CMAJ*. 1996;154:1493-1499.
8. Palmer RM. Geriatric assessment. *Med Clin NA*. 1999;83:1503-1523.
9. Jacob GM, Palmer RM. Tools for assessing the frail elderly geriatric evaluation focuses on improving quality of life. *Postgrad Med*. 1998;104:135-153.
10. Stalenhoef PA, Diederiks, JP, Knottnerus JA, Kester AD, Crebolder HF. A risk model for the prediction of recurrent falls in community-dwelling elderly: a prospective cohort study. *J Clin Epidemiol*. 2002;55:1088-1094.
11. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *New Engl J Med*. 1988;319:1701-1707.
12. Blake A, Morgan K, Bendall M, Dallosso H, Ebrahim SB, Arie TH, Fentem PH, Basse EJ. Falls by elderly people at home: prevalence and associated factors. *Age Ageing*. 1988;17:365-372.
13. Prudham D, Evans JG. Factors associated with falls in the elderly: a community study. *Age Ageing*. 1981;10:141-146.
14. Campbell AJ, Reinken J, Allen BC, Martinez GS. Falls in old age: a study of frequency and related clinical factors. *Age Ageing*. 1981;10:264-270.
15. Downton JH, Andrews K. Prevalence, characteristics and factors associated with falls among the elderly living at home. *Ageing*. 1991;3:219-228.
16. Hornbrook MC, Stevens VJ, Wingfield DJ, Hollis JF, Greenlick MR, Ory MG. Preventing falls among community dwelling older persons: results from a randomized trial. *Gerontologist*. 1994;34:16-23.
17. Hausdorf JM, Rios DA, Elderber HK. Gait variability and fall risk in community-living older adults: a 1-year prospective study. *Arch Phys Med Rehabil*. 2001;82:1050-1056.
18. Minnesota Hospital and Healthcare Partnership, 1997 e-code hospitalization data, special data run, 1999. Data analysis performed by Hennepin County Community Health Department. Minneapolis, Minn: 1999.
19. Howland J, Lachman ME, Peterson EW, Cote J, Kasten L, Jette A. Covariates of fear of falling and associated activity curtailment. *Gerontologist*. 1998;38:549-555.
20. Arfken CL, Lach HW, Birge SJ, Miller JP. The prevalence and correlates of fear of falling in elderly persons living in the community. *Am J Public Health*. 1994;84:565-570.
21. Rantanen T, Guralnik JM, Sakari-Rantala R, et al. Disability, physical activity, and muscle strength in older women: the Women's Health and Aging Study. *Arch Phys Med Rehabil*. 1999;80:130-135.
22. Yardley, L Smith H. A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. *Gerontologist*. 2002;42:17-23.
23. Ness KK, Gurney JG, Ishani S. Screening for risk of falls in the elderly in a community health fair setting: a feasibility study. *Issues on Aging*. 2001;24:12-16.
24. Ness KK, Gurney JG, Ice GH. Screening, education, and associated behavioral responses to reduce risk for falls among elderly persons attending a community health fair. *Phys Ther*. 2003;83:631-637.
25. Berg KO, Wood-Dauphinee SL, Williams JI, Gayton D. Measuring balance in the elderly: preliminary development of an instrument. *Physiother Can*. 1989;41:304-311.
26. Shumway-Cook A, Baldwin M, Polissar NL, Gruber W. Predicting the probability for falls in community-dwelling older adults. *Phys Ther*. 1997;77:812-819.
27. Thorbahn LD, Newton RA. Use of the berg balance test to predict falls in elderly persons. *Phys Ther*. 1996;76:576-583.
28. Tsang R. Berg balance test. *Phys Ther*. 1996;76:1126.
29. Harada N, Chiu V, Damron-Rodriguez J, Fowler E, Siu A, Reuben DB. Screening for balance and mobility impairments in elderly individuals living in residential care facilities. *Phys Ther*. 1995;75:462-469.
30. Fuller GF. Patient information: "What causes falls in the elderly? How can I prevent a fall?" *Am Fam Physician*. 2000;61:2173-2174.
31. Heinen T. *Latent Class and Discrete Latent Trait Models Similarities and Differences*. Thousand Oaks, Calif: Sage Publications; 1996:43-65.
32. Cumming RG, Salkeld G, Thomas M, Szonyi G. Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission. *J Gerontol A Biol Sci Med Sci*. 2000;55:M299-305.
33. Kressig RW, Wolf SL, Sattin RW, et al. Associations of demographic, functional, and behavioral characteristics with activity-related fear of falling among older adults transitioning to frailty. *J Am Geriatr Soc*. 2001;49:1456-1462.

34. Lachman ME, Howland J, Tennstedt S, Jette A, Assmann S, Peterson EW. Fear of falling and activity restriction: the survey of activities and fear of falling in the elderly (SAFE). *J Gerontol B Psychol Sci Soc Sci.* 1998;53:P43-50.
35. Tinetti ME, Mendes de Leon CF, Doucette JT, Baker DI. Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *J Gerontol.* 1994;49(3):M140-147.
36. Schoenfelder DP, Van Why K. A fall prevention educational program for community dwelling seniors. *Public Health Nurs.* 1997;14:383-390.
37. Cwikel J, Fried AV. The social epidemiology of falls among community-dwelling elderly: guidelines for prevention. *Disabil Rehabil.* 1992;14:113-121.
38. van Haastregt JC, Diederiks JP, van Rossum E, de Witte LP, Voorhoeve PM, Crebolder HF. Effects of a programme of multifactorial home visits on falls and mobility impairments in elderly people at risk: randomised controlled trial. *Br Med J.* 2000;321:994-998.
39. Tennstedt SL, Lawrence RH, Kasten L. An intervention to reduce fear of falling and enhance activity: Who is most likely to benefit? *Educ Gerontol.* 2001;27:227-240.
40. Tennstedt S, Howland J, Lachman M, Peterson E, Kasten L, Jette A. A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. *J Gerontol B Psychol Sci Soc Sci.* 1998;53B:384-392.

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