Will My Patient Fall?

EBEM Commentator Contact
Christopher R. Carpenter, MD, MSc

From the Division of Emergency Medicine, Washington University School of Medicine, St. Louis, MO.

0196-0644/$-see front matter

doi:10.1016/j.annemergmed.2008.04.020

[Ann Emerg Med. 2009;53:398-400.]

RATIONAL CLINICAL EXAMINATION REVIEW SOURCE

This is a rational clinical examination abstract, a regular feature of the *Annals*' Evidence-Based Emergency Medicine (EBEM) series. Each features an abstract of a rational clinical examination review from the *Journal of the American Medical Association* and a commentary by an emergency physician knowledgeable in the subject area.

The source for this rational clinical examination review abstract is: Ganz DA, Bao Y, Shekelle PG, et al. Will my patient fall? *JAMA.* 2007;297:77-86. The *Annals*' EBEM editors assisted in the preparation of the abstract of this rational clinical examination review, as well as selection of the Evidence-Based Medicine Teaching Points.

OBJECTIVE

To conduct a systematic review of studies that analyzed a common set of risk factors identifiable during a routine clinical examination that predict future falls.

DATA SOURCES

The authors conducted a specific search of MEDLINE (1966 to 2004) and CINAHL (1982 to 2004) for articles pertaining to accidental falls, favoring cohort studies over randomized controlled trials to optimize external validity.

STUDY SELECTION

Two investigators screened the titles and abstracts of the search results. Inclusion criteria included research reporting prospective data collection, fall incidence during a 6- to 12-month follow-up interval, community-dwelling or population-based samples, age 65 years and older, and English language. Studies including reports from sources other than patients or those recruiting only high- or low-risk populations were excluded. Individual study quality was judged by assessment of 7 previously described domains: assessment of falls at least every 3 months, loss to follow-up no greater than 20%, clear description of inclusion/exclusion criteria, adequate description of fall risk factors, definition of fall provided, random or systematic sampling, and a generalizable sampling of population, community, or practice-based patients. To screen for risk factors independently associated with fall risk, the authors focused only on the studies that performed multivariate analysis on at least 1 of 6 common risk factors: orthostatic hypotension, visual acuity, gait/balance assessment, medication use, activities of daily living, and cognition. Differences about inclusion or exclusion of articles were resolved by consensus.

DATA EXTRACTION AND ANALYSIS

Risk factors that were statistically significant at the .05 level from the individual study's multivariate analysis were then used to calculate likelihood ratios (LRs) with univariate analysis. Heterogeneous study design for risk factor definitions and variable inclusion prohibited the authors from combining results across studies.

MAIN RESULTS

Among 18 studies reporting multivariate analysis, only 9 had extractable data to permit calculation of LRs. The mean age ranged from 68 to 85 years. Pretest probability for 1 or more falls in the next year was 27% (95% confidence interval [CI] 19% to 36%) and for 2 or more falls in the next year, 10% (95% CI 7% to 15%). Age and orthostatic hypotension were not found to be independent predictors of future falls. Although 3 studies of visual impairment reported statistically significant results, none had extractable data to permit calculation of LRs, but odds ratios for future falls ranged from 1.6 to 2.0 for various measures of impaired visual acuity. No study separately assessed night vision.

For assessing the risk of 1 or more falls during the next year, the use of benzodiazepines, phenothiazines, or antidepressants had the best positive LR, though several other risk factors also had clinically useful positive LRs, as summarized in Table 1. None of the risk factors had useful negative LRs. In assessing the risk of 2 or more falls in the next year, dementia history had the highest positive LR, and several other risk factors also had clinically useful positive LRs (Table 2).

After patients or caregivers complete a pre-evaluation falls questionnaire, the authors advocate a multifactorial falls risk assessment for all patients who have reported a fall in the preceding year because they are at high risk for a recurrent fall.

Table 1. Most significant risk factors for 1 or more falls in 12 months.

Risk Factor	Positive LR (95% CI)	Negative LR (95% CI)
Benzodiazepine, phenothiazine, or antidepressant use	27 (3.6–207)	0.88 (0.82–0.95)
Dementia	17 (1.9–149)	0.99 (0.97–1.0)
Previous stroke findings on examination*	15 (3.6–67)	0.91 (0.86–0.96)
Parkinson's disease	5.0 (1.5–16)	0.98 (0.97–1.0)
Unable to rise from chair without using arms†	4.3 (2.3–7.9)	0.77 (0.66–0.90)
≥5 Errors on the Short Portable Mental Status Questionnaire	4.2 (1.9–9.6)	0.88 (0.81–0.96)
Fall in the previous month	3.8 (2.2–6.4)	0.84 (0.77–0.92)
≥4 Days in bed during month before baseline	3.7 (1.6–8.6)	0.94 (0.89–0.99)
≥1 Fall during previous year	2.8 (2.1–3.8)	0.86 (0.81–0.92)

LR, Likelihood ratio.
*Women.
†Men.

For those not reporting a previous fall, the authors recommend the domain of gait and balance testing as the most intensely studied assessment method with the best diagnostic test characteristics. For nonfallers they do not recommend routinely testing the other fall risk domains if the only purpose is to determine fall risk.

CONCLUSIONS

The pretest probability of falling at least once in the subsequent year in individuals older than 65 years is 27%, so a clinical finding with a positive LR of 2 to 4 is enough to increase the posttest probability of falls to more than 50%. Several such readily identifiable risk factors exist, including previous falls or gait abnormality. Screening is possible with previsit questionnaires or by trained office staff and represents the first step in preventing future falls. As such, falls are a treatable geriatric syndrome.

Rational Clinical Examination Author Contact
David A. Ganz, MD, MPH
Veterans Affairs Geriatrics Research Education and Clinical Center
Los Angeles, CA
E-mail dganz@mednet.ucla.edu

COMMENTARY: CLINICAL IMPLICATION

Between 1993 and 2003, emergency department (ED) visits for patients aged 65 to 74 years increased 34%, a rate that will double the number of emergency evaluations by 2013.[1] Unfortunately, the number of older adults with injurious falls is increasing even faster than their demographic surge.[2] Because 27% of older adults fall at least once per year and 15% fall more than once,[3] emergency physicians will evaluate many elderly fallers in coming decades. Almost half of falls among home-dwelling patients require admission and nursing home placement.[4] In Canada, falls were the cause of 85% of injury-related admissions among those older than 65 years in 2000,[5] suggesting that recognition of fall risk could lead to the prevention of substantial morbidity.

ED-initiated fall screening has been recommended,[6] although one ED-based trial failed to modify clinical staff behavior or fall risk,[7] and the Society for Academic Emergency Medicine Public Health and Education Task Force concluded in a 2000 statement that "there is not sufficient evidence to recommend for or against identification and counseling of geriatric patients at risk of fall."[8] An ED-based British trial of multidisciplinary secondary falls prevention demonstrated a 20% absolute risk reduction in 1-year falls.[9] In Europe, fall-related mortality has decreased 4.3% during the last decade, presumably because of proactive falls prevention services.[10] Despite these findings, as well as multiple systematic reviews of effective interventions to reduce falls,[11, 12] ED presentations after a fall do not commonly trigger fall risk assessments or prevention.[13]

The current rational clinical examination offers a systematic evaluation of fall-risk factors, as well as a baseline pretest probability for the general population of older adults. Recognition of such risk factors as dementia, gait instability, stroke-related neurologic deficits, and previous falls can serve as elements of a screening tool on which to risk-stratify patients in the ED. Ultimately, some combination of these risk factors may be combined to develop a clinical decision rule for geriatric falls.

TAKE-HOME MESSAGE

Strong, independent fall risk factors have been identified with which to select patients at high risk of future falls, for whom multidisciplinary interventions may be considered. These

Table 2. Significant risk factors for 2 or more falls in 12 months.

Signs	Positive LR (95% CI)	Negative LR (95% CI)
Dementia	13 (2.3–79)	0.97 (0.94–1.0)
Stroke	3.2 (1.9–5.4)	0.87 (0.78–0.97)
Frequent fear of falling	2.6 (1.9–3.5)	0.70 (0.59–0.84)
Unable to complete tandem walk test*	2.4 (2.0–2.9)	0.51 (0.38–0.68)
≥1 Fall during previous year	2.3 (1.8–2.9) to 2.4 (1.9–3.0)	0.60 (0.47–0.76) to 0.61 (0.49–0.76)
Needs >10 s to do 3 chair stands†	2.3 (1.8–2.9)	0.66 (0.54–0.80)
Self-perceived mobility problem	2.0 (1.7–2.4)	0.48 (0.34–0.68)

*Tandem walk test involves walking with the heel of one foot touching the toe of the other foot for 2 m.
†Get up and sit down in a chair 3 times in a row.

risk factors include particular medications, dementia, residual stroke sequelae, Parkinson's disease, difficulty rising from a chair, previous falls, and fear of falling. However, no factors appear to identify a reduced likelihood of falls.

EBEM Commentator Contact
Christopher R. Carpenter, MD, MSc
Division of Emergency Medicine
Washington University School of Medicine
St. Louis, MO
E-mail carpenterc@wusm.wustl.edu

EBEM TEACHING POINT

Recall bias. Systematic measurement error occurs in many ways. When a respondent's memory is relied on to denote an event's occurrence, the detection of the event may be subject to recall bias. Studies measuring events occurring during longer periods are more prone to this form of measurement bias. In general, those with worse outcomes or rare conditions may have better memory of exposures, risk factors, or preventive interventions than those unaffected. Because older adults have a higher prevalence of baseline cognitive dysfunction, any longitudinal event assessment should detail attempts to minimize recall bias. In the falls literature, investigators have recommended monthly fall-event logs to enhance memory of these events. However, it is likely that some recall bias affects the final outcomes. In the case of falls in the elderly population, existing literature demonstrates high fall prevalence during 1 year (approximately 27%) and recall bias seems likely to lead to underestimation rather than overestimation of this outcome, suggesting that 1-year fall prevalence is at least 27% and perhaps significantly more.

REFERENCES

1. Roberts DC, McKay MP, Shaffer A. Increasing rates of emergency department visits for elderly patients in the United States, 1993 to 2003. *Ann Emerg Med.* 2008;51:769-774.
2. Kannus P, Parkkari J, Koskinen S. Fall-induced injuries and deaths among older adults. *JAMA.* 1999;281:1895-1899.
3. Stalenhoef PA, Crebolder HFJM, Knottnerus JA, et al. Incidence, risk factors, and consequences of falls among elderly subjects living in the community: a criteria-based analysis. *Eur J Public Health.* 1997;7:328-334.
4. Sattin RW Lambert Huber DA, DeVito CA, et al. The incidence of fall injury events among the elderly in a defined population. *Am J Epidemiol.* 1990;131:1028-1037.
5. Weir E, Culmer L. Fall prevention in the elderly population. *CMAJ.* 2004;171:724.
6. Baraff LJ, Della Penna R, Williams N, et al. Practice guideline for the ED management of falls in community-dwelling elderly persons. Kaiser Permanente Medical Group. *Ann Emerg Med.* 1997;30:480-492.
7. Baraff LJ, Lee TJ, Kader S, et al. Effect of practice guidelines for emergency department care of falls in elder patients on subsequent falls and hospitalizations for injuries. *Acad Emerg Med.* 1999;6:1224-1231.
8. Babcock-Irvin C, Wyer PC, Gerson LW. Preventive care in the emergency department, part II: clinical preventive services—an emergency medicine evidence-based review. *Acad Emerg Med.* 2000;7:1042-1054.
9. Close J, Ellis M, Hooper R, et al. Prevention of Falls in the Elderly Trial (PROFET): a randomised controlled trial. *Lancet.* 1999;353: 93-97.
10. Petridou ET, Dikalioti SK, Dessypris N, et al. The evolution of unintentional injury mortality among elderly in Europe. *J Aging Health.* 2008;20:159-182.
11. Gillespie L, Gillespie W, Robertson M, et al. Interventions for preventing falls in elderly people. *Cochrane Database Syst Rev.* 2003;(4):CD000340.
12. McClure R, Turner C, Peel N, et al. Population-based interventions for the prevention of fall-related injuries in older people. *Cochrane Database Syst Rev.* 2005;(1):CD004441.
13. Donaldson MG, Khan KM, Davis JC, et al. Emergency department fall-related presentations do not trigger fall risk assessment: a gap in care of high-risk outpatient fallers. *Arch Gerontol Geriatr.* 2005;41:311-317.