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EVIDENCE-BASED EMERGENCY MEDICINE/SYSTEMATIC REVIEW ABSTRACT:

Preventing Falls in Community-Dwelling Older Adults

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SYSTEMATIC REVIEW ABSTRACT SOURCE

This is a systematic review abstract, a regular feature of the *Annals'* Evidenced-Based Emergency Medicine (EBEM) series. Each features an abstract of a systematic review from the Cochrane Database of Systematic Reviews and a commentary from an emergency physician knowledgeable in the subject area.

The source for this systematic review abstract is Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev.* 2009;(2):CD007146. DOI: 10.1002/14651858.

The *Annals'* EBEM editor assisted in the preparation of the abstract of this Cochrane systematic review.

OBJECTIVE

To summarize the best evidence for effectiveness of interventions designed to reduce the incidence of falls in older people living in the community.

DATA SOURCES

The authors searched the Cochrane Bone, Joint, and Muscle Trauma Group specialized register, Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, PsychInfor, AMED, the United Kingdom National Research Register, Current Controlled Trials, and the Australian New Zealand Clinical Trials Registry. Further evidence was identified by reviewing bibliographies and by contacting researchers in the field. No language restrictions were applied.

STUDY SELECTION

Randomized controlled trials of community-dwelling individuals older than 60 years were identified, including those in which allocation method was inadequately concealed. Trials with populations of community-dwelling and higher dependency place of residence were eligible for inclusion if data were provided for subgroups according to setting. Some of the mixed-population studies were included in a separate hospital or nursing home fall prevention Cochrane review, depending on the proportion of subjects in each setting.

DATA EXTRACTION AND ANALYSIS

One author screened titles and abstracts for possible inclusion. According to a full text review, 2 authors independently assessed potentially eligible trials for inclusion. Pairs of review authors using a pretested data abstraction form independently extracted data. Potential study bias was independently assessed by 2 review authors in the following domains: sequence generation; allocation concealment; blinding of participants, personnel, and outcome assessors; and fall-recall bias.

Trials were grouped for pooled analysis with the Prevention of Falls Network Europe classification system by combination (single, multiple, or multifactorial) and type of intervention. Intervention types included exercise, medication modification, surgery, urinary incontinence management, fluid or nutrition therapy, psychological interventions, environment/assistive technology, social environment, or educational interventions to increase patient knowledge. Data were pooled separately for rate of falls and number of people falling by using the generic inverse variance method. For the rate of falling, the authors present a rate ratio (RaR) with 95% confidence intervals (CIs) with unadjusted estimates. For dichotomous outcomes such as number of fallers or injurious falls, the authors report a risk ratio (RR) with 95% CIs, using the number of participants contributing data in each group if known. Data from cluster-randomized trials were adjusted for clustering by using an intraclass correlation coefficient. Heterogeneity between pooled trials was assessed by visual inspection of graphs and the I^2 statistic.

MAIN RESULTS

Among the 111 trials involving 55,303 participants from 15 countries, only 6 were emergency medicine–based trials. Cognitively impaired subjects were excluded in 66 trials, and 52 trials specified 1 or more risk factors for falling in their inclusion criteria. Forty-three trials tested the effect of exercise on falls, 13 tested the efficacy of vitamin D supplements, 3 assessed surgical interventions (pacer placement, expedited cataract surgery), and 10 evaluated environmental interventions. Ten studies had multiple interventions and 31 had multifactorial interventions in which specific modification depended on individual patient findings.

Exercise interventions containing 2 or more components significantly reduced the rate of falls (pooled RaR 0.78; 95% CI 0.71 to 0.86) and risk of falling (pooled RR 0.83; 95% CI 0.72 to 0.97) but with substantial heterogeneity identified ($I^2=52\%$). An a priori subgroup analysis of higher-risk fallers (ie, 1 or more fall risk factors at enrollment) demonstrated no significant differences for multicomponent exercise interventions. Home-based exercises and Tai Chi were specific exercise programs that showed benefit. Exercise interventions also reduced the risk of fractures (RR 0.36; 95% CI 0.19 to 0.70).

Cardiac pacing in fallers with cardioinhibitory carotid sinus hypersensitivity significantly reduced the rate of falls (RaR 0.42; 95% CI 0.23 to 0.75) but not the number of fractures. Expedited first eye cataract surgery reduced the rate of falls (RaR 0.66; 95% CI 0.45 to 0.95) but not the fall risk or fracture risk. Providing new glasses to improve vision significantly increased the rate (RaR 1.57; 95% CI 1.19 to 2.06) and number (RR 1.54; 95% CI 1.24 to 1.91) of falls while increasing fracture risk.

Yaktrax walkers (Yaktrax LLC, Morrisville, NC) a nonslip device applied to outdoor shoes in winter conditions, significantly reduced outdoor falls (RaR 0.42; 95% CI 0.22 to 0.78). Other home safety interventions did not significantly reduce fall rates, numbers, or fractures. However, a priori subgroup analysis of high-risk fallers suggested a benefit to home safety modifications (RaR 0.56; 95% CI 0.42 to 0.76) but with significant heterogeneity identified.

Home safety interventions appear particularly effective in patients with poor vision. A comprehensive intervention including patient education, an exercise program, and home safety evaluation reduced the rate of falls (RaR 0.69; 95% CI 0.50 to 0.96). Multifactorial interventions also reduced fall rates (RaR 0.75; 95% CI 0.65 to 0.86), with significant heterogeneity.

Several interventions did not affect fall rates, risk, or related fractures, including vitamin D supplementation, targeted medication modifications, nutritional supplements, cognitive behavior interventions, or patient-education-based knowledge enhancement programs.

CONCLUSIONS

Exercise interventions reduce the risk and rate of falls. Research is needed to confirm the contexts in which multifactorial assessment and intervention, home safety interventions, vitamin D supplementation, and other interventions are effective.

References

1. Stevens JA, Corso PS, Finkelstein EA, et al. The costs of fatal and non-fatal falls among older adults. *Inj Prev*. 2006; 12:290–295. [PubMed: 17018668]
2. American Geriatrics Society, British Geriatrics Society, American Academy of Orthopedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. *J Am Geriatr Soc*. 2001; 49:664–672.
3. 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. [PubMed: 10609924]
4. 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. [PubMed: 10023893]
5. Gates S, Lamb SE, Fisher JD, et al. Multifactorial assessment and targeted intervention for preventing falls and injuries among older people in community and emergency care settings: a systematic review and meta-analysis. *BMJ*. 2008; 336:130–133. [PubMed: 18089892]
6. Ganz DA, Alkema GE, Wu S. It takes a village to prevent falls: reconceptualizing fall prevention and management for older adults. *Inj Prev*. 2008; 14:266–271. [PubMed: 18676787]
7. Bleijlevens MHC, Hendriks MRC, van Haastregt JCM, et al. Process factors explaining the ineffectiveness of a multidisciplinary fall prevention programme: a process evaluation. *BMC Public Health*. 2008; 8:332. [PubMed: 18816381]
8. Horne M, Speed S, Skeleton D, et al. What do community-dwelling Caucasian and South Asian 60–70 year olds think about exercise for fall prevention? *Age Ageing*. 2009; 38:68–73. [PubMed: 19039019]
9. Hughes K, van Beurden E, Eakin EG, et al. Older persons' perception of risk of falling: implications for fall-prevention campaigns. *Am J Public Health*. 2008; 98:351–357. [PubMed: 18172132]
10. Tinetti ME, Baker DI, King M, et al. Effect of dissemination of evidence in reducing injuries from falls. *N Engl J Med*. 2008; 359:252–261. [PubMed: 18635430]
11. McKiernan FE. A simple gait-stabilizing device reduces outdoor falls and nonserious injurious falls in fall-prone older people during the winter. *J Am Geriatr Soc*. 2005; 53:943–947. [PubMed: 15935015]
12. Shaw FE, Bond J, Richardson DA, et al. Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: a randomized controlled trial. *BMJ*. 2003; 326:73–78. [PubMed: 12521968]

COMMENTARY: CLINICAL IMPLICATION

Falls are the leading cause of traumatic mortality among aging adults, with 27% of community-dwelling elderly experiencing a fall every year, costing the United States alone \$19 billion annually.¹ Three quarters of falls occur at home, and the active, community-dwelling elderly are more likely to experience injurious falls than frail, institutionalized adults. Up to 10% of falls result in a serious injury. Falls frequently herald functional decline, marked by fear of falling and culminating in nursing home admission. Accordingly, evidence-based reviews and multidisciplinary guidelines have advocated prevention focused on high-risk fallers.² Unfortunately, little evidence exists to support emergency department (ED)-based falls prevention. ED-based trials are few, frequently underpowered, and difficult to replicate. Simple interventions such as ED physician and nursing staff education have proven ineffective in a small single-center observational trial.³ Multidisciplinary interventions were effective in one British ED-based secondary falls prevention model, demonstrating a 20% absolute risk reduction in the number of falls at 1 year.⁴ However, more recent ED-based multidisciplinary efforts have failed to demonstrate effectiveness.⁵

Older adult fall prevention and management may be difficult to implement in the ED; however, observation unit-based interventions may offer one practical solution.⁶ Effective fall-prevention strategies require a willing and compliant patient, interconnected multidisciplinary professionals and settings, and efficient and dependable follow-up. Isolated ED staff education will not reduce fall rates or fall-related injuries. Similarly, simple referrals or exercise prescriptions also fail as a result of patient values and related noncompliance.⁷⁻⁹ Specific point-of-care interventions to prevent fall-related injuries, such as prescribing Yaktrax walkers after a fall on icy surfaces, coupled with institutional dissemination of best-evidence practice, are more often effective.^{10,11} Local solutions that actively organize relevant consultants (emergency medicine, occupational therapy, geriatrics, social work, pharmacy), with regularly scheduled multidisciplinary meetings to review communication streams, task assignments, and outcomes, offer greater opportunity to reduce fall morbidity.⁴ However, known limitations of these types of interventions must be recognized. For example, current multidisciplinary interventions are not effective in the cognitively impaired, who represent up to 40% of current emergency medicine geriatric populations.¹²

TAKE-HOME MESSAGE

Exercise programs and home safety assessments for the visually impaired currently offer the most effective interventions to prevent falls in community-dwelling older adults. Falls represent one of the most complex and life-threatening geriatric syndromes; a simple interventional solution is unlikely. Facing an unprecedented demographic surge of older adults, emergency medicine should develop and assess comprehensive multidisciplinary models based on interventions that have been demonstrated to be effective in other settings.