

In the Clinic®

Fall Prevention in Community-Dwelling Older Adults

Falls are common among older adults. One in 3 adults aged 65 years or older and 1 in 2 adults aged 80 years or older fall each year. Interventions for prevention have been identified; however, they are often not addressed in primary care practice. Screening all older adults annually for falls can identify who will benefit from further clinical evaluation and management. Falls and the need for care from subsequent injury increase with age. They adversely affect quality of life and are a financial burden on the health care industry. As a result, risk reduction is a key focus of prevention efforts, even among very elderly persons.

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Physician Writers
Elizabeth A. Phelan, MD, MS
Katherine Ritchey, DO, MPH
From the Division of Gerontology and Geriatric Medicine, Department of Medicine, University of Washington, Seattle, Washington.

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Practice Improvement

Risk Factors

Evaluation

Management

Practice Improvement

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Falls are common among older adults and have serious consequences. The generally accepted definition of a fall is "coming to rest unintentionally on the ground or lower level, *not* due to an acute event" (e.g., seizure, syncope, or stroke) or an overwhelming external force to which any person would be susceptible (1). Fall rates double with each decade of age beyond the seventh decade, and falls are the third leading cause of death resulting from unintentional injury (2). They are also the leading cause of fatal and nonfatal injury in older adults (3, 4). Even non-injurious falls may precipitate functional decline, psychological stress, and loss of independence,

adding significantly to the morbidity of this geriatric syndrome (5). Short- and long-term care for fall-related injuries contributes significantly to social and economic costs. In 2015, direct medical costs were estimated to exceed \$50 billion (6). However, only 1 in 4 community-dwelling older adults discusses falls with his or her health care provider (7). Evidence suggests that the risk for falling can be reduced by 20%–40% depending on the type of intervention (8). Health care providers must thus be proactive in their primary and secondary screening efforts and offer appropriate evidence-based recommendations.

Risk Factors

What factors increase risk for falls?

Falls typically do not have a single cause. Like other conditions that become more common later in life, they tend to result from several factors (9) stemming from the interaction of age-related changes, chronic medical conditions, and other individual and environmental variables (10). Falls frequently have adverse effects on function and quality of life, and similar to other geriatric syndromes, they are largely preventable and are not considered part of normal aging.

Risk factors for falls are classified as modifiable or nonmodifiable and as intrinsic (dependent on the individual) or extrinsic (environmental) (11) (see the **Box**: Intrinsic and Extrinsic Risk Factors for Falls). Intrinsic risk factors are age-related changes, chronic conditions, and behaviors that limit a person's inherent ability to prevent a fall. Many medical conditions increase fall risk, and they cover a range of organ systems, including the cardiovascular

(e.g., orthostatic hypotension), musculoskeletal (e.g., arthritis), neurologic (e.g., dementia, Parkinson disease, stroke), and urologic (e.g., urinary incontinence) systems (11, 12). Extrinsic factors comprise elements in a person's surroundings that are difficult to navigate (e.g., cords in walkways, steep or uneven surfaces, poor lighting), lack or improper use of an assistive device, inappropriate footwear, medications, and alcohol or drugs (13, 14). Falls frequently result from the simultaneous interaction of several of these factors.

Fall risk can be estimated by the strength of 1 risk factor or the cumulative effects of several factors. Independent risk factors associated with increased probability of falling include a history of falls (likelihood ratio [LR], 3), inability to rise from a chair without using the arms (LR, 4), slow gait (LR, 2), self-perceived mobility problem (LR, 2), use of psychoactive medications (LR, 20), dementia (LR, 15), Parkinson disease (LR, 5), or stroke (LR, 3) (15). Indi-

Intrinsic and Extrinsic Risk Factors for Falls

Intrinsic

Ocular: Decreased visual acuity, macular degeneration, glaucoma, cataracts, reduced accommodation, reduced depth perception, vision loss, retinopathy

Cardiovascular: Bradycardia, tachyarrhythmia, orthostatic hypotension, decompensated heart failure

Neurologic: Cognitive impairment or dementia, Parkinson disease, cerebrovascular accident, other movement disorder, peripheral neuropathy, gait deficits and imbalance

Urologic: Incontinence (any type), nocturia

Psychological: Insomnia/sleep deprivation, depression

Musculoskeletal: Osteoarthritis or inflammatory arthritis, pain, lower-extremity weakness, postural instability or imbalance, reduced flexibility

Extrinsic

Medications: Anticholinergics, antidepressants, antipsychotics, sedative-hypnotics, benzodiazepines, opiates, antihypertensives, α - and β -blockers, antiarrhythmics, use of more than 4 medications

Footwear: Backless shoes and slippers; high heels; shoes lacking dorsum, arch, or heel supports; shoes with heavy soles or a narrow toe box

Environment: Wet or slippery surfaces, lack of grab bars, uneven flooring, floor rugs, poor lighting, lack of handrails for steps, cords or other walkway hazards

vidual risk for falling increases markedly with an increase in risk factors.

In a prospective study of community-dwelling persons older than 75 years, the percentage who fell within 1 year nearly doubled with each additional risk factor (11). Even persons without any of the aforementioned risk factors had a 10% chance of falling, suggesting that advancing age by itself increases risk (11).

What factors put patients at risk for fall-related injuries?

Roughly half of falls result in injury (16), and 10% result in serious injury (5). The presence of both predisposing factors (individual features) and situational factors (fall circumstances) predicts persons at risk for serious injury, which includes fractures; joint dislocations, hemarthroses, and serious sprains; head injuries resulting in loss of consciousness and hospitalization; lacerations requiring sutures; and internal injuries resulting in hospitalization or decreased activity (17). Predisposing factors include fe-

male sex, low body weight (body mass index < 22 kg/m²), and cognitive impairment. Situational factors include falling on stairs, displacing activity (shifting weight over one's center of gravity, as when opening a door or reaching into a closet), or falling from a level equal to or greater than one's height (17). As with fall risk factors, each predisposing or situational factor exponentially increases risk for injury, from 0%–5% in persons with no injury risk factors to 23%–36% in persons with more than 2 factors (17).

A high-quality, prospective cohort study examined risk factors predictive of serious injury. It followed 1103 community-dwelling persons for 1 year. Factors that were independently associated with serious injury from a fall included cognitive impairment (adjusted odds ratio [OR], 2.2 [95% CI, 1.5–3.2]), presence of at least 2 chronic conditions (OR, 2.0 [CI, 1.4–2.9]), balance and gait impairment (OR, 1.8 [CI, 1.3–2.7]), and low body mass index (OR, 1.8 [CI, 1.2–2.5]). In a subset analysis of only persons who fell, female sex (OR, 1.8 [CI, 1.1–

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2.9]) was also more commonly associated associated with injurious falls. The study further highlighted the most important predictors of serious fall-related injuries (18).

How does fear of falling influence fall risk?

Fear of falling has psychological consequences that increase the overall risk for falling and functional decline (19). Roughly 21%-85% of community-dwelling older adults who have fallen and 33%-46% of those who have not report that they fear falling (20). Certain factors, such as difficulty using public transportation, poorer perceived health status, difficulty with balance, and inability to rise from a chair, characterize persons who may be at greater risk for fear of falling and

its associated morbidity (21). On a functional level, fear of falling is associated with postural changes, reduced balance confidence, activity avoidance, and reduced exercise (22, 23). It is also a strong predictor of future falls (24). Psychologically, persons who fear falling have poorer mental health, reduced independence, and poorer self-rated health (25). Fear of falling leads to activity restriction and accelerates functional decline. Recognizing this situation can enable providers to encourage affected patients to engage in fall prevention efforts with the goal of regaining confidence and eventually returning to previously enjoyable activities.

Risk Factors... Falls result from independent but interacting modifiable and nonmodifiable intrinsic and extrinsic risk factors. Factors associated with the greatest risk for falls include use of psychoactive medications, impaired gait, lack of lower-extremity strength and balance, and impaired cognition. Injurious falls are more common in women and persons with cognitive impairment, several chronic conditions, and low body weight. Severity of fall-related injuries is also affected by situational factors that increase the impact of a fall. The greater the number of risk factors present, the greater the risk for falls and fall-related injuries.

CLINICAL BOTTOM LINE

Evaluation

How often should patients be assessed for risk for falls?

Screening for falls begins with obtaining historical or self-reported information on balance, lower-extremity strength, and gait. The American and British Geriatrics Societies (AGS/BGS) clinical practice guideline recommends that all persons older than 65 years be asked yearly if they have fallen 2 or more times in the past year, were injured in a fall, or have any difficulties with walking or balance (26). Patients who answer "yes" to any of these

questions require further assessment. To encourage adoption of preventive measures by primary care providers, the Centers for Disease Control and Prevention (CDC) developed the Stopping Elderly Accidents, Deaths & Injuries (STEADI) tool kit to help integrate these guidelines into clinical settings (27). It suggests using the following key questions for screening: "Have you fallen in the past year?" "Do you feel unsteady when standing or walking?" and "Do you worry about falling?" The CDC also offers a

Table 1. Functional Tests

Test	Description	Comments
Timed Up-and-Go test	Assesses mobility, balance, transfer ability, and fall risk. A person rises from a hard-backed chair with arms, walks 10 feet, turns around, and sits back down in chair. Assistive device (cane or walker) is used if the person usually uses one.	Cut-off scores signaling high risk vary depending on population. Specificity (60%-87%) tends to be better than sensitivity (31%-56%).
Berg Balance test	14-item objective measure designed to assess static balance (i.e., sitting, standing, transferring, reaching and turning).	This test may be more time-consuming than other balance tests and requires training for administration and scoring. History of falls and score <51 or no history of falls and score <42 is predictive of falls (sensitivity 91%, specificity 82%). Score <40 associated with almost 100% fall risk.
Four-Stage Balance test	Tests static balance. A person moves through 4 stances, starting with a parallel stance, semi-tandem, full tandem, and ending with a single leg stance. The goal is to hold each stance unsupported for 10 seconds.	Was found in 1 study as being 45% sensitive and 74% specific to predict recurrent falls. Easy to administer in clinical setting.
Thirty-Second Sit-to-Stand test	Tests lower-extremity strength. A person stands from a seated position as many times as possible in 30 seconds without using the arms.	Normative values are sex- and age-specific, and completing less than the normative value for sex/age indicates risk for falling. Sensitivity 68% and specificity 54% for predicting falls at a cut-off of 11, regardless of sex or age.
Dynamic Gait Index	Assesses ability to maintain balance while walking in the presence of external demands.	No training required; takes less than 10 minutes to administer; <19 indicate increased risk for falling (sensitivity 59%, specificity 64%).
Four-Square Step test	A balance test that assesses a person's ability to step forward, sideways, and backward.	Exceeding 15 seconds for completion indicates increased risk for falling.

screening questionnaire developed to identify persons at risk for falling who would benefit from risk-reducing interventions. This 14-item "Stay Independent" questionnaire is a validated fall risk self-assessment that can be completed independently by an older adult and reviewed by the health care provider during a clinical visit (28). A score of 4 or more on the questionnaire or an affirmative answer to any of the key questions in the STEADI tool kit indicates that the patient is at risk for falling and requires further clinical assessment.

What measures are useful in screening for fall risk?

For persons with or without a history of falls or problems with balance or gait, clinical guidelines recommend functional assessments to evaluate gait, lower-extremity strength, and balance

(26). Several functional performance tests can be used to quantify fall risk (Table 1), but many of them are impractical and unnecessary for use in most primary care and specialty care clinics. Therefore, the AGS/BGS and the CDC recommend simple tests, such as the Timed Up-and-Go (TUG) test, Thirty-Second Sit-to-Stand (STS) test, and Four-Stage Balance test, to identify persons with mobility problems who are at risk for falling. The TUG test assesses gait, balance, coordination, and strength; does not require specialized training; and can be administered in about 5 minutes (29). Its predictive ability and diagnostic accuracy are moderate (30). Persons who take 12 or more seconds to complete the test are at risk for falling; those who take more than 20 seconds are at greatest risk. The

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Table 2. Core Elements of a Fall-Focused History and Physical Examination

Fall History	Physical Examination
Symptoms (prodromal): Dizziness/light-headedness, palpitations	Head, eyes, ears, nose and throat: Vision acuity, peripheral vision
Prior falls	Cardiovascular: Orthostatic vitals, rate, rhythm, murmurs
Location: Bedroom, bathroom, outside home, community	Neurologic: Cognitive screen, sensation, proprioception and balance, motor function and reflexes, cerebellar testing, gait
Timing: Postprandial, time of day, relationship to medications	Psychologic: Depression screen
Activity: Situation before fall—walking or just stood upright	Musculoskeletal: Standing posture, range of motion (particularly in joints of lower extremities, head and neck, trunk), muscle tone and bulk, foot and footwear assessment

STS and Four-Stage Balance tests are quick, office-based screening tools that gauge lower-extremity strength and balance, respectively, are easy to administer, and provide useful information to complement the TUG test (31, 32). Per the AGS/BGS guideline, any person who has gait or balance abnormalities requires a fall risk assessment.

A longitudinal cohort study investigated the predictive ability of a simple, static balance test on risk for falling and serious injury. Community-dwelling adults aged 60 years or older (n = 316) had a physical examination that included single-leg balance testing, defined as the ability to stand on 1 leg unsupported for 5 seconds. At 3 years, age older than 73 years was the only significant independent predictor of falls, and impaired single-leg balance was the only independent predictor of injurious falls (relative risk [RR], 2.13 [CI, 1.04–4.34]) (33).

What should the clinical assessment of an at-risk patient include?

The fall risk assessment involves a focused examination of the patient with attention to vital signs, including orthostatic blood pressure assessments; hearing and vision; the neurologic system, including both central and peripheral systems and cognition; and the cardiovascular and musculoskeletal (including examination of the feet) systems. Details of the fall itself should also be noted, such as timing, location, situational factors, and related symptoms (**Table 2**). Document-

tation of the fall history is one of the quality indicators for fall prevention and management (34). Medication review is a key component of the risk assessment because many medications increase risk for falling (see the **Box: Medications that Increase the Risk for Falling**). The clinician should review the clinical necessity of all medications—use of 4 or more is an independent risk factor for falling (35). Medications with central nervous system effects, including those with anticholinergic and sedating properties, are most strongly associated with falling and should be tapered, reduced, or discontinued whenever possible (36). These include antipsychotics, tricyclic antidepressants, serotonin reuptake inhibitors, centrally acting antihypertensives, opiates, sedative-hypnotics, and nonbenzodiazepine- and benzodiazepine-receptor agonists (37).

Selection of appropriate laboratory and radiologic tests should be guided by concerns identified during the fall risk assessment. Testing may include hematocrit measurement; measurement of thyroid-stimulating hormone, vitamin B₁₂, and 25-hydroxyvitamin D levels; and dual-energy x-ray absorptiometry (DEXA) scanning.

A meta-analysis that included 22 studies with a total of 79 081 participants clarified which medication classes increase risk for falling (36). The Bayesian unadjusted OR estimates

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were highest for antidepressants (OR, 1.68 [CI, 1.47-1.91]), neuroleptics and antipsychotics (OR, 1.59 [CI, 1.37-1.83]), benzodiazepines (OR, 1.57 [CI, 1.43-1.72]), and sedatives and hypnotics (OR, 1.47 [CI, 1.35-1.62]). Even after adjustment, OR estimates still indicated that neuroleptics and antipsychotics, antidepressants, and benzodiazepines were associated with increased risk (ORs, 1.39 [CI, 0.94-2.00], 1.36 [CI, 1.13-1.76], and 1.41 [CI, 1.20-1.71], respectively). Antihypertensives (OR, 1.24 [CI, 1.01-1.50]), diuretics (OR, 1.07 [CI, 1.01-1.14]), β -blockers (OR, 1.01 [CI, 0.86-1.17]), and non-steroidal anti-inflammatory drugs (OR, 1.21 [CI, 1.01-1.44]) were associated with reduced or non-significant risk. Opiates were also not associated with elevated risk (OR, 0.96 [CI, 0.78-1.18]). However, subsequent studies have informed the current recommendation from the AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults to avoid opiates in persons with a history of falls or fracture, excluding indications for acute pain management (moderate-quality evidence, strong recommendation) (37).

Fall risk can be classified as low or high depending on the patient's self-reported measures and performance on functional tests (38). Any person who has fallen, feels unsteady when walking, or worries about falling and has a gait, balance, or strength impairment on examination is likely to fall. Persons with these characteristics and those who have fallen 2 or more times or had an injurious fall are considered to be at high risk. Risk stratification can guide providers in choosing intervention options, help determine the need for in-depth assessment, and direct decisions about referral to geriatric specialists.

What tools measure fear of falling?

For at-risk persons, the provider should explore fears related to falling and the degree to which they may cause functional impairment. Such impairment can be qualified and quantified using either the long (16-item) or short (7-item) Falls Efficacy Scale-International (FES-I) (39). This assessment elicits concerns about falls during activities of daily liv-

ing (ADLs), such as getting dressed, preparing meals, or showering. The questionnaire categorizes people as having mild, moderate, or high concern about falling, with higher scores correlating with greater concern and risk (40). It is particularly useful in the outpatient setting for addressing fall-related functional impairment and identifying older adults who would benefit from durable medical equipment, a home safety assessment, or an occupational therapy evaluation.

What should a home safety assessment include?

In addition to the FES-I, functional and fall risk assessments can alert the provider that a home safety assessment should be considered. Functional histories can be obtained by standardized assessments, such as the Katz ADL and the Barthel Index (41). If the functional or fall history suggests concerns related to environmental factors, recommending home modifications (see the **Box: Basic Home Safety Recommendations**) or referring the person to occupational therapy would be reasonable (16). The CDC also offers a self-guided home safety assessment (Check for Safety) that older adults can complete independently (38). This is appropriate for anyone at risk for falling because it offers important, general recommendations for aging successfully at home and is freely available on the CDC Web site.

When should patients be referred to a specialist?

There is no specific guideline on patient referral to specialty care for assessment or management of fall risk. However, referral to a geriatrics specialist or fall clinic could be considered for persons with recurrent falls (≥ 2 in the past year); those who continue to fall despite preventive measures; those who are medically, socially,

Medications That Increase the Risk for Falling

- Antipsychotics
- Sedative/hypnotics
- Antidepressants
- Antihypertensives (central-acting)
- Diuretics
- Antiarrhythmics
- Opiates

Basic Home Safety Recommendations

- Entrances: Railings and steps in good condition, adequate lighting
- Kitchen: Common items in reachable places, rubber-backed mats
- Bathroom: Nonslip bathmat, grab bars for toilet and bath/shower, raised toilet seat, adequate lighting
- Stairs: Clutter removed, railings in good repair, color contrast strips on steps
- Hallways: Clutter removed, night-lights

46. Burton E, Cavalheri V, Adams R, Browne CO, Boverly-Spencer P, Fenton AM, et al. Effectiveness of exercise programs to reduce falls in older people with dementia living in the community: a systematic review and meta-analysis. *Clin Interv Aging*. 2015;10:421-34. [PMID: 25709416]
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Table 3. Interventions for Fall Prevention and Their Evidence Ratings

Intervention	USPSTF†	AGS/BGS‡	Cochrane Collaboration§
Strength and balance exercise	B	A	Effective (16 trials)
Tai chi	B	A	Reduced risk for falling (7 trials)
Home modification	I*	A	Effective (6 trials)
Medication—Reduction in psychoactive medications	I*	B	2 positive trials
Medication—Reduction in number or dose	—	B	—
Postural hypotension management	—	C	—
Vitamin D supplementation for fall prevention	D	B	Not effective overall (13 trials)
Vision screening and management	—	I	Harmful effect in 1 trial
Hearing screening and management	—	—	—
Foot/shoe screening and management	—	C	Reduced rate of falls in 2 trials
Education alone	—	D	1 negative trial
Cardiac pacing for carotid sinus hypersensitivity	—	B	Reduced rate of falls in 3 trials
First eye cataract surgery	—	B	1 positive trial
Multifactorial interventions	C	A	Effective in reducing rate of but not risk for falling (19 trials)

AGS = American Geriatrics Society; BGS = British Geriatrics Society; USPSTF = U.S. Preventive Services Task Force.
 † From reference 55. Ratings: A = recommended with high certainty of benefit; B = recommended with moderate certainty of benefit; C = selectively offer based on professional judgment and patient preferences; D = recommended against based on moderate or high certainty of no benefit or that harms outweigh the benefit; I = insufficient evidence; I* = evidence report finding of insufficient evidence/not part of summary recommendation.
 ‡ From reference 26. Ratings: A = strongly recommended; B = recommended; C = no recommendation; D = recommended against; I = insufficient evidence.
 § From reference 8. “Effective” and “not effective” based on authors’ main conclusions.

or physically complex; or those who have had an injurious fall (26). The patient should also be

referred if the provider does not have the skills or experience to manage fall risk factors (42).

Evaluation... Older adults should be asked yearly if they have fallen, feel unsteady when walking, or have gait or balance difficulty. The risk assessment should review the intrinsic and extrinsic causes of falls, with particular emphasis on risk factors that can also increase risk for injury. Standardized assessments and functional testing can help guide the health care provider in identifying potentially modifiable risk factors. Referral is necessary only if the clinician does not feel equipped to implement screening or preventive measures.

CLINICAL BOTTOM LINE

Management

What is the role of single clinical interventions in preventing falls?

Several single interventions are beneficial in preventing falls (**Table 3**). Exercise has the strongest evidence of any individual intervention—it reduces both falls and fall-related injuries, including

serious ones (e.g., fractures) (8, 43).

Home modification is also effective, although evidence is lacking on whether it reduces fall-related injury as a single intervention (43). Home modification is more effective in persons at higher risk for falling, including those with

50. Gardner MM, Buchner DM, Robertson MC, Campbell AJ. Practical implementation of an exercise-based falls prevention programme. *Age Ageing*. 2001;30:77-83. [PMID: 11322678]
 51. Clemson L, Fiatarone Singh MA, Bundy A, Cumming RG, Manolagas K, O’Loughlin P, et al. Integration of balance and strength training into daily life activity to reduce rate of falls in older people (the LiFE study): randomised parallel trial. *BMJ*. 2012; 345:e4547. [PMID: 22872695]
 52. Shubert TE, Smith ML, Jiang L, Ory MG. Disseminating the Otago exercise program in the United States: perceived and actual physical performance improvements from participants. *J Appl Gerontol*. 2018;37:79-98. [PMID: 27794055]
 53. Robertson MC, Campbell AJ, Gardner MM, Devlin N. Preventing injuries in older people by preventing falls: a meta-analysis of individual-level data. *J Am Geriatr Soc*. 2002; 50:905-11. [PMID: 12028179]

severe vision impairment. Home safety interventions seem to be more effective when delivered by an occupational therapist (8).

Elimination or dose reduction of centrally acting medications is effective in reducing falls (8, 26). In our clinical experience, most older adults have low awareness of the link between medications and falls, but once advised of this correlation they are typically receptive to reducing the number or doses of medications. Research on attitudes toward medications in older persons has found similar receptivity, with 68% reporting that they would like to reduce medication use and 92% willing to stop use of a medication if advised to do so by their physician (44). This study highlights the importance of provider engagement in medication reduction and the need to recognize medication risks and harms in older adults (37). Recent research found that discouragement of medication discontinuation by their health care provider is a key barrier to older adults successfully reducing psychoactive medication use (45).

What is the role of multifactorial and multicomponent interventions?

Multifactorial interventions identify and address fall risk factors based on an individualized assessment. Multicomponent interventions deliver a standardized (i.e., nonindividualized) combination of interventions that address more than 1 risk factor (e.g., balance and home safety).

Recent evidence from a comprehensive systematic review and network meta-analysis (43) (based on 54 randomized trials with a total of 41 596 participants that evaluated 39 interventions plus usual care) suggests that the following combinations of single interventions reduce fall-related

injuries: exercise plus vision assessment and management (OR, 0.17 [CI, 0.07–0.38]), exercise plus vision and environmental assessment and management (OR, 0.30 [CI, 0.13–0.70]), and clinic-level quality improvement (e.g., facilitated relay of information to clinicians, clinician reminders) plus multifactorial assessment and management plus vitamin D and calcium supplementation (OR, 0.12 [CI, 0.03–0.55]).

Based on the above findings, clinicians should encourage exercise (focused on strength and balance), regular vision evaluation, attention to environmental safety, and treatment of osteoporosis to help prevent fractures.

How can fall prevention be addressed for older adults with dementia?

Persons with impaired cognition are at high risk for falls and injuries, although most interventions have not been tested specifically in this population subset. Exercise has been shown to be effective in reducing the risk for falling in community-living older adults with mild to moderate dementia (46). However, engaging persons with dementia in routine exercise may be met with apathy, resistance, and behavioral disturbances and is a challenge for caregivers. A study of nursing home residents with dementia found that focusing on maintaining lower-extremity strength through a simple intervention of health care aide-prompted, repeated sit-to-stand activity during daily care routines on day and evening shifts was effective in maintaining the ability to transfer (47). For older adults with advanced dementia who are living at home, continuing to be able to transfer independently and safely (e.g., in and out of bed, on and off the toilet, in and out of a car) are important to being able to remain at home and may be

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more feasible than maintaining an exercise routine. Recommending sit-to-stand activity is a practical approach for clinicians seeking to advise family caregivers of persons who wish to age in place but are at high risk for falls due to dementia and impaired mobility.

What should clinicians recommend regarding exercise?

Strength and balance exercise has the strongest evidence for prevention of falls and fall-related injuries. Such exercise also seems to reduce fear of falling if participation is sustained (48). Most older adults do not exercise to improve strength and balance. Community programs that include strength and balance exercise may be recommended for both primary and secondary fall prevention (49). For older adults at high risk for falls, one-on-one exercise supervised by a physical therapist is the safest initial approach, with transition to a community class or home-based exercise program (such as the Otago Exercise Program [50] or the Lifestyle-integrated Functional Exercise Program [51]) when the patient is ready.

A series of trials testing the Otago Exercise Program found that it improved balance and reduced falls and fall-related injuries by 35% (fall incidence rate ratio [IRR], 0.65 [CI, 0.57-0.75]; fall-related injury IRR, 0.65 [CI, 0.53-0.81]) when led by a physical therapist or trained nurse. Developed by the New Zealand Falls Prevention Research Group in the late 1990s, the program involves an interventionist (typically a physical therapist) who trains at-risk adults to practice 17 exercises at home to improve gait stability, strength, and balance. The interventionist assesses, coaches, and moves the trainee through progressively more challenging exercises over the course of 6-12 months. Improvements may be seen as soon as 8 weeks after program initiation (52). The program is most effective in reducing fall-related injury among those aged 80 years or older (IRR vs. those aged 65-79 years, 0.54 [CI, 0.34-0.87]) (53). The Otago program is

being disseminated in the United States (52) and can also be delivered via DVD (54).

What is the role of vitamin D and calcium in fall prevention?

Vitamin D helps maintain muscle strength and function. However, clinical guideline recommendations seem to conflict on whether vitamin D₃ (cholecalciferol) supplementation is effective for fall prevention. The AGS (26) and the STEADI initiative (27) recommend daily vitamin D in modest (800-1000 IU) doses, given that vitamin D deficiency is common and supplementation is reasonably safe and inexpensive. The Cochrane Collaboration found that vitamin D supplementation did not reduce falls overall but seemed to do so in persons with low levels (8). The U.S. Preventive Services Task Force no longer recommends vitamin D supplementation for fall prevention in older adults who do not have osteoporosis or vitamin D deficiency (55, 56). This recommendation is related to recent evidence, including a large trial that administered a high dose of vitamin D infrequently (500 000 IU once annually) and found an increased risk for falls and fractures among community-dwelling, older, at-risk adults.

However, many older adults who are at risk for falls also have osteoporosis, vitamin D deficiency, or both, and ensuring that calcium and vitamin D levels are sufficient before osteoporosis treatment initiation is important. Thus, vitamin D supplementation (≥ 800 -1000 IU daily) makes clinical sense and is consistent with recommendations from professional societies (26, 57, 58).

What is the role of protectors for the hip and other sites?

Hip protectors, which are either hard plastic shields or soft foam pads, have been studied for prevention of hip fracture. Nearly all

(>99%) such fractures in older adults result from a fall. A Cochrane meta-analysis of 3 trials of hip protector use in community-dwelling older adults showed no evidence of reduced risk for hip fracture (RR, 1.14 [CI, 0.83–1.57]) (59). Receptivity to wearing hip protectors is low, and from a logistics standpoint they make dressing and undressing the lower body challenging. There is little to no evidence on the effectiveness of other wearable protective devices, such as helmets and elbow or knee protectors.

What strategies are useful in preventing falls in hospitalized patients?

Older adults are at risk for falls while they are hospitalized. Persons who have had a prior fall and those with cognitive impairment due to any cause (delirium, dementia) are at highest risk. Factors that increase risk for injury from inpatient falls include joint replacement (OR, 5.58 [CI, 1.84–16.9]), psychotropic agents (OR, 2.23 [CI, 1.39–3.60]), male sex (OR, 2.08 [CI, 1.28–3.45]), and history of a fall (OR, 2.08 [CI, 1.12–3.85]) (60).

A few single interventions have been found to reduce risk for falls in the inpatient setting. These include medication management and, for cognitively intact patients, education with health professional follow-up (61). Multifactorial interventions are supported by current evidence (62, 63).

Studies of single environmental modifications (low-low beds, bedside [“crash”] mats, bed alarms, floor material modification) have found no evidence of benefit. Bedside mats may actually increase risk for falls in ambulatory persons. No randomized trials of bed rails have been done, but they are typically considered a restraint

and thus should not be used for fall prevention.

What is the role of osteoporosis screening and management?

Although osteoporosis is not specific to fall prevention, many older adults at risk for falls have undetected osteoporosis, and certain types of fractures (e.g., hip) are overwhelmingly caused by falls in this age group. It thus makes clinical sense to screen for osteoporosis as part of routine fall prevention care. Screening can include measurement of bone mineral density by DEXA scan or clinical risk assessment via such tools as the Fracture Risk Assessment Tool (FRAX). The U.S. Preventive Services Task Force recommends bone mineral density testing for all women aged 65 years or older or at-risk postmenopausal women younger than 65 years. Although evidence on screening in men is insufficient, it should be considered if the patient has at least 1 risk factor for osteoporosis (e.g., smoking, androgen-deprivation therapy, history of or current excessive use of alcohol, hypogonadism, and long-term use of corticosteroids or anticonvulsants) because the mortality rate from hip fractures in men is high. There are a range of therapeutic options as well as lifestyle changes that should be discussed with patients whose DEXA scan shows a bone mineral density T-score of –2.5 or less and those who have higher T-scores but whose FRAX score indicates high risk for fracture. More information on management can be found elsewhere (64).

How should clinicians counsel patients and caregivers about fall prevention?

Development of the STEADI initiative stemmed in part from the recognition that few patients raise the issue of falls with their health care provider (7). The pro-

gram provides useful guidance and tools for clinicians seeking to counsel their patients and caregivers about fall prevention (see Talking about Fall Prevention with Your Patients at www.cdc.gov/steady/materials.html). Recognition of the need for patient acceptance and willingness to act on recommendations is paramount, and open discussion of what a patient is willing to do is essential for formulating a realistic care plan in partnership with the patient.

Research has shown that the recommendation of a health professional is an important facilitator in engaging in fall prevention behaviors (65). Other facilitators include providing a range of options to address a given risk factor (e.g., community- or home-based exercise class), framing the recommended changes in a positive light (e.g., return of confidence and ability to engage in activities one used to enjoy) as opposed to a negative one (having to give up belongings to which the patient may be attached, such as throw rugs or open-back shoes), and emphasizing the life-enhancing effects and increased opportunities to participate in enjoyable activities (e.g., exercise class presents an opportunity for social connection).

The patient must be made aware that walking (66) or upper body stretching exercises will not prevent falls and that improving bal-

ance is essential for fall prevention (67), that balance exercises must be done in a standing position at least 3 times per week on a routine basis for a sustained effect, and that the benefit of reduction in fall risk will not be apparent until after several months (> 50 hours) of routine balance practice (68). The importance of maintaining a balance exercise regimen over time cannot be overemphasized, and it is important to recognize that this is challenging for several reasons unique to this age group (e.g., personal or family illnesses; acute life stressors, such as death of a partner, sibling, or friend). Providers should ask about exercise adherence at each clinic visit. Suggesting that patients incorporate exercises into their daily routine (e.g., standing on 1 leg while brushing the teeth) is a practical way to encourage long-term exercise adherence (51).

To facilitate management of environmental risks, identifying and prioritizing hazards collaboratively with the patient and enlisting family support to accomplish any changes to which the patient is receptive is advisable. Identifying risky behaviors (e.g., carrying bags of groceries, not holding onto the stair railing) and encouraging adaptive strategies (e.g., carrying 1 bag at a time, identifying which entrance allows the easiest ingress into the building) can also be helpful (69).

Management... Fall risk must be managed with a patient-centered approach. Clinicians should recommend interventions to address modifiable risk factors and reduce injury from falls in the context of patient preferences and values. Maintaining the highest possible level of mobility and social and daily functioning is the key goal of fall prevention management. Engaging a caregiver can be helpful in achieving fall risk reduction in vulnerable older adults.

CLINICAL BOTTOM LINE

What measures do stakeholders use to evaluate the quality of care for patients at risk for falls?

The Merit-based Incentive Payment System (www.aafp.org/news/macra-ready/20180411mipstool.html) has a quality measure for fall risk assessment, which is the percentage of patients aged 65 years or older with a history of falls (i.e., ≥ 2 falls in the past year or any injurious fall in the past year) who had a risk assessment completed within 12 months. A patient-reported history of falls is sufficient. The risk assessment must cover balance and gait and 1 or more of the following: postural blood pressure, vision, home fall hazards, and documentation of whether medications contributed to falls in the past 12 months.

The Patient Protection and Affordable Care Act established the Centers for Medicare & Medicaid Services' "star ratings" (www.aafp.org/news/practice-professional-issues/20180109physiciancompare.html) of health care quality for various measures that form the basis of quality bonus payments to Medicare Advantage Plans. Measures relevant to fall prevention in 2018 include medication review, functional status assessment, and osteoporosis management in women who have had a fracture.

What do professional organizations recommend regarding fall prevention?

Several professional organizations endorse interventions to prevent falls among older adults. The recommendations vary.

The National Institute on Aging recommends strength and balance exercise, assessment of environmental hazards, optimization of hearing and vision, and medication management (70).

The AGS (26) recommends annual fall screening (asking about falls in the prior year) along with gait and balance assessment. Anyone who has fallen two or more times in the prior year, presented for medical attention for a fall, or has difficulty on gait and balance testing should have a multifactorial fall risk assessment. The AGS recommends the following interventions: balance and strength exercise, home modification, withdrawal or minimization of psychoactive or other medications, management of postural hypotension, management of foot problems and footwear, and vitamin D supplementation of at least 800 IU/d for persons who have vitamin D deficiency or are at increased risk for falls.

The CDC's STEADI initiative (www.cdc.gov/steady) is a health care provider-oriented set of materials to facilitate implementation of the AGS fall prevention guidelines in routine clinical practice. STEADI consists of 3 key strategies: screen to identify fall risk, assess modifiable risk factors, and intervene using effective strategies to reduce the identified risk factors. Recommended clinical strategies reflect the recommendations of the AGS/BGS and emphasize exercise, vitamin D supplementation, medication management, and home modification.

In the Clinic Tool Kit

Fall Prevention in Community- Dwelling Older Adults

Patient Information

<https://medlineplus.gov/falls.html>

Resources related to falls in MedlinePlus from the National Institutes of Health (NIH).

www.bones.nih.gov/health-info/bone/osteoporosis/fracture/prevent-falls-ff

www.bones.nih.gov/health-info/bone/espanol/osteoporosis/fracturas-ff-espanol

Recommendations in English and Spanish on prevention of falls and related fractures from the NIH Osteoporosis and Related Bone Diseases National Resource Center.

www.nia.nih.gov/health/prevent-falls-and-fractures

www.nia.nih.gov/health/prevenga-caidas-fracturas
Information in English and Spanish on prevention of falls in older adults from the National Institute on Aging.

www.mayoclinic.org/healthy-lifestyle/healthy-aging/in-depth/fall-prevention/art-20047358

Tips on fall prevention from the Mayo Clinic.

Clinical Guidelines and Other Information for Health Professionals

www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/falls-prevention-in-older-adults-interventions1

U.S. Preventive Services Task Force clinical recommendations for fall prevention in older adults.

www.cdc.gov/steady/materials.html

Resources for providers on preventing falls in older adults from the Centers for Disease Control and Prevention.

In the Clinic

WHAT YOU SHOULD KNOW ABOUT FALLS

In the Clinic
Annals of Internal Medicine

Am I at Risk for Falls?

Getting older can increase your risk for falling.

Even a minor fall can cause serious injury. You might be at higher risk for a fall if you:

- Have eye problems, like glaucoma or cataracts
- Have heart disease
- Have Parkinson disease or dementia
- Can't hold your urine (called incontinence)
- Are not getting enough sleep
- Have arthritis or chronic pain
- Use certain medicines, like sedatives or opiates

How Can I Prevent Falls?

- If you are over 65, talk with your doctor about how you can prevent falling.
- Exercise has been shown to help prevent falls. It helps you stay strong and keep your balance. Ask your doctor what exercise is safe for you.
- If you take medicines, ask your doctor if they increase your risk for falls.
- Talk with your doctor about your risk for osteoporosis.
- Check your home for safety. If you have stairs, make sure the banisters are sturdy. Make sure



there are no slippery surfaces or throw rugs that could trip you.

Questions for My Doctor

- Am I at risk for falling?
- How can I prevent falls?
- Do I need to be tested for osteoporosis?
- Do any of my health conditions put me at risk for a fall?

For More Information



American College of Physicians
Leading Internal Medicine, Improving Lives

National Institutes of Health

www.bones.nih.gov/health-info/bone/osteoporosis/fracture/prevent-falls-ff

National Institute on Aging

www.nia.nih.gov/health/prevent-falls-and-fractures
www.nia.nih.gov/health/prevenga-caidas-fracturas

Notes
