

Title: Clinical and community strategies to prevent falls and fall-related injuries among community-dwelling older adults

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Key Points:

- ❖ Falls are the leading cause of fatal and non-fatal injuries among older adults.
- ❖ Community-dwelling older adults should have an annual fall risk screening and/or assessment.
- ❖ Several evidence-based programs are available for community-dwelling older adults to raise awareness about falls, increase strength and balance, and address the fear of falling.

Synopsis:

Falls in older adults are the result of several risk factors across biological and behavioral aspects of the person, along with environmental factors. Falls can trigger a downward spiral in activities of daily living, independence, and overall health outcomes. Clinicians, who care for older adults, should screen them annually for falls. A multifactorial comprehensive clinical fall assessment coupled with tailored interventions, can result in a dramatic public health impact, while improving older adult quality of life. For community-dwelling older adults, effective fall

prevention has the potential to reduce serious fall-related injuries, emergency room visits, hospitalizations, institutionalization, and functional decline.

Introduction

As the aging population increases and lives longer, falls, fall-related injuries, and subsequent institutionalization are expected to rise. Various national studies from across the globe have demonstrated increasing fall-related incidence of injury (Canada), hospital admissions (Netherlands), and death due to falls (United States).¹⁻³ Preventing falls in community-dwelling older adults with, and without, a fall history is possible, but requires a multi-faceted approach utilizing education, clinical and community interventions, and health policies. The purpose of this article is to provide current evidence-based information on community-based fall screening, and comprehensive clinical fall assessment, as well as community-based interventions addressing fall prevention. Falls may be similar in the community and nursing home; however the relative rates and interventions differ in these settings, thus this article will focus on community-dwelling older adults. We will address non-syncopal falls, (e.g., falls that are not associated with loss of consciousness, stroke or seizure, or a violent blow.)

Epidemiology

Falls are the leading cause of fatal and non-fatal injuries in older adults.⁴ Each year about one third of adults aged 65 years or older, and half of those aged 80 years and older, will fall.⁵ Nearly half of all falls result in an injury,⁶ of which 10% are serious,⁷ and these injury rates rise with increasing age.^{8,9} In 2015, direct medical costs for falls totaled \$616.5 million for fatal and \$30.3 billion for non-fatal falls in the U.S.^{5,10} Older adult falls can trigger a downward spiral in activities of daily living (ADLs), independence, and overall health outcomes. Nearly 50% of older adult hospital admissions and the majority of nursing home placements are a direct result

of fall-related injuries such as hip fractures, upper limb injuries and traumatic brain injuries.^{5,11,12} Although about 85% of older adult falls do not result in fracture or other serious injury, a prior fall is a significant risk factor for a subsequent fall, increasing the likelihood of injury from a future fall.^{13,14} Additionally, many older adults associate falls with a potential loss of independence; as a result many community-dwelling older adults do not report non-injurious falls to their families or health care providers.

Fall Risk Factors in Community-Dwelling Older Adults

Falls in older adults are the result of a convergence of risk factors across biological and behavioral aspects of the person, and factors in their environments.⁹ Risk factors for falling among older adults are generally classified as either intrinsic or extrinsic (see Table 1). Falling is considered a “geriatric syndrome”—a *“multifactorial health condition that occurs when the accumulated effects of impairments in multiple systems renders an older person vulnerable to situational challenges”* (p. 781).¹⁵ In the U.S., white older adults are significantly more likely than black older adults to suffer an injury due to a fall, which is likely due to lower rates of osteoporosis in African Americans.^{16,17} Older women are likewise at a higher risk for injurious falls than are older men, although aging men are more likely to have a fatal fall.^{18,19} Low socioeconomic status, living alone, and social isolation have also been identified as contributing risk factors for falls among older women.^{12,20} Physiologically, the risk of falling is increased with low BMI, sarcopenia, and postural hypotension, as well as visual and hearing impairments.²¹ Prior falls, and fear of falling, contribute to a cycle of diminished physical activity and muscle decline, thereby increasing the risk of falling.²² Additionally, undiagnosed acute illness, such as pneumonia or a urinary tract infection, as well as chronic illnesses, geriatric syndromes and

medication side effects all can underlie a fall event.⁵

Factors in the physical environment are implicated in about a third of all falls among older adults.⁵ These factors can include poor lighting, loose carpeting, clutter, and stairs that do not have weight-bearing hand rails for support. Unlike with youth and young adults, few falls in older adults are the result of engagement in sports or physical activity, but rather they more likely occur during activities of daily living in the home or community.^{18,23} Specifically, falls occur most frequently when the older adult is transferring, or changing physical positions, such as from sitting to standing, climbing into a bathtub, or walking down stairs.¹⁹ For many older adults, environmental factors are often downplayed as their environments have remained constant for a decade or longer. The increased risk in these environments is typically due to the physical decline of the older adult leading to person-environment incongruence.^{9,24}

Screening for Fall Risk

Older adults may believe falls are a normal part of aging, or have concerns over institutionalization by overzealous family members, and may never report their falls to their health care providers or informal caregivers if they do occur. Thus, each time a health care provider does not screen for falls, there is a missed opportunity to prevent future falls. The American and British Geriatrics Societies' (AGS/BGS) joint Clinical Practice Guideline recommends that clinicians who care for older adults screen them for falls annually.²⁵ Initial screening can be easily performed at community health fairs, with primary care follow-up where indicated, or during primary care visits in the "Welcome to Medicare" or "Annual Medicare" visits. But even during routine out-patient visits a short and highly predictive question is to ask, "Have you had a fall in the previous six months?" If so, a follow-up

appointment for a Comprehensive Clinical Fall Assessment should be made.

Comprehensive Clinical Fall Assessment

A multifactorial comprehensive clinical fall assessment coupled with tailored interventions based on the assessment findings can result in a dramatic public health impact, while improving older adult quality of life, as is recommended by the AGS/BGS joint Clinical Practice Guideline.²⁵ In response to this growing public health problem of falls among older adults, the Centers for Disease Control and Prevention's Injury Center "STEADI (stopping elderly accidents, deaths and injuries), Preventing Falls in Older Patients—A Provider Tool Kit" developed a broad, evidence-based resource designed with input from health care providers to help them incorporate fall risk assessment and individualized fall interventions into clinical practice with links to community-based fall prevention programs.^{26,27} STEADI was developed through a comprehensive systematic review, which incorporated provider input of knowledge and practice gaps, and contains an array of fall resources. The STEADI algorithm (see https://www.cdc.gov/steady/pdf/algorithm_2015-04-a.pdf), begins with a 12-question "Stay Independent" patient self-assessment screening tool, with a score of 4 or more, or an affirmative response to any of three key questions (e.g., fallen in the past year, feeling unsteady when standing or walking, or worried about falling) requiring additional assessments. These assessments include gait, strength, and balance testing, a vision exam, orthostatic blood pressure measurement, medication review, physical exam, cognitive screen, and a thorough falls history.^{26,27} STEADI also provides care team information about falls, case studies, conversation starters, and video support and instructions for standardized fall risk, lower body strength and balance assessments (i.e., Timed Up and Go [TUG] test, 30-s chair stand, and 4-

stage balance test).^{26,27} Patient and family educational handouts and fall prevention brochures are likewise available. All materials are open access and free of charge.²⁶

Evidence-based Fall Prevention Interventions

For community-dwelling older adults, effective fall prevention has the potential to reduce serious fall-related injuries, emergency room visits, hospitalizations, institutionalization, and functional decline.^{25,28} Evidence-based fall prevention initiatives should acknowledge the multi-faceted risks for falling, and take into account biological, behavioral, environmental factors. In a recent systematic review²⁸ examining effective interventions for preventing falls among community-dwelling older adults, it was reported that group and home-based exercise programs, along with home safety interventions reduced the rate of falls and risk of falling. In addition, multifactorial assessment and intervention programs reduced the rate of falls but not the risk of falling. Further, Tai Chi was reported to reduce the risk of falling, while vitamin D supplementation did not appear to reduce falls.²⁸ Most guidelines reflect this, and recommend that assessment for fall risk along with fall prevention interventions be multifactorial, based on the individual's fall risk.^{25,29} At a minimum, it is recommended that assessment and intervention include vision screening, home environment, medication reduction and exercise.²⁵ Additional evidence suggests the potential value in expanding upon these interventions to also include assessment and intervention for cardiovascular syncope and postural hypotension, osteoporosis, calcium and vitamin D levels, proper footwear, cognitive impairment, urinary incontinence, transferring skills, and providing hip protectors or other assistive devices when indicated.^{11,25,29-32} More recent evidence points to the importance of dual-task balance training to reduce the risk of falling.³³ Although social factors, such as socioeconomic status and social

isolation, are associated with increased fall risk, less evidence is available regarding the mechanisms for this relationship, or how to properly intervene in these areas to reduce fall risk. Table 2 provides a list of sources for current evidence-based fall prevention recommendations.

Selected Community-based Exercise Programs for Fall Prevention

Several community-based programs are commonly available for fall prevention. Different programs can raise awareness about falls, increase strength and balance, and address the fear of falling. Table 3 provides information on what organization(s) recommend these programs, and the evidential outcome of each. Some of the most common fall prevention programs are described below.

A Matter of Balance (MOB). MOB is a community-based educational program led by trained lay leaders,³⁴ which was developed by MaineHealth's Partnering for Healthy Aging (<http://www.mainehealth.org/pfha>). The overarching goal of the program is to reduce the fear of falling and increase activity goals for community-dwelling older adults age 60 years and older. MOB uses cognitive restructuring to manage concerns about falling.³⁴⁻³⁶ During the MOB classes, a variety of strategies are used, such as restructuring misconceptions to promote a view of fall risk and fear of falling as controllable, setting realistic goals for increasing activity, changing the environment to reduce fall risk, and learning range of motion exercises to aid in fall prevention. This is done through eight two-hour sessions conducted with once (8-week course) or twice per week (8-week course), during which participants learn problem-solving, skill building, assertiveness training, and cognitive restructuring ("learning to shift from negative to positive thinking patterns, or thinking about something in a different way"), along with exercises to increase strength and balance. Participants of the MOB program report being

more comfortable discussing their fear of falling, increasing their physical activity and would recommend the course to others.³⁴⁻³⁶

Otago Exercise Program (OEP). Developed in New Zealand, the OEP increases balance and strength of community-dwelling older adults who cannot or will not attend a group-based exercise class. The OEP consists of 17 exercises performed in the home under the guidance of a trained physical therapist or nurse during 4 sessions, which are provided over 8 weeks with one “booster” session after 6 months. Participants are encouraged to do the exercises independently three times each week, and to walk outside twice a week. Randomized controlled trials of the program have found on average a 35% reduction in falls among participants, including those with vision loss.^{37,38} The highest benefits were found among those with the strictest adherence to the program, and those aged 80 and older who had experienced a fall in the prior year.^{38,39} Implementation of the OEP across eight states (i.e., Colorado, Oregon, Pennsylvania, Connecticut, North Carolina, South Carolina, Nebraska, and New Hampshire) among 210 older adults (mean age=80 years) resulted in significantly lower fall risk (Timed Up-and-Go, $p < .001$), better lower body strength (30-Second Chair Rise, $p < .001$), and better balance (Four-Stage Balance test, $p < .001$) following the 8-week program.⁴⁰

Stay Active and Independent for Life (SAIL). SAIL is a strength, balance and fitness program for adults 65 years and older or those who have fallen, which was developed by the Washington State Department of Health.^{41,42} The goals of SAIL are to reduce and prevent falls in older adults with fall prevention education and long-term structured exercise classes. Classes are conducted for one-hour, three times per week by fitness, exercise science or healthcare professionals who have completed the SAIL instructor training. The curriculum of activities in

the SAIL program includes warm-up exercises, aerobics, balance and strength exercises, stretching and education classes on falls prevention, exercise, medication safety, home safety, safe footwear, walkers, and canes. SAIL classes are able to accommodate people with a mild level of mobility difficulty (e.g. cane user), as the exercises can be done standing or sitting. Every 12 weeks a fitness check is completed on participants to assess fall risk (i.e. timed up and go test), and strength (i.e., biceps curl and chair stand).^{41,42} Evaluation of the SAIL program among 91 older adults (mean age=75 years) completing both baseline and follow-up testing, found significantly better upper and lower body strength ($p<0.01$).⁴² Participants can attend SAIL indefinitely, since they are encouraged to remain active and independent for life.

Tai Ji Quan: Moving for Better Balance® (TJQMBB). TJQMBB, developed by Fuzhong Li, Ph.D., a Senior Scientist at the Oregon Research Institute,⁴³ is a research-based balance training regimen designed for older adults, people with balance disorders or those who have fallen. TJQMBB is considered a functional therapy, based on Tai Chi principles derived from the Yang-Style of Tai Chi integrating motor, sensory and cognitive components to improve balance, strength, and gait, leading to fewer falls.^{44,45} Participants in the TJQMBB program attend a one-hour class twice/week for 24 weeks and learn a total of eight core tai chi movements, along with a set of therapeutic movements. A minimum of 48 hours of TJQMBB is recommended to reduce fall risk in older adults. TJQMBB classes are taught by trained instructors, and are able to accommodate individuals with a mild level of mobility difficulty (e.g. cane user), as the movements can be done standing or sitting. Community-based implementation of the TJQMBB program in Oregon among 511 older adults (mean age=75 years) across 32 senior centers, led to a 49% reduction in the number of falls.⁴⁵

Conclusion

Most fall reduction programs are targeted to those known to have already experienced a fall. Given the low rate of reporting of non-injurious falls, a large portion of the at-risk population is never identified for fall prevention services. Yet the promotion of physical activity and home assessments can be easily implemented at a population level. The recommendations provided in this paper equip nurses and other healthcare professionals with increased knowledge of current evidence-based information on fall screening, comprehensive clinical fall assessment, and community-based interventions addressing fall prevention in community-dwelling older adults. Although not every patient may warrant every assessment and intervention listed here, all older adults should receive targeted evidence-based fall screening risk assessment and intervention.

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Table 1: Fall Risk Factors*

Intrinsic	Extrinsic
Advanced age	Lack of stair handrails
Previous falls	Poor stair design
Muscle weakness	Lack of bathroom grab bars
Gait and balance problems	Dim lighting or glare
Poor vision	Obstacles and tripping hazards
Postural hypotension	Slippery or uneven surfaces
Fear of falling	Improper use of assistive device
Chronic conditions (e.g., arthritis, diabetes, stroke, Parkinson's, incontinence, dementia)	Psychoactive medications

*source=CDC-STEADI, <https://www.cdc.gov/steady/>

Table 2: Sources for identifying current evidence-based strategies for fall prevention among community-dwelling older adults

Source	Title	Publication Date	Type of Interventions Recommended
American Geriatrics Society/British Geriatrics Society,	Summary of the Updated American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons	2011	<ul style="list-style-type: none"> • Vision • Medications • Exercise • Home environment • Multifactorial
U.S. Preventive Services Task Force	Prevention of Falls in Community-Dwelling Older Adults: US Preventive Services Task Force Recommendation Statement	2012 (Update Forthcoming in 2017)	<ul style="list-style-type: none"> • Exercise/Physical Therapy • Vitamin D supplementation
Centers for Disease Control and Prevention	A CDC Compendium of Effective Fall Interventions: What Works for Community-Dwelling Older Adults, 3 rd Edition	2015	<ul style="list-style-type: none"> • Exercise • Home environment • Medications • Vision • Podiatric • Pacemaker • Multi-factorial
National Center on Aging	Falls Prevention Programs	2016	<ul style="list-style-type: none"> • Exercise

Table 3: Commonly available Community-based Fall Prevention Programs

Name of program	Recommended	Program Goals	Evidence
A Matter of Balance	AOA, NCOA	decrease fear of falling, and increase activity	reduced fear of falling
The Otago Exercise Program	AOA, CDC, NCOA	improve balance, strength, flexibility and mobility	35% fall reduction
Stay Active and Independent for Life	AOA, NCOA	improve balance and strength	better balance, strength and mobility
Tai Ji Quan: Moving for Better Balance	AOA, CDC, NCOA	improve balance, strength, and gait	49% fall reduction

AOA=Administration on Aging, CDC=Centers of Disease Control and Prevention,⁴⁶ NCOA=National Council on Aging (<https://www.ncoa.org/healthy-aging/falls-prevention/falls-prevention-programs-for-older-adults/>)