

PREVENTING FALLS IN OLDER ADULTS



Institute for
Aging Research
Hebrew SeniorLife



Affiliated with
Harvard Medical School

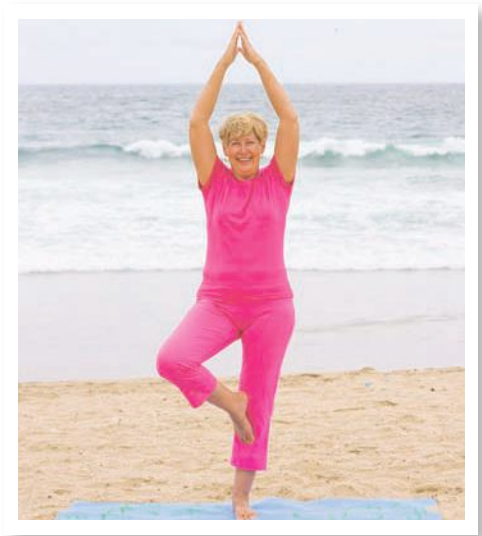
Copyright © 2013 Institute for Aging Research
All Rights Reserved

Created by Lewis A. Lipsitz, MD and Margaret M. Gagnon, RN, BSN

DO NOT REPRODUCE WITHOUT PERMISSION

PREVENTING FALLS IN OLDER ADULTS

LEWIS A. LIPSITZ, MD
MARGARET M. GAGNON, RN, BSN



*With contributing authors
Douglas P. Kiel, MD, MPH
Marian T. Hannan, DSc, MPH
Sarah D. Berry, MD, MPH*

*Institute for Aging Research, Hebrew SeniorLife
Affiliated with Harvard Medical School*

Preventing Falls in Older Adults was made possible with support from



The purpose of this guide

is to provide evidence based information for older adults, family members and health care providers for seniors in the area of falls prevention. The goal is to raise awareness of known risk factors for falls in older adults and practical steps for reducing these risks.

Falls in older adults are most often due to multiple risk factors, but these risk factors are different for each older adult. Therefore, this guide can be used as a



communication tool between older adults and their health care practitioners to identify the individual fall risk factors present and develop an individualized plan to reduce these risks.

Finally, this guide identifies other resources available for older adults and their caregivers to obtain additional information about fall risk reduction and fall prevention.

Table of Contents

Overview	6
Some Facts about Falls in Older Adults	8
Minimizing Fall Risk	9
Identifying Environmental Risks Inside and Outside the Home	9
Health-related Issues and Interventions	13
Medication and Falls	14
Foot Problems, Foot Pain and Falls	16
Cognitive Impairment and Falls	19
Raising Awareness - What to Do When a Fall Occurs	20
General Health Tips to Prevent Falls	20
Resources Available to Older Adults and Caregivers	26
Authors	28
Contributors	29



Overview

If you ask older adults, “What are your biggest fears?” many will tell you they have a fear of falling. Some have already fallen; while others have witnessed a friend or family member suffer a fall and its painful, or sometimes life-threatening consequences.

Falls in older adults are a major public health problem, occurring in 30-40% of community-dwelling older adults each year. They are not only a concern to older adults themselves, but also to all those involved in their lives.

More than two decades of research in this area has resulted in a significant increase in knowledge regarding risk factors and fall prevention strategies in this population.

Many studies have reported on the multi-factorial nature of falls in this age group. That is, in a person who has fallen, generally, multiple identifiable risks are present. Also, a person who has fallen once has a greater risk of falling again. While most falls do not result in a serious injury, **falls are the lead-**

ing cause of fatal and non-fatal injuries in adults over age 65.

The good news is that falls are preventable.



In the coming decades, as the Baby Boom generation reaches old age, the costs associated with falls and their resultant disabilities are expected to skyrocket. In 2000, the costs of fall-related injuries in people over 65 were



\$19.2 billion, and by 2020 they are estimated to reach \$43.8 billion. Although some fall prevention programs have reported success in reducing falls, there has not been widespread implementation. Awareness of falls reduction strategies is critical to prevent the enormous personal and societal costs of falling.

Unfortunately, many older adults do not receive the help they need to prevent falls because they are reluctant to report them. This may be due to concerns about possible loss of independence or the need to leave their own home and move in with others or even into a nursing home. By following the recommendations in this manual, most older adults will be able to remain safe in their own homes and avoid the injuries associated with recurrent falls.

Some Facts about Falls in Older Adults

Community Living Older Adults

About 1/3 of older community living adults over age 65 suffer a fall each year. Although 6% of these falls result in a serious injury, 2 million are treated in emergency departments for related injuries. Fall risk increases with each decade of life. In 2010, persons less than age 75 had the highest rate of fall related injuries for which a health care professional was consulted.¹

Hospitalized Older Adults

Older adults are more likely to have a fall while in a hospital. Increased weakness related to illness, unfamiliar surroundings, noise and hospital routines, medications, confusion, and exacerbations of chronic conditions are all contributing factors to the increased risk of falls.² Injuries related to the fall can lead to increased length of stay and increased costs.³

Older Adults Living in Long Term Care Facilities

About ½ to up to ¾ of all adults living in long term care settings suffer a fall each year.^{1,4} This is twice the rate of falls for older adults living in the community. Older adults who reside in nursing homes tend to fall because they are more frail in general than community dwelling seniors, are older, and have more cognitive impairment and difficulty walking.⁵



Minimizing Fall Risk

Many falls are potentially preventable. Identifying and reducing risks for falls is an important part of every older adult's health maintenance plan. Falls risks may include environmental risks at home or outdoors; as well as health conditions, medications that may be used to treat these conditions, or risky behaviors.⁶

Identifying Environmental Risks Inside and Outside the Home

Many environmental risk factors can be eliminated or reduced at little to no cost. Listed below and on the following page are environmental factors commonly associated with falls in older adults and appropriate interventions.

Factor	Intervention
General Home	
Clutter	Remove all clutter from every room including stairs and hallways.
Lighting	Check the lighting in each room. Replace light bulbs immediately when needed. Make sure stairways are well lit and that shadows do not fall across stairs.
Electrical Cords	Relocate any cords that are in pathways, keep cords against the walls.
Stairs	Secure banisters to each side of stairs; remove carpets with busy patterns (makes it difficult to distinguish individual steps – See picture on page 11); repair broken stairs.



Factor	Intervention
Room by room	
Living Room	<p>Remove scatter rugs.</p> <p>Check chairs and sofas to be sure they are sturdy, and not low to the ground. Chairs that are too low make it difficult to sit or stand up. If not sturdy, secure or remove chairs.</p> <p>Keep paths of rooms as wide as possible, reduce amount of furniture, remove anything not sturdy.</p>
Bedrooms	<p>Keep the path from bedroom to bathroom clear.</p> <p>Lights must be reachable from bed – keep a flash-light handy for emergencies.</p> <p>Telephone should be at bedside.</p> <p>Shoes or sturdy well fitting slippers should be close enough to the bed to put on at night.</p> <p>Light switch should be in easy reach.</p>
Bathrooms	<p>Secure grab bars in tub/shower and at toilet.</p> <p>Elevated toilet seat is preferred.</p> <p>Wipe up water spills right away.</p> <p>Use shower seat if needed.</p> <p>Remove scatter rugs.</p>
Kitchen	<p>Keep all food items and utensils in easy reach within lower cabinets.</p> <p>Clean up spills quickly.</p> <p>Consider a long handed grasper to help reach higher items.</p>
Outside the home	
Lighting	<p>External lighting must adequately illuminate the pathway to the home at all entryways.</p>
Stairs	<p>Fix cracked, uneven or broken stairs, Secure railings on both sides of stairs, remove decorative items that may be located on stairs, such as planters or other items.</p>
Walkways	<p>Keep the paths clear and well lit.</p>

Chart from – A Home fall prevention checklist for Older Adults, US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Injury Prevention and Control



Figure: A typical carpet pattern on stairs that makes it difficult to see where one step ends and another begins. Stairs should be clearly demarcated with contrasting strips and well lit.

In addition to those risks inside the home, there are many environmental hazards outside the home. These include uneven or broken pavements or sidewalks or no sidewalks. Poor lighting and icy/snowy streets or parking lots are hazards that can contribute to falls in older adults. Traffic lights may change too quickly for some people to cross the street, and curbs may be so high that it is hard to step up onto them. Indoor environments, such as shopping malls or other types of buildings may have changes in floor surfaces, such as linoleum flooring that changes to a carpeted floor surface. Also, as shown in the figure, carpeted stairs may have a busy pattern that makes it difficult to determine where one step begins and another ends.



Health-related Issues and Interventions

Chronic Diseases

Maintaining optimal health is very important to minimizing falls risk in older adults. Many older adults have one or more chronic health conditions that can lead to falls if not adequately treated. Examples of these are cardiovascular diseases such as heart failure, heart attacks, and fainting spells; neurological conditions such as strokes or Parkinson's Disease; arthritis; chronic pain, dizziness, balance problems, impaired vision, and other sensory impairments. Acute health conditions such as infections, influenza and pneumonia, particularly in individuals with multiple chronic health conditions, can lead to weakness and dehydration and increased risk of falls.



Pain

Many older adults suffer from chronic pain, which has been shown to be associated with an increased risk of falls in older adults.⁷ Older adults with chronic pain may be more likely to reduce their level of activity if the activity causes pain, which then can lead to muscle weakness and falls. Or, alternatively, medications used to relieve pain that have a sedative effect could lead to falls. Older adults who suffer from chronic pain should discuss this problem with their health care provider, and manage pain with the goal of maximizing the ability to participate in daily activities while avoiding over sedation.

Medication and Falls



Medications used to treat health conditions can also contribute to falls. The most dangerous medications are those that cause sedation, like sleeping pills, tranquilizers, and some antidepressants. Another commonly used medication that should be avoided if possible is Benadryl or Diphenhydramine. These are antihistamines sold over-the-counter that are found in many different cold preparations. It can cause dizziness, falls, confusion, and many other adverse effects.

People taking antihypertensive medications should have their physician or nurse check to be sure their blood pressure is not too low, especially when they stand up. Those taking diuretics should consult their doctor or nurse about holding them if they have a fever, diarrhea, or fasting laboratory test, or other condition associated with reduced fluid intake or fluid loss. Finally, older men taking medications to prevent frequent urination can experience dizziness or fainting spells when standing up. This is another common cause of falls.⁸

Researchers at Hebrew SeniorLife have shown that the risk of falls is particularly high within the first few days of starting these medications. Older adults should routinely go over their list of medications with providers so that unnecessary medications can be removed in an effort to prevent falls and other adverse outcomes. **Furthermore, older adults should be cautious immediately following a medication change.**

Summary: Health Related Fall Factors and Interventions

Factor	Intervention
Chronic Health Conditions	Keep chronic health conditions under control through regular check-ups, following treatment plans and reporting exacerbations promptly to health care providers.
Medications	Take medications only as directed by MD, reporting any side effects to MD. Always keep an updated list of medications in your wallet, and review these at each MD visit. Always discuss current medication list when seeing specialists who may be prescribing a new treatment.
Acute Medical Conditions	Get proper treatment for acute medical conditions promptly by contacting your primary care provider.
Sensory Issues	Get vision and hearing tested regularly, and when changes are noted.
Balance Problems	Wear well fitting, wide soled shoes. Avoid high heels. Exercise, such as Tai Chi; or Physical Therapy if indicated. Physical therapy can help enhance balance. Canes and walkers can help provide support if used properly.
Walking Problems	Wear well fitting shoes with good base of support. Review concerns with health provider. Practice regular exercise to maintain strength, balance and flexibility. Physical Therapy and gait training to improve walking. Canes or walkers can assist with walking.



Foot problems, Foot Pain and Falls

Taking Care of Your Feet Can Help in Reducing Risk of Falls

Foot problems and foot pain have also been implicated as important causes of falls yet they are often over-looked by health care providers and even persons who fall. Common foot problems, such as bunions, flat feet (or low arches), and hammer or claw toes, can contribute to foot pain, impair walking abilities, and disrupt balance.

Recent work from the MOBILIZE (Maintenance of Balance, Independent Living, Intellect and Zest in the Elderly) Boston Study has shown that foot pain seems to be a bigger factor in indoor falls than in outdoor falls. Other research has linked foot pain to slow gait and poor balance.



Exercise Suggestions

Here are several exercises that can help your foot muscles and improve foot function. These foot exercises can help make up for muscle loss or joint stiffness that can occur with underuse of foot and ankle muscles.



To make stronger ankle muscles: Often weak ankles can cause falls. To make ankles stronger, position a resistance band (a large rubbery stretchy band used for exercises) around the leg of a table or other large furniture that will not move. Move your ankle in circles so the band is stretched out away from the table leg.



To make stronger toe muscles: The toes have a tendency to curl with loss of foot muscles, perhaps contributing to hammer toes or claw toes. This exercise will help make the muscles in the toe area and underneath the foot stronger. Place either a small thin towel or several small marbles (or smooth stones) on the floor. Try to pick up the towel (or marbles) with your toes.



For those with mild bunions: Keep your heels on the ground. Placing a large rubber band around both of your big toes, make small circles with your feet away from each other. This exercise should increase the range of motion in the big toe joint affected by the bunion; it will not fix the bunion.

Also, Yoga and Tai Chi exercises can result in stronger feet, less foot pain and better balance and walking.

Shoes and Falls

People at risk of falling should wear low-heeled shoes that fit well, with slip-resistant soles. Many running or walking shoes are available with a wide, roomy, and comfortable fit for many foot types. Many people do not wear their shoes while in their own home. In several studies, over half of falls in one's home occurred in persons who were barefoot, wearing socks without shoes, or wearing slippers. Thus, it is sensible to **avoid going barefoot**, wearing socks without shoes, or wearing slippers whenever possible.

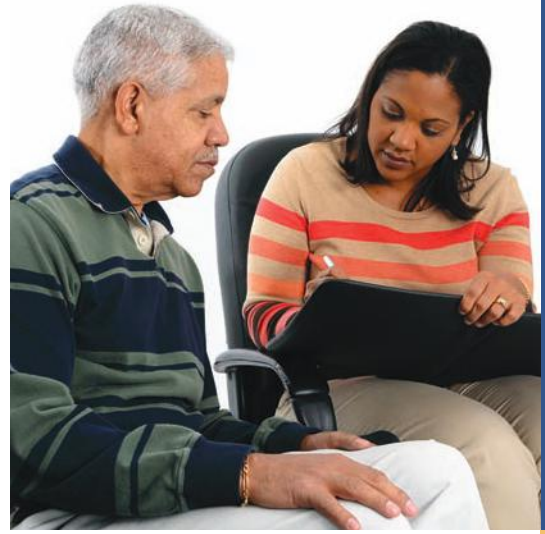


Diabetes and Falls

People with diabetes are particularly prone to foot problems and associated falls. Diabetes can impair sensation in the feet, not only making it difficult to balance, but also making it hard for a person to detect small cuts or scratches that can become infected. Therefore, it is important for people with diabetes to inspect, clean and moisturize their feet every day.

Cognitive Impairment and Falls

Older adults with moderate to severe memory impairments have a higher risk of falls. Although the precise reasons are not completely understood, impaired cognitive abilities can reduce attention and compromise posture and gait (walking) stability.⁹



Cognitive impairment or dementia may also cause behavioral issues, such as agitation, wandering, or poor judgement, which may increase the risk of falls. A person with poor judgement may fail to recognize and adjust for identifiable fall risks.^{10,11} Older adults with dementia may also experience perceptual deficits, making it more challenging to negotiate things like changes in floor surfaces, contrasting colored floors, or stairs.¹¹ The consequences of falls in older adults with dementia are serious; fallers with cognitive problems are approximately five times as likely to be admitted to institutional care as people with cognitive problems who do not fall.¹²



Raising Awareness- What to Do When a Fall Occurs

Importance of Documenting Time of Fall

- What time of day?
- Where did the fall occur?
- Were there any symptoms?
- What was the person doing at the time of the fall?
- What medications were taken prior to the fall?
- Did they eat a meal before the fall occurred?
- Was the person wearing shoes, eyeglasses, hearing aides?

This type of information can be useful to identify contributing factors which should be discussed with health care providers. By reviewing the exact circumstances of a fall, your primary care physician or nurse can determine what steps can be taken to minimize the risks of future falls.



All persons over age 70 should be asked about fall history, questioned about the circumstances of falls and examined for potential fall risk factors. By identifying the multiple risk factors for falls and minimizing them, falls can often be prevented.¹³

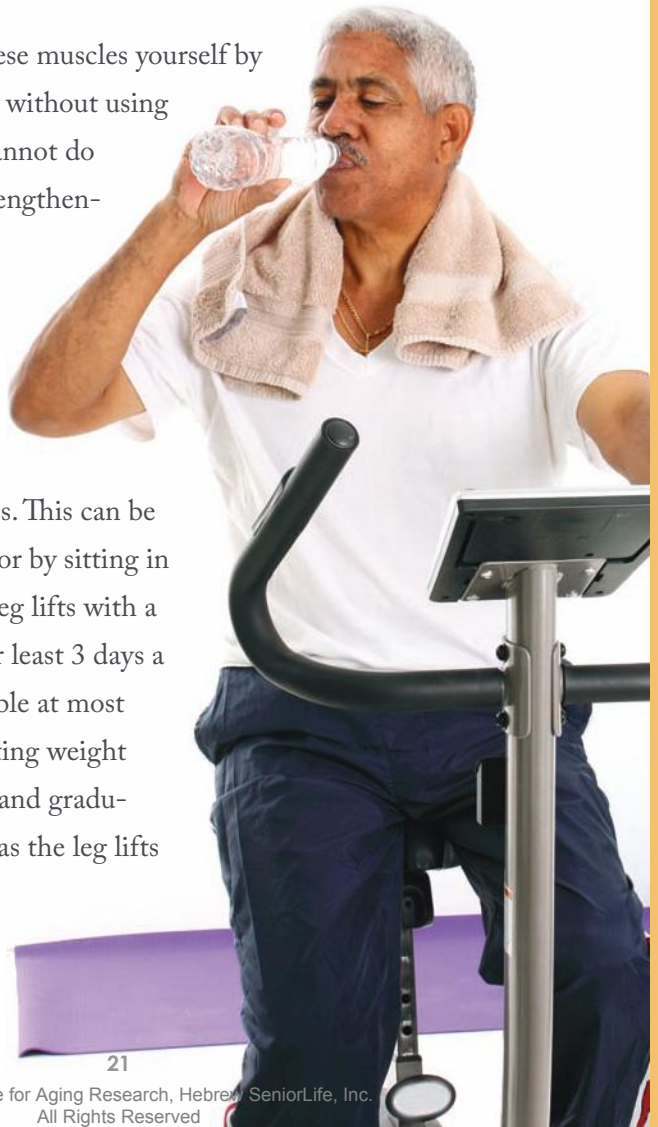
General Health Tips to Prevent Falls

Activity and Exercise

Participating in regular physical activities that include aerobic, strength, and flexibility are very important in maintaining health, physical strength, walking ability and balance. Strong muscles in the buttocks and thighs are particularly important for standing up, climbing stairs, and avoiding falls. Research studies have shown that weakness of these muscles is a strong risk factor for falls.

You can test the strength of these muscles yourself by trying to stand up from a chair without using your arms to push off. If you cannot do this, you need to do muscle strengthening exercises.

Research has shown that even people as old as 100 years of age are able to increase the strength of these muscles through weight-lifting exercises. This can be done with machines in a gym, or by sitting in a chair and doing 3 sets of 10 leg lifts with a weight around the ankles at for least 3 days a week. Ankle weights are available at most sporting goods stores. The starting weight should be about ½ to 1 pound and gradually increased every 2-3 weeks as the leg lifts become easier to perform.





Walking is also an excellent form of exercise to prevent falls. Everyone should walk for at least 20-30 minutes every day. This doesn't have to be done all at once. It can be done while shopping, walking in a parking lot, walking the dog, or taking a stroll. It is a good idea to park far away from your destination or take the stairs instead of an elevator to incorporate exercise into your daily activity.

For older adults with balance problems

- Tai Chi may be a very effective intervention. Tai Chi is an ancient Chinese practice that combines slow movements with focus on breathing techniques. IT is considered a mind/body practice that focuses attention and awareness on the body's position with each movement. Tai Chi Centers are now located in most cities.
- Sometimes a walker becomes necessary to stabilize a person with severe balance difficulty.

There is also growing evidence that keeping active socially and mentally can help maintain brain health, which may preserve walking ability and reduce the risk of falls.¹⁴



Get Your Rest– Sleep is Important for Overall Health

Many older adults experience some type of sleep disturbance which can result in day-time sleepiness, increased drowsiness and increased risk of falls. It is important to establish a good routine to help promote sleep. Regular exercise can also help promote sleep.

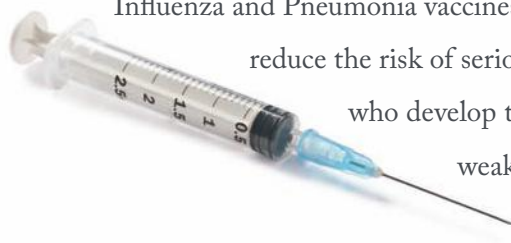
Persistent troubles with sleep should be reviewed with your primary care provider to develop a successful strategy to promote restful sleep. Sometimes older people develop a condition called sleep apnea, which can result in hypertension, day-time sleepiness, cognitive impairment, and associated falls. This can be diagnosed and treated by your physician.



Avoid Dehydration

Older adults tend to excrete a lot of fluid by the kidneys and are less likely to feel thirsty when fluids are restricted. This makes it very easy to become dehydrated. **Dehydration can occur when fluids are being lost from the body and not sufficiently replenished.** This is particularly important in hot weather or during a viral infection or preparation for a medical procedure when fluids are withheld. Dehydration can lead to drops in blood pressure upon standing up. This drop in pressure can cause lightheadedness and dizziness and can lead to a fall. The general recommendation is 6-8 glasses of water or other fluids a day to stay well hydrated. For some people, this amount may cause frequent urination or incontinence. In this case, it may be helpful to spread fluid intake over the course of the day. Starting first thing in the morning is a good idea to replenish lost fluids during sleep. Having a glass of water at each meal, and after exercise is another good way to help get in enough fluid to stay well hydrated.

Get Immunized



Influenza and Pneumonia vaccines are important preventative measures to reduce the risk of serious illness in older adults. Older adults who develop the flu or pneumonia can quickly become weakened, lethargic, dizzy, confused as well as dehydrated.

Take Vitamin D

Vitamin D is called a vitamin, but may actually act in some ways like a hormone. Vitamin D not only improves calcium absorption to build the skeleton, but also binds to receptors located all over the body. Vitamin D intake has been found to be related to physical performance such as strength and balance as well as functional capabilities.

The preponderance of evidence suggests that Vitamin D also prevents falls, possibly by its effects on strength, balance and functional status. Recommendations from various consensus reports state that seniors should take 800 to 1,000 International Units (IU) daily. The best supplement is called cholecalciferol or vitamin D₃.

Check Your Bone Density and Treat Osteoporosis

Osteoporosis is a disease that causes fragility of the skeleton resulting in fractures, most often from a fall. Since fractures are one of the most common injuries sustained during a fall, it is important to ascertain if a person has osteoporosis to minimize injuries resulting from a fall. For this reason, everyone over the age of 65 should know their bone density, since bone density is one of the strongest risk factors for fractures. Ask your primary care physician to check your bone density and if it is low, consider taking medications to improve it. This can also help prevent fractures if you do fall.



Check Your Vision

Poor vision can result in misplaced footing or disorientation. Regular eye exams are critical to maintain appropriate eyewear or to determine the need for eye surgical procedures. Updating your eyeglass prescription or removal of severe cataracts may reduce falls.



Resources Available to Older Adults and Caregivers



www.cdc.gov/HomeandRecreationalSafety/Falls/adultfalls.html

This site provides more information on the statistics of falls in older adults and ways to maintain independence and reduce falls



www.cdc.gov/nccipc/pub-res/toolkit/cksafety

A great resource for identifying home fall hazards. Most are low or no cost fixes



www.partners.org/cird/FallsPrevention/FallsInfo.htm

This site provides information about falls in hospitalized older adults and tips for avoiding falls while in the hospital



www.hebrewseniorlife.org/healthcare-hrc-evidence-based-programs-massachusetts

Offers information on Evidence based programs available to older adults such as *A Matter of Balance* and *Fit for Your Life*



www.health.harvard.edu

Better Balance: Easy exercises to improve stability and prevent falls. Offers a manual of balance workouts, safety checklists, and special bonus section on preventing falls



www.nihseniorhealth.gov

Provides healthy aging tips and online videos of exercise and information on falls in older adults

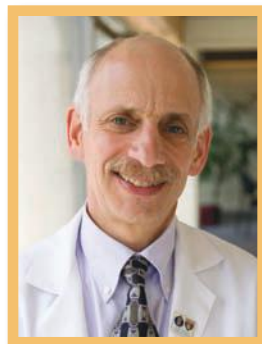
References

1. Center for Disease Control and Prevention Falls Among Older Adults
www.cdc.gov/homeandrecreationalafety/falls/adultfalls/html
2. Dykes PC, Carroll, DL, Hurley A, Lipsitz S, Benoit A, Chang F, Meltzer S, Tsurikova R, Zuyov L, Middleton B. Fall Prevention in Acute Care Hospitals: A Randomized Trial, *JAMA* 2010 November 3; 304(17): 1912-1918
3. Bates DW, Pruess K, Douney P, Platt R. Serious falls in hospitalized patients: correlates and resource utilization. *Am J Med.* 1995;99(2):137-143.
4. Rubenstein LZ. Preventing falls in the nursing home. *Journal of the American Medical Association* 1997;278(7):595-6
5. Besdine RW, Rubenstein LZ, Snyder L, editors. Medical care of the nursing home resident. Philadelphia (PA): American College of Physicians; 1996
6. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community, *N Engl J Med* 1988; 319:1701-1707
7. Leveille SG, Jones RN, Kiely DK, Hausdorff JM, Shmerling RH, Guralnik JM, Kiel DP, Lipsitz LA, Bean JF. Chronic Musculoskeletal Pain and the Occurrence of Falls in an Older Population. *JAMA* November 25, 2009 Vol 302, No.20; 2214-2221
8. Lipsitz LA. An 85 year old woman with a history of falls. *JAMA* 1996; 276(1): 59-66
9. Woollacott M, Shumway-Cook A. Attention and the control of posture and gait: A review of an emerging area of research. *Gait Posture* 2002; 16:1-14
10. Kiely DK, Kiel DP, Burrows AB, et.al. Identifying nursing home residents at risk of falling. *J Am Geriatr Soc* 1998; 46: 551-5
11. Chris Perkins. Dementia and falling, *NZFP* Vol 35 Number 1, Feb 2008
12. Morris JC, Rubin EH, Morris EJ, et al. Senile dementia of the Alzheimer's type: An important risk factor for serious falls. *J Gerontol* 1987;42:412-417
13. Tinetti ME. Preventing Falls in Elderly Persons, *N Engl J Med* 348:1 Jan 2, 2003
14. Montero-Odasso M, Verghese J, Beauchet O, Hausdorff, JM. Gait and Cognition: A Complementary Approach to Understanding Brain Function and the Risk of Falling, *J Am Geriatr Soc* 2012 Nov; 60(11) 2127-36

AUTHORS

Lewis A. Lipsitz, MD

Lewis Lipsitz is the Director of the Institute for Aging Research at Hebrew SeniorLife and holds the Irving & Edith S. Usen and Family Chair in Medical Research; Vice President of Academic Medicine, Hebrew SeniorLife, Chief of the Division of Gerontology at Beth Israel Deaconess Medical Center, and Professor of Medicine at Harvard Medical School. His research is focused on the mechanisms and management of common geriatric syndromes, including hypo- and hypertension, falls, syncope, and cognitive dysfunction.

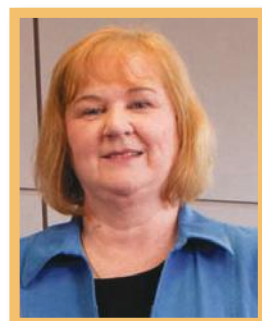


As Principal Investigator of the MOBILIZE Boston Study (Maintenance of Balance, Independent Living, Intellect, and Zest in the Elderly of Boston), Dr. Lipsitz directed the research of nearly 800 participants over age 70 who are living independently. Participants were followed longitudinally for falls using monthly postcard calendars. Data from this population are being used to elucidate poorly understood risk factors for falls as illustrated within this guide.

With over 30 years of clinical experience helping patients and families manage these and other geriatric conditions, he has led numerous research and educational programs aimed toward improving the care of elderly patients. Dr Lipsitz holds a Merit Award from the National Institute on Aging, Awards for Excellence in Mentoring, and the Joseph T. Freeman Award from the Gerontological Society of America. For the past decade, Dr. Lipsitz has been recognized by Boston Magazine as a Top Doctor in Geriatric Medicine.

Margaret M. Gagnon, RN, BSN

Ms. Gagnon, is a Clinical Research Associate and Project Director at the institute for Aging Research at Hebrew SeniorLife. Ms Gagnon has more than 30 years of professional nursing experience, and over 20 years in gerontologic nursing and geriatric clinical research, having managed many clinical studies at the Institute. Ms. Gagnon also served as a member of the HSL Institutional Review Board for over 10 years and Co-Chair for 2 years. She has collaborated and co-authored many scientific publications in the area of geriatric research, specifically in cardiovascular aging and falls research, and has presented research findings at many professional scientific meetings. Ms. Gagnon speaks to Boston area communities and senior groups on topics related to aging, healthy aging, and falls prevention and is a member of the Massachusetts Falls Prevention Coalition.



Contributors

Douglas P. Kiel, MD, MPH

Dr. Kiel is a Professor of Medicine at Harvard Medical School and Director of the Musculoskeletal Research Center at IFAR. He is the principal investigator of the Framingham Osteoporosis Study, which has studied osteoporosis and musculoskeletal disease over the past 25 years. He has expertise in the area of falls, having worked on the MOBILIZE Boston Study. Dr. Kiel has conducted randomized trials of vitamin D to prevent falls, and has been the senior author on the UpToDate chapter on falls, that is currently part of the Geriatric Review Syllabus from the American Geriatrics Society. Additionally he is senior author on the falls chapter that is part of the definitive textbook on Osteoporosis scheduled for release in the coming year.



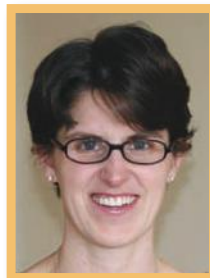
Marian T. Hannan, DSc, MPH

Marian T. Hannan, DSc, MPH, is a Senior Scientist and the Co-Director for the Musculoskeletal Research Center at the Institute for Aging Research at Hebrew SeniorLife. She is also an Associate Professor of Medicine at Harvard Medical School and the Editor of *Arthritis Care & Research*. Dr. Hannan received a B.A. in Health Sciences from the University of California, an M.P.H. in Epidemiology from Yale University School of Medicine and a D.Sc. in Epidemiology from Boston University School of Public Health. Her primary research interests focus on understanding the etiology of, and interventions for, osteoporosis and hip fractures in older adults. She is the principal investigator of the National Institute of Health-funded (NIH) Framingham Foot Study, a 10-year observational cohort study to examine the role of foot disorders on functional limitations and disability. Dr. Hannan is also a co-principal investigator on an NIH-funded grant to study the heritability of specific foot disorders and foot biomechanics in two large population-based cohorts, the Framingham Foot Study and the Johnston County Osteoarthritis Project at the University of North Carolina. Most recently, Dr. Hannan was awarded a three-year, multi-site NIH grant (as a principal investigator) to determine the contribution of directly measured trochanteric soft tissue thickness to hip fracture risk and to use this in the biomechanical Factor-of-Risk approach to hip fracture risk assessment.



Sarah D. Berry, MD, MPH

Sarah D. Berry, MD, MPH, is a geriatrician and clinical researcher, who received a B.S. in Biomedical Science from Auburn University, an M.D. for the University of Alabama



School of Medicine and an M.P.H. in Clinical Effectiveness from Harvard University School of Public Health. Dr. Berry is an Assistant Scientist II in the Musculoskeletal Research Center for the Institute for Aging Research at Hebrew SeniorLife and an Assistant Professor in Medicine at Harvard Medical School. Her primary research focus has been on outcomes following hip fractures, both in the community and nursing home settings. Given the low adherence with osteoporosis medications and the strong link between falls and fracture, she is also interested in studying novel and modifiable risk factors for falls. She has experience with clinical trials: as the principal investigator of a nonrandomized feasibility study and the co-site investigator of two, large international phase III trials. Her current funding is through a Career Development Award from the National Institute on Aging (NIA), which will examine medication changes as an acute risk factor for falls in the nursing home setting. This award is likely to lead to future studies that examine other acute risk factors for falls, as well as to the development and testing of fall intervention programs in the nursing home.



Preventing Falls in Older Adults was made possible with support from

