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Podiatry's Vital Role in Fall Prevention

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Our Vital Role in Fall Prevention: Tools That Can Make a Difference

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Much has been written and publicized regarding our role as podiatric physicians in addressing the needs of the diabetic foot. Volumes have been written and even more products have been sold to enhance, educate and prevent diabetic related foot sequela. On the other hand, very little has been published regarding our role in addressing an equally devastating epidemic in our society.

Falls and fall-related injuries are the leading cause of injury deaths among older adults ¹. Fall-related hip fractures account for approximately 25 percent of injury deaths among those over age 65, and 34 percent of injury deaths among those aged 85 or older. ²

Though falls are the most preventable cause of needing nursing home placement, falls and fall related injuries are more common than strokes.

Among adults 70 years and older in the United States, falls are the cause of 16 percent of all Emergency Department visits, and almost 7 percent of all hospitalizations are for fall-related injuries. ³

Three in 10 seniors fall each year while 2 in 10 who need home health care after being in the hospital will fall during the first month after coming home. One in 10 suffer a serious fall injury such as a broken bone or head injury while 5 in 10 have problems getting up without help after they have fallen. Falls cause over 90% of broken hips; only half of those who break their hip will get around like they did before their broken hip. ⁴

According to data compiled from the 1997 and 1998 National Health Interview Survey, the majority (55%) of fall injuries among older people occur inside the house. An additional 23% occurred outside but near the house.

Additionally, 22% occurred away from the home ⁵ while Gill et al. ⁶ reported that older persons who resided in dwelling units that had no stairs fell in the following areas: hallways (10%), bathrooms (13%), kitchens (19%), bedrooms (30%), and living rooms (31%).

Risk factors associated with falls include intrinsic factors like neuropathy, ankle instability, and weakness along with other specific acute and chronic diseases that can impact sensory and musculoskeletal systems. (See Table 1)

Furthermore, extrinsic factors play a significant role in falls including environmental hazards and obstacles interfering with safe mobility, and medication side effects. ⁷

Since the risk of falling is not related to a single disease, clinicians may not recognize falling as a treatable health problem. The consequences of untreated falls and risk factors can be just as serious as those of other untreated chronic diseases. The risk of falling increases as the number of risk factors an older person has for falling increases. The risk of sustaining an injury from a fall depends on the individual patient's susceptibility and environmental hazards. The frequency of falling has been described as an accumulated effect of multiple disorders superimposed on age-related changes. The literature recognizes a myriad of risk factors for falls. The likelihood of falling increases with the number of risk factors. ^{8,9}

Risk Factors for Fall (Table 1)^{10, 11}

Demographic factors

Older age (especially ≥ 75 years)

White race

Housebound status

Living alone

Historical factors

Use of cane or walker

Previous falls

Acute illness

Chronic conditions, especially neuromuscular disorders

Medications, especially the use of four or more prescription drugs (see Table 2)

Physical deficits

Cognitive impairment

Reduced vision, including age-related changes (i.e., decline in visual acuity, decline in accommodative capacity, glare intolerance, altered depth perception, presbyopia [near vision], decreased night vision, decline in peripheral vision)

Difficulty rising from a chair

Foot problems

Neurologic changes, including age-related changes (i.e., postural instability; slowed reaction time; diminished sensory awareness for light touch, vibration and temperature; decline of central integration of visual, vestibular and proprioceptive senses)

Decreased hearing, including age-related changes (i.e., presbycusis [increase in pure tone threshold, predominantly high frequency], impaired speech discrimination, excessive cerumen accumulation)

Others

Environmental hazards (see Table 4)

Risky behaviors

While some factors that increase risk of falling cannot be changed, such as age and history of previous falls, there are a number of factors that can be addressed proactively. Of these listed, several can and should be directly addressed in podiatric offices and under our oversight.

1. Gait/ankle instability, weakness, unstable gait, osteoarthritis.
2. Taking 4 or more medications
3. Foot problems or unsafe footwear.

4. Blood Pressure abnormalities (Orthostatic)

5. Visual Impairments.

6. Obstacles and hazards at home.

Research has shown that treating and correcting these specific risk factors reduces the rate of falling by more than 30%.¹¹

Intervention

There are many intervention strategies have been implemented with different target populations and in a variety of settings over the years.¹² Statistics show, however, that few clinicians put practical strategies in place within their practice.

Intervention strategies (designed to address the above listed risk factors) can include, but are not limited to: (1) fall risk assessment and management (including medication management), (2) physical activity-based interventions, (3) environmental modifications, (4) education, (5) assistive devices, (6) visual interventions, and (7) footwear interventions.

Although much can be said of all of these intervention strategies, the focus of this article will be on providing interventions in the area of:

1. Actively performing fall risk assessment,
2. Offering assistive devices for those at risk (canes, walkers, fall prevention ankle foot orthosis).
3. Offering and educating our patients about footwear options that will enhance stability and prevent falls.
4. Providing physical activity options (physical/occupational therapy)

Assessing Patients for Fall Risk

As podiatric physicians we assess risk in our patients every day. We assess our diabetic patients for ulceration/amputation risk, and we regularly assess our patients at risk for peripheral arterial disease. Few however, have put measures or protocols in place to assess fall risk in patients at risk.

Screening tools are abundant for many of the more common causes for falls, but in podiatric medicine, few tools have ever been identified or introduced for practical use in the office setting.

The author has identified, with the assistance of a fall prevention Occupational Therapist, several easy to perform, well published assessment tools that should be identified and implemented by the podiatric physician and his/her staff.

Below is summary of several well known and easy to perform assessments that can be documented and used as a basis for a treatment strategy.

1. The Timed Up and Go Test (TUG)

Age	60-64	65-69	70-74	75-79	80-84	85-89	90-84
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Women	6.0-4.4	6.4-4.8	7.1-4.9	7.4-5.2	8.7-5.7	9.6-6.2	11.5-7.3
Men	5.6-3.8	6.7-4.3	6.0-4.2	7.2-4.6	7.6-5.2	8.9-5.3	11.5-7.3

A time of greater than approximately 14-15 seconds equates to a high risk of falls in community dwelling people

The timed “Up and Go” test measures, in seconds, the time taken by an individual to stand up from a standard arm chair (approximate seat height of 46 cm [18in], arm height 65 cm [25.6 in]), walk a distance of 3 meters (118 inches, approximately 10 feet), turn, walk back to the chair, and sit down. The subject wears their regular footwear and uses their customary walking aid (none, cane, walker). No physical assistance is given. They start with their back against the chair, their arms resting on the armrests, and their walking aid at hand. They are instructed that, on the word “go” they are to get up and walk at a comfortable and safe pace to a line on the floor 3 meters away, turn, return to the chair and sit down again. The subject walks through the test once before being timed in order to become familiar with the test. Either a stopwatch or a wristwatch with a second hand can be used to time the trial. It was reported in 2005, that the Timed Up and Go (>15 secs) is as accurate at predicting a future fall as the more complex Berg Score, Tinetti Scale and the even more complex Physiological Profile Assessment (PPA) ^{13, 14}

2. “Walk and Talk” Test

This easy to perform test has been long held to be a highly sensitive assessment for fall risk. The test is designed to evaluate the ability of the patient to divide attention between multiple tasks; in this case, the task of walking and talking.

As the patient is being walked to the treatment room, conversation is initiated with the patient. A “positive” score is recorded if the patient has to stop to respond your question while a “negative” score is recorded for one who is able to continue walking. Tiedmann noted that this test was one of the most sensitive for fall risk. ¹⁵

3. Functional Reach Test

The Functional Reach Test is designed to assess balance by measuring the forward reach capability of a patient while standing. In other words, this test evaluates the voluntary limits of stability in the anterior direction.

Position the patient close to the wall so that they may reach forward along the length of the yardstick. The patient is instructed stand with feet shoulder distance apart then make a fist and raise the arm up so that it's parallel to the floor. At this time the examiner takes an initial reading on the yard stick, usually spotting the knuckle of the third metacarpal. The patient is instructed to reach forward along the yardstick without moving the feet. Any reaching strategy is allowed but the hand should remain in a fist. The therapist takes a reading on the yardstick of the farthest reach attained by the patient without taking a step. The initial reading is subtracted from the final to obtain the functional reach score.

A score of 6 or less indicates a significant increased risk for falls.
A score between 6-10 inches indicates a moderate risk for falls. ¹⁶

	(in inches)	(in inches)
20-40yrs	16.7 ± 1.9	14.6 ± 2.2
41-69yrs	14.9 ± 2.2	13.8 ± 2.2
70-87	13.2 ± 1.6	10.5 ± 3.5

4. Single Leg Stance Test

This test measures the static balance of a patient while also assessing ankle stability and lower leg strength. Both of these conditions (static balance and ankle stability) are key factors in fall risk that will be discussed further.

Normal Scores

AGE (in years)	MEN (seconds)	WOMEN (seconds)
60 – 64	34	38
65 – 69	24	24
70 – 74	20	18
75 – 79	12	11
> 80	10	11

5. Preferred Gait Speed

This test is not only easy to perform in the podiatric office, it has been determined to one of the most accurate and sensitive in several published trials. Measure a standard distance (e.g., 20 feet) and place markers at the start and finish. Start the patient 5 feet in front of the mark and have the patient walk 5 feet past the finish mark. Begin the stopwatch as soon as the person's foot crosses the start line and stop recording when the person's second foot crosses the finish line. Have the person perform 3 repetitions of each condition and calculate the average time.

Gait Speed = distance / time e.g. 20' / __ sec.

Instructions for the Patient:

1. Ask the patient to walk at his/her preferred walking speed. Instruct the patient to continue walking 5 feet beyond the finish line.
2. Ask the patient to walk as quickly as possible, but safely. Instruct the patient to continue walking 5 feet beyond the finish line.

Reference values	Preferred (ft/s)	Maximal (ft/s)
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Age	Men	Women	Men	Women
20s	3.57	3.47	6.40	6.43
30s	4.17	3.81	5.99	5.43
40s	3.72	3.53	5.70	5.16
50s	3.07	3.59	3.85	4.90
60s	3.11	2.85	3.95	4.15
70s	3.08	2.79	4.44	3.89
frail	1.18	1.38	1.97	1.57

Note: Reference values are based on small sample sizes. ¹⁷

A score of less than 1.8 ft./sec = risk for recurrent falls ¹⁸

A New Podiatric Fall Risk Assessment (PFRA)

With the assistance of an Occupational Therapist certified in vestibular rehabilitation and fall prevention, and based upon a variety of published risk factors and well known balance assessment tools, the author has developed a simple one page fall risk assessment tool that is designed to combine a number of lower extremity related risk factors along with several easy to perform fall risk assessments into a easy to use tool that can be completed in the podiatric office. (Available for free download at www.fallpreventionbrace.com)

This assessment tool includes several of the most standardized tests and review of history components that have been published and standardized as key factors involved in falls. The system allows one to calculate risk based upon a point system. A point value of 10 or higher indicates high risk for falling.

Studies indicate that among the factors that have the highest predictive value for fall risk is the patient's history of falls within the last year. Although some studies differ on the number of falls indicative of the highest risk, I placed a very high value of 8 for those who indicate 3 or more falls within the past year.

Among people ages 75 years and older, those who have a history of a fall are four to five times more likely to be admitted to a long-term care facility for a year or longer ¹⁹

There is no question that evidence demonstrates a gradual decline in balance abilities and speed of gait with age, but a myriad of factors can and often do make one's risk for falls much more likely.

A critical element of the targeted history for those at risk for falls are medications, including prescription, over-the-counter, herbal and illicit drugs. Red flags are polypharmacy (four or more prescription medications), the initiation of a new drug therapy in the previous two weeks, and the use of any drug listed in table 2.

Physicians need to maintain a high index of suspicion when reviewing the medications taken by a patient who falls. As such, the podiatric fall assessment guide places a value of 4 points for those that are taking 3 or more medications listed that predispose them for falls. Tricyclic antidepressants and other heterocyclic antidepressants have long been associated with an increased risk for falls. The selective serotonin reuptake inhibitor (SSRI) antidepressants are largely free of the side effects of tricyclic antidepressants and have been presumed to be safer for use in persons

at high risk for falling. However, a recent large study of almost 2,500 nursing home residents found little difference in the rate of falls between patients receiving tricyclic antidepressants and those receiving SSRIs.

Podiatric Fall Risk Assessment Form

Patient Name: _____ Date _____

Circle appropriate score for each section and total score at bottom.

Parameter	Score	Patient Status/Condition
A. Vestibular (Dizziness)	0	No complaints of dizziness
	2	Intermittent complaints of dizziness
	4	Dizziness that interferes with ADLs
B. History of Falls (past 12 months)	0	No falls
	2	1-2 falls or near falls
	9	3 or more falls or near falls
Demographics	1	Female
	2	Female > 65 years
D. Vision Status	0	Adequate (w/ or w/o glasses)
	2	Poor (w/ or w/o glasses)
	4	Legally blind
E. Gait and Balance	-----	Have patient stand on both feet w/o any type of assist then have walk: forward, thru a doorway, then make a turn. (Mark all that apply.)
	0	Normal/safe gait and balance.
	1	Balance problem while standing.
	1	Balance problem while walking.
	1	Decreased muscular coordination.
	1	Change in gait pattern when walking through doorway.
	1	Jerking or unstable when making turns
	1	Requires assistance (person, furniture/walls or device).
F. Ankle Strength/ Range of Motion	0	Normal ankle strength and ROM within normal limits
	2	Moderate limitation of ankle joint range of motion and strength
	4	Significant ankle joint instability and weakness
G. Medications	-----	Based upon the following types of medications: anesthetics, antihistamines, cathartics, diuretics, antihypertensives, antiseizure, benzodiazepines, hypoglycemics, psychotropics, sedative/hypnotics.
	0	None of these medications taken currently or w/in past 7 days.
	2	Takes 1-2 of these medications currently or w/in past 7 days.
	4	Takes 3-4 of these medications currently or w/in past 7 days.
	1	Mark additional point if patient has had a change in these medications or doses in past 5 days.
H. Predisposing Diseases	-----	Based upon the following conditions: neuropathy, hypertension, vertigo, CVA, Parkinson's Disease, loss of limb(s), seizures, arthritis, osteoporosis,
	0	None present.
	2	1-2 present.
	4	3 or more present.
I. Get Up and Go	0	Able to rise in a single motion (no loss of balance with steps)
	2	Pushes up, successful in one attempt
	4	Multiple attempts to get up, but successful
J. Walk and Talk	5	Inability to maintain normal gait pattern while walking
	8	Must stop walking in order to speak
TOTAL SCORE		A score of 10 or more indicates high-risk for falls. If score is 10 or more, complete page 3.

indicates primary consideration for MBB

Drugs That May Increase the Risk of Falling Table 2

Sedative-hypnotic and anxiolytic drugs (especially long-acting benzodiazepines)

Tricyclic antidepressants
Major tranquilizers (phenothiazines and butyrophenones)
Antihypertensive drugs
Cardiac medications
Corticosteroids
Nonsteroidal anti-inflammatory drugs
Anticholinergic drugs
Hypoglycemic agents
Any medication that is likely to affect balance

Additionally, the correlation between complaints of foot and ankle pain in the senior patient and the incidence of falls is significant.

Over 75% of older adults have foot pain. Foot pain is caused by, but not limited to, thin heel pad, corns, bunions, dry and cracked skin, ingrown or over grown toe nails, and sores. Foot pain can cause a change in the biomechanics or alignment of the body, thereby increasing the risk for falls.

Another potential risk factor for falls is decreased sensation in the feet. This is more noticeable in the person with diabetes, but gradually occurs with the aging process.

Podiatric physicians need to realize that simple deformities and areas of pain can impair balance and result in a fall.

Ankle instability is another key component of fall risk and as such, ankle range of motion/instability is among the measures in the Podiatric Fall Risk Assessment. Four points come from the presence of significant weakness or loss of range of motion of the ankle joint.

In a recent study, Menz studied seventy-one participants (41%) who reported falling during a follow-up period. Compared to those who did not fall, fallers exhibited decreased ankle flexibility, more severe hallux valgus deformity, decreased plantar tactile sensitivity, and decreased toe plantarflexor strength; they were also more likely to have disabling foot pain. Discriminant function analysis revealed that decreased toe plantarflexor strength and disabling foot pain were significantly and independently associated with falls after accounting for physiological falls risk factors and age.²⁰

A gradual decline in balance abilities and speed of gait occurs with age. These two are directly linked with activity level. Weakness in the anterior tibialis muscle, which dorsiflexes the ankle and toes to clear the toes during walking is common in seniors, which is why many falls every year are attributed to lower extremity weakness, instability and often poor shoe wear which contributes to stumbling and tripping. With age, this tibialis muscle (among others) can get 'out of sync' in its timing with other muscles in the leg. As a result, the timing of toe clearance is altered and the toe may catch on the floor.

Postural Control: A Modifiable Factor In Fall Prevention

Postural control can be described as the ability of a person to maintain their center of gravity over their legs, ankles and feet. When there is a defect in the mechanism of postural control, postural sway can be measured and assessed as a significant factor in falls.

The ability to maintain a stable upright posture is an important factor involving our somatosensory system, not only in the initiation

and the control of voluntary movement, but also in the prevention of injury. Decreased postural control or increased postural sway can occur because of ankle instability and when there is a loss of normal sensation, such as in diabetes and other causes of peripheral neuropathy.^{21,22}



(Postural Sway Increases with Age)

Providing Assistive Devices For the At Risk Patient

Localized fatigue of the ankle muscles, known to alter the force-generating capacity of the ankle joint, also affects the function of the proprioceptive system.²³

While some has been written in the literature regarding how foot orthosis can improve fatigue by correcting the mechanics that often lead to foot and leg fatigue, these studies fall short considering how important the ankle is in postural sway. Lundin, et. al., demonstrated how fatigue of the lower leg muscles adversely affected balance and postural control. While Ochsendorf and co-workers showed how foot orthoses could significantly offset the negative effects of fatigue of the lower leg muscles on postural control.^{24,25}

The use of an ankle foot orthosis has also been reported to improve postural control under both

monopedal (standing on one foot) and bipedal (standing on both feet).^{26, 27} Proprioceptive information at the level of the foot/ankle, the vestibular or balance system within the inner ear, and vision are all important factors in the measurement of postural sway.

The AFO stabilizes the foot/ankle even in the absence of visual information by increasing sensorimotor function offered by the ankle and foot support while postural control is improved when ankle movement is controlled. Naturally, an AFO will be of considerable importance when ankle/foot fatigue exists. While foot orthosis alone have also been characterized as devices that increase sensorimotor function of the foot, ankle control and sensorimotor feedback around the ankle is even more paramount in addressing those that risk for falls.



Considering the fact that many seniors are absent of many of the sensory inputs, postural control, therefore, requires the interaction of multiple sensory inputs from either the same or different sensory systems. When sensory information is missing or altered, cooperation and the gathering of other pieces of sensory information by the brain is used to maintain balance and posture.

Being that the AFO will stimulate cutaneous (skin) mechanoreceptors, the stimulation by the pressure contact of the material on the skin leads to additional nervous information sent to the brain and central processing center. This enables the AFO to become another source of sensory information, thus improving balance under conditions in which other sensory cues are eliminated. Imagine a senior walking in a dark room for instance; while their visual cues are decreased, the

physical contact of the AFO can provide additional sensory information, allowing more stability in the absence of the visual input. In addition, depending on the design of the AFO, a posterior leaf spring component will also provide for improved toe clearance in gait.

So, a balance AFO can lead to sensory reorganization for postural control as a function of the neuromuscular constraints acting on the patient's foot and ankle. An AFO can provide significant improvement in postural control and, in aging, help to reduce the risk of falling and its potential for injury.

Two years ago, the author began to employ the use of an AFO for those at risk for falls. While there are a few manufacturers that have designed an AFO for balance, after many attempts and through much trial and error, the author realized there were considerable flaws in the design of these AFO's.

For example, many are too cumbersome for the elderly put on, and many restricted motion too much around the ankle making it even harder to walk. After multiple attempts to modify and tweak many existing styles, the author set about to record the key characteristics of a balance AFO that were vital for success.

Key Features of a Balance AFO (Table 3)

1. Easy to put on
2. Light weight
3. Posterior leaf design to aid in toe clearance
4. Custom made to maximize somatosensory feedback
5. Eliminates abnormal mechanics (frontal plane ankle motion) while allowing some ankle joint dorsiflexion to aid in a smooth gait
6. No laces or latches that make it difficult for the senior to utilize.
7. Some, but not too much cushion on the foot plate for comfort (avoiding a hard shell feel)
8. Padded tongue to prevent rubbing/friction where the ankle is allowed to dorsiflex and plantarflex
9. Correction for varus/valgus instability in manufacturing
10. Velcro latching that is easy to latch even after the shoe is on.



With these characteristics in mind, the author set about to try incorporating these characteristics into an AFO using a lab of highest Orthotics & Prosthetics standards. Thus, the Moore Balance Brace (MBB) was born. The MBB has now been employed in my practice for nearly a year and over 60 patients have been trialed.

Before a patient receives the MBB, the patient will have the Podiatric Fall Risk Assessment and strengthening and exercise program will be implemented (preferably in our therapy department with a Physical or Occupational Therapist)

Additionally, after one month or more of the patient having had the MBB, the patients are brought back into the office for a follow up with our therapy team who then puts the patient through several assessments WITH and WITHOUT their MBB. This data is actively being gathered for a future study.

Thus far, among the most significant finding among the assessments we are measuring, are significantly improved Timed Up and Go times and gait speed.

Though there are over the counter ankle braces that can achieve some of the goals of the Balance AFO, the fact that the MBB is fabricated from a cast taken from the individual's foot/ankle assures maximum cutaneous mechanoreceptor sensory activity.

As the MBB covers part of the foot sole as well as the upper part of the foot, the ankle is stabilized medially and laterally (several inches of the leg above the ankle) thus providing for a significant amount of surface area of the foot/ankle to maximize skin mechanoreceptors.

Plantar cutaneous nerve firing plays an important role in the shaping of postural responses. The results of many studies showed loss of plantar sensation is an important contributor to balance deficits and increased risk of falls associated with peripheral neuropathies.^{28, 29, 30}

In summary, a Balance AFO like the MBB will reduce postural sway, restrict undesirable motion at the foot and ankle and enhance joint mechanoreceptors to detect disturbances and provide structural support for controlling postural sway. Furthermore, the MBB will improve ankle joint position sense thus enhancing ankle joint proprioception and its afferent feedback to the central

nervous system. Lastly, as our study preliminarily demonstrates, people usually walk more quickly with an AFO and walking speed affects most gait variables including step length, foot clearance of the walking surface, and body stability. This improved gait speed and stability can be attributed to more activity of the quadriceps muscle in the upper thigh during the early stance which improves load bearing and leg swing symmetry.

Additional Assistive Devices to Consider:

First, consider the option of consulting an occupational therapist who can help devise a plan to prevent falls in the home. Some solutions are easily installed and relatively inexpensive.

Key considerations for in the home are:

- Grab bars mounted inside and just outside the shower or bathtub.
- A raised toilet seat or one with armrests for stabilization
- A sturdy plastic seat placed in the shower or tub to allow for a seated shower, or a tub transfer bench that will allow tub transfers without stepping over a tub edge. A hand-held shower nozzle is also a helpful safety tool for bathing.
- Handrails on both sides of stairways.
- Non-slip treads on bare-wood steps.
- Good lighting (including night-lighting) is imperative for patients with low vision and/ or vestibular deficits

Canes are generally prescribed for a moderate level of gait instability, whereas walkers are recommended for more generalized weakness, limited weight bearing ability or poor balance. Women are more likely to use walkers than men. Even though there are twice as many older adult cane-users than walker-users, studies have shown that walkers are associated with 7 times as many ED fall injury visits as canes. Women are 2 ½ times more likely to report to the ED for these walker-fall injuries. Those 85+ years of age on a walker are at particularly high risk. Each year in the US there are 47,312 nonfatal fall injury ED visits associated with the use of canes and walkers by people 65+ years of age; 60% of these happen at home. ³¹

The injuries sustained in these falls are serious with one-third of patients requiring hospital admission for fractures, contusions, abrasions & internal injury. Men are more likely to sustain head and neck injuries while women more commonly injure the lower trunk.

If you are involved in writing prescriptions for assistive devices for seniors, it is essential that older adults receive instruction from qualified therapists or physicians who can intervene to reduce intrinsic risk factors (poor balance) as well as maximize the likelihood of proper fit and safe use of assistive devices. Particular attention should be given to those helping those aged 85+ master the physical and cognitive skills required for safe walker use. Having an in-house physical program can be a tremendous advantage in this situation.

The Role of Shoe Wear in Fall Prevention

Helping our patients to choose the right kind of footwear for fall prevention is a fundamental responsibility we have as podiatric physicians.

I have always advocated offering and maintaining a shoe recommendation guide for all of the more common conditions that we see. There has never been a more important time to put such a list together than now, especially in light of the vital role that shoes have in fall prevention.

First, put protocols in place for you and your staff to make sure seniors are made aware that high heels, floppy slippers/shoes, slick soles, barefoot walking and walking in stockings or socks can drastically increase their risk of falling.

Additionally, consider these recommendations for your patients:

- Avoid shoes that are excessively flexible and worn.
- Wear shoes that encourage activity. Walking shoes and leisure shoes that are light weight are often the best, as long as the midsole is not too flexible.
- Avoid open-back shoes or open-back house slippers. Such footwear can be hazardous and cause falls.
- If your foot swells or becomes larger during the day, stretchable Lycra shoes are best, so long as they remain supportive and not too flexible.
- Proper fit is critical. Shoes that are too big can be a hazard as well as shoes too small (width or length) as they can cause callus, corns and sore areas that can cause falls.
- Depth shoes are good for balance as they often support the foot higher toward the ankle. Putting too much into the shoe (an extra thick insole or pad) may cause imbalance if it puts the patient too high.
- Shoes that are lower to the ground are always the best. Anything with a very high sole or anything that puts the patient off the ground creates more imbalance.
- Shoes with good padding are more comfortable and are recommended, but too much padding will be like walking on sand and can push the patient up too high in the shoe.
- Avoid excessively slick soled shoes, as well as those that are too 'grippy'. Soles that are excessively slick or slippery, or the opposite, too 'grippy', can cause falls. A crepe sole is one recommendation because it also absorbs the shock.
- Avoid any shoe with a sole over ½ inch.
- Velcro laces are ideal, but Velcro latching is often neglected thus creating a situation where the shoe can become too loose. Shoes with lace are fine, so long as they are tied snug to create a good fit.
- Avoid shoes with thick heavy soles. Though these are often the most supportive (motion control), they are not always the best for seniors.
- In numerous studies, those that went barefoot or those that wore slippers in the house were found to be at the highest risk for falling
- Wearing shoes with low heels and large/wide contact area may help older adults reduce the risk of a fall in everyday settings and activities.
- Diabetics and seniors should also avoid open-toed shoes, sandals, or flip-flops.
- If patients report bending over to put on their shoes makes them off – balance, suggest a long-handled shoe horn.

Experience suggests that many seniors have a very difficult time finding shoes that are comfortable and successfully address a clinical problem they are experiencing.

Clinicians are often faced with the difficult task of recommending shoes to their patients that will address either or both of these requirements. Many don't realize this is something you, as a podiatric physician, can offer.

This is very good reason why we, as podiatric physicians, should take the lead on this issue and develop and provide such a list of shoes that you offer in your office. A "Dr. ____ Shoe Recommendation List" can be a great marketing tool for your practice.

A report published in the Journal of the American Geriatrics Society indicated that only 58% of healthcare providers either provided intervention or made a referral for foot or footwear problems identified in their patients, with providers including Emergency Department physicians, hospital discharge planners, home health agency nurses, and primary care physicians.^{32,33}

Though by no means complete, here are a few shoes that I have on my shoe list for fall prevention:

1. Brooks Addiction Walker- Velcro option, extra depth, under 12 oz, very stable and affordable.
2. Orthofeet 910 for women and 610 for men. -Lightweight, added depth, lace/velcro combination, affordable.
3. Drew Force V- Lightweight, accommodates some braces and orthotics, velcro option, firm heel stabilizer.
4. Pedors 800/801- Lycra middle (for hammertoes, added width), Traction control soles, durable, Velcro; accommodates AFO very well.
5. Mt. Emey 618 for women and 718 for men.- Excellent for AFO fitting

Physical /Occupational Therapy and Fall Prevention

I have always been a vocal advocate of the concept of offering physical therapy services in the podiatric office by contracting or employing a physical therapist. In fact, the AAPPM offers educational workshops on how to ethically implement these types of services into your office to enhance outcomes and improve communication. Though not within the construct of this article I would be remiss if I didn't relate what a great collaboration this can be for your office.

Research has demonstrated the effectiveness of strength and balance exercises in reducing the risk of falls in older adults. National organizations such as the National Council on Aging (NCOA) and the Centers for Disease Control (CDC) recommend a multi-factoral approach to fall prevention due to so many variable factors involved in a fall.

Physical therapist researchers at Cal State University Northridge performed a study to determine the effectiveness of a balance exercise training program on strength, balance, gait, and fall risk in 23 healthy community-dwelling older adults at risk for falls. Subjects were randomly assigned to an exercise group or non-exercising control group. The exercise group performed a small group-based balance program, "A Matter of Balance" for 12 weeks, three times a week in a class setting at the PT department.

According to the authors, the exercises included balance exercises standing on foam surfaces and balance boards, as well as squats with an exercise ball. Interestingly, there was no resistive strengthening component in their description of the exercise program, although other like program have used Thera-Band® resistive bands.

After the training program, the exercise group significantly improved lower extremity strength, improved their balance and functional mobility, and reduced their incidence of falls compared to the control group.

Simple balance training devices such as Thera-Band® Stability Trainers, balance boards, and exercise balls can be helpful at reducing falls and improving function in older adults. These are services that can be prescribed easily by a podiatric physician.³⁴

The Cochrane Collaboration conducted a systematic review of fall prevention studies incorporating exercise programs such as progressive muscle strengthening, balance training, and a walking plan, individually tailored for each participant by a trained health professional. Pooled data from these studies indicate that such programs significantly decreased the number of individuals experiencing a fall over one year when compared with a control group that received no intervention. The number of patients injured during a fall also was significantly reduced. The evidence was strongest for balance retraining, supporting inclusion of these exercises as a component of fall prevention programs.^{35, 36}

Conclusions:

Overall, offering your own multi-factorial evaluation, followed by targeted intervention for identified risk factors, is the most effective strategy for fall prevention.^{37, 38}

A systematic review of multidisciplinary, multifactorial health and environmental screening and intervention programs in community-dwelling older adults found a significant reduction in falls when compared with a control group in unselected, community-dwelling older adults and in older patients with a history of falling or with known risk factors.

The components of a successful multifactorial intervention include: exercise programs incorporating gait and balance training; implementation of assistive devices like a Balance AFO or other assistive devices with the help of an occupational therapist; review and modification of medications; evaluation and treatment of foot wear; and education regarding the removal or modification of environmental hazards (see table 4)

Environmental Hazards: Table 4

- Remove boxes, newspapers, electrical cords and phone cords from walkways.
- Move coffee tables, magazine racks and plant stands from high-traffic areas.
- Secure loose rugs with double-faced tape, tacks or a slip-resistant backing.
- Repair loose, wooden floorboards and carpeting right away.
- Store clothing, dishes, food and other household necessities within easy reach.
- Immediately clean spilled liquids, grease or food.
- Use nonskid floor wax.
- Use nonslip mats in your bathtub or shower.

In 2008, a team of Australian physicians published a proposed randomized trial to study a multifaceted podiatry program to improve balance and prevent falls in older people.³⁹

The intervention group in this study received what by all accounts could be described as a simple, easy to put in place program that included:

1. Routine foot care (i.e. nail care and callus debridement) along with a multifaceted podiatric intervention protocol that consisted of:

- (1) Prefabricated insoles customized to accommodate plantar lesions;
- (2) Footwear advice and assistance with the purchase of new footwear if current footwear is inappropriate;
- (3) A home-based exercise program to strengthen foot and ankle muscles; and
- (4) A falls prevention education booklet.

I would contend that if all of us put in place similar measures, even as simplistic as the one described above, we could all make a major impact toward preventing falls in our senior community.

There is no simple fall prevention strategy that will work for all of our patients. In general, it has been difficult to study and evaluate the merits of specific interventions because of logistical considerations such as varying populations, simultaneously employed multiple interventions, and confounding variables. As falls appear to happen because of a complex interaction of intrinsic and extrinsic risk factors, interventions require a multifaceted approach. A strong fall prevention strategy that encompasses a number of different interventions (like those we have outlined above) and targets multiple risk factors is more likely to be successful. Thus, the success of a program appears to be not as dependent on a specific intervention but on a comprehensive interdisciplinary program.

Let us, as podiatric physicians, make a positive difference when it comes to preventing falls.

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