Fall Prevention

Introduction

Fall prevention is a crucial aspect of rehabilitation in hospitals and skilled nursing facilities. Falls can impact any population, but they are especially common in older adults due to an increase in risk factors that make them more likely to experience a fall.

A fall, especially one that results in injury, can complicate an older adult's discharge plan from an institutional setting. If a fall occurs within the home, this can lead an older adult to be admitted to a nursing facility. For these reasons, fall prevention is a hot topic in geriatric care settings. But there are many other populations that can benefit from preventive intervention in this area. Patients taking certain medications, those with a history of seizures, individuals with neurological conditions, and more are all appropriate for fall prevention interventions.

Occupational therapists are well-equipped to intervene in the area of fall prevention. Therapists can analyze internal and external factors that place someone at risk for a fall, assess their physical and mental functions, and offer a range of educational, technological, and environmental interventions. Fall prevention intervention should be a large part of every therapist's skill set, since it can be very helpful for any population.

Section 1: Prevalence and Impact of Falls

References: 1,2,3,4,5,6,7,8

The statistics surrounding falls in America are quite harrowing. The Centers for Disease Control and Prevention (CDC) state that the rate of falls in older adults has increased by 30% from 2007 to 2016. This number is expected to rise between now and 2030. Annually, 3 million older adults receive same-day emergency room treatment for fall-related injuries. The yearly number for those who are admitted to the hospital as a result of injuries sustained from a fall is lower (at 800,000), but this total is still quite significant. Aside from traumatic brain injuries, hip fractures are one of the most common fall-related injuries that warrants hospital admission. Over 95% of fractured hips are sustained as a result of falling.

Studies show that people who suffer one fall, no matter how minor, have a 50% greater risk of falling again at some point in the future. This not only makes intervention after a fall crucial, but it is also a testament to the importance of prevention before that first fall even occurs. What is even more important to note is that many people who fall and do

not experience severe injuries (e.g. fractures, head injuries, or spinal cord injuries) are far less likely to report that fall to their doctors, family members, and caregivers.

Worldwide statistics are similarly concerning, and indicate that falls across the board are a public health concern. Over 684,000 falls that take place across the world have fatal outcomes. An overwhelming 80% of these falls are concentrated in impoverished countries or countries that are home to a large number of middle-class individuals. High numbers of falls are also reported in Southeast Asia and countries in the Western Pacific region.

Globally, individuals ages 60 and older are at the highest risk for falls, since they suffer the greatest amount of falls compared to other age groups. Due to the number of complications that can result from falls, these events are responsible for over 38 million disability-adjusted life years (years of life lost due to premature death or years with ill-health) across the globe.

While falls are not as prevalent (and usually not as devastating) in children, they do commonly result in injury. Every year, 27,000 children between the ages of 5 and 14 are admitted to the hospital as a result of fall-related injuries. The United States groups childhood falls into a category called unintentional injury, which also includes accidents like suffocation, motor vehicle accidents, fire, poisoning, and drowning. Falls are one of the leading causes of unintentional injuries in children. In 2019, the incidence of these injuries in children from ages 0 to 19 was 7,000.

The generalized impact that falls have on young adults is somewhere in between that of children and older adults. Many minor falls (such as slips and trips) in this age group are less likely to lead to significant injury as it might in a child or older adult. However, some recent literature shows that it is more of a concern than many people would assume. One study recorded fall frequency and subsequent injuries in a group of several hundred participants with a mean age of 19. Results showed that 48% of participants fell at least once in the last 24 hours, while 25% of subjects fell more than once. While only 10% noted an injury as a result of the reported fall, there were other commonalities observed. Females were slightly more likely to experience a fall when walking (44%) than when playing sports (33%). On the other hand, males were more likely to sustain a fall when playing sports (49%) as compared to walking (37%). While this was a small study, falls did appear to be connected with the male gender, higher activity levels, and a greater number of regular prescription medications.

Falls also have a major financial impact in the United States. Each year, fall-related injuries that do not result in death cost a total of $50 billion in medical management. Fatal falls are also very costly, coming in at $754 million in charges for medical services. Of the sum for the non-fatal falls, more than half is paid out by Medicare for their subscribers. By looking at these totals, allied health professionals can come to several conclusions. This is even more evidence that older adults are the age group that falls the most. But, more importantly, these statistics offer occupational therapists a significant opportunity to reduce the costs associated with falls through education and intervention.

Section 1 Personal Reflection

How might an occupational therapist's fall prevention intervention for an older adult differ from their intervention for a young adult?

Section 2: Outcomes of Falls

References: 3

A fall is one of the most frequent injury-causing events that places an older adult at risk for health complications. Falls can lead to some of the following health complications:

- Hip, spinal, pelvic, or wrist fractures
- Soft tissue injuries such as muscle sprains
- Hematomas
- Torn or overstretched tendons or ligaments
- Dislocated joints
- Internal organ damage
- Traumatic brain injuries
- Spinal cord injuries
- Nerve damage
- Cuts, abrasions, and contusions

- Herniated discs in the spine

One out of five falls results in a serious injury, including a head injury or one or more broken bones. Many people consider minor falls to be those that do not result in any injury aside from a small cut or another abrasion. While this is often the case, some injuries - such as soft tissue impairments - do not appear right away. It can take several days for bruises, especially large ones such as hematomas, to fully become visible.

Long lie times are also to blame for a host of other health complications. A long lie time is what is referred to as someone who falls and spends an extended period of time on the floor before getting up or receiving outside help. This is a problem, not only because it can be distressing and anxiety-inducing for the person who has fallen, but also because it delays their ability to get medical care. Rhabdomyolysis is one of the most impactful health concerns that can result from a long lie time after a fall. Rhabdomyolysis is a condition that results from an excess of damaging proteins (called myoglobin) being released into the blood as a result of muscle breakdown. After a fall, any muscle injuries trigger the production of such proteins to help the body recover. So, the longer someone remains immobile after a fall, the more these proteins will accumulate and harm the body. The kidneys cannot process large amounts of this protein, so it causes damage to these organs that might lead to permanent damage or, in severe instances, even death.

Someone who experiences a fall of any severity is at risk of suffering from fall-related anxiety, which can greatly impact their ability to ambulate, engage socially, and care for themselves. As a result of a fall, individuals might isolate themselves more often or appear hostile about entering new situations that make them fearful of falling again. After someone falls, their gait pattern may change to become more narrow with their legs closer together, which might give someone a greater sense of security. Someone who has a history of falls might also adopt a waddling gait, which consists of exaggerated trunk movements in lieu of sufficient lower body motion.

In a more functional sense, a fall can also lead someone to lose their independence, dignity, and the sense of safety they feel within comfortable or unfamiliar environments. Falls of any kind also result in an increased caregiver burden in a variety of forms. This is because additional measures (including but not limited to alarms, personal alert buttons, and cameras) must be put into place to ensure the safety of someone who is now considered at risk of falling. This is not to mention that it also places a strain on caregivers (both existing or new) when someone has a history of falling. A fall might lead

someone's caregivers to increase their hours and spend more time attending to their loved one.

An alternative situation is that an individual's family may begin to seek regular, in-home personal assistance to prevent future falls. Someone who experiences a fall will also usually receive additional services, which vary depending on what setting they are in. If the person is at home when they fall, they are likely to begin receiving home health care, which includes home health aides (also known as personal care attendants), case management (if falls are a sudden issue and pose a severe risk to the person's health and well-being), nursing care, occupational therapy, and physical therapy. This will firstly cause increased utilization of these services, since most healthcare disciplines will intervene after a fall. This will result in a greater amount of insurance money being spent on preventing future falls, and might even cost the patient money out of their own pocket if insurance doesn't cover these services.

If someone is already in an institution at the time of their fall, they are likely to be included in a fall-specific daily rounds with providers. Daily rounds is an opportunity for medical professionals to have a roundtable discussion about all patients, but particularly those with specific care recommendations. If someone has fallen (whether it be once or consistently), this means their case is likely to be reviewed more frequently to make note of falls that have occurred and discuss the ongoing plan of action to prevent additional falls for this particular person. Depending on the institution, patients who fall in hospitals and skilled nursing facilities also get a "red flag" or other defining sign above their bed. This is intended to indicate that they are a fall risk and providers should pay extra attention to minimize risk factors or they should follow a specific protocol designed for prevention in that patient.

If a patient falls while a provider is present, they must take time to document the fall, fill out specific forms detailing the incident, and often duplicate these efforts across several platforms or safety reporting systems. Providers who are involved in this situation might also need to consult with their company's legal team and deal with liability claims through malpractice insurance, if the patient or their family take action against them. This takes providers away from treating other patients, thereby decreasing their productivity since documentation is considered a non-billable service. Moreover, such outcomes of a provider-witnessed fall can lower a clinician's self-efficacy and confidence in their own skills. It can also lead providers to be more hesitant to take on additional patients who pose a fall risk.

Since falls are considered preventable, providers should always exercise good judgment regarding what activities are safe to engage patients in. Yet, at a certain point in most patients' treatment plans, providers will work with immobile patients to get them moving, walking, and caring for themselves again during therapy. Even patients who are not able to be rehabilitated to the point of walking can fall while providers are transferring them. All of these necessary interventions inherently come with a risk for falls, especially for patients who have been hospitalized for some time and have become deconditioned after what might have been a long illness.

Despite all this, falls are still considered largely preventable. This also means the manpower they require from the healthcare system (including time spent on the rounds process, the development of specific care protocols, increased provider intervention, insurance dollars, out-of-pocket costs, and more) is also preventable. A fall has a far-reaching impact on the person affected as well as their loved ones, but it does not end there. Falls have a ripple effect that extends to include fiscal, professional, emotional, physical, social, and cognitive aspects.

Section 2 Personal Reflection

What might be considered the most significant outcome of a fall?

Section 2 Key Words

Hematoma: A general term used to describe blood that has collected outside of blood vessels; it is more commonly considered a bad bruise; hematomas are not viewed as serious unless they are found in the brain

Liability claim: A request for financial assistance initiated by a person who holds insurance; in the case of a healthcare provider who has malpractice insurance, this claim is initiated when a provider has been alleged of misconduct that has resulted in some form of patient harm (a fall, negligence, inappropriate behavior, etc.); when this occurs, the clinician who holds the policy requests funds from their insurance company to help mitigate the claim

Long lie time: A term that is used to describe when someone falls and remains on the floor (or otherwise unable to seek medical care) for an extended period of time

Myoglobin: A protein that is located in muscles and stores/releases oxygen to keep muscles functioning; this protein is released from muscles and enters the bloodstream when they have been somehow injured (sprained, torn, bruised, etc.); high amounts of this protein in the blood dangerous and considered a medical emergency that can lead to rhabdomyolysis

Rhabdomyolysis: A medical condition that results from an excess of myoglobin accumulating in the bloodstream after an injury; if this myoglobin is not eliminated from the body (via medical treatment), it can lead to permanent kidney damage, organ failure, and even death

Utilization of services: A general term that is used to describe how many/how much services a person receives; it can be used in rehabilitation to describe how many visits a patient has already had on their plan of care; it can also be used in insurance to describe how many claims for reimbursement a member has submitted

Section 3: Risk Factors for Falls

References: 6,7,9,10

There are a range of factors that can increase someone's risk of falling. All risk factors (even those for chronic conditions and other health concerns) can be classified as either internal risk factors or external risk factors. Internal risk factors are those that are specific to the person and cannot be changed. While internal factors cannot be modified, identifying them can still help prevent falls. External risk factors, on the other hand, are those that are specific to the environment. These risk factors are not related to the person, which means they are often easier to change and lower someone's risk of falling.

Internal risk factors include:

- Age (older individuals are at a greater risk, especially those who are above 80)
- Prior history of falls
- Ethnicity (Caucasian individuals are more likely to fall than African-Americans, Latinx, or Asian individuals)
- Socioeconomic-related factors, such as mothers who gave birth at a young age, overcrowded housing accomodations, single-parent households, and poverty

- A low body mass index (BMI), which may also indicate malnutrition
- Gender (incidence of falls is about even throughout most of the lifespan, but women over the age of 80 fall more frequently than men over the age of 80)
- Fear of falling
- Conditions that cause health complications (usually those that impair balance) which increase fall risk
    - Neurological conditions, such as stroke and Parkinson's
    - Respiratory conditions, such as Chronic Obstructive Pulmonary Disease (COPD)
    - Cognitive conditions, such as traumatic brain injuries and dementia
    - Joint conditions such as arthritis
    - Thyroid dysfunction (hypothyroidism or hyperthyroidism)
    - Heart disease
    - Anemia
    - Mental health concerns, namely major depressive disorder and those that cause agitation or delirium
    - Circulatory conditions, such as Diabetes mellitus
    - Urinary or fecal urgency or incontinence, since making multiple, hurried trips to the bathroom can increase someone's risk
    - Disorders of the foot or ankle (foot drop, also known as peroneus nerve palsy, is one of the most common, but this category can also extend to bunions, sores, and deformed nails)
    - Vitamin D deficiency
    - Sensory processing disorder, which can cause confusion and disorientation in the presence of certain stimulus
    - Chronic pain conditions, such as fibromyalgia, multiple sclerosis, complex regional pain syndrome (CRPS), and lupus

- Neuromuscular deficits; this can range from simpler, age-related concerns such as muscle weakness, motor impairments, delays in response time, and decreased endurance to more complex concerns including nerve paralysis, paresthesia, or impingement
- Changes in executive functioning, including environmental awareness, judgment, attention, and safety
- Postural hypotension
- Balance impairments
- Vestibular disorders such as vertigo and migraine-related dizziness
- Vision deficits, including macular degeneration, cataracts, glaucoma, visual field cuts, impaired depth perception, poor visual acuity, and contrast sensitivity

Extrinsic risk factors can include some of the following:

- Using stairs without handrails
- Living alone (this is not only because it increases the risk of a long lie time after a fall, but also because it increases the likelihood of more severe injury)
- Individuals living in an institutional setting or long-term care setting, such as a hospital or skilled nursing facility
- Residing in a two-story home, multi-level apartment building, or other living situation that requires the ascent of stairs to enter the home
- Ascending or descending steep or improperly designed stairs
- Ambulating where there are visible obstacles
- Sedentary behaviors that lead to decreased mobility
- Slippery surfaces indoors or outdoors (black ice, linoleum, or marble flooring)
- The lack of grab bars in the bathroom (particularly near the shower or tub and toilet)
- Keeping excess clutter, throw rugs, exposed wires, and other hazards in walking paths

- Uneven ground inside or outside (loose or ill-fitting tiles, gravel, cobblestone, mismatched bricks, broken concrete or asphalt)
- Improper use of assistive devices or refusal to use prescribed assistive devices, particularly those that assist with mobility and sensory-motor functions
    - Glasses
    - Contact lenses
    - Hearing aids
    - Cochlear implants
    - Memory aids
    - Walkers
    - Canes
    - Mobility scooters
    - Wheelchairs
- The use of unsafe or improper footwear
    - Backless shoes
    - Shoes with untied laces
    - Shoes with a flimsy or absent sole
    - Wearing shoes that do not fit appropriately
    - Shoes with a heel, especially a slim heel such as that on stilettos
- Prescription medications with side effects such as lethargy or dizziness; anyone who takes more than four medications (even ones without the aforementioned side effects) is at a greater risk of falling due to synergistic medication interactions and poly-pharmacy
    - Benzodiazepines (which are used to treat insomnia, some forms of anxiety, and seizures)
    - Anti-anxiolytics (used to treat anxiety)

    - Antipsychotics/psychotropics (these have a major tranquilizing/sedating effect since they are used to treat psychosis and psychotic symptoms associated with conditions like schizophrenia)
    - Muscle relaxers and opioid pain relievers (which both target the brain in an attempt to manage chronic or acute pain)
    - Antiarrhythmics (medications used to regulate and stabilize the heart beat)
    - Digestive medications (specifically anti-nausea, antiemetics, and antidiarrhetics)
    - Nitroglycerin (commonly used to treat chest pain, but may be used to treat other select heart conditions)
    - Antihistamines (this class of medications is used to treat a range of allergies, but can also be an active ingredient in many insomnia medications)
    - ACE inhibitors, calcium-channel blockers, beta blockers, and diuretics (these are used to treat high blood pressure)
    - Medications that decrease urinary urgency at night
    - Antidepressants (namely those in a class called tricyclics)
    - Antiepileptics/anticonvulsants (can be used to treat mental health concerns such as bipolar disorder or seizures disorders)
- Attempting to independently complete self-care tasks with mobility impairments
- Regular use of recreational drugs
    - Dextromethorphan (DXM)
    - Alcohol
    - Inhalants
    - Marijuana (THC)

Since internal risk factors are those that are innate to each person (age, ethnicity, health status, and more), there is not much intervention that can remediate these. However, occupational therapists can still make an impact in the life of a person who has a lot of

internal risk factors for falling. First and foremost, therapists can offer extensive education surrounding what these risk factors are so that people are cognizant of whether or not they are in the high-risk category.

This type of awareness can improve a person's knowledge about fall risks and, with additional intervention, will encourage patients to lessen the impact of external risk factors. This combination of action and education can make a substantial difference in decreasing a person's risk of falling.

Thankfully, patients can benefit from a range of interventions that address external risk factors for falling. Each plan of action should be specific to the risk factor and the person, since there is no one recommendation that will help every person and every situation. After an occupational therapist completes a thorough, patient-centered assessment, they can determine what risk factors are present. The evaluation process will also help therapists gain a better understanding of the patients themselves, which helps them determine what works best for their circumstances.

Section 3 Personal Reflection

How can a therapist appropriately include a patient in the intervention process for eliminating external risk factors for falling?

Section 3 Key Words

Antiemetics: A type of medication that prevents someone from vomiting (a process that is also called emesis)

Body mass index: A measurement that compares someone's height to their weight and determines the percentage of body fat they have; also abbreviated BMI, this measurement places people into one of the following categories: underweight (18.5 or less), normal weight (18.5-24.9), overweight (25-29.9), obese (30 or more), or extremely obese (35 or more)

External risk factor: An event, circumstance, or situation that is part of a person's environment; as it pertains to a person's fall risk, external risk factors are those that often can be controlled and modified to make someone safer

Internal risk factor: An event, circumstance, or situation that is part of a person; as it pertains to a person's fall risk, internal risk factors are those that cannot be controlled or changed to make someone safer

Malnutrition: A medical condition that is caused by someone lacking proper nutrients; this may be caused by other medical conditions or it can develop on its own from poor eating habits

Poly-pharmacy: When someone is prescribed multiple medications to treat the same health concern; poly-pharmacy greatly increases someone's risk for falling

Postural hypotension: A sharp drop in blood pressure that results from rapid position changes; if this comes on fast enough, it can cause someone to pass out but it may also lead to intense dizziness that places someone at risk for falling

Synergistic medication interactions: Two medications that work together to produce the same or similar effect; this can be helpful for therapeutic purposes, but it can also be dangerous if it maximizes side effects such as lethargy, sedation, or dizziness

Section 4: Rehabilitation's Role in Fall Prevention

References: 11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29

As the saying goes, "everything is better in pairs." When discussing fall prevention, the same is true of both occupational and physical therapy. Both disciplines (separately and together) can have a major impact on someone's health status and in helping to prevent falls.

There is a lot of evidence supporting the value of occupational therapy in the realm of fall prevention. One systematic review found that many OT-run fall prevention programs for patients living with Parkinson's were effective. Various intervention groups involved the use of fall prevention booklets, tai chi, exercise programs focused on lower limb strengthening and balance training, tango classes, multimodal exercise programs, caregiver training focused on function, Nordic walking training, and hatha yoga. Results varied, but the most effective programs appeared to be those that involved participation in tango classes and tai chi. A targeted intervention called ParkFit, which is a unique behavioral change program that boosts physical activity, did not yield notable improvements in functional levels or fall incidence despite serving to increase activity levels as intended.

Fall intervention was also an area identified as high need for individuals living with cancer. Literature supports environmental modifications and generalized adaptations as one of the most effective ways to prevent falls, and there are some studies that also support the efficacy of such interventions to prevent falls in those with cancer. Another similar study that focused on hospice patients and therapists working in hospice units found that falls resulting in injury are one of the leading reasons for emergent OT treatment in the hospice population. This leads most therapists to conclude that, even at the end of a person's life, decreasing the impact of falls and fall-related injuries remains at the top of the list in regards to intervention and treatment goals.

Another area where occupational therapists can make an impact in the realm of fall prevention is with individuals with a vision population. A systematic review shows that providing treatment after a fall occurs, implementing preventive interventions to help someone avoid a fall, and addressing a patient's fear of falling were all included in the list of the most common and prioritized goals.

A different study analyzed the quality of the IMPACT (Improving Medicare Post-Acute Care Transformation) Act of 2014 in terms of its ability to prevent falls as well as hospital readmission. Results showed that interventions addressing multiple risk factors at once yielded the lowest strength of evidence, which gives increased value to individualized, targeted approaches. Again, the study found moderate evidence supporting community- and group-based interventions. Interventions such as educational programs and physical exercises also were found to have low quality evidence.

Occupational therapists also analyzed the efficacy of Stroll Safe, which is a 7-week fall prevention program that takes place outdoors and includes group problem solving, didactic learning, self-advocating for outdoor structural concerns and barriers, and practical use of learned strategies. Results were largely positive when the program was carried out with a group of community-dwelling participants who were already physically active enough to participate. A 12-week yoga therapy program aimed at preventing falls yielded improvements in the Canadian Occupational Performance Measure (COPM) and the MiniBESTest. While this was a small sample, the results were promising in terms of self-efficacy and the potential continuation of gains seen during the study.

One study focused on older adults and their views surrounding home modifications. Results from one piece of research showed that just over half of older adults kept home modifications for fall prevention in place one year following the initial intervention. Unsurprisingly, further investigation found that levels of compliance and adherence with

modifications were strongly correlated with the belief that changes would help them be safer.

Further studies have explored the connection between caregiver views about falls and prevention and the occurrence of falls. Results from this particular study showed a high correlation between the number of falls an older adult experienced and how their direct caregivers view falls and subsequent hospitalizations. This is suggestive of the strong need for caregiver involvement, not only in separate and independent fall prevention education, but also in the training process.

Other research found that OT played a vital role in providing quality care focused on fall prevention within a multidisciplinary treatment team. Two separate studies showed even more utility when fall prevention was focused on individuals with multiple sclerosis and Parkinson's disease who experienced a high number of injury-causing falls. Specifically, positive outcomes included a decreased fear of falling, less functional decline, increased balance, and improved strength. The strongest correlation was seen between these results and multifactorial interventions including home modifications, exercise programs, vision screening, medication checks, assistive technology, or educational training.

One study focused on determining the effectiveness of the "My Safe and Sound Plan" in preventing falls. Results supported what other studies have been showing: that education, even when evidence-based and comprehensive, is not enough to prevent falls when implemented as a stand alone intervention. Education is a major part of fall prevention, but it is best when done in conjunction with environmental modifications and other context-related adjustments.

To aid in the therapy process, therapists of all disciplines should be aware of how to increase motivation in patients in order to improve adherence to their safety recommendations. For this reason, some research has aimed to explore barriers and promoting factors that contribute to the success of fall prevention intervention. Results showed that common barriers to fall prevention intervention were the person's denial of their fall risk status and a general lack of motivation to participate in such intervention. Good provider follow-up after initial intervention is considered one of the best facilitating factors. Another motivating factor is a clinician's ability to consistently and regularly dispel myths and correct misconceptions about fall prevention strategies.

As you can see, occupational therapy plays a large part in fall prevention, but it is not necessarily more important than other interventions. Physical therapy and other

disciplines also play a large role in preventing falls using similar methods. Evidence supports the use of physical therapy to prevent falls in a range of populations. One research study looked at the course of physical therapy-based fall prevention with patients who have Parkinson's disease. Results showed that predictive measures were most accurate and most beneficial when completed in 6 month intervals. This is intended to inform practice for working with this population, so follow-ups should come at 6 months and 12 months following the initial visit in order to be most effective at identifying those at risk for falling.

A study jointly done by physical therapists and occupational therapists yielded strong evidence for the effectiveness of physical therapy programs focused on resistance training, aerobic exercise, and supervised gait training for people with Huntington disease. This can be expected to improve participants' walking abilities, yet is not necessarily indicative of a lower fall risk. The study goes on to note that there is less reliable evidence supporting balance as a positive outcome of the exercise programs. Furthermore, results were proven to inconsistently reduce the occurrence of falls. It appears that more comprehensive intervention surrounding fall prevention is needed to make a significant impact on patients living with Huntington disease.

Other research shows that fall prevention training is an important part of preoperative physical therapy education for individuals about to undergo total knee arthroplasty (TKA). Additional research should be done to verify the utility of balance training and movement symmetry during the postoperative period to further decrease the risk and occurrence of falls. After surgery, these methods are considered potentially more important than education.

Additional studies analyzed the effectiveness of the following physical therapy interventions in preventing falls: balance training, overground walking, circuit class training, and high-intensity exercise therapy. Results showed that there was not enough data to support any of these interventions as evidence-based methods for reducing the prevalence of falls. However, another study posited that balance training for individuals at risk for falls is vastly underutilized. Despite inconsistent evidence, this suggests that there are different schools of thought on what the most effective fall prevention interventions are within the field of physical therapy.

As you can see, the similarities between occupational therapy and physical therapy do not necessarily lend themselves to adjacent worldviews on how the area of fall prevention should be addressed. Of all the evidence presented on the topic, it appears

the general consensus is that multifactorial, comprehensive treatment is the best option for preventing falls.

Section 4 Personal Reflection

How do you think occupational and physical therapists can effectively co-treat patients who are at a high risk for falls?

Section 5: The Evaluation of Patients at Risk of Falling

References:
30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56

As you might imagine, an evaluation to determine a person's potential for a fall consists largely of reviewing and identifying any risk factors that pertain to them. This is often done by speaking with a patient, reviewing their medical records, and completing any relevant tests.

Standardized Testing

Standardized assessments are the best way to formally test a patient's balance, strength, and gait. These assessments are well-respected and evidence-based within the rehabilitation fields:

The Timed Up and Go (TUG)

This test is one of the easiest ways to assess someone's mobility skills, since it simply involves tracking their ability to ambulate between two points. It only requires that the therapist has a way of keeping time. A watch can work, but a digital timer (e.g. on your phone) or stopwatch is usually best for the sake of accuracy. Patients should have their standard mobility device with them, if they use one, and should also be wearing footwear they traditionally wear when walking. In the way of preparation, therapists should demarcate a spot 10 feet away from where they plan to begin the test. This can be indicated by the presence of another chair or a clearly-visible piece of tape placed on the floor.

Patients should be seated in a chair at the starting point when therapists give them the instruction to “go.” At this time, the therapist will start the timer and keep it running until the patient reaches the point located 10 feet away, turns, walks back, and sits in the chair they were in at the start. Therapists should instruct patients to walk at a steady pace and not rush. Therapists should also observe the following as the patient moves about:

- Stride length (shorter strides and shuffling gait increases fall risk)
- Arm swing (little or no arm swing increases fall risk)
- Walking pace (tentative, slow steps or impulsive, fast steps both increase fall risk)
- Balance (any balance loss increases fall risk)
- Furniture walking (presence of this increases fall risk)
- Turning style (en bloc turning - which involves moving the neck, head, and trunk as a whole - increases fall risk)
- Assistive device use (improper or unsafe use increases fall risk)

This test focuses primarily on the patient’s finishing time and does not necessarily give therapists the opportunity to score a patient based on the above criteria. However, these aspects are important to note, since they can help providers track progress over time. Since this test is intended for use with older adults, any geriatric person who cannot complete the 10-foot loop in 12 seconds or less is considered to be at risk for falls.

30-second Chair Stand Test

This test, also known as the 30-second Sit-to-Stand Test, is used to assess the strength and stamina of an older adult by testing their ability to go from sitting to standing without the use of their upper body. Unlike the TUG, this test comes along with norms that allow therapists to compare each patient’s score to that of peers in their age group. Therapists will need a stopwatch or similar timekeeping device for this test. They will also need a straight-back chair without armrests for the patient to sit in when completing this test. It is important that the chair is freestanding, meaning it is not positioned against a wall, chair, or another surface, since this can aid in the standing process. Patients are able to complete one practice trial before the official test begins.

The instructions state that patients must sit naturally in the chair and cross their arms in front of their chest with each hand touching the opposite shoulder. They are to rise from a seated position to a standing position while keeping their arms on their chest and their back straight. Therapists are instructed to observe while the patient goes from sit to stand, stand to sit, and so on until 30 seconds runs out on the timer.

If the patient uses their arms at any point during the test, therapists are to stop and give a score of zero. The test is scored by counting the number of sit-to-stand repetitions a patient is able to complete in 30 seconds. If a patient happens to be in the process of completing another repetition when the buzzer goes off, therapists can count this only if the patient is more than halfway through the sequence.

Therapists can compare the patient's score with the norms for their age. If the patient's number falls below the one listed on the table, they are considered at risk for falls. Therapists can use the following norms to gauge a patient's results on this test:

	At-risk men	At-risk women
60-64 years old	Less than 14	Less than 12
65-69 years old	Less than 12	Less than 11
70-74 years old	Less than 12	Less than 10
75-79 years old	Less than 11	Less than 10
80-84 years old	Less than 10	Less than 9
85-89 years old	Less than 8	Less than 8
90-94 years old	Less than 7	Less than 4

The 4-stage Balance Test

This test entails older adults holding a series of four positions while keeping their balance. Since these are stationary positions that are meant to be sustained for 10 seconds each, the 4-stage Balance Test is an ideal way to determine an older adult's static balance. This test specifically states that therapists should give verbal instructions

for one position, visually demonstrate it, and then allow the patient to attempt to replicate it.

If patients cannot replicate the position (meaning they move their feet into another position while trying to assume the requested position), the therapist should stop the test and make note of that. Therapists should notify patients that they can hold their arms in whatever position they would like and can even move their body from side to side as they get their bearings. After the initial instruction, the therapist should ask the patient to replicate and hold that stance for 10 seconds while the provider monitors the time.

Therapists should record the time patients can hold the following positions:

- Standing with their feet side by side
- Standing with their big toe touching the instep of their other foot
- Standing with their big toe touching the heel of their other foot (tandem stance)
- Standing on only one foot

There are no norms provided for this test or even for each position. However, it is said that older adults who cannot maintain the tandem stance for at least 10 seconds are at risk for falling.

The Five Times Sit-to-Stand Test (5xSTS or FTSTS)

This test has the same premise as the 30-second Chair Stand Test in that it aims to determine a person's lower body strength based on their ability to transfer in and out of a chair using only their legs. Other variations of this test exist, including:

- Ten Times Stand Test
- One-Minute Sit-to-Stand Test
- Six Times Sit-to-Stand Test
- Zero Second Sit-to-Stand Test
- Single-Leg Sit-to-Stand

The main way that this test differs from the other is that the parameters are reversed. This means the patient should be instructed to sit in the chair, cross their arms in front of

their chest (in the same way as the other test), and complete the sit-to-stand sequence five times in a row. Instead of seeing how many times the patient can do this within 30 seconds, the therapist will be watching the timer to see how long it takes the patient to complete 5 repetitions. The length of time will then be recorded as a means of comparison.

If the patient cannot complete the full 5 repetitions or they attempt to use their upper body at any point during the test, therapists should record this as a failure. While time is the main component of this test, therapists should also document the assist level as one of the following:

- Contact guard assistance (CGA)
- Stand-by assistance (SBA)
- Modified independent (MI)
- Independent

If the patient requires a greater level of assistance from the therapist, they have failed the test. Similarly to its sister test, patients are able to complete one practice trial before the official test begins. The age-related norms for this test are as follows:

- 60-69 years old: 11.4 seconds
- 70-79 years old: 12.6 seconds
- 80-89 years old: 14.8 seconds

Other literature defines diagnosis-specific norms. For example, patients with Parkinson's disease who score greater than 16 seconds are considered a fall risk. Patients with residual effects from a stroke who score greater than 12 seconds are considered a fall risk. Patients who have vestibular disorders or impairments and score greater than 15 seconds are considered a fall risk. Patients who have a history of recurrent falls and score greater than 15 seconds are considered a fall risk. Any other elderly patient who scores greater than 12 seconds is considered at risk for falls and should undergo further testing.

Single Leg Stance Test (SLS)

Also known as the One-Legged Stance Test (OLST), this assessment tool can be used to test balance. A therapist administers the SLS by asking a patient to keep their eyes open

and place both hands on their hips. The patient is then to bend one knee in order to lift that foot off the ground. They are not able to hold on to an assistive device, wall, countertop, or another person. The therapist must time how long a patient can stand in this position without their foot coming down to the ground or their hands coming off their hips.

Anyone who cannot maintain this position for at least 5 seconds is considered a fall risk. Literature suggests that patients over the age of 80 should be able to sustain this posture for around 10 seconds. Age-related norms for this test are as follows:

	Eyes open	Eyes closed
18-39 years old	43.3 seconds	9.4 seconds
40-49 years old	40.3 seconds	7.3 seconds
50-59 years old	37.0 seconds	4.8 seconds
60-69 years old	26.9 seconds	2.8 seconds
70-79 years old	15.0 seconds	2.0 seconds
80-99 years old	6.2 seconds	1.3 seconds

Berg Balance Scale (BBS)

As the name suggests, the Berg focuses on measuring a person's balance by taking them through a series of 14 different tasks. It was initially designed for use with individuals who have sustained a stroke or older adults above 65 years. But rehabilitation professionals now use it on patients with a range of conditions from spinal cord injuries to vestibular disorders to Parkinson's to dementia.

Providers are to give patients a score between 0 and 4 for each task. The BBS involves completion of the following tasks:

- Unsupported sitting
- Going from sitting to standing without support

- Transfer between two chairs
- Stand up with your eyes closed
- Go from standing to sitting
- Go from sitting to standing
- Stand up with both feet directly next to each other
- Reach in front of you while keeping your feet fixed on the floor
- Bend over and pick an object up off the floor
- Alternate when putting both feet on a stool in front of you
- Turn around in a full circle
- Turn around to look behind you
- Stand with one foot directly in front of the other without support
- Stand on one leg for as long as possible

As for scoring, a total score between 0 and 20 indicates that someone is likely dependent on a wheelchair to get around. A score between 21 and 40 suggests that the patient needs some type of mobility device, typically a walker or a cane. A score between 41 and 56 infers that someone should be able to move about their environment entirely independently.

If you recall, the literature does not support balance, strength, or gait testing as a reliable predictor of fall risk. This same rationale applies to the Berg, so it is best used with other tests.

Dynamic Gait Index

The Dynamic Gait Index (DGI) is a good way for therapists to assess a patient's walking skills by having them ambulate 20 feet. If they have one, they can use their assistive device or they can walk independently.

Therapists are to score patients between 0 and 3 (zero being severe impairment and three being no dysfunction noted) on the following tasks:

- Walking while turning the head horizontally and vertically

- Stepping around and over various obstacles
- Walking with a changing pace
- Climbing stairs
- Walking and pivoting
- Steady walking

A score of less than 19 indicates that someone is at an increased risk of falls. This test can be used on individuals with a history of Parkinson's disease, stroke, multiple sclerosis, vestibular disorders, and traumatic brain injuries.

BESTest

This balance-focused assessment targets skills including postural responses, anticipatory responses, gait stability, sensory orientation, biomechanical constraints, and stability limits. Each task should be scored between 0 and 3, with a score of 0 being the worst performance and a score of 3 being the best performance. Patients are allowed to use an assistive device during this test, but therapists must score them one point lower if this is the case.

Functional Reach Test

The Functional Reach Test (FRT) is another simple assessment that requires very few materials. It can be administered and scored in less than 5 minutes, so it is one of the most efficient ways to determine someone's ability to keep their balance and interact with objects around them.

Using a ruler taped to the wall, a patient should be instructed to keep their feet planted on the floor while they move their arms (and body) as far forward as they can. Therapists should ensure patients are not touching the wall and that their forward flexed arms end at the start of the ruler. Therapists must verbalize to patients: "Reach as far forward as you can without taking a step." While therapists cannot hold the patient in any way as they reach, they should be prepared and able to block patients if they fall forward, since that is the direction they will be facing.

Therapists should guide patients through three trials: a practice trial followed by two standard trials. In terms of scoring, therapists should average together the last two trials. Scoring is as follows:

- Patients who can reach forward 10 inches or more are at a low risk for falling.
- Patients who are able to reach between 6 and 10 inches forward are twice as likely to fall than others their age.
- Patients who can reach forward 6 inches or less are four times as likely to fall as their peers.
- Patients who are unwilling or entirely unable to reach forward are eight times as likely to fall as someone else their age.

Fall-specific Assessment Tools

The Activities-Specific Balance Confidence (ABC) Scale

This assessment tool does focus on balance, but it is not functionally-based like the other tests. This aims to determine a patient's perception of their own balance while they are completing certain tasks. It's a self-report, so patients will fill out the questionnaire and rate how they feel about 16 different scenarios. Fear of falling is a major component of fall prevention, so it's crucial that therapists identify and address these emotions and beliefs to effectively mitigate risk. There are no norms for this test, since the aim is for therapists to gradually help improve a patient's confidence so that it gets closer to 100%. This will allow patients to feel more self-assured when navigating their environment and, therefore, help prevent falls.

Falls Efficacy Scale (FES)

This is another measure that determines a person's confidence when completing certain tasks. Patients are asked to rate the following activities on a scale of 1 to 10 with 1 being very confident and 10 being not at all confident:

- Getting in and out of bed
- Answering the phone or door
- Getting in and out of a chair

- Getting on and off the toilet
- Getting dressed
- Completing grooming (washing face, brushing hair, putting on makeup, etc.)
- Preparing meals in the absence of heavy objects
- Walking around the house
- Reaching into cabinets, shelves, or closets
- Taking a shower or a bath

Patients who have a total score that exceeds 70 are at risk for falls due to excessive fear of falling.

Falls Risk Assessment Tool (FRAT)

This comprehensive fall assessment takes into account a person's cognitive status, medications, and any changes in their functional status. This not only gives people an immediate snapshot of a person's health status, but it allows them to rate their fall risk based on a variety of reliable factors. The FRAT also allows providers to create a personalized action plan that works to remediate someone's fall risk.

Hendrich Fall Risk Model

The Hendrich is a similarly comprehensive tool that allows providers to assign a number of risk points to a variety of risk factors and activities that might place someone at a greater chance of falling. This tool also mentions medications along with the ability to rise from a chair and medical conditions like vertigo, all of which impact someone's propensity for falling.

Humpty Dumpty Scale

The Humpty Dumpty Scale is another tool commonly used in hospitals to determine a patient's risk for falls. This is especially sensitive to an acute care population in that it includes whether or not someone recently had surgery, since the post-operative aftercare process usually involves:

- Detoxification from anesthesia

- Regular doses of pain medications, which can cause disorientation and grogginess
- Potentially unmanaged symptoms related to the recovery process
- Inflammation and increased sensitivity in certain areas of the body
- Muscle weakness, usually if the surgery was orthopedic in nature and requires special weight-bearing protocols that make getting around more challenging

Patients who score between 7 and 11 on this scale are considered at a low risk for falling. Those who score above 12 are placed in the high risk category.

Johns Hopkins Fall Risk Assessment Tool (JHFRAT)

It is not uncommon for well-known and prestigious organizations to develop their own fall risk tools to ensure the specific needs of their population are being met. There have been positive outcomes (e.g. fewer falls) reported when other organizations have adopted this tool. This tool is somewhat similar to the others in that it covers areas like medications and health conditions. However, it tends to be more sensitive in that it comes with a home health version and an acute care version. Patients who score between 6 and 13 are considered a moderate fall risk, while patients who score 13 or above are deemed a high fall risk.

Moore Balance Functional Fall Risk Assessment Tool

The Moore tool is another helpful one that scores patients on a variety of factors. This tool differs from others in that certain aspects of it can be used to recommend that someone uses the Moore Balance Brace (MBB). It also comes with a referral chart that cites physical therapy, occupational therapy, primary care, podiatry, and home care as potential services that might assist people who score low in certain areas of the test. Patients who score between 0 and 9 are at a low risk for falls, those who score between 10 and 20 are considered high risk, and anyone scoring above 20 is labeled an extreme risk for falls.

Morse Fall Scale (MFS)

This is another fall scale that aims to give patients a firm action plan based on their end score. It is similar to some of the others in that it is intended to be used within a hospital or skilled nursing facility setting. The items score patients on similar criteria to the other

institutional assessments. If someone scores between 0 and 24, they are considered to not be at risk for falls. It's important to note that the Morse Fall Scale is the only fall-specific assessment that allows someone to be labeled not at risk for an incident. The action plan for that scoring category is basic nursing care according to their needs. Anyone who scores between 25 and 50 is considered at a low risk for falls. Patients in this group should be treated with the standard fall prevention interventions established by that facility. Patients who score 51 or above are considered a high risk for falls and any treating providers should implement the high risk fall prevention interventions.

GRAF-PIF

The General Risk Assessment for Pediatric Inpatient Falls (GRAF-PIF) is considerate of the nuances associated with pediatric hospitalization and fall risk reduction. It is considered to be effective, especially due to its ability to lead to targeted interventions and improved family education.

In particular, any patient under 12 months old is considered to be developmentally at risk for falls. This is considered a more sensitive measure, since any child who scores above 2 on the entire assessment is labeled at risk for falls.

Clinical Opiate Withdrawal Scale (COWS) and Clinical Institute Withdrawal Assessment of Alcohol Scale (CIWA)

The COWS and the CIWA are two other assessments that are not solely fall risk assessments, but can help assess safety for patients who are undergoing detoxification from substances. The Clinical Opiate Withdrawal Scale (COWS) and Clinical Institute Withdrawal Assessment of Alcohol Scale (CIWA) both review a range of body systems and functions to determine where patients are in the withdrawal process.

If someone scores between 5 and 12 on the COWS, their withdrawal symptoms are considered mild. If the score sums 13 to 24, withdrawal symptoms are considered moderate. A score between 25 and 36 is considered moderately severe and a score above 36 indicates severe withdrawal. If someone scores between 0 and 10 on the CIWA, they have mild withdrawal symptoms. A score between 8 and 15 is associated with moderate withdrawal symptoms and a score greater than 15 indicates severe withdrawal symptoms.

When a patient is withdrawing from alcohol or opioid-related substances, they can experience physical, cognitive, and emotional symptoms that impair their ability to

appropriately move around. The COWS and CIWA both assess factors such as orientation, tremors, tactile hallucinations, visual disturbances, restlessness, and joint or bone aches. While these measures don't give providers an outright classification of a patient's fall risk as part of the scoring process, they do note the presence of any of the above symptoms. As a result, providers who record any symptoms that place a patient at risk for falls can act accordingly by initiating a fall prevention protocol.

Identify medications that increase fall risk

Healthcare providers use the American Geriatric Society (AGS) Beers Criteria to assist in this process. The Beers Criteria set forth guidelines that help prescribing providers improve the safety of the recommendations they make to individuals over the age of 65. These guidelines are applicable for geriatric individuals in all settings aside from palliative care. This criteria includes five main categories of medications that should have special attention:

- Medications that are potentially inappropriate for older adults
- Medications that are potentially inappropriate for adults with certain health conditions
- Medications that need to be used with much caution in older adults
- Medication combinations that can produce dangerous interactions
- Medications that should have different dosage or be avoided entirely by people who have poor kidney functioning

This criteria is more common and more appropriate for use by nurses and physicians, but therapists can still do medication reviews with their patients to ensure their safety.

Determine home hazards

Environmental assessments and modifications are one of the main ways that therapists can assist in preventing falls. Home hazards can be present in any part of the home. In particular, outdoor hazards include:

- Unrepaired driveway or sidewalk cracks
- Icy ground surfaces

- Landscaping that is steep and slippery, such as gravel or smooth stones
- Exposed tree roots
- Long grass, which can hide obstacles or trip hazards
- Roof drainage that releases water over walking surfaces like the driveway or any walking path
- Not having a consistent plan for managing outdoor terrain in winter months
- An inaccessible front entrance (often this means places don't have a ramp)
- A sloping driveway
- Loose, absent, or one-sided handrails

Indoor hazards might occur in the form of:

- Uneven flooring panels or tiles
- Loose rugs
- A toilet seat that is too low
- Puddles of water on countertops or floors
- Poor lighting (either lighting that is too bright or too dim)
- Loose, absent, or one-sided handrails
- Four-legged pets
- Carpet that bunches up or is not affixed to the floor
- Lack of motion-activated lighting or nightlights
- High shelves in the kitchen
- Chairs, couches, and sofas that are too low
- Not having a clearly-defined path from the bedroom to the bathroom
- Poorly-made or otherwise unstable furniture (especially tables and chairs)

- Bulky, unsecured wires, especially those that run under rugs or across hallways and flooring
- Not having a flashlight accessible in the event of an emergency
- Lack of handrails in the bathroom or near the shower
- Using narrow or unstable stools with small steps
- Not having a telephone close enough to the bed
- Storage that keeps frequently used items out of reach
- Creaky or weak stairs
- A furniture layout that does not allow for safe walking
- Long, steep stairs
- Throw rugs without a non-slip backing
- Toys left on the floor
- Clutter in hallways or other walkable spaces

Measure orthostatic blood pressure

This is good practice for therapists who work with a geriatric population or those considered medically fragile. But anyone can be affected by orthostatic hypotension, which is a condition that causes someone to experience an abnormal and sudden drop in blood pressure when they change their position too quickly. Symptoms include dizziness and fatigue, which are some major signs that can lead to a fall.

To prevent this from happening with patients who are prone to orthostatic hypotension, therapists should consistently measure blood pressure and record the results in the patient's medical records. This allows other providers to see trends and respond accordingly.

An ideal blood pressure for an adult is around 120/80 mmHg, while an infant's blood pressure should remain around 80/45 mmHg and a school-aged child's blood pressure is best around 110/70 mmHg. Therapists should take care to measure blood pressure at the start of the session, at some point during the session, and at the end before the

patient is dismissed. This is because someone who has orthostatic hypotension can be more sensitive to exertion during therapy sessions, transfers, ambulation, and frequent changes in position.

Check visual acuity

Visual acuity is a patient's ability to see details and shapes from a distance. While therapists are fully able to complete screening for visual acuity to help decide their risk of falling, this assessment is more often performed by physicians.

The Snellen Test (using the Snellen Eye Chart) is the most common method of measuring visual acuity. Many people are familiar with this as the standard eye chart that is visible at the doctor's office. The chart is to be placed 10 feet away from where the patient will be standing. Patients are to cover one eye before beginning to read from the top to the lowest line that is clearly visible to them. Providers should make note of where the patient stops, and then ask them to cover their other eye while repeating the same process. Scoring is self-explanatory, since each line has the person's visual acuity ranking (e.g. 20/20, 20/30, 20/40) labeled on the left.

Another test that can also be used to determine someone's visual acuity is the Chronister Pocket Acuity Chart (CPAC). This uses the same premise as the Snellen Test, but only focuses on identifying numbers rather than numbers and letters. This assessment differs in that it offers measurements for distance and near visual acuity. The CPAC is not quite as limiting as the Snellen in that it can be performed at any distance, since it offers a conversion chart to adjust the patient's scores accordingly. The Chronister also comes in the form of a booklet so it can be transported and used on-the-go.

As the Snellen Test and CPAC both note, visual acuity is just one aspect of a person's visual abilities. So, in isolation, this test is not a good indicator of a person's depth perception and binocular vision, which should be functional for someone to avoid falls and safely navigate their surroundings. Therapists should also test pursuits, saccades, convergence, and visual fields as part of a thorough visual examination for someone who is at risk for falls. OTs can use some of the following assessments:

Beery Test of Visual-Motor Integration (Beery VMI)

The Beery VMI is more commonly used with children and adolescents but there are several versions, which can cumulatively be used on patients ages 2 through adulthood. The patient's score is calculated by comparing their results to a set of age-based norms.

Northeastern State College of Optometry Eye Movement Test

This test gives providers a view of both pursuits and saccadic eye movements by testing a patient's ability to visually track a target horizontally and rotationally. Scoring is calculated by comparing a patient's results to a set of age-based norms.

Motor-Free Visual Perception Test (MVPT)

This test can be used on patients as young as 4 years old and those older than 80. The MVPT is particularly helpful if therapists want to isolate a patient's visual-perceptual abilities from their motor skills to get a truer picture. Providers calculate a patient's score by comparing results to a set of age-based norms.

Assess feet and footwear

A focus on feet and associated footwear is common practice for therapists when working with patients who have diabetes, as is training patients to self-assess their feet for any abnormalities, injuries, sores, or sensory changes. But therapists should incorporate this into fall prevention training as well, since education on proper footwear can go a long way. Shoes that are ideal for preventing falls should have some of the following features:

- Front closure such as laces, velcro, or straps
- Heels that are lower than 1 inch
- Soles with good treading on the bottom
- Non-slip, hard, but thin soles
- Proper sizing
- Supportive fabric and backing located at the heel
- Shoes that are light and have a solid back (no slippers, clogs, or slip-ons)

- Slight angling or beveling at the heel (to prevent slippage)

While each shoe will differ, brands such as Skechers, Hush Puppies, and New Balance commonly have many of these features, so they are a good starting place if you are going shoe shopping. Therapists should also educate patients on the importance of wearing some sort of shoe within the home. The right kind of slipper may be acceptable here, as long as it has a firm, treaded sole. If your patient still insists on going barefoot within the home, you should encourage them to wear socks with non-slip backing to promote their safety.

Therapists should be sure to include an assessment of the feet in their evaluation. They should test the strength and range of motion of the legs and feet. Therapists should look for any signs of foot drop that might place someone at risk of falling. Foot drop might cause some asymmetry in the way someone walks (they might drag one foot behind them or swing it out to the side to compensate for poor motion). But therapists should also look at the individual functioning of each foot. Both feet can be weak, which leads to shuffling gait, small steps, a narrow base of support, and other red flags that place someone at risk for falls. Based on the results of their evaluation, therapists might need to refer patients to a podiatrist or orthotist for a more detailed assessment, customized shoe inserts, or individually-made shoes.

Assess Vitamin D intake and levels

This is another area of intervention that mainly falls under a physician's scope of practice, but it is important in preventing falls. Research has shown that individuals who do not consume enough Vitamin D often have low bone mineral density and, subsequently, low bone strength. Both of these concerns make someone less mobile and less stable when moving around, so the root cause (low Vitamin D) is considered to be a risk factor for falls. Supplementation has a sizable impact, with some studies noting that daily doses between 700 and 1,000 IU can reduce the occurrence of falls by nearly 20%.

While doctors can make supplement recommendations and monitor levels via blood work, therapists can provide ample education about how to boost Vitamin D levels through diet. Therapists can instruct their patients to eat some of the following foods to indirectly help prevent falls:

- Beef liver
- Eggs (whole eggs, since the yolk is the main source)

- Fish, including sardines, cod liver oil, tuna, salmon, and swordfish
- Orange juice (be sure the label says that it's fortified with Vitamin D, since not all brands are)
- Cow's milk or plant-based milk (be sure the label says it's fortified with Vitamin D, since not all brands are)
- Fortified cereals

Vitamin D deficiency does not always appear as readily as other deficiencies. Patients may present with fatigue, poor immunity, muscle and joint pain, depressed mood, and slowed wound healing. If the deficiency and these symptoms are minor, the concern may go unnoticed for some time.

Therapists should know that patients with inflammatory bowel disease (IBD), Crohn's disease, ulcerative colitis (UC), obesity, lactose intolerance, or those who are post-gastric bypass surgery are all at an increased risk of being deficient in Vitamin D. This can help them target the patients in the most need.

Identify comorbidities

While occupational therapists don't have the ability to diagnose patients, they can point out warning signs that might indicate the presence of a health condition. This can help initiate the diagnostic process so patients can get the treatment they need. There are certain conditions that might increase a patient's risk of falling, including:

- Neurological conditions, such as stroke and Parkinson's
- Respiratory conditions, such as Chronic Obstructive Pulmonary Disease (COPD)
- Cognitive conditions, such as traumatic brain injuries and dementia
- Joint conditions such as arthritis
- Thyroid dysfunction (hypothyroidism or hyperthyroidism)
- Heart disease
- Anemia

- Mental health concerns, namely major depressive disorder and those that cause agitation or delirium
- Circulatory conditions, such as Diabetes mellitus
- Urinary or fecal urgency or incontinence, since making multiple, hurried trips to the bathroom can increase someone's risk
- Disorders of the foot or ankle (foot drop, also known as peroneus nerve palsy, is one of the most common, but this category can also extend to bunions, sores, and deformed nails)
- Vitamin D deficiency
- Sensory processing disorder, which can cause confusion and disorientation in the presence of certain stimulus
- Chronic pain conditions, such as fibromyalgia, multiple sclerosis, complex regional pain syndrome (CRPS), and lupus

Section 5 Personal Reflection

How else can a therapist help with identifying comorbidities for falling?

Section 5 Key Words

Binocular vision: The type of vision that humans have, which allows the vision in each eye to overlap slightly for a more complete picture of the outside world

Bone mineral density (BMD): A measure of the vitamin and mineral content of your bones

Depth perception: An aspect of our vision that allows us to see in three dimensions

En bloc turning: A dysfunctional type of movement that involves the simultaneous motion of the pelvis, head, and trunk when turning; a more functional movement would involve each of these body parts turning one-by-one from the head down

Furniture walking: The act of holding onto furniture, walls, and other nearby structures for support while walking; this is often done by people who are unsteady on their feet and decline to use an assistive device to help them get around

Orthostatic hypotension: A condition that involves a rapid drop in blood pressure when someone changes positions too quickly (e.g. goes from sitting down to standing up)

Stride length: The distance between each foot when someone is walking forward; this can be more specifically calculated by measuring from the big toe on the right foot to the big toe on the left foot (or the right heel to the left heel)

Visual acuity: A function of the eyes that allows someone to see details associated with shapes, letters, and other imagery from a distance

Section 6: Environmental Modifications

References: 57,58,59,60,61,62,63

As the research shows, making environmental modifications is one of the most efficacious interventions for fall prevention across all ages and populations. For this reason, therapists should understand the best way to go through a patient's home from top to bottom and make recommendations that will increase their safety. Therapists should focus on some of the following environmental modifications for older adult patients:

- Removal of small, unsecured throw rugs; an alternative is adding non-slip backing to otherwise unsafe rugs
- Organizing, repurposing, and storing items that are on the floor or blocking walkways
- Use blackout curtains, shades, and task lighting to reduce glare
- Improve lighting by switching to LED bulbs and ensuring there is sufficient light in each part of the home
- Keep flashlights and other important items readily available in the event of an emergency
- Encourage the purchase (and use) of chairs with armrests
- Install a zero-step entrance that is flush with the floor (no threshold)
- Store any items on shelves (kitchen, bathroom, pantry, closets, etc.) in between eye and hip level to improve accessibility

- Repair any steps, floorboards, tiles, etc. that are broken, uneven, loose, or poorly made
- Add anti-slip floor finish to hardwood floors
- Install flooring that is glare-free and slip-resistant
- Keep a clear path from the bedroom to the bathroom, especially if you get up in the night to use the bathroom
- Place heavy items that are used often on the countertops or in the places they would be used to prevent unnecessary transport
- Install lighting by the front door (motion-activated lights - be sure they aren't overly bright flood lights - or dual sconces)
- Mount soap, shampoo, conditioner, and other hygiene products in dispensers on the wall of the shower or tub
- Install grab bars in particularly tricky areas: near the toilet, in the tub or shower, just outside of the tub or shower, and next to the front door (if there is a threshold to clear)
- Have a loved one help rotate seasonal items regularly (such as winter vs summer clothing, cooking items, holiday decorations, etc.) so that most-used items are always accessible
- Modify bathroom to have a curbless, roll-in shower
- Encourage the use of a medical alert button
- Install a handheld shower head
- Avoid using floor polish or wax when cleaning
- Secure loose wires and place them away from walkways
- Utilize contrasting colors to demarcate changes in flooring, furniture, and walls
- If the patient uses a wheelchair, ensures hallways are shorter and wider to offer appropriate clearance
- Place one phone set close to ground-level in case you fall

- Post emergency numbers in large print and place them somewhere that is easily read (on the fridge, by the nightstand, next to the phone, etc.)
- Adjust the height of the bed so that patients can more easily sit down and get up independently
- Use a bed that is low to the ground and has a handrail on either side
- Put non-slip mats beside the bed
- Add motion-sensor lighting to dim or dark areas of the home
- Install ramps at the front entrance of the home to improve ingress and egress
- Add handrails to both sides of the stairs
- Place light switches at the top and the bottom of the stairs
- Place a table lamp or a light switch right by the nightstand so it's within arm's reach of the bed
- Mark elevation changes with bright tape (any indoor or outdoor thresholds or steps)
- Install a handrail just outside the front door
- Place non-skid mats in areas that often get wet and can become dangerous, namely by the kitchen and bathroom sinks
- If someone is looking to purchase a new home, recommend single-floor homes with an open floor plan
- If they are not willing or not able to move, recommend that someone with a two-story home sets up a bedroom on the first floor

As you know, older adults are not the only ones who can benefit from environmental modifications to prevent falls. This intervention can also be helpful in the workplace, especially for people who do manual labor and have physically strenuous jobs. There are many home modifications that can be equally as helpful in the workplace, but there are also additional tips that may be specific to the type of business. In addition to modifications in the workplace, therapists can help businesses establish or better enforce workplace safety recommendations to prevent falls and on-the-job injuries. As for environmental modifications within the workplace, changes might include:

- Ensuring that all heavy machinery (forklifts, cranes, computer-assisted machinery, etc.) is working properly
- Post warning signs, protocols, factory guidelines, and other safety rules for workers and visitors
- Install mirrors to assist with removing blind spots
- Keep aisles and work areas clean and clear of clutter
- Install anti-fatigue mats to prevent muscle and joint fatigue
- Develop workflows for the prompt remediation of spills, leaks, and other incidents
- Install and maintain proper drainage in areas that often have water flow
- Provide dry, elevated mats for workers to stand on in wet or damp areas
- Use anti-glare covers on computer screens
- Place toe-boards, top and middle railings, and/or floor holes around any holes that are present but cannot be immediately repaired or patched
- Allow for ample task lighting in work areas
- Ensure the presence of harnesses and safety nets when workers are ascending structures
- Repair and replace malfunctioning wiring, switches, and cords
- Install guardrails and toe-boards around any elevated, open platforms
- Place guardrails so they separate machinery, dangerous equipment, or hazardous materials from walkways
- Create appropriate access points for vehicles that are coming and going through the workplace
- Have ladders and step stools readily available near shelving and other high storage areas
- Install arrest systems

- Provide workers with the personal protective equipment (PPE) needed to do their job
- Use scaffolding in instances of construction
- Implement initial and ongoing training to ensure workers are well-versed enough to perform their job safely and effectively

Environmental modifications and protocols can also be used to prevent falls in institutions such as skilled nursing facilities and hospitals:

- Orient patients, caregivers, and visitors to their room, its features, and the call light
- Request medication reviews for patients with side effects that place them at risk for falls
- Place the fall risk sign on the door and/or above the patient's bed
- Safety checks at every shift change
- Habitually ask patients if they need anything before leaving the room
- Complete hourly safety checks (pain, positioning, and bathroom needs)
- Secure tubes, lines, and wires away from the patient
- Request physical transfer assistance from other providers, when needed
- Move important equipment to the patient's stronger (or, in the instance of a stroke, unaffected) side
- Continually update other providers as to a patient's safety awareness and ongoing risk
- Clear linens, equipment, toys, and anything else off the floor before leaving
- Place 2 bed rails or 4 crib rails up before leaving the room
- Be sure that product securing devices are installed on all hospital equipment
- Providers should place the patient's tray table next to them (whether they are in bed or in a chair) before leaving the room
- Give patients a yellow (or other uniform but noticeably-colored) armband

While parent training is one of the best ways to prevent falls in children, they can also benefit from a range of home modifications to make the home safer and more kid-friendly. This includes standard child-proofing (which some parents may or may not know about) and other recommendations:

- Install an emergency release on all windows above the second floor
- Arrange tables, cribs, chairs, and other furniture away from windows
- Put window stops and window guards on all windows within arm's reach
- Do not let your child ride or play in the main shopping cart, lower rack, or the sides
- Consider using immovable activity centers rather than baby walkers
- Open windows from the top whenever possible
- Secure all furniture using anti-tip bars, mounts, brackets, anchors, etc.
- Discourage play on balconies, porches, raised patios, decks, and other elevated surfaces
- Require helmet use when riding bikes, scooters, snowboarding, and skateboards
- Don't let your child climb on furniture like tables, shelves, dressers, or stands
- Supervise your child when they are going up and down stairs
- Install baby gates at the top and bottom of all stairs and affix them to the wall
- Never leave your child unattended while sitting in a shopping cart
- Fasten the seatbelt when your child is sitting in a child-friendly shopping cart seat
- Always use safety belts/straps on carriers, strollers, high chairs, swings, and other seating
- Keep windows closed and locked when they are not in use
- Avoid letting your child play directly on concrete or asphalt
- Place occupied baby carriers on the floor and not on furniture

- Keep corded blinds away from children as both the pull cord and inner cords can cause a child to be entangled (install touch-lift adjustable shades or blinds as an alternative)
- Exercise caution by always supervising your baby when they use baby walkers (they can roll down the stairs easily)
- If using a trampoline, encourage one person to be using it at a time
- Change your baby's diaper on the floor so they can't roll off a table
- If you do change your baby on a table, always supervise them
- Educate all parents about activities that place their child at risk for falls or other injury
- Position crib beds in the lowest position and rails at the highest level
- Create and implement parenting programs that target first-time parents, low-income, and underserved families

Section 6 Personal Reflection

What education might a therapist give to a first-time parent being discharged from the hospital after delivery?

Section 7: Person-Centered Interventions

References: 64,65,66,67,68,69,70,71,72,73

Therapists in most all healthcare settings should also be focused on improving a patient's mobility skills in order to decrease their risk of falls. This includes, but is not limited to, addressing client factors such as:

- Transfer training
- Range of motion
- Strengthening
- Balance

- Bed mobility
- Neuromuscular reeducation
- Gait training

Therapists can address these areas through interventions such as:

- Range of motion activities gradually building to progressive resistance training (PRT)
    - Chair stand
    - Marching in place
    - Side leg raise
    - Single leg stance (SLS)
    - Back leg raise
    - Heel toe stand (tandem stance)
    - Tandem walking
    - Side lunges
    - Side twist
    - Pelvic bridges
    - Step ups
    - Corner stand
    - Side twist on one leg
    - Side step
    - Supine straight leg raise
    - Sit-to-stand
    - Weight shifting
    - Foot taps

        - Head rotations
        - Standing dual heel raises
        - Toe stand
        - Knee curl
        - Leg extension
        - Hamstring stretch
- Qi gong
- Tai chi
- Cycling on a stationary bike
- Progressive ambulation training
    - Practice walking to the beat of a metronome or music
    - Treadmill walking
    - Upgraded outdoor walking
- Aquatic therapy
- Stretching
- Yoga

Therapists are also adept at teaching patients how to modify activities. In some instances, this means using an alternative method that follows energy conservation techniques:

- Energy conservation strategies
    - Plan ahead to prevent rushing
    - Use a shower caddy to keep items together and prevent unnecessary reaching and bending
    - Whenever working, take frequent rest breaks (especially before you notice any fatigue)

- Plan household tasks throughout the week rather than doing them all on one day
- Lay out your entire outfit before you begin dressing
- Delegate heavy lifting or labor-intensive tasks to family, friends, or caregivers
- Use equipment to assist with chores whenever possible
- Complete as many household chores as you can while sitting down
- Shop on off hours to avoid crowds and lines
- Use a list when grocery shopping and organize the list by aisle
- Ask grocery attendants for help loading bags into the car
- Complete meal preparation while sitting
- Alternate demanding tasks with easier tasks to conserve strength
- Cook larger portions and save the rest for easy meals later that week
- Keep frequently-used kitchen utensils and appliances within arm's reach or on the countertop
- Plan activities based on your energy levels; if you're more alert in the morning, schedule your most important activities then
- When caring for children or grandchildren, plan tabletop activities like coloring, drawing, painting, card games, board games, reading, video games, etc.
- When caring for children or grandchildren, encourage them to sit on your lap or get into chairs on their own to prevent you from lifting
- Slide objects along tabletop surfaces or drag them on the floor rather than lifting
- Place chairs in areas where you frequently need to stop and rest (e.g. the hallway)

- Opt for button-up shirts instead of pullovers (use appropriate adaptive equipment if buttoning is an area of concern for you)
- Use frozen, pre-prepared ingredients when possible
- Dress your lower body before your upper body, since this takes more energy and focus
- Utilize modified clothing like shoes with elastic shoelaces, velcro closures on shirts and pants, etc.
- Avoid overly-scented lotions, body sprays, and perfumes, since these can make it harder to breathe (for you and others around you)
- Place a trash can in each room of the home to prevent extra walking
- Gather all ingredients needed for a recipe before you start cooking
- If one side of your body is weaker than the other, dress the weaker side first
- Plan for a reasonable bedtime to give yourself much-needed energy the next day
- Avoid holding your breath when doing exerting tasks; train yourself to take slow, even, deep breaths
- Avoid wearing loose, poor-fitting clothing that you can trip on
- Understand your physical and cognitive limits by listening to your body
- Wear comfortable, supportive footwear
- Use small, simple appliances as much as possible when cooking
- Cross one knee over the opposite leg when putting socks and shoes on
- Fasten bras in the front and rotate toward the back when completed
- Sit down when getting dressed and toweling off after bathing
- Use a cloth robe to do most drying off and finish the process with a towel
- Break activities down into smaller steps

In other instances, activity modification focuses more on the use of adaptive equipment. Patients can benefit from a range of low-tech and high-tech assistive devices, such as:

- Reacher
- Long-handled shoe horn
- Shower bench
- Grab bars
- Tub transfer bench
- Weighted utensils
- Scoop dish
- Sock aid
- Shower chair
- 3-in-1 commode
- Raised toilet seat
- Dressing stick
- Rocker knife
- Long-handled brush and sponge
- Electric can opener
- Soap on a rope
- Bed rail
- Walker basket

Additionally, there are many mobility devices that help people conserve energy while preventing falls and improving their safety:

- Power scooter
- Walker

- Walking frame
- Wheelchair
- Transport chair
- Ramp
- Stair lift
- Cane
- Hospital bed

Section 7 Personal Reflection

What is an indication that a patient needs to be retrained on the use of an assistive device?

Section 8: Fall Protocol

If you encounter a patient who is unconscious as a result of a fall, be sure they are not still in harm's way (e.g. ensure that no objects will fall on them or other environmental hazards are present) while you get help. If you are in a hospital or nursing facility, this involves ringing the call bell and asking for nurses to come to the room. If you are with the patient in their home, you will need to call 911.

If the patient is awake and able to speak with you, you can check their level of orientation ("Where are you? What is your name? What is the date?" etc.) and ask them if anything hurts. In the event that they are in extreme pain, they might have sustained a fracture. Someone with a bone break will need medical attention, so this is another instance where you should call 911. It's best to not move the patient and keep them awake and alert until an ambulance arrives.

How to Help Fallen Patients Get Up

Before helping them off the floor, ensure the patient stays where they are for several minutes. Dizziness often causes falls, but falls can also worsen feelings of

lightheadedness. Staying in the same position for a short time will ensure any remaining dizziness passes and prevents another fall from happening once the patient stands.

Once the person who has fallen reports they are feeling well enough to get up, follow the steps below. Be sure that you are doing the majority of the work, since pulling the patient up can cause further injury:

1. Gently guide the patient as they roll onto one side.
2. Give some help as they kneel on both knees.
3. Once they are in a stable position, bring a non-rolling chair over to them.
4. Tell the patient to place their arms on the seat of the chair.
5. Gently support the patient as they adjust their position to kneel on just one knee.
6. Once they are in a stable position, bring a second non-rolling chair over to them.
7. Instruct the patient to place their arms on the seat of the chair in front of them.
8. Gently help them use their arms and legs to push up to standing.
9. Support their back as they slowly sit in the chair behind them. You can guide their hips and tell them to use their arms to feel for the chair before sitting, but do not lift them up or push them down.

Instructing Patients How To Get Up By Themselves After a Fall

In the event that a patient is alone when they fall, they should know how to best get to safety without further injuring themselves. Therapists are well-equipped to teach patients the best protocol for getting up after a fall:

1. Do a quick body scan to see if there is pain anywhere in your body.
2. If you feel any pain, nausea, or lightheadedness, call for help before getting up. Each of these symptoms can cause you to fall again, so it’s best to seek assistance before trying on your own.
3. If you have gone through the above steps and have the “all clear” to get up, first be sure that several minutes have passed since your fall.
4. Once you are calm and ready, roll onto your side.

5. Slowly use your arms and legs to push yourself up on all fours (your hands and knees).
6. If a sturdy structure or piece of furniture is nearby, scoot toward that and use it to get yourself to a kneeling position.
7. Use your arms to stabilize on the furniture and slowly pull one leg up. After this, one knee should be bent on the floor and the other knee should be bent with its foot flat on the floor. This is the "down on one knee" position, as if you are proposing.
8. Keeping your hands on the external structure, slowly pull the knee on the floor up and put your foot flat on the floor so you are in a standing position.
9. Use your arms to straighten the rest of your body so you are standing tall.

Therapists should encourage patients at risk for falls to get a medical alert button or have their cell phone with them at all times. If patients don't have either of these readily available, they should try to make as much noise as possible to get the attention of someone else in the house or a nearby neighbor.

Section 8 Personal Reflection

Do you know of any assistive technology patients can use to help get off the floor after they have fallen?

Section 9: Case Study

A 50-year-old patient with a recent diagnosis of multiple sclerosis experienced a fall at home while left unattended. Her symptoms are consistent with a relapse in her multiple sclerosis, which caused her to report intense weakness, fatigue, and brain fog. She was attempting to get in her standard combination tub/shower at the time of the fall. She does not use an assistive device at this time. This patient just got a script from her doctor to receive occupational therapy for the purpose of managing her diagnosis.

1. What is the most appropriate occupational therapy evaluation for this patient?
2. What intervention should the therapist focus on implementing first?

3. What is a secondary and tertiary concern that should also be addressed?

Section 10: Case Study Review

This section will review the case studies that were previously presented. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What is the most appropriate occupational therapy evaluation for this patient?

   The Four-Stage Balance Test might offer the most information in terms of this patient's ability to keep her balance in a variety of contexts. This could also shed some light as to whether balance, strength, or range of motion are the main concerns. This patient would also benefit from the Timed Up and Go test to determine whether or not she can effectively and safely get around without an assistive mobility device. Since this will impact ADL function, a therapist should know if they need to refer the patient to PT. The therapist should also be sure to include manual muscle testing (MMT) and gross range of motion (ROM). Since the patient is not currently getting PT, this therapist will need to get a more thorough baseline of the patient's strength and motion to inform goal writing. The Functional Reach Test is another good measure to include, since this will give the OT even more insight as to the patient's functional abilities. A low Functional Reach score will place a patient at increased risk of falling during even the simplest of functional tasks, so this will help the therapist prioritize certain interventions.

2. What intervention should the therapist focus on implementing first?

   The occupational therapist should focus mainly on fall prevention, since this is where their only known fall occurred. Since the bathroom is also one of the most dangerous areas of the home, the therapist should make the first modifications in this room. One of the first changes should be getting the patient a seating device for the shower. As a result of the evaluation, the therapist should have a better sense of what the patient would benefit most from: a tub bench, a shower chair, or a tub transfer seat.

3. What is a secondary and tertiary concern that should also be addressed?

Once these modifications have been made, the therapist should educate the patient on a range of energy conservation techniques throughout the household and all ADL areas. This is crucial since fatigue was one of the symptoms that was reported around the time of the fall. Balance is another important area to address, since this will impact the patient's ability to safely complete ADLs. While lower body strength and motion both technically fall under a PT's scope of practice, the therapist should attempt to incorporate these areas into sessions until the patient begins getting PT. The occupational therapist should also communicate with the patient's doctor to get a referral for PT.

Section 11: Case Study

An occupational therapist who just began working at a skilled nursing facility gets a report that there has been a 35% increase in patient falls. As a new employee, the therapist is not very familiar with the patients at this facility. However, he has viewed the statistics and it appears that the most patient falls are occuring when certified nurse's assistants (CNAs) are with patients. The therapist acts by making a proposal for a fall prevention educational seminar to assist all staff at this facility.

1. What are the main points this therapist should cover in the seminar?
2. What might be a helpful way for the therapist to prepare for this seminar?

Section 12: Case Study Review

This section will review the case studies that were previously presented. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What are the main points this therapist should cover in the seminar?

   This therapist should ideally include patient lifting techniques to ensure that is not a source of patient falls. Another important aspect should be setting up the room appropriately to prevent patient falls (e.g. leaving the call bell and all vital items nearby when leaving the room, updating the information board to offer orienting information, doing extra rounds on those identified as a fall risk, encouraging use of mobility devices, ensure appropriate lighting is available, etc.).

The therapist should also emphasize the importance of always supervising patients during ADLs and promptly responding to call bells when patients ring them.

2. What might be a helpful way for the therapist to prepare for this seminar?

   Since the therapist is not entirely familiar with the diagnoses, ages, and more at this facility, it is best practice to look into that and add information accordingly. For example, if the long-term care unit has a high number of individuals with spinal cord injuries, the therapist should include how to supervise transfers in mobile patients while still ensuring their safety and autonomy. The therapist should also cover red flags and warning signs for those at risk of falls so that staff can do a better job identifying and monitoring them.

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