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Contact Hours: **3**

Fall Prevention
Interventions for Balance Problems and Risks

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LEARNING OUTCOME AND OBJECTIVES: Upon completion of this course, you will have gained increased knowledge related to preventing falls in clinical and community-based settings. Specific learning objectives to address potential knowledge gaps include:

- Discuss the impact of falls on patients, clinicians, caregivers, and facilities.
- Summarize the components involved in maintaining balance.
- Understand the primary roles of the interdisciplinary team members in managing patients at risk of impaired balance and falls.
- Identify common risk factors for balance impairments and increased falls.
- Describe how to assess a patient for increased risk of falls.
- Discuss appropriate falls prevention and risk mitigation strategies for individuals at increased risk of falling in both clinical and community settings.

FALLS AND THEIR IMPACTS

Falls present a serious and growing public health problem. The World Health Organization defines a fall as “an event which results in a person coming to rest inadvertently on the ground or floor or other lower level” (WHO, 2018). Falls may be fatal or nonfatal.

Falls have been identified worldwide as the second most common cause of unintentional death. It is estimated that approximately 646,000 people die from fall-related injuries each year, with over 80% of fatal falls occurring in low- or middle-income nations (WHO, 2018). Fall risk continues to rise with increased age, with those over 70 estimated to have a 38% to 42% risk of falling. For elders living in facilities, the risks are still higher. Worldwide, it is estimated that 30% to 50% of

individuals in care facilities experience a fall each year, with 40% experiencing recurrent fall events (WHO, 2007).

In the United States, falls are the leading cause of injury-related mortality and morbidity in adults aged 65 and older. As the population continues to age, the problem of falls may be expected to increase as well. According to the U.S. Preventative Services Task Force, in 2014:

- Approximately 29 million falls occurred in the United States.
- 2.8 million older adults sought treatment in emergency departments for falls.
- Approximately 800,000 required hospitalization for a fall, and more than 27,000 ultimately died.
- Falls were responsible for over 90% of hip fractures, which can lead to death or long-term impairment for a significant number of those affected.
  (USPSTF, 2018)

Up to one third of adults over age 65 in the United States may be expected to fall in a given year, with the likelihood of a fall increasing with age. Those who experience a fall are up to 2 to 3 times more likely to suffer a repeat fall, and falls are responsible for up to 15% of rehospitalizations following discharge (CDC, 2015).

For older adults, a fall can be a serious threat to health, mobility, and long-term independence, which can also impact caregivers and other family members. Even when falls are not fatal, they can have serious and far-reaching consequences. For example, 20% to 30% of older people who fall in the United States suffer moderate to severe injuries such as bruises, hip fractures, or head trauma (CDC, 2018a).

The financial burden of treating falls is profound. Direct medical costs of treating fall-related injuries exceeded $50 billion in 2015, which places a significant burden on both Medicare and Medicaid, as well as on private insurers and individuals (CDC, 2015, 2016). These medical costs include hospital and nursing home care, healthcare provider and other professional services, rehabilitation, community-based services, rental or purchase of durable medical equipment, prescription drugs, and insurance claims processing. In the United States, injuries from falls are among the top 20 most expensive medical conditions, with the average hospital costs for a fall event reaching over $30,000 in 2016 (CDC, 2016). As a person's age increases, so too does the average cost of treating a fall-related injury.

Indirect costs resulting from falls may include long-term effects such as disability, loss of personal independence, time lost from work and household duties, diminished social and/or community engagement, and overall reduction in quality of life (CDC, 2016).

The consequences of falls are not limited solely to the individual who experiences the fall. Loss of independence following a fall event may lead an individual to depend more on caregivers. Research indicates that caregivers may feel increased burden of care, fear the care recipient may experience another fall, and potentially increased risk of caregiver depression following the care

recipient's first fall (NCOA, 2018). A history of falls in an individual has been associated with increased caregiver burden and increased caregiver changes to social and/or work engagements out of fear of leaving care recipients unsupervised (Ang et al., 2018).

When preventable falls occur in a facility setting as a result of errors or oversights, both patient welfare and a facility's finances and reputation may be adversely affected. In 2008, the Centers for Medicare and Medicaid Services stopped reimbursing hospitals for costs related to patient falls, leaving facilities and staff with increased responsibility for making falls prevention a high priority and crucial component of patient care (Quantros, 2020; Fehlberg et al., 2017).

However, for such a serious public health problem, falls are also among the most preventable. Research has shown that injury prevention programs related to falls can significantly decrease the incidence and reoccurrence of balance-related falls for those at risk. Adopting clear and consistent safety guidelines and providing comprehensive education for patients, caregivers, and clinicians may help facilities reduce their risk of patient falls and related injuries, allowing them to provide better care for at-risk patients.

FALLS AND HEALTHCARE-ACQUIRED CONDITIONS

Injurious falls were deemed a healthcare-acquired condition (HAC) by the 2005 Deficit Reduction Act, and hospitals no longer receive reimbursement for treating injuries resulting from falls occurring during hospitalization. More recently, the Affordable Care Act (ACA) has led to changes in reimbursement models in order to incentivize hospitals to improve patient outcomes, including injurious falls (Hester, 2015). An example of this is the Hospital-Acquired Condition Reduction Program (HACRP), which was established under the ACA and implemented in 2015. Under this program, Medicare decreased payments by 1% to hospitals who score in the bottom quartile of performance based on risk-adjusted measures of certain hospital-acquired conditions, including surgical site infections, pressure ulcers, or hip fractures resulting from falls (NEJM, 2018).

COMPONENTS OF BALANCE

It is commonly accepted that falling is often, if not nearly always, the result of "losing one's balance." But what exactly does *balance* mean and how does its presence or absence contribute to falls?

Defining "Balance"

Balance refers to the ability of an individual to maintain their line of gravity within an established base of support. Alternatively, balance may be described as being able to maintain one's equilibrium, or a state in which all acting forces cancel one another and create a stably balanced system. *Postural control*, *postural stability*, and *equilibrium* are alternative terms for balance (Physiopedia, 2018).

Static balance is the ability of the body to be held in a fixed (unmoving) position, maintaining postural orientation and stability with the body at rest and the center of mass held over the base of support. **Dynamic balance,** in contrast, is the ability to maintain stability and orientation of one's posture while the body is in motion (Bannister, 1969, quoted in Physiopedia, 2018).

Systems of Balance

When properly functioning, the human balance systems allow individuals to:

- Clearly see surroundings while in motion
- Determine orientation with respect to gravity
- Interpret the speed and direction of movement
- Make continuous and automatic adjustments to posture

These abilities contribute to maintaining stability while engaging in various activities under varying environmental conditions (VEDA, 2018).

Balance, or the lack thereof, is thus not a function of merely one discrete component but is the result of input from several distinct sensorimotor control systems within the human body that work synergistically. The ability of an individual to maintain balance is controlled by integrated sensory input from vision, proprioception, and the vestibular system, with subsequent motor output to the muscles of the eyes and body. If one or all of these components is adversely affected (which may be caused by factors such as disease, injury, aging, or drugs), an individual's overall balance may become compromised (VEDA, 2018; Physiopedia, 2018).

VISUAL SYSTEM

The retinae of the eyes contain rods (for vision in low-light situations) and cones (for color and fined-tuned vision). When struck with light, these structures convey impulses to the brain with visual cues regarding how the body is orientated relative to surrounding objects. The visual system provides approximately 10% of total balance input on stable surfaces and 30% on unstable surfaces.

Many different visual dysfunctions contribute to problems with balance. A few examples include:

- **Aniseikonia:** A condition in which there is a significant difference in how an individual's right versus left eye perceives an image's size, which may cause disorientation, eyestrain, headache, and/or issues with dizziness and balance.
- **Vertical imbalance:** A condition in which one eye aims higher than the other instead of both eyes working in synchrony. An affected person will frequently tilt their head to help align the eyes in order to try to compensate for this vertical maladjustment, which may then adversely affect the vestibular fluid of the inner ear.

- **Binocular vision dysfunction:** A condition in which the eyes struggle to work together when aiming or focusing at a point in space or when quickly changing gaze between closer and farther objects. It may be caused by brain injury to specific neural centers and can lead to eye teaming/focusing issues, resulting in double or blurry vision. (NORA, 2019)

SOMATOSENSORY/PROPRIOCEPTIVE SYSTEM

Proprioceptive information from the skin, muscles, and joints involves sensory receptors that are sensitive to stretch or pressure in the surrounding tissues. Proprioceptive cues help a person's body determine its position in space. Of particular importance to balance, cues from the **neck** indicate the direction the head is turned, and cues from the **ankles** indicate body movement and/or sway relative to the standing surface and its quality (soft, uneven, solid, etc.). The somatosensory/proprioceptive systems provide approximately 70% of total balance input on stable surfaces and 10% on unstable surfaces (VEDA, 2018; Physiopedia, 2018).

Problems related to the somatosensory/proprioceptive systems may adversely affect balance. For example:

- **Impaired cervical range of motion** is associated with diminished protective responses and/or balance. Patients with cervical pain/dysfunction often experience symptoms of dizziness/light-headedness and/or unsteadiness, which lead to increased fall risk (Sremakaew et al., 2018).

- **Loss of ankle range of motion** and proprioception after ankle injury has been shown to adversely impact postural and balance control, and athletes with impaired ankle proprioception post injury tend to perform more poorly in both static and dynamic postural and balance control tasks. These effects are shown to impact both the injured and uninjured sides (Han et al., 2015).

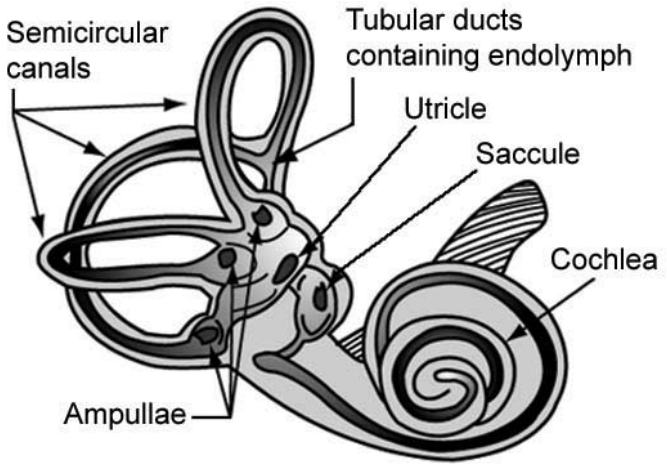
- **Sensory impairments** such as peripheral neuropathy have been shown both to significantly diminish an individual's functional balance and to increase their risk of falls (Wilson et al., 2016).

VESTIBULAR SYSTEM

The vestibular apparatus is located within each inner ear. It includes the utricle, saccule, and three semicircular canals and provides sensory information regarding equilibrium, motion, and spatial orientation. The **utricle** and **saccule** detect linear movement and vertically oriented input (i.e., gravity), while the **semicircular canals** detect rotational movement.

The semicircular canals are located at right angles to one another and are filled with **endolymphatic fluid**. When the head is turned in certain directions, the endolymphatic fluid in the corresponding semicircular canal moves more slowly due to inertia, placing pressure against the canal's sensory receptor, which subsequently sends impulses to the brain specifically about the movement occurring in that particular canal.

When the vestibular system is functioning correctly, these impulses are symmetrical to both sides of the head. The vestibular system provides approximately 20% of total balance input on stable surfaces and 60% on unstable surfaces.



Vestibular system. (Source: NASA.)

There are a number of conditions that can cause vestibular system dysfunction, which may in turn lead to dizziness or affect balance. Some examples include:

- **Benign paroxysmal positional vertigo** (BPPV): Between 17% and 42% of patients seen in a clinical setting with a vertigo complaint will ultimately be diagnosed with BPPV. The most common cause of vertigo, BPPV is a mechanical problem that occurs when calcium carbonate crystals (called *canaliths* or *otoliths*) become displaced in the inner ear, stimulate nerve hairs, and send false movement signals to the brain, which can cause dizziness and visual disturbance. This may occur as a result of infection, trauma, or normal aging (Bhattacharyya, 2017; VEDA, 2019b).

- **Acoustic neuroma:** Nonmalignant tumor that develops on the sheath of the inner ear's vestibulo-cochlear nerve. Also known as *vestibular schwannoma.*

- **Autoimmune inner ear diseases:** Includes Cogan's syndrome, relapsing polychondritis, polyarteritis nodosa, Wegener's granulomatosis, systemic lupus erythematosus, ulcerative colitis, Sjogren's syndrome, and rheumatoid arthritis.

- **Cholesteatoma:** A skin growth that occurs in the middle ear behind the eardrum; can increase in size and destroy middle ear structures over time.

- **Labrynthitis and vestibular neuritis:** Disorders resulting from an infection of the inner ear or the nerves connecting the inner ear and brain, disrupting transmission of sensory information.

- **Mal de débarquement syndrome** (MDDS): Most commonly occurs after sea or other forms of travel; the sensation of movement continues after movement has stopped. Cause not definitely known, may last for weeks, months, or even years.

- **Migraine associated vertigo** (MAV): Approximately 40% of migraine patients have some accompanying vestibular syndrome involving disruption in their balance and/or dizziness; thought to be a combination of altered vascular and neural processes.

- **Otosclerosis:** Abnormal bone growth in the middle ear, which can cause hearing loss, dizziness, balance problems, or tinnitus.

- **Ototoxicity:** Poisoning that results from exposure to drugs or chemicals that damage the inner ear or the vestibulo-cochlear nerve; may be temporary or permanent.

- **Perilymph fistula:** A tear or defect in either or both the oval window and the round window that separate the middle and inner ear, allowing perilymph to leak into the middle ear. Most frequently caused by head trauma (such as a direct blow or a whiplash injury). Other causes include ear trauma, perforated eardrum, "ear block" during airplane descent, or scuba diving.

- **Persistent postural perceptual dizziness** (PPPD): Postural dizziness without vertigo and fluctuating unsteadiness provoked by environmental or social stimuli (e.g. crowds), not attributable to another neuro-otologic disorder.

  (VEDA, 2019b)

VERTIGO VS. DIZZINESS

While the terms are often used interchangeably, these are two distinct symptoms. **Dizziness** can refer to an altered sense of spatial orientation or a general feeling of one's balance feeling "off." **Vertigo**, in contrast, is a sense of actual motion, of either oneself or one's surroundings, causing a spinning sensation (Cleveland Clinic, 2019).

INTERDISCIPLINARY TEAM IN FALLS MANAGEMENT AND PREVENTION

Since falls are often a combination of multiple causative factors, the skills of multidisciplinary teams are required to determine and implement the best possible management and prevention plan and quality assurance processes, with appropriate referrals made between various members within the team according to a patient's demonstrated areas of need. There may be significant overlap in care, with clinicians from more than one discipline addressing the same issues (e.g., patient safety education, vestibular rehabilitation).

A comprehensive management team may include the following clinicians:

Physicians/Primary Care Providers

- Order appropriate diagnostic tests
- Prescribe and adjust medications as necessary
- Make referrals to other disciplines or community-based programs, as appropriate
- May also include (but are not limited to) geriatricians, neurologists, internists, dentists, oral surgeons, and orthopedists

Nurses

- Serve a pivotal coordination role between multidisciplinary team members
- Educate clinical staff on the patient's fall risk status and appropriate safety measures
- Monitor patient status and vital signs (e.g., blood pressure in standing, sitting, and supine positions)
- Implement risk-reduction strategies in facilities
- Help coordinate discharge planning
- Provide patient education and advocacy
- Follow up with patients after discharge home

Physical Therapists

- Evaluate and treat functional mobility and ambulatory safety
- Address specific balance, strength, and/or mobility deficits
- Provide recommendations and training on assistive devices
- Prescribe progressive, specific therapeutic exercise regimens to optimize functional mobility, static and dynamic balance, and endurance
- Provide vestibular evaluation and rehabilitation (when specially trained and/or certified)

Occupational Therapists

- Evaluate and treat activities of daily living (ADLs) and instrumental activities of daily living (IADLs)
- Work with patient/client on remedial and compensatory interventions that target improving physical abilities to safely perform daily tasks

- Provide recommendations for home modifications, safety awareness, community reintegration, and adaptive/assistive devices
- Provide more advanced vestibular evaluation and rehabilitation (when specially trained and/or certified)

Other Care Team Members

- Orthotists and assistive technology professionals: Assist in selection and fabrication of postural bracing systems, specialized footwear, and/or assistive devices such as customized wheelchairs
- Psychologists/psychiatrists: Work with patients to address any fear of falling and/or significant anxiety following a fall
- Social workers: Provide case management for patients/clients and caregivers, help identify potential supports and/or challenges in a client's home and/or social environment, and assist in discharge planning and obtaining alternate placements or community supports, as needed

(Palmer & Watkins, 2017)

ASSESSING A PATIENT'S FALL RISK

Identifying specific fall risks and the most appropriate strategies for intervention can be a complex task and may involve multiple members of a healthcare team. Physicians and other primary care providers, nurses, physical therapists, occupational therapists, social workers, caregivers/family members, and the patient/client all hold key areas of expertise that may help build a complete picture of the multiple factors that may put someone at risk for falling.

Every person's situation is unique, with a distinct combination of physical/functional status, cognitive ability, living situation, family/caregiver supports, and other resources. Therefore, there is no one correct means to accurately predict fall risk. Rather, clinicians rely on a holistic examination. The information gathered from multiple information sources may identify multifactorial issues, which are then addressed by various interventions (Lusardi et al., 2017).

Intrinsic and Extrinsic Fall Risk Factors

Most falls occur as a result of multiple factors, and having a greater number of risk factors makes it increasingly likely that a person will suffer a fall. The risk level may be due in part to physical, sensory, and cognitive changes associated with aging in combination with environments that are not adapted for an aging population (WHO, 2017).

Some risk factors cannot be altered, while others may be lessened or even eliminated. Fall risk factors are either intrinsic (inherent to an individual) or extrinsic (pertaining to situational and/or environmental factors outside an individual).

INTRINSIC FALL RISK FACTORS

- Advanced age (>65 years)
- Young age (due to childhood developmental stages, innate curiosity, and risk-taking behavior)
- Previous falls
- Muscle weakness
- Gait disorders
- Balance disorders
- Foot and/or ankle disorders
- Poor or insufficiently corrected vision
- Postural hypotension
- Chronic conditions (arthritis, CVA, incontinence, diabetes, neurologic conditions, etc.)
- Dementia
- Fear of falling
  (CDC, 2017; WHO, 2018b)

EXTRINSIC RISK FACTORS

- Lack of stair handrails
- Poor stair design
- Lack of bathroom grab bars
- Dim lighting or glare
- Obstacles and tripping hazards
- Slippery or uneven surfaces
- Psychoactive medications
- Taking more than one medication (polypharmacy)
- Improper use of an assistive device
- Occupations at elevated heights or other hazardous working conditions
- Alcohol or substance use
- Socioeconomic factors (poverty, overcrowded housing, sole parenthood, young maternal age)
  (CDC, 2017, 2018b; WHO, 2018)

Multifactorial Risk Assessment and Patient History

A careful and comprehensive patient history provides valuable information regarding an individual's intrinsic and extrinsic risk factors for falling, which can, in turn, help to appropriately guide any needed interventions and/or preventive strategies. Open-ended questioning techniques may encourage individuals to speak freely and lead to further opportunities for information gathering on the part of the clinician (Lunsford & Wilson 2015; NICE, 2016; Royal College of Nursing, 2016).

The National Institute for Health Care Excellence (NICE, 2016) has issued clinical guidelines for falls risk assessment and intervention strategies. Older people who present for medical attention because of a fall, report recurrent falls in the past year, or demonstrate abnormalities of gait and/or balance should be offered a multifactorial falls risk assessment.

This assessment should be performed by a healthcare professional with appropriate skills and experience and includes:

- Identification of falls history (particularly within the past year)
- Assessment for impaired gait, balance, mobility (including assistive devices), and/or muscle weakness
- Assessment of osteoporosis risk
- Assessment of the person's perceived functional ability and fear relating to falling
- Assessment of visual impairment
- Assessment of cognitive impairment, mental status, and neurological examination
- Assessment of incontinence
- Assessment of home hazards
- Cardiovascular examination and medication review
- Assessment for history or presence of orthostatic hypotension
- Assessment for current medications associated with falls (e.g., sedative-hypnotics, blood pressure drugs)

  (NICE, 2016; Royal College of Nursing, 2016)

Medical Tests

For individuals with a history of falling, their primary care provider may order certain tests to rule out specific conditions and/or injuries, as well as complete a review of the patient's most current list of medications.

Some common, relevant medical tests may include:

- Brain scans for traumatic brain injury
- Magnetic resonance imaging (MRI) for soft-tissue damage
- Radiographic imaging for fracture
- Electrocardiogram (ECG) to screen for heart conditions (such as arrhythmia, cardiomyopathy, or heart attack)
- Ambulatory ECG monitor (if arrhythmias are suspected) and blood pressure monitoring (if low blood pressure is suspected)
- Tilt-table testing in patients with recurrent syncope/fainting
- Ultrasound bone scans
- Ophthalmology or optometry exam to identify and address visual impairments
- Audiology exam to identify and address hearing impairments
  (Palmer & Watkins, 2017; Mayo Clinic, 2019a)

MEDICATIONS REVIEW

According to the CDC, it is important for a patient's medical provider and/or pharmacist to conduct a comprehensive medication review to look for presence of central nervous system active or psychoactive medication; presence of any medication that can cause dizziness, sedation, orthostatic hypotension, blurred vision, or confusion; or use of four or more medications (polypharmacy), as any of these factors can increase falls risk (CDC, 2019a).

The American Geriatrics Society (AGS, 2015) released the **Beers Criteria**, with the collaboration of a 13-member interdisciplinary panel of experts in geriatric care and pharmacotherapy, in order to provide clinicians with recommendations on drugs that may be inappropriate and/or unsafe for older adults, including those that may increase risk of falls. The list is periodically updated based on careful review of the most up-to-date evidence and is available in pocket-sized clinician guides.

Functional Assessment

There are a wide variety of functional assessment tools available for helping to determine an individual's risk of falling. Some tools are self-assessments that may be used by individuals and/or their caregivers; others require specialized training to administer and should only be carried out by clinicians with appropriate levels of training. It is important to consider an individual's physical capabilities, previously known risk factors, home and living environment, and level of family/caregiver support when selecting an appropriate assessment tool.

FALL RISK FUNCTIONAL ASSESSMENT TOOLS

Some of the most commonly used tools in clinical and community settings are:

- **2-Minute Walk Test** (2MWT): Assesses walking distance over a timed period of two minutes to determine walking endurance.
- **Activities-Specific Balance Confidence Scale** (ABC): Self-administered or conducted in person or via telephone; participants indicate level of self-confidence that they will not lose balance or become unsteady during 11 various activities.
- **Ankle range of motion:** Measured using goniometer, inclinometer, or knee-to-wall ratio (using tape measure), ideally by a rehabilitation professional skilled in joint measurement with kinesiology background; lower-than-average ankle dorsiflexion linked to increased risk of balance-related falls in some populations as one factor contributing to variance in gait and balance performance.
- **Balance Error Scoring System** (BESS): Assesses static postural stability; developed to assist with mild head injury return-to-play determinations; training required to administer.
- **Berg Balance Scale** (with adaptations for special patient populations): 14-item scale measuring balance of an adult in a clinical setting (does not assess gait); requires 15 to 20 minutes to administer; training required to administer.
- **Community Balance and Mobility Scale:** Designed for clients who are mobile and functioning at a high level but who have persistent balance problems and are at risk for falling.
- **Dizziness Handicap Inventory** (DHI) **for Benign Paroxysmal Positional Vertigo** (BPPV): Subjective 25-item patient self-assessment that measures functional limitation due to vestibular-related vertigo.
- **Dynamic Gait Index:** Assesses eight facets of gait in order to predict falls risk in community-dwelling elderly.
- **Elderly Mobility Scale** (EMS): 20-point validated scale that assesses functional mobility of frail elderly subjects in hospital settings.
- **Falls Efficacy Scale-International** (FES-I): 16-item self-assessment that assesses fear of falling in community-dwelling elderly populations.
- **Falls Risk Assessment Tool** (FRAT): Assesses fall risk via brief, clinician-administered questions; offers general guidance on any identified areas of fall risk.
- **Four Step Square Test:** Assesses an individual's dynamic balance when stepping over objects forward, backward, and sideways.

- **Functional Independence Measure** (FIM): 18-item assessment of physical, psychological, and social function for individuals with any motor impairment that addresses feeding, grooming, bathing, upper-body dressing, lower-body dressing, and toileting.

- **Functional Reach:** Assesses a patient's/client's ability to reach outside a fixed based of support while maintaining balance; may be modified to perform in sitting posture if needed.

- **Head-Shaking Nystagmus Test** (pHSN): Tests for peripheral vestibular disorders by observing for presence of nystagmus during specific abrupt head movements; training and specialized equipment highly recommended for administration.

- **STEADI Falls Risk Assessment**: Used for screening, fall risk assessment, and care management; self-administered checklist; toolkit includes clinician resources and patient education resources.

- **Timed-Up-and-Go** (TUG), with optional cognitive (TUG-COG) and/or manual (TUGman) variations: Assesses dynamic mobility for determining falls risk by observing the patient/client rising from a chair, walking a predetermined distance, and returning to sitting; may be modified by adding cognitive and/or manual task components.

- **Tinetti Performance-Oriented Mobility Assessment** (POMA): Assesses gait and balance; rates ability to maintain balance while performing ADL-related tasks; training recommended to administer.

  (CDC, 2019b; Howe et al., 2006; Powell & Myers, 1995; Tinetti et al., 1986; Shirley Ryan Abilitylab, 2020a–i; NHS, 2020; Spencer, 2020; University of Scranton, 2020; Brown et al., 2014; CDC, 2017c)

Comprehensive Balance Evaluation

While not all falls are the result of specific balance impairments, problems with balance do comprise a significant subset of risk factors for falling. If an initial patient screening shows any potential red flags for specific balance impairments, a referral to a physical therapist may be indicated. A physical therapist may perform a comprehensive balance evaluation to determine specific causes of impairment and to design an appropriate intervention strategy.

When conducting a balance assessment, the following questions may be helpful in obtaining detailed and relevant patient information:

- How often do you experience problems with your balance?
- What are you doing when you experience balance problems?
- Is your balance worse at nighttime or in dark rooms?
- Does the room spin, or do you feel off balance?

- How many times have you fallen in the past year?
- Have you suffered injuries from falling?
- Have you changed or limited your daily activities because of your balance problems?
- What medications do you take?
- Have you had a vision or ear checkup recently?
- Do you have difficulty with any daily activities?
- How much and what kind of daily exercise do you get?
- Do you have any other medical conditions or problems?
- Are you under the care of a physician?
- What are your goals?
  (APTA, 2018)

Home Safety Assessment

A home safety assessment by a healthcare professional is particularly valuable when there are questions or concerns regarding a patient's/client's ability to safely navigate their home environment physically and/or cognitively, with sufficient safety awareness to minimize risk of injury. Observing an individual operating within their home environment provides a more holistic picture of their functional abilities than can be gleaned solely from a more controlled clinical setting.

A comprehensive home safety assessment provides an in-depth evaluation of potential structural and/or environmental hazards or concerns that may put an individual at greater risk for a fall. Home safety assessments may be performed by occupational therapists, physical therapists, medical social workers, specially trained nurses, or other appropriately trained professionals. A referral from a primary care provider or home health services may be needed for a patient to receive a professional home safety assessment.

(Recommendations for addressing specific safety deficits or potential hazards are discussed later in this course.)

CLINICIAN HOME SAFETY ASSESSMENT TOOLS

- **Safe at Home Checklist:** Created in partnership by the Administration on Aging and the American Occupational Therapy Association (AOTA), this checklist is used by clinicians to identify home safety, fall hazards, and accessibility issues for homeowners, patients/clients, and/or family members. It includes modifiable checklists of suggestions for addressing specific identified safety concerns.

- **I-HOPE:** This tool identifies performance struggles faced by individuals in their homes, with the clinician observing for barriers during problematic activities. Each barrier carries a score to determine severity level. Designed for individuals with higher functional levels, it is not appropriate for pediatric clients or for those with dementia.

- **SAFER-HOME:** A task performance observation and an interview are combined to assess safety concerns and functional performance. This tool addresses mobility, household, and bathroom safety. It does not fully address issues such as food preparation and personal care.
  (AOTA, 2019)

When conducting a home safety assessment, it is important for clinicians to remember that what may seem like clutter or a hazard to them may mean something entirely different for the individual and/or their family. Mementos, keepsakes, old furniture, and other seemingly replaceable items may hold great sentimental value to their owners. Clinicians should be mindful of potential emotional attachments and be respectful of an individual's available resources and values when identifying potential environmental modifications.

PATIENT HOME SAFETY SELF-ASSESSMENT

There are a number of home safety checklists available for use by a patient and their family to examine their own living environment for potential hazards that may increase risk of a fall at home. Two examples include:

- **Check for Safety: A Home Fall Prevention Checklist for Older Adults:** Created by the CDC, this brief checklist helps assess a home for common environmental fall risks (such as clutter, loose rugs, improper lighting) and provides suggestions for addressing these risks.
- **Home Safety Self-Assessment Tool** (HSSAT): Created by the University of Buffalo's Occupational Therapy Geriatric Group, this extensive tool includes a screening checklist for identifying environmental hazards in the home as well as written and video resources with suggestions and instructions for specific home safety improvements. (See also "Resources at the end of this course.)"

FALL PREVENTION STRATEGIES

The best strategy to avoid the negative impacts of falls is to prevent them from happening in the first place. It is in the best interests of everyone involved in patient/client care—clinicians, caregivers, facilities, and most importantly, at-risk patients/clients themselves—to consider and adopt comprehensive and individualized strategies and planning to minimize the risk of falls.

Whether in clinical, community, or home-based settings, there are a number of strategies to mitigate risk of patient falls. There is no one-size-fits-all strategy; effective fall prevention planning is highly specific to an individual's unique situation and needs.

Interventions Based on Type of Fall Risk in Clinical Settings

In order to design the most effective prevention strategies in the clinical environment, it is helpful to determine which specific type(s) of fall an individual may be most at risk for. The primary types of fall risk include anticipated physiologic falls, unanticipated physiologic falls, and accidental falls.

ANTICIPATED PHYSIOLOGIC FALLS

Examples of **risk factors** for anticipated physiologic falls may include:

- Unstable or abnormal gait
- History of falling
- Frequent toileting needs
- Altered mental status
- Certain medications

Among hospitalized older adults, evidence shows that:

- About 38% to 78% of falls can be anticipated.
- One third of reportable falls with injuries in hospitalized older adults are linked to bathroom use.
- More than half are associated with medications known to contribute to falls, such as antianxiety and antipsychotic drugs.
  (Lunsford & Wilson, 2015)

Intervention strategies for anticipated physiologic falls require careful consideration of a patient's specific risk factors, both intrinsic (visual impairment, balance, gait, sensory neuropathy, orthostatic hypotension, confusion, etc.) and extrinsic (medications, mobility aids, etc.). To minimize risk of anticipated physiologic falls:

- Employ interventions tailored to the patient's identified risk factors.
- Implement consistent toileting schedules for patients with elimination needs.
- If a patient has sleep deficits, sleep hygiene protocols (such as soft music or audiobooks) may be helpful, as opposed to sleep medications.
- Keep mobility aids (such as canes or walkers) within reach and ensure that such devices fit properly and are in good repair.
- Referrals to rehabilitation specialists (such as physical, occupational, or speech therapy) may be beneficial for further evaluation of specific concerns related to mobility, assistive equipment, ADL function, cognition, etc.
  (Quigley, 2015)

UNANTICIPATED PHYSIOLOGIC FALLS

These falls may occur with a **temporary change** in physical or cognitive function and **unfamiliar surroundings**. Such falls are considered unanticipated because the patient is otherwise at low risk for falls. Risk factors include conditions like seizures, syncopal episodes, and delirium. Persons age 85 or older, those with osteoporosis, and those taking anticoagulant medications are at highest risk of injury from this type of fall (Lunsford & Wilson 2015).

Because no formal assessment tools currently focus specifically on prevention of unanticipated physiologic falls, team intervention is focused on preventing potential injury from such falls as well as appropriate post-fall care and management (Quigley, 2015). (Specific strategies are discussed in further detail later in this course.)

ACCIDENTAL FALLS

This type of fall can stem from slipping, tripping, or other accidents and is frequently linked to extrinsic (and often modifiable) factors. In long-term care facilities, one of the most common causes of accidental falls is improper technique (either by residents or improperly trained staff) or improperly used assistive equipment, such as canes, walkers, or wheelchairs, during transfers (Lunsford & Wilson, 2015).

Risk reduction strategies for accidental falls in **facility settings** include careful assessment of a patient's physical environment, bedroom and bathroom setup, assistive devices, clothing, footwear, and other physically modifiable potential risk factors. Steps to minimize risk of accidental falls include:

- Eliminating slipping and tripping hazards
- Keeping the bed at the proper height during transfer and when the patient rises to a standing position
- Not keeping the bed in a low position at all times, since this makes it more difficult for patients to safely and effectively stand up
- Checking chairs, toilets, and safety grab bars for potential safety problems
- Using proper room lighting
- Ensuring the patient wears proper footwear (not just nonskid socks)
- Conducting environmental rounds to identify and modify environmental fall and injury risks

  (Quigley, 2015)

Rehabilitation for Nonvestibular Balance Deficits

According to clinical guidelines established by the American Physical Therapy Association's (APTA) Academy of Geriatric Physical Therapy, people with established deficits in balance (inability to stand with one foot directly in front of the other for three seconds), strength (inability to stand up from a chair at least five times in 30 seconds), or coordination should be referred for physical therapy for evaluation and treatment (Avin et al., 2015).

BALANCE RETRAINING

For balance deficits determined to be nonvestibular in nature, a physical therapist can provide a comprehensive evaluation and individualized treatment program. (For balance deficits due to specific vestibular dysfunction, see "Vestibular Rehabilitation" later in this course.)

A balance retraining program may include specific interventions to improve static and dynamic balance, reaction time, protective responses, proprioception, and the ability to perform balance tasks under varying environmental conditions—such as on soft surfaces, in high-distraction environments, or while simultaneously performing cognitive tasks (Palmer & Watkins, 2017).

A balance retraining program is highly specific to an individual's unique functional strengths and deficits. The following are examples of generalized exercises that help to improve or maintain balance:

- Standing march
- Standing three-way kicks
- Sidestepping
- Single-legged standing
- Sit-to-stands
- Tandem standing or walking
  (Mulcahy, 2019)

Specific exercise recommendations are made by clinicians with appropriate training and expertise and implemented under appropriate supervision.

OTAGO EXERCISE PROGRAM

Originally developed in New Zealand, the Otago Exercise Program (OEP) is one example of an evidence-based, home-based strength and balance retraining program. The program is carried out by physical therapists/physiotherapists and/or trained community providers such as nurses. The program consists of a number of face-to-face home visits (ranging from five to nine) and phone support and includes specific balance and strengthening exercises. This program has been adapted for the United States and Australia and has been found to reduce

rates of falls and death in older adults (particularly those over age 80) as well as being fairly cost effective (Physiopedia, 2019; Avin et al., 2015).

THERAPEUTIC EXERCISE

Rigorous evidence exists to indicate that exercise can help reduce risk of falls, particularly when exercise occurs more than three hours per week and includes a significant balance-challenging component (Sherrington et al., 2017). Specific and progressive exercise regimes devised and supervised by a physical therapist target and address specific and individualized deficits that may contribute to falls. The following generalized exercise strategies may be considered for specific deficits:

- **Lower extremity muscle weakness**: General strengthening with particular focus on spinal extensor and quadriceps musculature; addition of weights and/or resistance bands, as indicated
- **Diminished lower-extremity range of motion (ROM)**: Exercise that addresses specific areas of restriction, particularly in calcaneal tendons and hamstrings, with progression as tolerated
- **Decreased endurance**: Generalized aerobic conditioning to tolerance, progressing to supervised or independent community walking, if appropriate

(Palmer & Watkins, 2017)

Contraindications to specific exercise regimens are assessed on a case-by-case basis. More generally, according to the APTA's Academy of Geriatric Physical Therapy, community-dwelling women who are postmenopausal and have a history of fracture should not engage in a brisk walking (defined as a "moderately hard perceived work load") exercise program (Avin et al., 2015; Avers & Brown, 2009).

COMMUNITY-BASED ACTIVITY PROGRAMS

A number of community-based programs (such as Pilates, tai chi, or adaptive yoga) have been shown to help maintain or improve mobility and balance. Any engagement in a community health program for balance purposes should only be undertaken after discussion with and approval from an individual's appropriate healthcare provider.

AQUATICS

Water-based programs allow the patient to perform challenging exercises characterized by lower impact, increased resistance and buoyancy, and reduced fear of falling (as may occur with land-based exercise programs). The viscosity of water creates increased drag and sensory stimulation, and functional gains in balance made during exercises practiced in the water may be transferrable to land-based situations (NSPF, 2017). **Aquatic therapy** is provided in a supervised setting by a physical or occupational therapist and is tailored to an individual patient, while **aquatic exercise**

is a more generalized water-based exercise program (often in a group setting) offered in a community setting.

GAIT TRAINING

An atypical or impaired gait pattern may increase an individual's risk of falling. A physical therapist can provide a comprehensive gait evaluation, including an analysis of an individual's walking speed, step length, and step symmetry (or lack thereof) as well as evaluation and treatment of any specific gait abnormalities (i.e. antalgic, Trendelenberg, steppage, stance-phase hyperextension, etc.). The treatment of gait deviations may include:

- Specific gait training activities
- Selective strengthening
- Addressing any underlying lower-extremity range of motion impairments
- Recommendation of appropriate and properly fitting footwear and/or specific assistive equipment, such as orthotics or mobility devices

  (Palmer & Watkins, 2017)

VIRTUAL REALITY AND VIDEO GAMES

Virtual reality (VR) is an emerging area in falls management and involves the use of computerized technology to provide patients with simulated experiences, such as playing a sport or engaging in typical day-to-day functional activities (including obstacles, multiple pathways, and/or distractions). While this technology is comparatively new, studies have shown positive results. One found significantly fewer falls in older adults after a combination of VR and treadmill training than in treadmill training alone (Mirelman et al, 2016.), while another found improved performance in older adults on several physical performance tests after participation in simulated sports (such as downhill skiing or football) (Kamińska et al., 2018).

More traditional video games, such as Wii-Fit, have also shown promise as balance retraining tools. In a randomized controlled trial of 25 subacute CVA patients, balance training using the Wii-Fit video gaming system was found to measurably improve balance scores and independence in activities of daily living more than conventional balance training programs (Morone et al., 2014). In a small trial (n=12) that compared the effect of the Nintendo Wii balance board (NWBB) and tai chi chuan (TCC) on the standing balance of older adults, both interventions were found to beneficially affect standing balance, but the NWBB was linked to improvement in more variables of postural control than TCC (Gatica-Rojas et al., 2019).

Rehabilitation for Vestibular Dysfunction

Vestibular dysfunction is a common contributor to balance-related issues and falls. An estimated 35.4% of all adults in the United States have some degree of vestibular dysfunction, including

75% of adults over age 70 and >85% of adults over age 80. When left unaddressed, vestibular hypofunction can result in subjective dizziness/imbalance, blurred vision with head movements, and postural instability, and the incidence of falls in those with vestibular hypofunction is known to be greater than in age-comparable, community-dwelling healthy individuals (Hall, 2016).

Vestibular rehabilitation interventions target aberrant vestibular symptoms and resultant functional limitations and have been demonstrated to diminish dizziness, improve visual acuity, and reduce falls risk. Vestibular rehab is an important subspecialty of physical therapy practice/study.

EXERCISE-BASED INTERVENTIONS

There are four primary components to the exercise-based approach used in vestibular rehabilitation:

- **Gaze stability exercises:** Exercises to promote vestibular **adaptation** involve head movements while focusing on an object that may be moving or stationary. Exercises to promote **substitution** involve the development of alternative strategies (such as smooth-pursuit eye movements or central preprogramming of eye movements) in order to help compensate for deficiencies in vestibular function.

- **Habituation exercises:** Involves systematic and repeated exposure to symptom-provoking stimuli, with the goal of reducing symptoms over time as the vestibular system becomes gradually accustomed to the stimuli. Examples include optokinetic stimuli, which uses repeated moving patterns, and virtual reality, which puts patients into virtual and visually challenging environments.

- **Balance and gait training:** Designed to use visual and somatosensory cues as compensation for vestibular deficiencies, this component of vestibular rehabilitation may include balancing exercises under enhanced or altered conditions (such as under distraction, with altered visual input, on foam or moving surfaces, with altered base of support, etc.). Gait activities may be executed while turning the head or performing additional tasks in order to increase challenge. Virtual reality and/or gaming technology may be employed.

- **Endurance training:** While not an effective treatment for vestibular dysfunction on its own, general endurance training is often included in a vestibular rehabilitation program because many people affected by vestibular dysfunction may self-limit their physical activities in order to avoid eliciting symptoms.

  (Hall et al., 2016)

When vestibular impairments significantly affect an individual's ability to meaningfully engage in preferred roles, activities, and/or occupations, occupational therapists may also work with patients to modify, remediate, and/or adapt as needed to help affected individuals maximize their participation, performance, self-efficacy, and perceived quality of life (AOTA, 2017b).

MANUAL TECHNIQUES FOR BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)

One of the most common causes of vestibular disfunction, BPPV is a condition that occurs when small calcium carbonate crystals (called canaliths or otoliths) move within the semicircular ear canals, leading to dizziness and visual disturbance and increase the risk of falling (VEDA, 2019a). The diagnostic and treatment process for BPPV differs from other vestibular dysfunctions and is generally more focused on specific manual techniques to locate and reposition displaced canaliths.

Diagnosis with Dix-Hallpike Maneuver

The Dix-Hallpike maneuver is a manual test performed to help clinicians determine which specific semicircular canal contains displaced canaliths, as well as whether they are in the canals themselves (canalithiasis) or trapped in the cupola of one of the canals (cupulolithiasis) (University of Michigan 2017, VEDA 2019a). To minimize the risk of neck/back injury or worsening of symptoms, this testing maneuver—as well as any of the following treatment techniques—should be performed by clinicians with appropriate training. The general test progression is as follows:

1. The patient is positioned on the examination table in long-sitting, with the examiner in front of them. The examiner turns the patient's head 30° to 45° to one side and helps the patient lie quickly with their head hanging off the table (maintaining cervical extension and rotation).

2. The examiner watches the patient's eyes for signs of elicited nystagmus. Appearance and timing of any nystagmus can help identify whether the patient's vertigo is of central (CNS) or peripheral (inner ear) origin.

3. The patient sits up and is given time to recover from any symptoms elicited during the test. The test is then repeated with the patient's head turned in the opposite direction.
   (University of Michigan, 2017)

Canalith Repositioning Techniques

If testing indicates the presence of BPPV, the following treatment measures may be indicated in to attempt to reposition displaced canaliths out of the semicircular canals. Repositioning techniques have evidence-based support for reducing symptoms and improving patient quality of life (Ribeiro et al., 2018). Detailed instruction in vestibular rehabilitation is beyond the scope of this course, but the following is a list of more commonly used manual repositioning techniques.

- **Modified Epley's maneuver/canalith repositioning maneuver** (CRP): Used to treat BPPV occurring in the anterior or posterior semicircular canals; intended to relocate free-floating canaliths out of the canals in order to reduce or eliminate vertigo

- **Semont-Liberatory maneuver:** Used to redirect unattached canaliths out of the posterior semicircular canal and into the utricle

- **BBQ roll:** Used to treat BPPV caused by canaliths in the lateral semicircular canal

- **Brandt-Daroff exercises:** Adjunct treatment to the above clinician-administered techniques; may be taught to a patient to perform independently at home
  (Physiopedia, 2019)

Addressing Environmental Safety Hazards in the Home

Falls that occur at home are often the result of environmental factors that may be easy to overlook but comparatively easy to address. Occupational therapists are specifically skilled in helping individuals identify and address potential safety hazards in the home that may increase the likelihood of a fall (AOTA, 2017a). Specific evaluations/recommendations an occupational therapist can provide to minimize hazards and optimize safety in the patient's home include:

- Placing furniture more safely

- Ensuring easy access to both frequently used items (such as dishes) and those used only occasionally (such as holiday decorations); moving frequently used items in cupboards to lower shelves

- Ensuring a clear pathway to move through the home environment by moving furniture, papers, books, and other objects out of the way

- Ensuring appropriate lighting

- Recommending location/placement of safety features such as grab bars, safety railings, and nonskid matting (see also "Environmental Safety Devices" later in this course)

- Removing rugs or securing them to the floor with double-sided tape

- Taping down or bundling up wires

- Repairing broken steps and installing lighting above stairs

- Keeping a phone on each level of the home or wearing a medical alert device
  (AOTA, 2012; AOTA, 2017a; CDC, 2017a)

ADL Training

Limitations in one's ability to perform basic activities and instrumental activities of daily living (ADLs and IADLs)—such as dressing, meal preparation, toileting—may lead to increased risk of falling. Occupational therapists are the clinical experts in the evaluation and management of

ADL deficits, and a referral to an occupational therapist should be considered if any concerns exist regarding an individual's functional abilities in these areas.

Occupational therapists work with patients to identify specific ADL and IADL deficits and strengths and assist individuals to design safe and beneficial daily activity programs based on what a patient enjoys (e.g., gardening or walking to promote balance/endurance). OTs can also work with patients at a highly individualized level to help break the cycles of inactivity that can result from fear of falling and, if unaddressed, can increase odds of falling due to decreased physical functioning (AOTA, 2012).

Examples of therapeutic interventions to help address ADL deficits include:

- Functional exercises geared specifically toward performance of ADLs (reaching, stepping up/down, practicing shower transfers, etc.)
- Home safety modifications
- Training a patient/client in the use of specific assistive devices (reachers, tub transfer chairs, dressing aides, etc.)
  (Palmer & Watkins, 2017)

LIFESTYLE INTEGRATED FUNCTIONAL EXERCISE

There is some research to indicate that Lifestyle Integrated Functional Exercise, which works to embed exercise into daily activities, can be beneficial in reducing falls, reducing fall risk, and improving self-efficacy with regards to managing fall risk. Evidence suggests that dual-task or multi-task activities, which combine both cognitive and motor components, may be especially beneficial (Elliot & Leland, 2018).

Devices to Reduce Fall Risk or Injury

There are a number of items—some commonly available and others more specialized—which can help reduce risk of falls if selected and used correctly. Three general categories of such devices include environmental, surveillance/monitoring, and injury prevention.

ENVIRONMENTAL SAFETY DEVICES

There are a number of devices that may be employed to improve environmental safety—both in clinical and home/community settings—and help mitigate the risk of falls in commonly utilized areas of the home. Some examples include:

- Handrails for both sides of stairways (should be sturdily attached)
- Nonslip materials on treads of uncarpeted steps and in the shower
- A raised toilet seat or 3-in-1 commode
- Grab bars for shower or tub

- Shower seat or tub transfer bench
- Hand-held showerhead to allow bathing while seated
  (Mayo Clinic, 2019b)

SURVEILLANCE/MONITORING DEVICES

Various devices and technologies are available to monitor patients or individuals at increased risk of falling. Such devices are frequently used in clinical or residential care settings, and some may also be used in a home-based setting to assist caregivers of at-risk individuals. Examples of surveillance devices used in falls prevention include:

- Bed alarms
- Pressure-sensing chair alarms
- Clip-on personal alarms
- Wall-mounted motion sensors
- Video monitoring equipment

Advances in technology have also led to a number of smartphone and app-based monitoring systems, with wearable body sensors that can be placed in watches, shoes, belts, etc. Challenges to more technology-based monitoring options include creating a user-inclusive interface and protection of an individual's privacy (Rajagopalan et al., 2017).

As with any other preventative strategy, monitoring devices intended to alert staff/caregivers are selected with an individual's specific needs in mind (Quigley, 2015). For example, a buzzing chair alarm may not be the best option for a skilled nursing facility patient who becomes agitated by loud noises.

INJURY-PREVENTION DEVICES

Despite clinicians' best efforts, a patient/client fall is not always avoidable. When falls are anticipated despite best practices and vigilant staff and/or caregiver intervention, a number of specialized devices may help mitigate the potential for fall-related physical injury.

As with any specialized devices, it is important to carefully determine the proper device and/or strategy for each individual patient and to train staff and caregivers in its correct usage. Up-to-date and standardized care plans, routine in-service training, and appropriate staff orientation and caregiver training can help optimize the safe use of injury-prevention devices and strategies.

Injury-prevention devices provide an environment that minimizes fall potential and/or fall-related injury. Examples include:

- **Flooring/matting**: Compliant floors or matting provide a softer, shock-absorbing surface that may prevent or minimize risk of injury from a fall. Floor matting is relatively cost

effective, portable, and easily cleaned. Mats with beveled edges and luminescent strips may offer increased safety to both patients/clients and staff/caregivers. Floor matting should be in place when a patient is unattended (such as at night) and rolled up during direct patient care.

- **Hip protectors**: These garments, available as slip-on briefs or pants, have special padding at the lateral hip areas, which can provide cushioning at areas vulnerable to injury and/or fracture from a fall. Designed for use by one patient only, hip protectors are washable, relatively inexpensive, and may be indicated particularly for frail patients or those with low bone density or degenerative bone diseases.

- **Helmets/protective caps**: These protect the head from falls-related impact and may be solid-shell, vented foam, or protective impact polymer. Particularly useful in patients at risk for head bleeds; should be a serious consideration in patients receiving anticoagulants or who have liver disease, elevated partial thromboplastin times, or low platelet counts.

- **Low-low beds**: Specialized beds that keep the patient positioned as low to the ground as possible in order to mitigate risk of injury in the event of a fall from bed. May be rented or purchased from a medical supply company. Require staff/caregiver training to use effectively, particularly regarding appropriate transfer techniques. Low surface may make it difficult for patients with muscle weakness (particularly in the quadriceps) to transfer out of this type of bed; may not be appropriate for all patients and/or settings.
  (Hester, 2015)

RESTRAINTS

Once common in clinical settings, the use of restraints is now deemed controversial and a **measure of absolute last resort** for the prevention of patient/resident falls. According to the American Medical Association Code of Ethics, a patient should never be restrained for convenience, as a punitive measure, or without a physician's specific order (except in rare emergency cases). Additionally, a physician who deems restraint to be the only alternative should seek informed consent of a patient or surrogate, as well as explain the following:

- Why restraint is being recommended
- What type of restraint will be used
- Length of time for which restraint is intended to be used

It is imperative that the need for restraint be regularly reassessed and updated in the patient's medical record (AMA, 2020).

A restraint is defined by the Centers for Medicare and Medicaid Services as "any manual method, physical or mechanical device, material, or equipment attached to or adjacent to the resident's body that the individual cannot remove easily which restricts freedom of movement or normal access to one's body" (He et al., 2013).

Examples of physical restraints utilized for fall prevention include:

- Mittens
- Vests
- Belts
- Geriatric chairs
- Bedrails

CASE

Ms. Lupe Morales, an active 75-year-old woman, was walking briskly across the grocery store parking lot when she tripped over a curb, lost her balance, and fell onto her left side. Bystanders called EMS, and Ms. Morales was transported to nearest emergency department (ED) with presenting complaint of severe (L)-hip pain. She was examined by the ED physician, who ordered X-rays that showed a femoral fracture requiring surgical intervention, and Ms. Morales subsequently underwent an open-reduction internal fixation (ORIF) procedure and was eventually cleared to perform functional mobility with weight bearing as tolerated (WBAT), with appropriate assistance and instruction from clinical staff.

During the **acute-care phase** of her recovery, clinicians from multiple disciplines were involved in Ms. Morales' postsurgical care, early-stage rehabilitation, patient education, and discharge planning. Her primary care nurse played a key role in helping to coordinate the interdisciplinary team's interventions both pre- and post surgery and monitored Ms. Morales's pain level and medication needs throughout her hospitalization and early-stage rehabilitation. As Ms. Morales was considered to have an increased risk of falling—both because of her postoperative status and because of her initial injury mechanism—her primary care nurses ensured that all inpatient floor staff were aware of Ms. Morales's fall precautions, made sure that her call button was always within reach, and reminded Ms. Morales not to attempt to get out of bed without assistance.

A physical therapist evaluated Ms. Morales's functional mobility and worked with her on improving her ability to safely perform bed mobility, transfers, and negotiate several steps with handrail support, as well as instructing Ms. Morales in the safe and appropriate use of a front-wheeled walker for ambulating and prescribing lower-extremity strengthening and balance exercises under appropriate supervision. An occupational therapist evaluated Ms. Morales's ability to perform ADLs such as dressing, bathing, and toileting and worked with her to devise safe strategies for performing these tasks, as well as discussing which tasks she liked to perform at home that might require safety adaptations. The hospital social worker helped Ms. Morales identify community resources and to prepare for her eventual return home, and the nursing team helped to coordinate interdisciplinary consults and recommendations while advocating for the patient's overall and ongoing needs.

As the time approached for Ms. Morales to be **discharged home,** the care team expressed some concerns as to whether she would be able to safely navigate her home environment, as

she lived alone in a one-story home with three steps to enter. The occupational therapist performed a home safety assessment at Ms. Morales's home and made several recommendations for safety modifications, including the addition of grab bars in the bathroom, removal of several throw rugs in the kitchen area, and the addition of a shower chair so that Ms. Morales could bathe with reduced risk of slips/falls. When the OT had determined that Ms. Morales could safely navigate her home environment with appropriate modifications, the team met and collectively agreed that Ms. Morales could be discharged to home with specific supports, including home health nursing, PT and OT evaluations, and Meals on Wheels, with a follow-up outpatient appointment scheduled with her orthopedist.

Discussion

Each member of the interdisciplinary team played a key role in helping Ms. Morales avoid falls and remain safe during her recovery by focusing on their specific areas of expertise. Communication and collaboration are key elements in maximizing the effectiveness of each discipline and of the care team as a whole when helping a patient recover from a fall-related injury and working to prevent additional falls.

CONCLUSION

Balance-related falls are a significant cause of injury-related mortality and disability, especially in older and/or otherwise compromised populations, and can significantly impact the quality of life of affected individuals and their loved ones. Preventable falls place a costly financial burden on healthcare systems, and effective prevention strategies and protocols are of high priority for clinicians and healthcare institutions wishing to provide the best quality of patient/client care and to mitigate potential consequences of preventable fall-related injuries.

The successful management of fall-related injuries and the prevention of additional falls require strong collaboration among the multidisciplinary healthcare team as well as the patient/client and family. A careful and detailed patient history and a comprehensive physical examination are key components to effectively identifying and addressing balance deficits and other risk factors that may lead to preventable falls. There are a number of evidence-based, standardized assessment tools used by clinicians to determine a patient's risk of falling so that appropriate preventive measures may be undertaken. Home safety assessments may provide valuable additional information regarding environmental factors that can be modified to improve patient safety in their home setting.

By understanding the primary risks and causes of falls, together with the numerous medical conditions and environmental factors that can adversely affect balance, healthcare professionals work collaboratively with one another and patients and their caregivers to provide effective clinical and rehabilitative interventions and preventive measures. Both individual and institutional strategies may be employed to minimize the risk of preventable falls, thereby creating a safer environment for patients and clinicians alike.

RESOURCES

Check for safety home fall prevention checklist for older adults (CDC)
https://www.cdc.gov/steadi/pdf/STEADI-Brochure-CheckForSafety-508.pdf

Falls prevention resources for older adults and caregivers (Administration for Community Living)
https://acl.gov/FallsPrevention

Home Safety Self-Assessment Tool (HSSAT)
http://sphhp.buffalo.edu/rehabilitation-science/research-and-facilities/funded-research/aging/home-safety-self-assessment-tool.html

Older adult falls (CDC)
https://www.cdc.gov/homeandrecreationalsafety/falls/index.html

Safe at home checklist (Administration on Aging/AOTA)
https://www.aota.org/~/media/Corporate/Files/Practice/Aging/rebuilding-together/RT-Aging-in-Place-Safe-at-Home-Checklist.pdf

Vestibular Disorders Association (VEDA)
https://vestibular.org

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1. Which is a **true** statement regarding falls among older adults?

a. The risk of falling does not increase with age.

b. Falls rarely lead to long-term disability.

c. Consistent safety guidelines may help reduce falls in facility-based settings.

d. An older adult who has fallen once is less likely to fall again.

2. Which is **not** a true statement regarding the impact of falls?

a. Falls are among the most preventable public health problems.

b. Consequences of falls are usually limited to the individual who directly experiences the fall.

c. Falls can cause significant financial burden to both individuals and to healthcare systems.

d. The impacts of falls may be either direct or indirect.

3. The vestibular system of the inner ear is comprised of the utricle, saccule, and:

a. Auricle.

b. Tympanic membrane.

c. Canaliths.

d. Semicircular canals.

4. Which is **not** a condition known to contribute to impaired balance?

a. Benign paroxysmal positional vertigo

b. Mal de débarquement syndrome

c. Age-related hearing loss

d. Ototoxicity

5. Which is a **true** statement regarding an interdisciplinary team approach to falls prevention and management?

a. Usually only one clinical discipline is required to effectively manage a patient at risk of falling.

b. There is never any overlap between disciplines when working with patients at risk of falling.

c. Vestibular rehabilitation may be provided by either specially trained physical therapists or occupational therapists.

d. When working with patients at risk of falling, physical therapists primarily focus on activities of daily living such as bathing, dressing, and meal preparation.

6. Which is an example of an **intrinsic** risk factor for falling?

a. An icy parking lot in front of a grocery store

b. Multiple burned-out lightbulbs in a stairwell

c. Being employed as a roofer

d. Being afraid of falling again after a previous fall

7. Which tool assesses an individual's dynamic balance when stepping over objects forward, backward, and sideways?

a. Function Independence Measure (FIM)

b. Four Square Step Test (FSST)

c. Berg Balance Scale (BBS)

d. Falls Risk Assessment Tool (FRAT)

8. Which is a home safety assessment tool that can be administered by a patient and/or their family?

a. I-HOPE

b. Home Safety Self-Assessment Tool (HSSAT)

c. Safe at Home Checklist

d. SAFER-HOME

9. Which scenario would be classified as an **unanticipated physiologic** fall?

a. An 80-old resident of an assisted living facility who uses a walker trips and falls on an unsecured throw rug while walking into the dining room.

b. A 72-year-old, deconditioned man admitted to the hospital for a UTI gets up in the middle of the night to use the bathroom without ringing the call bell and falls to the floor.

c. A 69-year-old community-dwelling woman with no prior medical history has a sudden seizure while doing housework and falls down three steps into her laundry room.

d. A CNA forgets to lock the wheelchair brakes prior to transferring a resident from their bed to a wheelchair, resulting in the chair abruptly rolling out from under the resident during the transfer.

10. Which is **not** an effective strategy for minimizing the risk of accidental falls?

a. Conducting environmental rounds to identify and modify environmental fall and injury risks

b. Keeping the bed in the lowest position all the time

c. Using proper room lighting

d. Ensuring the patient wears proper footwear (not just nonskid socks)

11. Which is **not** an intervention intended to treat specific gait deviations?

a. Selective strengthening

b. Addressing lower-extremity range of motion impairments

c. Recommending orthotics or mobility devices

d. Providing vestibular rehabilitation

12. Which is **not** a true statement regarding vestibular rehabilitation exercises?

a. Many people with vestibular dysfunction may self-limit their physical activities to avoid eliciting symptoms.

b. Virtual reality may be used in both balance training and habituation exercises.

c. Gaze stability exercises may focus on promoting both adaptation and substitution.

d. Endurance training alone is an effective form of vestibular rehabilitation.

13. Which intervention is classified as a **manual** technique for the treatment of BPPV?

a. Habituation exercises

b. Endurance training

c. Modified Epley's maneuver

d. Gaze stability exercises

14. Which is **not** a recommendation to reduce fall risk in the home environment?

a. Installing a nonslip mat and a grab bar in the shower to help get in and out safely

b. Placing throw rugs over hard floors in order to cushion any potential falls

c. Keeping pathways clear by moving furniture, papers, books, and other objects out of the way

d. Keeping a phone on each level or wearing a medical alert device in order to call for help

15. Which is **not** an example of a falls surveillance/monitoring device?

a. Pressure-sensing chair alarm

b. Clip-on personal alarm

c. Wall-mounted motion sensor

d. Geriatric chair