Introduction

Despite numerous prevention efforts, inpatient falls remain a leading adverse event in hospitals and other inpatient settings, resulting in loss of function, death, and higher health care costs. Physical therapists and physical therapist assistants play an important role in identifying at-risk patients or residents and preventing falls in all settings. This article will focus on issues unique to the inpatient setting and is a companion article to the CEU series published in July and November 2007 issues of PT Magazine on reducing the risk of falls in older adults.

Fall Prevalence/Incidence In Inpatient Settings

The standard definition of a fall is an unexpected event in which the participant comes to rest on the ground, floor, or lower level.\(^1\) However, the definition of an inpatient or resident fall is often uniquely specified by each facility and can therefore vary from one facility to the next. In long-term care settings, a fall may be defined by state law or regulation. Some facilities may differentiate between a fall and an assisted fall (an individual who was assisted to a seated or floor position) even though both by policy may be considered fall occurrences.

Although adults 65 years of age and older constitute about 14% of the population in the United States, they account for almost 50% of total hospital expenditures and 44% of total hospital day care expenditures.\(^2\) Falls are the most frequently reported adverse events in the adult inpatient setting, with fall rates ranging from 1.7 to 25 falls per 1,000 patient days depending on the setting/care area.\(^3\) Hitchco et al studied the fall rates for patients admitted to medicine, neurology, orthopedics, surgery, and other services. They reported a falls risk rate for medicine and neurology services at 6.12 per 1,000 patient bed days, a rate of 2.18 per 1,000 patient bed days for surgery service, and a rate of 0.80 per 1,000 for orthopedic service.\(^4\)

The majority of falls occurring in the acute inpatient setting occurred in the patients’ rooms, generally around the bed\(^5\) and in bathrooms\(^6-7\), with the majority of falls not being observed. Fall rates were the highest during the first week of hospitalization and rose again during the third week of hospitalization.

Older adults living in residential care are at a higher risk
Injuries Resulting from Inpatient Falls

Injuries are reported to occur in approximately 6% to 44% of inpatient falls. In the long-term care population, between 9% and 15% of falls result in an injury, with approximately 4% of these falls resulting in fractures. Most patients who fell in an acute care facility were not seriously injured, with less than one third of patients actually sustaining injuries. Deaths from falls in the inpatient environment are relatively rare, occurring in less than 1% of falls. However, given the number of hospital admissions, up to 11,000 fatal falls could occur per year nationwide. Each year in nursing homes, nearly 1,800 reported resident falls result in a fatality.

Costs Related to Inpatient Falls

Fall injuries account for 6% of medical expenses among those 65 and older. According to the Centers for Disease Control and Prevention (CDC), the direct cost of falls in older adults (including hospitalizations, rehabilitation, equipment, etc) was $20.2 billion in 1994 and is estimated to rise to at least $32.4 billion by 2020. Fall injuries increase inpatient costs for a variety of reasons, including resource utilization, increased length of stay (LOS), and an increased chance of unplanned readmission or discharge to residential or nursing home care. Patients who have incurred an injury due to a fall have approximately 60% higher total charges than those who did not fall or those who fell but had no related injury. Hospital charges for patients who sustained a fall were more than $4,200 higher than patients with no fall. In addition to immediate and direct hospital costs, falls in an inpatient setting result in additional risk factors and related expenditures due to a resultant functional decline.

Risk Factors

The admission of an individual to an institution is a risk factor for falls in and of itself. This is due to a variety of factors, including: 1) the patient may have an acute illness/injury, 2) the patient may have a poly pharmacy treatment strategy, or 3) the patient may be unfamiliar with his or her surroundings. Age has been
cited in some studies as a risk factor in the acute care setting, but not consistently. Additional risk factors for falls in an inpatient population are similar to, though perhaps more prevalent than, those found in the community dwelling older adult described in the previous CEU article. These risk factors include:

1. Musculoskeletal disease/weakness, especially hip and/or lower extremity
2. History of falls, especially multiple falls or injurious fall
3. Balance deficit
4. Neurological disease
5. Visual deficit
6. Poor nutrition
7. Impaired activities of daily living
8. Cognitive impairment
9. Multiple medications* (see box below)
10. Hypotension
11. Special toileting needs (urinary incontinence and frequency)
12. Depression
13. Medications contributing to fall risk factors

Acute care patients may have a temporary, transient increased risk for falls due to post-procedure symptoms and new medications. Many patients also have multiple comorbidities, chronic illnesses, and exacerbations of symptoms and/or conditions that increase falls risk. Patients in acute rehabilitation units may be at higher risk because they often have acute/new onset conditions or injuries such as cerebral vascular accident (CVA), multiple sclerosis, hip fracture, and others. At the same time, these patients are being “physically challenged,” which may increase the risk for falling. A study in a tertiary teaching hospital in Australia found that the diagnoses with the highest proportion of fallers were dementia, delirium, stroke, and respiratory conditions. Long-term care residents often have decreased cognition, are more dependent in functional mobility, and have more chronic illnesses than their community-dwelling cohorts. The Long Term Care – Minimum Data Set (LTC-MDS) specifically cites the inability to transfer effectively and short-term memory loss because of those conditions’ correlations to falls in long-term care settings. Toileting issues are considered a risk factor for fall-related injuries in many hospitalized or residential patients, and vitamin D deficiency also is associated with falls and fractures in nursing home residents. Likewise, elevated alkaline phosphates and low serum parathyroid hormone have been linked to falls in this population. Behavioral health settings, although similar in many ways to other inpatient settings, have unique indicators in that many patients who experience a fall are less than 65 years of age and are “experiencing anxiety and agitation and receiving a sedative, tranquilizer, or laxative.”

**Medications Contributing to Fall Risk Factors**

- Antiarrhythmics
- Antidepressants
- Antihypertensives
- Diuretics
- Hypoglycemics
- Laxatives
- Neuroleptics
- NSAIDs
- Psychotropics
- Sedatives
- Vasodialtors

Preventable Falls

Inherent in falls reduction programs is the notion that many falls, if not most, are preventable. Furthermore, fatal injuries from preventable falls should not occur while a patient is under hospital care. Morse, Tylko, and Dixon first described the preventable fall as an “anticipated physiological fall,” defined as a fall that occurs in patients identified as “fall prone” based on a falls risk assessment. They concluded that 78% of falls could be anticipated based on the presence of physiologic risk factors such as a history of falling, weak/impaired gait, comorbidities, or impaired judgment. Fourteen percent of falls can be classified as “accidental,” or having some environmental cause, and the remaining 8% occur for physiologic reasons (ie, stroke, syncope, or seizure). Morse and colleagues also observed that more than half of all second falls occurred under circumstances similar to the first fall.

**The Joint Commission And Falls Reduction**

The Joint Commission (JC) published the first set of National Patient Safety Goals in 2003. The goals were designed to highlight problematic areas in health care related to patient safety and share appropriate evidence and expert-based solutions to the most commonly identified issues. As with other standards, the JC evaluates accredited organizations for continuous compliance with goal requirements or demonstration and approval by the JC of effective alternative approaches through the accreditation cycle.

The goal of “Reducing the risk of patient harm resulting from falls” first appeared on the JC National Patient Safety List in 2005. Hospital compliance for 2006 was measured at 93.5% of the 1,429 surveys conducted. This goal remains on the list for 2007 and 2008 because falls continue to account for a significant portion of injuries in hospitalized patients. Accredited organizations are expected to implement a fall reduc-
ation program with an evaluation that is appropriate to their population, setting, and services. Among the implementation expectations are requirements that the organization’s program include:
- interventions to decrease patients’ risk of falling;
- staff education and training in the fall reduction program;
- patient and family education in the program and the patient’s individualized fall reduction strategies; and
- outcomes evaluation of the program for effectiveness.

The Joint Commission defines a sentinel event as “an unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof.” Patient falls are tracked by the JC as a type of sentinel event. As of December 31, 2006, falls in 2006 totaled 224, or 5.5% of all sentinel events that were reviewed by the JC. Although at first this may not appear to be a large number, these are only the falls that resulted in death or serious injury.

**Identification Of Falls Risk**

Because of JC standards and related quality of care values, most inpatients will receive an initial fall screening, regardless of setting. Initial screenings or assessments, ongoing reassessments, and individualized prevention strategies have been linked to decreased falls in inpatient settings. This success has led to an initiative by many regulatory agencies, including CMS and the JC, to ensure that facilities develop programs to decrease the root causes of inpatient falls. Organizations that encourage identification of errors, evaluation of causes, implementation of actions to improve future performance, and promotion of a culture of safety facilitate the prevention of errors such as falls. According to JC analysis of sentinel events from falls, the leading cause of fall injuries was poor staff communication and/or poor orientation or training of staff. Other primary causes included inadequate assessment of the patient, factors in the physical environment, and inappropriate care planning.

Bonner, MacCulloch et al also demonstrated that falls rates in long-term care settings can be decreased with comprehensive falls prevention training of nursing staff and other key staff with periodic assessment of learning through post-test, periodic informational newsletters or brochures, and peer leadership training.

Multi-disciplinary risk assessment and management strategies are the most effective preventative tools. However, in most inpatient settings, a member of the nursing staff is generally the first provider to assess the patient for falls risk. Nurses typically perform an initial falls risk screening within the first few hours after a patient is admitted to care.

There is no one assessment tool for all facilities or patients; however, comprehensive standardized tests and measures with reliability and validity, especially predictive validity, are recommended for use in every setting. In other words, to accurately assign a risk value based on the outcome of a standardized risk screen or assessment, the instrument should be utilized in populations and settings equivalent to those in which it has been studied. In the acute care setting, popular tools include the Morse Fall Scale (MFS), the STRATIFY risk assessment tool, and the Hendrich Falls Risk Model II (HFRM-II).

The Morse Fall Scale (MFS) scores six areas in ranges of no risk, low risk, and high risk. The areas include:
- History of falling: immediate or within 3 months
- Secondary diagnosis
- Ambulatory aid

- Bed rest/nurse assist
- Crutches/cane/walker
- Furniture
- IV/Heparin Lock
- Gait/transferring
- Normal/bed rest/immobile
- Weak
- Impaired
- Mental Status
- Oriented to own ability
- Forgets limitations

The Hendrich II Falls Risk Model has been validated in acute care, skilled nursing and rehabilitation settings. Similar in many ways to the Morse Scale, the Hendrich II Falls Risk Model assesses:
- Medications
- Confusion
- Vertigo
- Elimination
- Depression
- Gender
- Mobility (Get Up and Go test)

A score of 5 or greater on the Hendrich II Falls Risk Model indicates a high risk for falls.

Standardized tools for other settings are being studied and have shown varying effectiveness. The Mini-Mental State Exam, the Geriatric Depression Scale, and the Functional Intervention Model have been studied in acute rehabilitation. In long-term care, the Mobility Interaction Fall Chart and the Downtown, among others, have been reviewed. Regardless of the tool used, the initial screening is one of the first steps in falls risk identification. The nature of an inpatient’s status often evolves; therefore, ongoing assessment and the clinical judgment of the care providers at each encounter is key to preventing falls.

This importance of clinical judgment in combination with routine assessment exemplifies the need for staff education and training. All health care providers working with patients at risk for falls in inpatient settings should recognize that
patients have the potential throughout their stay to change status regarding falls risk. Those who were at a high risk for falls on the initial assessment may reduce their risk, while a patient with a low falls risk upon admission may require increased falls prevention strategies with a change in condition.

Regardless of when the risk for falls is identified, practitioners should further evaluate patients or residents assessed as at-risk and should develop individualized prevention strategies.

### Physical Therapist Role in Inpatient Falls Prevention

After the initial falls assessment at admission, usually completed by nursing staff, patients typically are rated for falls risk (low, moderate, or high). The next objective is to match the appropriate intervention strategies for the falls risk to falls prevention. Appropriate screening and risk identification may be required, with the ultimate goal of targeting appropriate prevention strategies and interventions to at-risk populations, stratified to the type and level of risk.

In many facilities, physical therapists (PTs) play multiple roles in a falls prevention program. They are part of interdisciplinary teams to develop, integrate, and evaluate facility falls prevention programs and policies. Physical therapists can and should play a role in training and consulting with nursing and other staff, including safe mobility training, especially gait and transfers.

In many facilities, a high or even moderate falls risk often will trigger a physical therapy referral. It is important the physical therapist review the patient’s history and perform a systems review to identify any problems that require more detailed examination and/or consultation with other members of the health care team. Assessment of heart rate and blood pressure should be performed in various positions (supine, seated, standing) to determine the presence of orthostatic hypotension, which can precipitate a fall, especially after bed rest.

The examination should include tests and measures that focus on joint range of motion, muscle strength, sensory integrity, balance, and gait. However, the practitioner must be sure to match the correct tool(s) with each patient’s physical and cognitive abilities. Foot and ankle characteristics are associated with impaired balance and functional ability in older people, and the PT should consider these when examining an older patient. Foot and ankle deficits in tactile sensitivity, ankle flexibility, and toe strength are all important factors that can affect balance and functional ability in older adults. PTs should evaluate lower extremity muscle strength because weakness around the knee and ankle has been related to an increased incidence of falls.

The practitioner also should determine the patient’s functional abilities and the level of assistance needed when coming to a sitting position in bed, transferring, and ambulating. Standardized tools that may be used to assess balance and evaluate falls risk in the inpatient setting, depending on the patient’s abilities, include the Timed Up and Go, the Berg Balance Scale, the Romberg, and the Functional Reach. Additional functional activities that may provide insight into the patient’s balance include stance tests (eyes open, eyes closed), one-legged stance time, marching in place, and semi tandem and tandem walking.

Once the physical therapy evaluation is completed on patients with moderate or high falls risk, the physical therapist should clearly communicate findings related to falls risk and prevention to both physician and nursing staff. This information also should be integrated into the patient’s overall care plan. For example, details about a patient’s functional mobility, need for assistive device(s), and any safety factors related to mobility should be communicated and understood by all caregivers.

### Inpatient Falls Prevention Strategies

Prevention of falls and injuries from falls has been the focus of much research. Numerous studies, systematic reviews, and meta-analyses have evaluated falls prevention strategies with mixed results. Many reviews find insufficient support for conclusions due to poor methodology, inconclusive evidence, and contradictory results between similar studies. However, as is true for community dwelling seniors, research from multifaceted falls assessment and risk reduction approaches seems to be most beneficial to inpatients. Implementation of research results needs to incorporate individualized risk reduction plans based on the patient’s or resident’s needs.

The following sections summarize findings for many components of comprehensive falls reduction efforts implemented in inpatient settings.

#### Bed/Chair Alarms

Bed/chair alarms are set to trigger an alarm when a patient moves to get out of a bed or chair. Alarm systems may be indicated for patients who have a history of falls, unsafe bed mobility, cognitive deficits, confusion, and/or are unable to use the call bell. The alarm can be set at a specific sensitivity to alert a caregiver when enough weight has been lifted from the surface to indicate that a patient may be attempting to get out of bed. Some

**For more information on Falls Prevention, visit www.apta.org. The Falls Prevention Web page is located in the Practice area.**
studies indicate that such alarms and related equipment and monitoring systems can decrease falls and fall injuries; however, further research is warranted.

**Hip Protectors**

The use of hip protectors, especially in longer-term care, has been evaluated and shows some evidence in reducing the incidence of hip fracture. However, many studies found that utilization and compliance of hip protector use was difficult for staff to maintain over time.

**Patient/Resident Identification**

Many facilities use color-coded stickers, armbands, or magnets to alert staff that a patient is at risk for falls. At present, research does not indicate a resulting decrease in fall rate.³

**Exercise Interventions for Falls Prevention**

Research has shown exercise to be effective in reducing falls in individuals who range from relatively fit and community dwelling to those who are cognitively intact and living in residential care facilities.⁴⁶ However, fewer studies of exercise and the impact on falls reduction address the inpatient setting. In a study by Hauer et al, an exercise intervention that included progressive resistance training, coordination, and functional training was shown to reduce falls incidence in patients who were admitted to acute care or inpatient rehabilitation with a history of recurrent or injurious falls.⁴⁷

Another study by Stenvall et al showed that the incidence rate of falls decreased in inpatients involved in a multidisciplinary, multifactoral program. This program included rehabilitation interventions with mobilization within 24 hours after surgery and specific exercises and performance training with a special focus on falls risk factors. The benefits of exercise include reducing fear of falling and improving cardiovascular health, among others.

Exercises for patients who are at risk for falling in the inpatient setting should focus on lower extremity strengthening, especially the muscles around the ankles and knee; trunk strengthening; and bal-
ance retraining activities that control the center of gravity over the base of support. Gait training may include fitting and training with appropriate assistive devices, weight shifting, progressing to increasing distance, and postural transitions (start, stop, change in direction) with lessening of external (therapist) assistance.

**Vitamin D Deficiency**

The effect of vitamin D on the risk of fractures has been attributed primarily to the effect on bone mineral density. However, research also has shown vitamin D to have an effect on functional performance, reaction time, and balance. In other studies, vitamin D in conjunction with calcium improved body sway in elderly ambulatory women and also was found to increase musculoskeletal function in institutionalized elderly women. Vitamin D supplementation appears to reduce the risk of falls among ambulatory or elderly individuals in good health, particularly women.

**Restraints/Bedrail**

It was found that for all age-gender groups, the incidence of falls from beds with bedrails elevated was equal to or higher than when bedrails were not elevated. Alternative fall prevention and injury reduction strategies include low-to-the-ground hospital beds, mats placed on the floor, frequent toileting programs, video monitoring, and in-room supervision. One final important consideration is that severely minimizing or preventing mobility is not likely to reduce falls and falls injuries. Patients who are able to ambulate should be encouraged to do so with appropriate supervision and safeguards. Further debilitation often will lead to increased falls risk.

**Conclusion**

Prevention of falls in inpatient settings requires a multidisciplinary, multifaceted approach. The physical therapist plays an important role that includes development, training, integration, and evaluation of falls prevention programs. The physical therapist can also assess specific individual falls risk factors and participate in conjunction with other practitioners in designing a plan of care to reduce an individual’s risk of falling.

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