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*Falls represent a significant geriatric problem, with multifactorial etiologies and multiple consequences. Falls should not be considered a normal aspect of aging. Part I of this issue reviewed the epidemiology, etiology, and common risk factors for falls. This issue will examine the consequences of falls, including common fall injuries; the emergency department (ED) management of the older person who falls; and prevention of falls and fall injuries. Key physical findings in elderly patients who fall are reviewed, and a practice guideline for ED management of falls in older patients is presented.*

— The Editor

**Consequences of Falls**

The important consequences of falls include serious injuries, long lies (inability to get up after a fall), fear of falling, decreased physical activity, and death.

**Distribution of Injuries.** Fractures are the most common serious injuries in elderly persons who fall.<sup>1</sup> One group examined the distribution of 249 serious injuries in 546 community-dwelling elderly who fell, and found that fractures comprised 74%; dislocations, 6%; other joint injuries, 5%; serious laceration, 12%; and intracranial injuries, 3%.<sup>1</sup> The types of fractures appear to vary with the gender of the faller. According to one study, the most common injuries requiring hospitalization for elderly men (in descending order) are fractures of the hip, ribs, spine, humerus, and pelvis, while the most common injuries requiring hospitalization for elderly women (in descending order) are fractures of the hip, humerus, wrist, pelvis, and ankle.<sup>2</sup>

**Head Injury.** Acute subdural hematoma is a common cause of death in elderly patients who die from ground-level falls.<sup>3</sup> The presentation of subdural hematoma in the elderly patient

may be masked by cerebral atrophy as well as other medical conditions.<sup>4,5</sup> Because subdural hematoma may occur in the absence of signs of head injury, any change in baseline cognition or other neurologic function in an elderly patient suggests the diagnosis until proven otherwise.<sup>5</sup>

**Spine Injury.** Although spinal fractures comprise a minor

portion of fall-related fractures in the elderly, they have major health implications.<sup>1,6</sup> In one study of serious injuries in community-dwelling adults who fall, spine and rib fractures together made up 17% of all fall-related fractures.<sup>1</sup>

The most common cause of acute spinal fracture in the elderly is falls, with upper cervical spine injuries predominating. Odontoid fractures are

the most common type of cervical spine fractures in patients older than 70 years and form the majority of spine fractures in patients older than 80 years.<sup>7</sup> Ninety percent of odontoid fractures in the elderly occur as a result of standing level falls.<sup>8</sup> The increased risk of spinal injury in the elderly has been attributed to degenerative changes that stiffen the spine and osteoporosis.<sup>9</sup>

Falls also are the most common cause of spinal cord injury in the elderly.<sup>10</sup> Central cord syndrome is the most common type of spinal cord injury in this age group and tends to occur in patients with preexisting degenerative disease who sustain a hyperextension injury. Central cord syndrome is characterized by bilateral, predominantly distal, upper extremity motor weakness, which corresponds to injury to the central portions of the long spinal cord tracts.<sup>11</sup>

**Chest Injury.** Rib fractures are a serious consequence of falls in the elderly because of their association with atelectasis and pneumonia. One group reported that rib fractures comprised

**Falls in the Elderly****Part II: ED Evaluation and Management**

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6% of all fall-related fractures in a five-year study of residents of a long-term facility.<sup>12</sup> Multiple rib fractures are especially worrisome in the elderly. Another group reported that the incidence of serious complications from flail chest, such as the need for mechanical ventilation or pneumonia-related sepsis, increases significantly after age 50.<sup>13</sup>

**Pelvic Fracture.** Pelvic fractures are a minor but important fraction of fall-related fractures in the elderly. One study found that pelvic fractures comprise 8% of all fractures in community-dwelling elderly who fall.<sup>1</sup> Another study found that pelvic fractures comprise only 4% of all fall-related fractures in elderly residents of a long-term care facility.<sup>12</sup> These factors are often missed in the demented nursing home patient, and clinicians should have a high index of suspicion in patients with pain in this region.

However, when pelvic fractures occur in the elderly, 85% are a result of falls.<sup>14</sup> Because the elderly tend to fracture their pelvises by falling, they are much less likely to fracture poste-

rior pelvic sites, such as iliac and sacroiliac elements, than younger patients who tend to sustain pelvic fractures via motor vehicle collisions (75%).<sup>14</sup> Accordingly, the most common site of pelvic fracture in the elderly is the pubic ramus (48%). Another 16% involve the acetabulum.<sup>14</sup> Either of these locations may be clinically occult.

**Hip Fracture.** Hip fractures are the most common fractures suffered when elderly patients fall, with approximately 1% of all falls in the elderly resulting in an estimated 250,000 hip fractures per year in the United States.<sup>1,12,15</sup> Researchers found that hip fractures comprise 37% of fall-related fractures in community-dwelling elderly adults.<sup>1</sup> Similarly, another group found that hip fractures comprise 44% of all fall-related fractures in elderly residents of long-term care facilities.<sup>12</sup> The vast majority of hip fractures occur in women.<sup>16,17</sup>

Despite recent suggestions that many hip fractures are spontaneous, the vast majority of hip fractures occur as a consequence of a fall.<sup>16,18</sup> One group evaluated 911 hip fractures in patients 60 years or older and found that 96% were associated with falls, while only 2% were spontaneous.<sup>16</sup> The exact mechanism by which spontaneous hip fracture occurs is uncertain, although vigorous muscle contraction or stress fractures involving individual trabeculae have been implicated.<sup>19</sup> A history of previous hip fracture appears to be associated with an increased risk of subsequent fall, since older persons who have suffered hip fractures are often left with decreased quadriceps strength and increased postural sway.<sup>20</sup>

**Upper Extremity Fracture.** Wrist or distal radius fractures are the second most common fractures in community-dwelling elderly who fall, comprising 12-29% of all fall-related fractures.<sup>1,21</sup> Colle's fracture (characterized by dorsal angulation of the distal fragment) is the most common type of distal radius fracture, and usually results from falls on an outstretched hand (FOOSH).<sup>22</sup> Elderly women with distal radius fractures are more likely to fall backward, to land on their hands, and to be unable to break their falls by grabbing or hitting an object.<sup>23</sup>

Proximal humerus fractures are the next most common upper extremity fractures in the community-dwelling elderly, comprising 8-11% of all fall-related fractures.<sup>1,21</sup> Most proximal humerus fractures in the elderly occur from standing height falls, and 85% are only minimally displaced.<sup>24</sup> Radial head fractures also occur from a FOOSH mechanism in community-dwelling adults.

The pattern of upper extremity fractures differs in elderly residents of a long-term care facility. In these patients, researchers reported that upper extremity fractures occurred in the following order: hand (9%); forearm (8%); humerus (6%); elbow (2%); and shoulder (< 1%).<sup>12</sup>

**Long Lies.** Long lies occur when elderly patients are unable to stand after falls. Tinetti and colleagues reported that 47% of community-dwelling elderly fallers were unable to get up without assistance after a fall.<sup>25</sup> One group found that 10% of falls left older patients unable to get up for 10 minutes.<sup>23</sup> In a separate study of falls in inner-city elderly African-Americans, 3% of fallers remained on the ground or floor for three or more hours.<sup>26</sup> Persons found lying for long periods after a fall are at risk for dehydration, pressure sores,

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**Table 1. Mnemonic for Key Physical Findings in the Elderly Patient Who Falls or Nearly Falls**

- I** Inflammation of joints (or joint deformity)
- H** Hypotension (orthostatic blood pressure changes)
- A** Auditory and visual abnormalities
- T** Tremor (Parkinson's disease or other causes of tremor)
- E** Equilibrium (balance) problem
  
- F** Foot problems
- A** Arrhythmia, heart block or valvular disease
- L** Leg-length discrepancy
- L** Lack of conditioning (generalized weakness)
- I** Illness
- N** Nutrition (poor, weight loss)
- G** Gait disturbance

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pneumonia, rhabdomyolysis, and renal failure. Inability to arise after a fall is a marker for physical frailty and often results in hospitalization.<sup>25,27</sup>

**Fear of Falling and Decreased Physical Activity.** Falls frequently result in fear of falling, restriction of mobility and activity, and a subsequent loss of independence. One study determined that 92% of elderly Japanese patients who fell once were afraid of future falls, and one-third restricted subsequent physical activity.<sup>28</sup> Another reported that 42% of elderly fallers limited their activities at least temporarily because of injury, fear of falling, or physician's orders.<sup>23</sup> Tinetti et al found that half of older people who are afraid of falling restrict their social and physical activities.<sup>29</sup> Fall survivors experience greater functional decline in activities of daily living, physical, and social activities and also have a much higher risk of institutionalization.

**Mortality.** Falls are the leading cause of death from injury in the elderly, resulting in 12% of all geriatric deaths.<sup>30,31</sup> According to researchers, 2.2% of injurious falls in the elderly are fatal.<sup>32</sup>

Hip fracture is the most common cause of death among all fall-related injuries, accounting for half of all fall-related deaths in the elderly.<sup>2,32</sup> One group reported a 35-day mortality rate of 8% for hip fractures in the elderly, and a one-year mortality rate of 24%.<sup>33</sup> Pulmonary embolism (PE) is often the proximal cause of death, occurring in 13% of those elderly patients who die from falls.<sup>31</sup> Cervical spine injury is also lethal in this age group, with a mortality rate of 26%.<sup>6</sup>

Although elderly women are more frequently injured in falls, elderly men are more likely to sustain fatal falls.<sup>2,32-34</sup> White men ages 85 years or older appear to be particularly vulnerable, with a fall-related mortality rate exceeding 180 deaths per 100,000 population.<sup>31</sup>

Falling is an ominous sign in nursing home residents. Researchers compared the mortality rates of 207 nursing home residents who fell during a two-month study period to 94 residents of the same nursing home who did not fall. One year after the fall, 74 elderly patients (36%) who fell had died

vs. only 13 of the controls (14%).<sup>54</sup>

## Emergency Department Evaluation

The goal of the ED evaluation is to simultaneously identify both the causes and consequences of a fall. Special emphasis is placed on the identification of life-threatening acute medical conditions that may have led to the fall, such as syncope or delirium. Risk factors for falls that are potentially reversible should be aggressively sought, including high-risk medications, treatable medical conditions, and remediable environmental hazards. A mnemonic (I HATE FALLING) can be a useful reminder of key physical findings in patients who fall or nearly fall. (*See Table 1.*)

Concomitantly, the emergency physician should approach the elderly patient who falls with the same priorities as any other trauma patient. Keep in mind that the older patient may not be able to mount an adequate compensatory response to the stress of trauma or its sequelae. Since life- or limb-threatening injuries may not be obvious in the elderly, always maintain a high index of suspicion for common occult injuries, such as subdural hematoma or hip fracture.

**History.** The history of present illness should address the characteristics, causes, and consequences of the fall. Understanding the mechanism of the fall is essential for predicting injury patterns. For example, hip fractures are most likely to result from falls to the side, while wrist fractures are more likely to result from falls backward. The likelihood of injury is influenced by whether the patient broke his or her fall by striking or grasping something on the way down. Carpeting or other soft materials on the floor may attenuate the force of impact. Understanding the mechanism of the fall also may lead to the discovery of specific environmental hazards that can be remedied later.

The location of the fall also provides an important clue about the underlying health status of the elderly patient. Falls that occur indoors are more likely to be associated with patients with underlying frailty, while falls that occur outdoors are more likely to be associated with more active elderly patients (vigorous fallers).<sup>36</sup>

Determining the cause of falls can be extremely difficult in elderly patients, since the older patient may not remember the fall or remember losing consciousness. Amnesia for loss of consciousness is a particularly vexing, common problem in the evaluation of the elderly patients who fall. In a study of 26 elderly patients who presented to the ED after falls, with either recurrent falls or unexplained loss of consciousness, amnesia for loss of consciousness was present in seven (27%).<sup>37</sup> Amnesia for loss of consciousness also is present in 50% of elderly patients with carotid sinus syndrome who present only with falls or falls and dizziness.<sup>38</sup> Furthermore, witnesses may be unavailable to corroborate the elderly patient's recollection of the fall. Bystander accounts are typically unavailable in half of all syncopal episodes,<sup>38</sup> and important details, such as the time of fall, remain unknown in approximately one-third of cases.<sup>39</sup>

Be wary of accepting simplistic explanations for the cause of falls in elderly patients. Attributing the etiology of a fall to its proximal cause, such as tripping over a step, can be devas-

tating in the older age group, in whom underlying intrinsic causes are relatively common, including acute medical conditions or problems with medications.

Inquire about the presence of syncope, seizure, stroke, altered mental status, neuromuscular impairment, congestive heart failure, myocardial infarction, gastrointestinal bleeding, dehydration, and intercurrent infection (especially pneumonia or urinary tract infection [UTI]).

Postural dizziness is a significant complaint in the elderly and is associated with an increased risk of falling and syncope.<sup>40</sup> Loss of consciousness is a critical symptom that not only suggests syncope as the cause of the fall, but places the patient at greater risk of injury. Always consider syncope in the differential diagnosis of falling in the elderly, since syncope and falling frequently overlap clinically.<sup>38</sup> Remember that acute medical conditions often present atypically in the elderly. For example, weakness may be the presenting complaint for myocardial infarction in the elderly.<sup>39</sup>

Address the consequences of fall through a careful inventory of potential injuries. For example, neck pain in a patient older than 70 years suggests an odontoid fracture until proven otherwise.<sup>7</sup> Some authors recommend maintaining a high index of suspicion for cervical spine injury in every elderly patient who falls.<sup>41</sup>

Hip pain after a fall strongly points to the presence of hip fracture, since two-thirds of these patients will ultimately be shown to have at least a hip stress fracture.<sup>19</sup> Hip pain in the absence of trauma also may predispose to subsequent falls, since it may suggest underlying hip osteoarthritis.<sup>42</sup> Isolated knee pain in the absence of limb deformity is an unusual, but documented, presentation of hip fracture in the elderly.<sup>43</sup>

New alteration in mental status or the inability to demonstrate that an alteration in mental status is preexisting suggests a subdural hematoma in an elderly patient who falls.<sup>5</sup> The most common symptoms of a chronic subdural hematoma are changes in mentation, headache, and hemiparesis.<sup>44</sup> The inability to get up without assistance after a fall is an important historical feature that suggests a decline in functional status and increases the likelihood of the need for hospitalization.<sup>45</sup>

**Medical History.** The medical history should address the presence of chronic medical conditions that might lead to a fall through an acute exacerbation (e.g., congestive heart failure [CHF]) or serve as an underlying risk factor for falling (e.g., Parkinson's disease). Possible syncope mandates a search for diseases known to be associated with syncope, such as cardiac disease, diabetes mellitus, or hypertension. Other risk factors for coronary artery disease should be sought, since 6% of myocardial infarctions present as syncope.

Knowledge of the functional status of the elderly patient prior to the fall helps interpret fall sequelae as well as determine the patient's disposition. For those living at home, essential independent activities of daily living (ADLs) include mobility and meal preparation.

Determine the elderly patient's tetanus immunization status, since 35% of cases of clinical tetanus in the United States occur in patients ages 60 years or older.<sup>46</sup> Family members are important sources of further information about past medical problems, baseline functional status, and medications.

**Medications and Review of Systems.** Review prescription and nonprescription medications for their potential role in causing the fall or compromising the ability of the older patient to respond to injury. Over-the-counter anticholinergic medications and ophthalmologic beta-blocker solutions often are overlooked. A directed review of systems is important for any elderly patient who falls, because falls in this age group tend to be multifactorial in nature.

**Physical Examination.** Vital signs provide essential clues regarding the presence of cardiovascular disease, pulmonary disease, and intercurrent infection. Keep in mind that the elderly trauma patient may appear to have "normal" blood pressure and heart rate values early in the course of occult cardiogenic shock.<sup>47</sup> Long lies or suspicion of hypothermia warrant measurement of core body temperature.

Obtain orthostatic vital signs in elderly patients who fall in whom presyncope or syncope is suspected. Measurements of blood pressure and pulse should be made after five minutes of rest in the supine position and after one and three minutes of standing. A drop in systolic blood pressure of more than 20 mmHg is a significant finding.<sup>48</sup> Postural dizziness or dizziness on standing may be an even more important marker in elderly patients for the risk of falling or syncope than is postural hypotension.<sup>40</sup>

Examine the head for signs of trauma, including basilar skull fracture. Evaluate the mucous membranes for signs of anemia and dehydration. Visual acuity testing is an often overlooked, but important, part of the examination of elderly patients who fall.

Palpate the posterior neck for tenderness. Examine the neck for jugular venous distension, which provides information about volume status or the presence of right-sided heart failure.

Palpate the chest wall thoroughly for signs of rib fracture. Auscultate the lungs for findings of CHF or pneumonia. A thorough cardiovascular exam is warranted in elderly patients who fall (focusing on signs of arrhythmia, valvular heart disease, and impaired ventricular function) because of the possible association with syncope.

Assess the abdomen, pelvis, and back for signs of trauma. Remember that older patients are less likely to localize abdominal tenderness or manifest peritoneal signs. Rectal examination is indicated in elderly patients with presyncope or syncope to look for occult gastrointestinal bleeding.

Signs of an occult hip fracture include the inability to bear weight, decreased range of motion, and point hip tenderness.<sup>19</sup> Palpate the upper extremity for signs of fractures commonly associated with FOOSH: proximal humerus, radial head, and distal radius fractures.<sup>49,22</sup>

A full neurologic examination, including mental status examination (MSE), is a critical part of the evaluation of all elderly patients who fall. Elderly patients with cognitive deficits that cannot be clearly identified as preexisting should be considered to have a subdural hematoma until ruled out by an appropriate imaging study.<sup>5</sup> A minimal MSE involves establishing that the elderly patient is fully oriented and can recall the names of three objects at 3-5 minutes.<sup>39</sup>

Evaluate the gait of elderly patients who fall, if possible, since 7% of these patients will ultimately have cerebellar atax-

ia. Cerebellar ataxia has a number of reversible causes, including tumors, hydrocephalus, and medications.<sup>50</sup> The inability to balance on one foot for five seconds has been shown to be an independent predictor of injurious falls in older patients (one-leg balance test).<sup>51</sup>

The get-up-and-go test is a practical test for assessing global neurologic function in the elderly. Cognition, strength, gait, and balance can be simultaneously assessed by asking the older patient to get off the gurney or out of the chair and walk toward a wall, then turnaround without touching the wall and return to the gurney or chair. Difficulty or inability to rise from a seated position suggests significant proximal muscle weakness and is also a predictor for the development of subsequent disability.<sup>67</sup> Furthermore, the get-up-and-go test essentially rules out significant spinal, pelvis, and lower extremity injury.<sup>39,52</sup>

Examine the skin for signs of long lie, such as skin breakdown or pressure sores, as well as for signs of cellulitis, which may explain why the patient fell.

**Laboratory Tests and Electrocardiography.** The laboratory work-up of older patients who fall is necessarily individualized. Laboratory studies are particularly helpful in the evaluation of underlying conditions that led to the fall. Presyncope or syncope generally requires hemoglobin, glucose, electrolyte, and renal function tests. A blood urea nitrogen (BUN)-creatinine ratio greater than 25, or plasma osmolality greater than 295 mmol/kg is consistent with hypovolemia.<sup>68</sup> Because of the lack of specific physical findings in the elderly, a recent rise in BUN-creatinine level may be the only clue to underlying dehydration. If myocardial infarction is considered, one should obtain a serum troponin level. Syncope also warrants the assessment of serum levels of digoxin, antiarrhythmics, anticonvulsants, theophylline, and lithium in patients taking these drugs.<sup>48</sup>

Delirium may call for pulse oximetry, complete blood count, glucose, electrolytes, renal function tests, calcium, troponin, urinalysis, or thyroid function tests. Patients who fall while taking certain medications may warrant specific laboratory studies, such as electrolytes in patients on diuretics or prothrombin time in patients on warfarin.

Elderly patients who present with altered mental status should have drug levels assessed for possible toxicity, including digoxin, lithium, and aspirin.<sup>39</sup> Elderly patients with significant trauma require serial hematocrits, electrolytes, renal function tests, and coagulation studies, at a minimum. Electrocardiography is indicated in elderly patients who present with presyncope, syncope, delirium, or significant trauma.

**Imaging Studies.** Imaging studies help identify conditions predisposing to fall, as well as fall sequelae. For example, a suspicion of delirium warrants a chest radiograph for occult pneumonia, while a suspicion of cerebellar ataxia requires a brain computed tomography (CT) scan for hydrocephalus or tumors.<sup>50</sup>

Maintain a low threshold for obtaining radiographs of injured areas in the elderly. Even minor signs of head injury or subtle neurologic changes are indications for obtaining a CT scan of the brain, because of the higher risk of occult subdural hematoma. Other common occult injuries include vertebral

body compression fractures, rib fractures, and pubic rami fractures. The identification of an upper cervical spine fracture on radiograph warrants the exclusion of a second cervical spine fracture, since 9% of all patients have more than one cervical spine fracture.<sup>7</sup> As in children, the presence of fractures of multiple ages suggests elder abuse.

Keep in mind the limitations of plain radiography. For example, radiographs fail to detect up to 70% of hip stress fractures, which may require a bone scan or magnetic resonance imaging for detection.<sup>19,53</sup>

## Management

ED management of elderly patients who fall includes the simultaneous treatment of acute medical conditions that may have led to the fall and the treatment of fall sequelae, including head injury, fractures, soft tissue injuries, and complications of long lies. A useful practice guideline for the ED management of older patients who fall is shown in Table 2.

**Trauma Care.** Improved trauma care of the fallen elderly patient has played a major role in the dramatically improved mortality rates of these patients over the past few decades.<sup>54</sup> Management of the significantly injured elderly patient follows guidelines established by the American College of Surgeons in the Advanced Trauma Life Support Course.<sup>55</sup>

Provide oxygen liberally in the early phase of care, since elderly trauma patients typically tolerate hypoxemia poorly, particularly in the setting of chest wall injury. Pulse oximetry and the patient's clinical course will guide subsequent oxygen requirements. Evaluate the elderly patient carefully for indications for endotracheal intubation, including loss of protective airway reflexes and occult respiratory failure. The cervical spine should be immobilized in elderly patients who fall until cervical spine injury can be ruled out clinically or radiologically.<sup>41</sup>

Patients with significant trauma or possible presyncope or syncope require cardiac monitoring in the ED. IV fluid resuscitation should proceed with crystalloid solution in judicious volumes and with ongoing reassessment, since most elderly patients tolerate fluid overloading little better than shock. Because normal saline may lead to hyperchloremic metabolic acidosis in elderly patients with impaired renal function secondary to aging, Ringer's lactate solution is a more rational choice of IV fluids in the significantly injured elderly.<sup>9</sup>

The elderly are usually unable to increase their cardiac output in order to meet peripheral tissue oxygen demands and are consequently much more dependent on blood hemoglobin content for adequate oxygen delivery. Thus, elderly patients with potentially significant blood loss should be transfused at higher hemoglobin levels than younger patients would ordinarily be.<sup>47</sup>

Immobilize fractures as early as possible, since they may be a cause of significant soft-tissue bleeding in the elderly. In general, obtain emergent orthopedic consultation for fractures that are open, severely displaced, severely angulated, severely comminuted, or associated with neurovascular compromise.<sup>22</sup>

Most upper extremity fractures can be immobilized and referred to an orthopedist. Immobilize uncomplicated proximal humerus fractures with a sling.<sup>24</sup> Immobilize nondisplaced or minimally displaced radial head fractures for pain, although

**Table 2. Practice Guideline: ED Management of Falls in Patients Ages 65 Years and Older**

**Circle your response to each question and make intervention when appropriate.**

<u>Assessment</u>			<u>Intervention</u>
<b>TRIAGE NURSE</b>			
> 4 medications	Y	N	PMD/GA
Flurazepam, diazepam, and amitriptyline	Y	N	ED MD/PMD
Ethanol	Y	N	ED MD/PMD
Seizure/loss of consciousness	Y	N	ED evaluation
<b>PRIMARY NURSE</b>			
Vital and orthostatic vital signs	Y	N	ED evaluation
> 1 fall in preceding 3 months	Y	N	PMD/GA
Long lie (> 5 minutes) or assistance required to get up	Y	N	PMD/GA
Recent change in mental status	Y	N	ED evaluation
Environmental hazards (e.g., poor lighting)	Y	N	HH
Vision examinations in preceding year	Y	N	Optometry
Complex social problems	Y	N	SS
Elder abuse	Y	N	SS
Inability to live independently	Y	N	SS
<b>PHYSICIAN</b>			
Abnormal orientation, including month and year	Y	N	ED evaluation
Abnormal hydration	Y	N	ED evaluation
Nutritional deficiency	Y	N	SS
Abnormal gait or balance: Get-Up-And-Go Test	Y	N	PMD/PT
Foot problems	Y	N	Podiatry
<b>PHYSICIAN ASSESSMENT OF CAUSE OF FALL (MAY BE MORE THAN ONE)</b>			
Sports or occupation	Y	N	Treat injury
Weakness/poor balance	Y	N	PMD/PT
Syncope/near syncope	Y	N	ED evaluation
Delirium/dementia	Y	N	ED evaluation
Seizure	Y	N	ED evaluation
New stroke	Y	N	ED evaluation
Complex medical problems	Y	N	PMD/GA
<b>PREVENTIVE MEASURES FOR OLDER PATIENTS</b>			
Exercise program	Y	N	Information
Calcium and vitamin D supplements	Y	N	Information
Pneumovax	Y	N	ED/PMD
Influenza vaccine	Y	N	ED/PMD

**Legend**  
**PMD** = Primary physician  
**ED MD** = ED physician  
**SS** = Social services  
**GA** = Geriatric assessment  
**HH** = Home health  
**PT** = Physical therapy

Adapted from: Baraff LJ, Della Penna R, Williams N, et al. A practice guideline for the ED management of falls in community-dwelling elderly persons. *Ann Emerg Med* 1997;30:480-489.

elbow motion is allowed as soon as comfort allows.<sup>56</sup> Consider closed reduction for most Colle's and Smith's fractures, although many emergency physicians may elect to splint and refer these fractures to an orthopedist.<sup>22</sup>

Soft-tissue atrophy and fragility make the elderly especially vulnerable to bleeding from wounds. Scalp lacerations may be associated with considerable ongoing blood loss in the elderly. Assure early hemostasis in these patients through direct pressure and prompt primary closure. Administer tetanus toxoid to all elderly trauma patients who are not adequately immunized, since patients ages 60 years and older are at much higher risk of acquiring tetanus than patients in younger age groups.<sup>46</sup>

### Prevention of Falls and Fall Injuries

Multiple studies have shown that elderly people who fall are likely to have fallen before. Every encounter with an elderly patient who falls provides an opportunity to review risk factors for falling, some of which might be reversible.<sup>57</sup> Emergency physicians play a central role in fall prevention, because they collect information about the circumstances of the fall from the patient, family, bystanders, and EMS personnel, which can illuminate intrinsic or extrinsic factors that are potentially modifiable.

This in turn requires an understanding of the basic principles of fall and injury risk mitigation and familiarity with those interventions that can be initiated in the ED. The major target areas for fall and fall injury risk mitigation include: the prevention of medication complications; improvements in mobility, balance, gait, and vision; elimination of home environmental hazards; and protection from osteoporotic fracture. These tasks are accomplished by: 1) evaluating the elderly patient's medications, functional status, home environment, and risk of osteoporosis; 2) educating the patient (and his or her family); and 3) referring the patient to his or her private physician, other health care professionals, or community-based resources for further intervention. Furthermore, the emergency physician plays a critical role in fall prevention simply by recognizing and treating those acute medical conditions and injuries that might lead to future falls.

**Prevention of Complications of Medications.** The role of reviewing and rationalizing the elderly patient's medications with the goal of eliminating or minimizing medication side effects that contribute to fall or fall injury generally belongs to the patient's primary care physician. However, the emergency physician needs to be cognizant of the effect medications have in contributing to falls.

It is recommended that short-lasting medications be prescribed over long-lasting medications. Persons older than 65 years should not take long-acting benzodiazepines (e.g., diazepam, chlordiazepoxide, or flurazepam) or long-acting antidepressants (e.g., amitriptyline). Avoid using longer-lasting nonprescription sleep preparations containing diphenhydramine (e.g., Tylenol PM). Long-lasting benzodiazepines, over-the-counter sleep preparations, and barbiturates all can be readily replaced by the shorter-acting lorazepam.<sup>39</sup>

Pain relief should start with the simplest measures with the least side effects, such as acetaminophen, and work step-wise toward more potent narcotics. Avoid using longer-acting nar-

cotics, such as propoxyphene, or more-sedating narcotics, such as hydromorphone or oxycodone in the elderly. Hydrocodone is an excellent alternative in these patients.<sup>39</sup> Carefully consider every prescription for sedative-hypnotic, analgesic, or psychotropic medication in the elderly from the perspective of their potential contribution to falling. In general, emergency physicians should avoid prescribing muscle relaxants, anticholinergics, hypnotic sedatives, and psychotropic medications whenever possible in the geriatric population.

When possible, adjust the dosing of essential medications that may lead to falls. Avoid overtreating hypertension, since antihypertensive medications are frequently associated with postural hypotension. Diuretics are commonly associated with hypovolemia and are a modifiable risk factor for falls in certain groups of elderly patients, such as residents of nursing homes.<sup>35</sup> Use the lowest effective dose of phenothiazines, such as prochlorperazine and promethazine.<sup>39</sup>

Perhaps most importantly, clinicians should attempt to minimize the number of medications taken by the elderly.

**Improvement of Mobility, Balance, Gait, and Vision.** In general, habitually active older persons have a lower prevalence of risk factors for falling.<sup>58</sup> Regular aerobic exercise appears to reduce the risk of falling and should be encouraged in elderly persons.<sup>59</sup> Exercise is especially important for patients who have fallen previously because these individuals tend to limit future physical activity, which increases the risk of subsequent falls.<sup>39</sup>

Exercises that promote agility and balance may be especially beneficial in elderly persons. The low-impact, Chinese martial art of Tai Chi improves balance and strength, while reducing the risk of falling in older patients.<sup>60,61</sup> Researchers recently reported that 15 weeks of Tai Chi reduced the risk of falls or multiple falls by 47.5% in an elderly cohort.<sup>60</sup> Referral to a physical therapist may benefit older patients with proximal muscle weakness or gait or balance problems.<sup>39</sup>

Elderly patients with lower extremity injuries may require mobility aides, such as canes, crutches or walkers. When a single point cane is used in reciprocal gait (cane used on the side opposite of the affected leg), about 15-20% of body weight is displaced onto the cane. Although increasingly more weight is displaced on four-point canes, crutches, and walkers, these devices are often more awkward to use than a single point cane. Consider consulting a physical therapist regarding the selection of the optimal mobility device.<sup>62</sup>

Improved footwear and foot function decrease the risk of falling. Shoes with flat soles are preferred in the elderly. Refer elderly patients with foot problems to a podiatrist for evaluation.<sup>39</sup> Refer elderly patients who have not had their eyes checked in the past two years to an optometrist.<sup>39</sup>

**Environmental Improvement.** Review the elderly patient's or his or her family's account of the fall with the goal of eliminating hazards and suggesting improvements that might mitigate falls. Night lights may reduce the risk of falls. Bath-tubs and showers should have safety strips and grab bars. Handrails are important for the ambulatory elderly. Throw rugs should be secured. Clutter should be minimized and objects that are difficult to see should be removed. Energy-dissipating surfaces and flooring may lessen the risk of injury from fall.<sup>39,63</sup>

Although many recommend home health visits by home health nurses, physical therapists, or occupational therapists in order to detect environmental hazards, the benefit of this strategy has been recently questioned.<sup>39</sup> One group recently reviewed the medical literature regarding the outcomes of preventive home visits to community-dwelling elderly and were unable to find clear evidence that home visits prevented falls.<sup>64</sup> This may reflect the relatively greater importance of intrinsic risk factors for falling, which home visits would not be expected to modify. However, these services still can be helpful in identifying and modifying suspected extrinsic factors, if suggested by the fall history.

**Fracture Protection.** The management of osteoporosis plays a central role in protecting elderly women from fractures. The emergency physician should be familiar with current modalities for managing osteoporosis, including hormonal replacement, pharmacological treatment, exercise, and nutritional support. Hormones include estrogen replacement therapy, tamoxifen, alendronate, growth hormone, testosterone, synthetic derivatives of progesterone, and calcitonin. Long-term estrogen use may not only increase bone mineral density, but also improve postural balance.<sup>65</sup> Pharmacological treatment includes biphosphonates, fluoride, and thiazides. Dietary modification includes increasing the intake of calcium to 1500 mg per day and Vitamin D to 750 U per day. The intake of caffeine, phosphates, and alcohol should be limited, and smoking should be ceased.<sup>66</sup>

## Disposition

Elderly patients with suspected cardiac syncope should be admitted to a telemetry bed for cardiac monitoring and serial serum troponin levels to rule out unstable cardiac arrhythmias and myocardial infarction.<sup>48</sup> Elderly patients with other acute medical problems, such as pneumonia or CHF, may require hospital admission depending on the nature of their associated conditions. Hospitalization may not be necessary for elderly patients with syncope who are hemodynamically stable and have no evidence of cardiovascular disease and a normal EKG.<sup>48</sup>

Elderly victims of blunt trauma with evidence of hypotension or tachycardia deserve rapid evaluation in the ED, focusing on the primary survey, and an expedited admission to a surgical intensive care unit bed for possible invasive hemodynamic monitoring (or to the operating room if indicated).<sup>47</sup>

Elderly trauma patients who fall, but who do not sustain life-threatening injuries, may be safely discharged from the ED after appropriate care. One study evaluated the outcomes of 105 consecutive elderly patients who presented with any potentially serious mechanism of injury and who were discharged home from the ED. Seventy-four of these patients sustained ground level falls. These 105 patients suffered a combined 131 injuries, consisting of 26 fractures; two dislocations; and an unspecified number of contusions, sprains and lacerations. At a mean interval of 49 days after discharge, only three patients had experienced complications, including two wound infections and one poorly healing wound.<sup>63</sup>

Patients without obvious fractures on plain radiographs should be instructed to follow up if they have persistent pain or a new complaint of pain or swelling. Nursing home resi-

dents and patients with cognitive impairment should be re-examined by their primary care physician to detect any new complaints or findings.

## Summary

The multifactorial and complex nature of falls in the elderly requires that emergency physicians develop and maintain an integrated and systematic approach to the care of the older patient who falls. Accordingly, emergency physicians should understand how intrinsic and extrinsic risk factors contribute to both falls and fall injury. They must also be able to anticipate the multiple consequences of falls, including injury and death. The ED evaluation of the elderly patient who falls should always include a careful search for the serious causes of fall, such as syncope and delirium, as well as the serious sequelae of falls, such as subdural hematoma and occult fractures. Perhaps most importantly, appropriate ED management of the elderly patient who falls requires that emergency physician follow both tracks simultaneously and provide emergency care for acute medical problems and trauma care for acute injuries.

The emergency physician also plays a potentially important role in fall and fall injury risk mitigation in the elderly outpatient sent home from the ED. Every ED encounter with an elderly patient who falls provides an opportunity to search for the remediable risk factors for falling, and to initiate appropriate counseling and referral.

## References

1. Tinetti ME, Doucette J, Claus E, et al. Risk factors for serious injury during falls by older persons in the community. *J Am Geriatr Soc* 1995;43:1214-1220.
2. Riley R. Accidental falls and injuries among seniors. *Health Rep* 1992;4:341-354.
3. Hartshorne NJ, Harruff RC, Alvord EC. Fatal head injuries in ground-level falls. *Am J Forensic Med Pathol* 1997;18:258-264.
4. Ellis GL. Subdural hematoma in the elderly. *Emerg Med Clin North Am* 1990;8:281-294.
5. Velasco J, Head M, Farlin E, et al. Unsuspected subdural hematoma as a differential diagnosis in elderly patients. *South Med J* 1995;88:977-979.
6. Spivak JM, Weiss MA, Cotler JM, et al. Cervical spine injuries in patients 65 and older. *Spine* 1994;19:2302-2306.
7. Ryan MD, Henderson JJ. The epidemiology of fractures and fracture-dislocations of the cervical spine. *Injury* 1992;23:38-40.
8. Muller EJ, Wick M, Russe O, et al. Management of odontoid fractures in the elderly. *Eur Spine J* 1999;8:360-365.
9. Mandavia D, Newton K. Geriatric trauma. *Emerg Med Clin North Am* 1998;16:257-274.
10. Lovasik D. The older patient with a spinal cord injury. *Crit Care Nurs Q* 1999;22:20-30.
11. Wagner R, Jagoda A. Spinal cord syndromes. *Emerg Med Clin North Am* 1997;15:699-711.
12. Cali CM, Kiel DP. An epidemiologic study of fall-related fractures among institutionalized older people. *J Am Geriatr Soc* 1995;43:1336-1340.

13. Freedland M, Wilson RF, Bender JS, et al. The management of flail chest injury: Factors affecting outcome. *J Trauma* 1990;30:1460-1468.
14. Alost T, Waldrop RD. Profile of geriatric pelvic fractures presenting to the emergency department. *Am J Emerg Med* 1997;15:576-578.
15. Tibbitts GM. Patients who fall: How to predict and prevent injuries. *Geriatrics* 1996;51:24-31.
16. Norton R, Campbell AJ, Lee-Joe T, et al. Circumstances of falls resulting in hip fractures among older people. *J Am Geriatr Soc* 1997;45:1108-1112.
17. Ross PD. Risk factors for osteoporotic fractures. *Endocrin Metabol Clin* 1998;27:289-301.68
18. Hopkins-Woolley JA, Parker MJ. Fractures of the hip: Does the type of fall really affect the site of fracture? *Injury* 1998;29:585-587.
19. Nguyen ND, Oesterling BR, Mc Laughlin RE, et al. Femoral neck fractures in the elderly patient: A preventable injury. *Am J Emerg Med* 1996;14:288-290.
20. Sherrington C, Lord SR. Increased prevalence of fall risk factors in older people following hip fracture. *Gerontology* 1998;44:340-344.
21. Tromp AM, Smit JH, Deeg DJ, et al. Predictors for falls and fractures in the Longitudinal Aging Study. Amsterdam. *J Bone Miner Res* 1998;13:1932-1939.
22. Villarin LA, Belk KE, Freid R. Emergency department evaluation and treatment of elbow and forearm injuries. *Emerg Med Clin North Am* 1999;17:843-858.
23. Nevitt MC, Cummings SR, Hudes ES. Risk factors for injurious falls: A prospective study. *J Gerontol* 1991;46:164-170.
24. McKoy BE, Bensen CV, Hartsock LA. Fractures about the shoulder. *Orthop Clin North Am* 2000;2:205-216.
25. Tinetti ME, Liu W, Claus EB. Predictors and prognosis of inability to get up after falls among elderly persons. *JAMA* 1993;269:65-70.
26. Grisso JA, Schwarz DF, Wolfson V, et al. The impact of falls in an inner-city elderly African-American population. *J Am Geriatr Soc* 1992;40:673-678.
27. King MB, Tinetti ME. Falls in community-dwelling older persons. *J Am Geriatr Soc* 1995;43:1146-1154.
28. Aoyagi K, Ross PD, Davis JW, et al. Falls among community-dwelling elderly in Japan. *J Bone Miner Res* 1998;13:1468-1474.
29. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med* 1988;319:1701-1707.
30. Baker SP, Harvey AH. Fall injuries in the elderly. *Clin Geriatr Med* 1985;1:501-508.
31. Sattin RW. Falls among older persons: A public health perspective. *Annu Rev Public Health* 1992;13:489-508.
32. Sattin RW, Lambert Huber DA, DeVito CA, et al. The incidence of fall injury events among the elderly in a defined population. *Am J Epidemiol* 1990;131:1028-1037.
33. Walker N, Norton R, Vander Hoorn S, et al. Mortality after hip fracture: Regional variations in New Zealand. *N Z Med J* 1999;112:269-271.
34. Stevens JA, Hasbrouck LM, Durant TM, et al. Surveillance for injuries and violence among older adults. *Mor Mortal Wkly Rep CDC Surveill Summ* 1999;48:27-50.

35. Jantti PO, Pyykko I, Laippala P. Prognosis of falls among elderly nursing home residents. *Aging (Milano)* 1995;7:23-27.
36. Bath PA, Morgan K. Differential risk factor profiles for indoor and outdoor falls in older people living at home in Nottingham, UK. *Eur J Epidemiol* 1999;15:65-73.
37. Davies AJ, Kenny RA. Falls presenting to the accident and emergency department: Types of presentation and risk factor profile. *Age Ageing* 1996;26:362-366.
38. Shaw FE, Kenny RA. The overlap between syncope and falls in the elderly. *Postgrad Med J* 1997;73:635-639.
39. DeVito CA, Lambert DA, Sattin RW, et al. Fall injuries among the elderly. Community-based surveillance. *J Am Geriatr Soc* 1988;36:1029-1035.
40. Ensrud KE, Nevitt MC, Yunis C. Postural hypotension and postural dizziness in elderly women. The study of osteoporotic fractures. The Study of Osteoporotic Fractures Research Group. *Arch Intern Med* 1992;152:1058-1064.
41. Lieberman IH, Webb JK. Cervical spine injuries in the elderly. *J Bone Joint Surg Br* 1994;76:877-881.
42. Nahit ES, Silman AJ, Macfarlane GJ. The occurrence of falls among patients with a new episode of hip pain. *Ann Rheum Dis* 1998;57:166-168.
43. Guss DA. Hip fracture presenting as isolated knee pain. *Ann Emerg Med* 1997;29:418-420.
44. Traynelis VC. Chronic subdural hematoma in the elderly. *Clin Geriatr Med* 1991;7:583-598.
45. Calkins DR, Rubenstein LV, Cleary PD, et al. Failure of physicians to recognize functional disability in ambulatory patients. *Ann Intern Med* 1991;114:451-454.
46. Bardenheier B, Prevots DR, Khetsuriani N, et al. Tetanus surveillance—United States, 1995-1997. *Mor Mortal Wkly Rep CDC Surveill Summ* 1998;47:1-13.
47. Scalea TM, Simon HM, Duncan AO, et al. Geriatric blunt multiple trauma: Improved survival with early invasive monitoring. *J Trauma* 1990;30:129.
48. Forman DE, Lipsitz LA. Syncope in the elderly. *Card Clin* 1997;15:295-311.
49. Villarín LA, Belk KE, Freid R. Emergency department evaluation and treatment of elbow and forearm injuries. *Emerg Med Clin North Am* 1999;17:843-858.
50. Safe AF, Cooper S, Windsor AC. Cerebellar ataxia in the elderly. *J R Soc Med* 1992;85:449-451.
51. Vellas BJ, Wayne SJ, Romero L, et al. One-leg balance is an important predictor of injurious falls in older persons. *J Am Geriatr Soc* 1997;45:735-738.
52. Mathias S, Nayak USL, Issacs B. Balance in elderly patients: The "Get-up-and-go" test. *Arch Phys Med Rehabil* 1986;67:387-389.
53. Pandey R, McNally E, Ali A, et al. The role of MRI in the diagnosis of occult hip fractures. *Injury* 1998;29:61-63.
54. Riggs JE. Mortality from accidental falls among the elderly in the United States, 1962-1988: Demonstrating the impact of improved trauma management. *J Trauma* 1993;35:212-219.
55. Advanced Trauma Life Support Student Manual, 6th ed. Chicago, IL: American College of Surgeons; 1997.
56. Kuntz DG, Baratz ME. Fractures of the elbow. *Ortho Clin North Am* 1999;1:37-61.
57. Kiely DK, Kiel DP, Burrows AB, et al. Identifying nursing home residents at risk for falling. *J Am Geriatr Soc* 1998;46:551-555.
58. Henderson NK, White CP, Eisman JA. The roles of exercise and fall risk reduction in the prevention of osteoporosis. *Endocrinol Met Clin* 1998;27:369-387.
59. Lord SR, Ward JA, Williams P, et al. The effect of a 12-month exercise trial on balance, strength and falls in older women: A randomized controlled trial. *J Am Geriatr Soc* 1995;43:1198-1205.
60. Wolf SL, Barnhart HX, Kutner NG, et al. Reducing frailty and falls in older persons: An investigation of Tai Chi and computerized balanced training. *J Am Geriatr Soc* 1996;44:489-497.
61. Wolfson L, Whipple R, Derby C, et al. Balance and strength training in older adults: Intervention gains and Tai Chi maintenance. *J Am Geriatr Soc* 1996;44:498-506.
62. Hoening H, Nusbaum N, Brummel-Smith K. Geriatric rehabilitation: State of the art. *J Am Geriatr Soc* 1997;45:1371-1381.
63. Ferrera PC, Bartfield JM, D'Andrea CC. Geriatric trauma: Outcomes of elderly patients discharged from the ED. *Am J Emerg Med* 1999;17:629-632.
64. Van Haastregt JC, Diederiks JP, Van Rossum E. Effects of preventive home visits to elderly people living in the community. *BMJ* 2000;320:754-758.
65. Naessen T, Lindmark B, Larsen HC. Better postural balance in elderly women receiving estrogens. *Am J Obstetr Gyn* 1997;177:412-416.
66. O'Connell MB. Prevention and treatment of osteoporosis in the elderly. *Pharmacotherapy* 1999;19:7-20.
67. Guralnik JM, Ferrucci L, Simonsick EM, et al. Lower-extremity function in persons over the age of 70 years as a predictor. *N Engl J Med* 1995;33:556-561.
68. McGee DJ, Mobley HL. Is this patient hypovolemic? *JAMA* 1999; 281:1022-1029.

### Physician CME Questions

23. Which of the following medications should be avoided in the elderly because of the association listed?
  - A. Acetaminophen: liver toxicity
  - B. Hydrocodone: long duration of action
  - C. Muscle relaxants: increased risk of sedation
  - D. Lorazepam: prolonged half-life.
24. Which of the following disposition decisions regarding elderly persons who fall, is true?
  - A. All persons older than 80 years who fall should be admitted.
  - B. Nursing home residents and patients with cognitive impairment who have no obvious fracture on plain films require close follow-up and re-examination.
  - C. Patients with possible cardiac syncope can be discharged home if their EKGs are normal.
  - D. Elderly patients who fall and are discharged from the ED are at high risk for poor outcomes and complications.
25. Elderly patients who fall are at high risk for all of the following injuries *except*:
  - A. subdural hematoma.

- B. odontoid fracture.
  - C. proximal humerus fracture.
  - D. calcaneal fracture.
26. All of the following are true regarding elderly patients who die from fall *except*:
- A. More elderly patients die from falls than any other mechanism of injury.
  - B. Hip fractures occur in half of elderly patients who die from falling.
  - C. Pulmonary embolism occurs in 13% of elderly patients who die from fall.
  - D. Open-book type pelvic fractures is a common cause of death in elderly patients who fall.
27. The evaluation of the elderly patient who falls includes all of the following *except*:
- A. EKG for patients with possible syncope.
  - B. MRI scan for patients with persistent hip pain, but negative plain films.
  - C. head CT scan for patients with a change in mental status.
  - D. CBC in all patients who fall.
28. The most important intervention in preventing complications from medications in elderly patients who fall is:
- A. replacing short-lasting medications with long-lasting ones.
  - B. discontinuing all narcotic analgesics.
  - C. eliminating antidepressants.
  - D. minimizing the total number of medications.
29. The appropriate management of the elderly patient with injurious fall includes all of the following *except*:
- A. treatment of proximal humerus fractures with a sling.
  - B. cardiac monitoring for all patients who suffer injurious fall.
  - C. fluid resuscitation with IV Ringer's lactate solution.
  - D. tetanus toxoid administration in patients not adequately immunized.
30. Falls cause significant morbidity and mortality in the elderly. Which of the following is true?
- A. Falls are the second leading cause of death after pedestrian-MVAs.
  - B. Hip fractures account for one-half of all fall-related deaths.
  - C. Elderly women are more likely to sustain a fatal fall.
  - D. Nursing home patients who fall have a slightly increased risk of one-year mortality compared to non-fallers.

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