

Falls in the elderly

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ABSTRACT With a rapidly ageing population, doctors in all specialties are likely to encounter older people with falls. Falls in the elderly are common and associated with major morbidity and mortality. Falls cause injuries, fractures, loss of confidence and independence, depression and death. Recurrent falls and fear of falling are the most common reasons for an older person to require nursing home care. An initial fall may be a manifestation of an acute illness and may be the only presenting feature. However, it is known that an index fall is a risk for future falls and approximately half of those who fall once are likely to do so again.

There is good evidence to support a multidisciplinary risk factor assessment and approach to the prevention of falls. Up to 30% of falls in community-dwelling older adults may be prevented if this standardised approach is applied. In addition, falls of hospital inpatients are difficult for patients and staff. Carers in environments where specialist medicine for the elderly services are not routinely available often struggle to minimise and manage falls. While arguably more problematic to manage, a simple structured approach to these falls can also reduce risk.

This article will cover the recommended approach to the management of older people presenting with a fall and give some guidance about managing falls of hospital inpatients.

KEYWORDS Elderly, falls, hip fracture, osteoporosis

DECLARATION OF INTERESTS No conflict of interests declared.

It is known that approximately one in three people over the age of 65 living in the community will fall each year. This figure approaches one in two by the age of 80, and fall rates are even higher for residents of nursing homes and those in institutions.

Falls cause injuries such as bruising, lacerations and fractures, for example Colles's fracture and fractured neck of femur. These injuries are both costly to the individual, in terms of loss of independence and functional ability, and costly to the health and social care services. It is estimated that the NHS in England and Wales spends an average of £15 million annually on fall-related injuries; this excludes hip fracture, which costs the NHS in the UK £1.7 billion annually.

Further hidden costs for the individual occur in terms of depression, loss of confidence and even mortality. Falls are the leading cause of accidental death in older people.

Up to 30% of falls are preventable if a standardised multidisciplinary approach is used. Guidelines do exist from the National Institute for Health and Clinical Excellence (NICE), the Joint British and American Geriatric Societies and the American Academy of Orthopaedic Surgeons and the Scottish Intercollegiate

Guidelines Network (SIGN), and are derived from a robust body of evidence. There is now a political will within the National Service Framework for Older People in England and Wales and within the Scottish Executive to tackle this problem uniformly throughout the UK.

The high incidence of osteoporosis (see SIGN 71, listed in Further Reading) and risk of fracture in the older population means that it makes sense to combine falls prevention with fracture prevention measures.

Falls and fracture assessment depends on accurate history and examination. Risk factors are addressed individually, but also essentially as part of a multidisciplinary team assessment. The risk of future falls increases with the number of risk factors found (see Table 1). It is of note that some risk factors are not modifiable. The essential features of this risk assessment and interventions that are of proven benefit are discussed below.

RISK ASSESSMENT

An accurate history is vital in order to dictate how a fall is investigated. Is this the first fall, or has the patient fallen before? It is important to judge if this fall is in the context of an acute illness. Does the patient suffer

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TABLE 1 Risk factors for falls

- Lower limb weakness
- History of falls
- Gait/balance problem
- Visual impairment
- Arthritis of lower limb joints
- Postural hypotension
- Polypharmacy, i.e. four or more drugs
- Cognitive impairment
- Incontinence
- Age over 65

TABLE 2 Common causes of postural hypotension

- Drugs
- Dehydration
- Anaemia
- Sepsis
- Alcohol
- Prolonged bed rest following illness
- Carotid sinus disease
- Autonomic failure
- Adrenal insufficiency

recurrent falls? What were the circumstances? Was there any warning prior to the fall, and was there any witnessed syncopal event? For patients with poor recall, a collateral history from a carer is extremely useful.

The most important aspects of history-taking and examination are highlighted below.

Light-headedness/dizziness

Light-headedness is generally caused by postural hypotension; this should be distinguished on history from dizziness or syncope.

Postural hypotension is usually described as a feeling of light-headedness and relates to standing or changes in posture. It is a particularly significant symptom and has a range of causes. This is the most common modifiable risk factor for falls in older people. The major causes of postural hypotension are shown in Table 2.

Older people use the term 'dizziness' to describe both light-headedness and vertigo (true dizziness). A history of vertigo should include reference to rotational or 'to-and-fro' hallucination of movement. If confirmed, conditions such as benign positional vertigo (vertigo on head movement/change in posture associated with nystagmus and nausea), vestibular neuronitis (due to viral labyrinthitis, usually associated with systemic upset) or Ménière's disease (deafness, tinnitus and unsteadiness) should be considered (see Table 3). Isolated acute

TABLE 3 Causes of vertigo

- Benign positional vertigo
- Viral labyrinthitis
- Ménière's disease
- Brainstem stroke

TABLE 4 Drugs linked to falls causation

Drugs linked to falls by causing postural hypotension	Drugs linked to falls via other mechanisms, e.g. sedation/confusion/unsteadiness
Nitrates	Benzodiazepines
Angiotensin-converting enzyme (ACE) inhibitors	Antipsychotics, e.g. haloperidol
Diuretics	Opiates
Anticholinergics	Codeine-based analgesics
L-Dopa	Anticonvulsants
Anti-platelet agents	Digoxin (not known)
Antidepressants, particularly tricyclics and selective serotonin reuptake inhibitors (SSRIs)	Class Ia anti-arrhythmics (not known)

vertigo is unusual. If vertigo is a result of stroke then it will be associated with brainstem/cerebellar symptoms and signs.

Syncope

There are many causes of syncope, and a full discussion is outside the scope of this article. Syncope implies loss of consciousness and there may be amnesia regarding the event. A witness history in these circumstances is vital. There has been much interest in carotid sinus hypersensitivity (CSH) as a cause of syncope/falls in the elderly. Carotid sinus hypersensitivity is a condition of abnormal baroreceptor response to changes in posture, and causes either hypotension (vasodepressor type), bradyarrhythmia (cardio-inhibitory type) or a combination. There are no specific features of CSH on history-taking, but it should be considered within the differential diagnosis for falls if syncope is suspected.

Past medical history

Neurological conditions such as previous stroke, Parkinson's disease, multiple sclerosis and multisystems atrophy increase the risk of falls. Diabetes and alcohol causing peripheral neuropathy or peripheral vascular disease also increase the risk, as does any condition causing arthropathy, particularly of the lower limb joints.

Drug history

Polypharmacy (four or more drugs) is associated with an increased risk of falls. This reflects multiple co-morbidities,

TABLE 5 Mini Mental State Examination (MMSE) or clock-drawing test for cognitive impairment

The **Mini Mental State Examination** is a 30-item screening questionnaire that tests many domains of cognition. A score of 24 or less indicates significant cognitive impairment.

The **clock-drawing test** involves the patient being asked to fill in a circle resembling a clock face and to set the hands at a specific time, e.g. 11:45. The clock face is divided into four quadrants and a total of 15 points is given for correct completion.

but some drugs have been found specifically to increase the risk of falls, e.g. digoxin, benzodiazepines and sedatives. Other drugs have a direct blood pressure-lowering effect, e.g. anti-anginals, antihypertensives, dipyridamole, antidepressants, L-dopa and anticholinergics. Altered drug metabolism in the elderly, e.g. with opiates (prolonged half-life due to renal impairment), also contributes to unsteadiness and confusion (see Table 4).

Osteoporosis

Any history of previous fracture (particularly low-impact fracture such as Colles's, hip or vertebral fractures) and screening questions for osteoporosis (history of premature menopause/loss of height/maternal hip fracture/long-term steroids) are important in order to assess for osteoporosis and minimise future fracture risk.

EXAMINATION

General examination should include a full cardiovascular, neurological and musculoskeletal examination looking for signs of postural hypotension, aortic stenosis, joint deformity and instability (particularly of lower limb joints). Lower limb weakness of any cause and peripheral neuropathy should be looked for. Kyphosis, often an incidental finding, should highlight osteoporosis.

Gait

The patient's gait should be reviewed. A simple assessment of gait is the 'get up and go' test, where patients are asked to stand unaided from a chair, without the use of their arms, and walk six metres. They are then asked to turn around and return to the chair. This can be performed in any setting, is easily reproducible and there is little in the way of inter-observer variability. Impaired 'sit to stand' is probably the most sensitive indicator of falls risk. If a patient presents with a fall and an unsteady 'get up and go' test, a full multidisciplinary falls assessment is needed.

Feet

The patient's feet should be examined for abnormalities and inappropriate footwear.

Visual acuity

Visual impairment per se is a risk factor, and visual acuity should therefore be measured.

Cognitive assessment

Dementia is associated with gait instability and poor safety awareness. An initial screening using the clock drawing test or Mini Mental State Examination (see Table 5) should be performed where cognitive impairment is suspected. A collateral history will help to differentiate acute delirium from dementia. Patients with dementia constitute a significant proportion of those who fall, and their risks should be addressed or modified where possible.

INVESTIGATIONS

Patients with falls should have electrolytes and full blood count measured to exclude anaemia or dehydration. Erythrocyte sedimentation rate and bone biochemistry is worth measuring if looking for causes of osteoporosis.

Significant postural hypotension is defined as a drop of at least 20 mmHg in systolic blood pressure (BP) and \pm 10 mmHg in diastolic BP. Postural BP measurements should be taken with the patient supine and relaxed for at least five minutes before the initial measurement, and BP should be repeated once the patient stands, and again at five minutes. It is easy to miss postural hypotension, as BP control varies throughout the day with posture, eating and micturition. Measurements should be made at varying intervals throughout the day, particularly if the patient has definite symptoms. Occasionally, 24-hour BP monitoring is helpful if the patient remains symptomatic and falling and initial measurements have failed to confirm the diagnosis.

An electrocardiogram is useful if arrhythmia or syncope is suspected, especially if there is a history of presyncope and/or underlying cardiac disease; but if entirely normal there is little value in pursuing a holter monitor, as the diagnostic yield is limited.

Tilt testing for CSH can be performed, providing frailty does not preclude it.

Benign positional vertigo can be diagnosed in an outpatient setting by performing a Hallpike manoeuvre (Figure 1). If positive, a series of Epley's manoeuvres (Figure 2) can be combined with simple advice about posture. It is particularly rewarding to diagnose benign positional vertigo, as it is one of the few treatable causes of vertigo. An ear, nose and throat referral may be appropriate if there is doubt or difficulty performing the tests.

Fracture risk

A patient with a history of previous low-impact fractures or evidence of vertebral fractures may be confirmed to

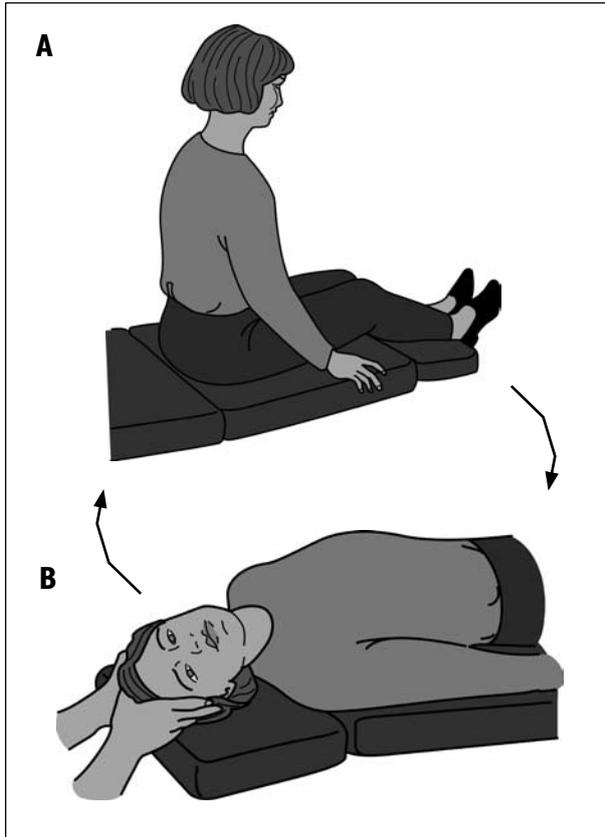


FIGURE 1 Hallpike manoeuvre

Patient sits upright with head turned sideways to examiner and then brought rapidly down to 30 degrees below the level of the couch.

Patient may experience vertigo and nausea during test and should be advised to keep eyes open so that nystagmus can be observed.

A positive test reveals fast nystagmus in the eyes towards the lower ear and slow towards the upper ear. This is repeated on the opposite ear for testing.

(Taken from: <http://www.dizziness-and-balance.com> with permission from T Hain.)

have osteoporosis by dual energy X-ray absorptiometry scanning. A bone mineral density of 2.5 standard deviations below the mean confirms the diagnosis (see SIGN 71).

Physiotherapy

The cornerstone of physiotherapy is assessment of gait and balance, and may include the Elderly Mobility Score, 'get up and go' and 180-degree turn. The latter is a measure of the number of steps required to turn 180 degrees, and increases with unsteadiness.

Occupational therapy

Assessment of transfer safety, footwear and environmental hazards are standard risk assessments for falls.

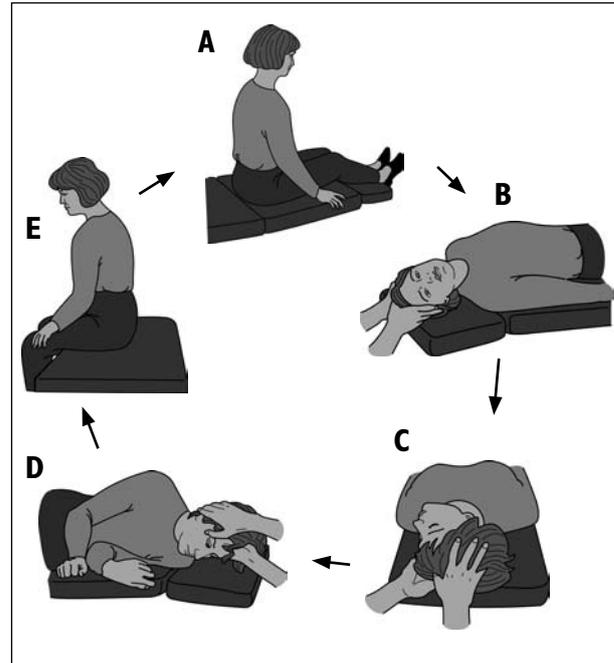


FIGURE 2 Epley's manoeuvres

A Hallpike manoeuvre is performed on the affected side and the head is rotated around in a series of movements as shown. (Taken from: <http://www.dizziness-and-balance.com> with permission from T Hain.)

INTERVENTIONS

Interventions for the prevention of falls are multidisciplinary. Medical interventions are focused on treatment of postural hypotension, review of medication, vision, continence, cognition and osteoporosis.

Postural hypotension may improve on discontinuation of culprit drugs. Symptomatic measures such as thromboembolism-deterrent stockings, raising the bed head and ensuring adequate fluid intake may be of benefit but can be impractical to implement.

If the patient remains symptomatic, and simple causes have been excluded, consider drug treatment. Drugs such as fludrocortisone (0.1 mg daily, increasing to twice daily) may help, but electrolytes should be monitored for hypokalaemia. Midodrine is an alpha-agonist and is not licensed in the UK, but can be used to treat severe postural hypotension on a named patient basis.

All drugs should be reviewed and discontinued where appropriate. A pragmatic approach to the reduction of medication is often necessary, particularly for medication used for secondary prevention (e.g. warfarin for atrial fibrillation or antihypertensives), if an individual's injury or fracture risk outweighs their risk of future stroke or myocardial infarction.

Syncope, if confirmed as cardio-inhibitory CSH, may respond to permanent pacemaker insertion. There is

some evidence that, if searched for aggressively, CSH can be found in up to 23–50% of individuals presenting with unexplained falls. Guidelines suggest screening should be considered in patients with syncope where pacemaker insertion would be appropriate.

While falls prevention alone does not necessarily reduce fractures, a combined 'osteoporosis risk' approach is vital. Osteoporosis (see SIGN 71) should be treated and lifestyle advice provided, e.g. smoking cessation, reduction in alcohol intake, adequate calcium and vitamin D intake and exercise. Calcium and vitamin D are recommended for frail, housebound people in order to prevent fractures, although this does not necessarily prevent falls. Some studies indicate that vitamin D supplementation may prevent postural sway and improve lower limb strength, while other studies have been inconclusive. Compliance is undoubtedly an issue with calcium and vitamin D. Older people should be encouraged to get exposure to sunlight and have a calcium intake of at least 1 g daily.

Visual problems should receive specialist ophthalmology review and, if appropriate, be referred for cataract surgery. Depth perception is altered by wearing bifocals, which is ill-advised when walking.

Guidelines deem incontinence as a risk factor for falls. It is good practice therefore to assess the cause of incontinence, e.g. detrusor instability, stress incontinence, faecal impaction or retention with overflow, and treat as appropriate.

Physiotherapy interventions focus on strength and balance training. Programmes should be individually tailored and last for at least eight weeks. The Otago programme, an exercise programme for community-dwelling individuals in New Zealand, is easily reproducible and cost-effective.

Occupational therapy, in particular home hazard intervention, aids for transfers, community alarm service (CAS) alarms (a pendant worn around the neck, which the wearer can press to summon help from carers should they fall) and environmental modification are beneficial.

Falls research has confirmed that the only effective interventions for prevention are multidisciplinary. No individual intervention alone can be recommended. Multidisciplinary assessment with physiotherapy exercise programmes and occupational therapy hazard reduction has been tried and tested in a variety of settings. It is essential that a patient presenting with a fall can access a full multidisciplinary assessment. How this occurs will depend on local services. For elderly patients in the UK this is normally done via the geriatric day hospital or community rehabilitation teams.

TABLE 6 'Modified' STRATIFY risk assessment tool (adapted from Oliver et al.)

Answer questions below. YES=1, NO=0. A score of 2 or more indicates risk.

Did the patient present to hospital with a fall or has he or she fallen on the ward since admission?

Do you think the patient is:

Agitated?

Visually impaired to the extent that everyday function is affected?

In need of especially frequent toileting?

Unsteady in their gait/transfer?

INPATIENT FALLS

Inpatient falls are challenging. They may occur frequently in confused older patients with an acute illness or in well patients who fall more frequently during the acute phase of rehabilitation.

Assessment tools vary between settings, and are used primarily to highlight awareness of risk. None of these tools are ideal, but an example is a 'modified' STRATIFY score (see Table 6). An approach similar to the multifactorial one described above, along with nursing care plans and raised awareness, has been shown to be effective in preventing inpatient falls. A pragmatic approach to injury prevention seems appropriate.

Lowering the height of the bed, ensuring the call bell is within reach and one-to-one nursing observation at night are practical measures that help to prevent injuries. Sedatives should be avoided at all costs. Cot sides are controversial, as their use may mean that a fall occurs from a greater height and there have been reports of entrapment in bed rails. Assessment of risk over benefit should be made on an individual basis, with consent if possible. Initial reports of hip protectors in hip fracture prevention were promising in cluster-randomised, controlled trials in institutional settings, but more recent randomised trials have failed to confirm their benefit. It can be helpful to acknowledge that some falls cannot be prevented, but all attempts to reduce injuries should be made. A combination of strategies, along with education of staff and relatives, can reduce the anxiety for carers.

Finally, incident reporting is vital, and falls should always be included as a diagnosis on the discharge summary. They are an important marker of frailty in older people. Under-reporting is a major issue and hampers good research.

KEY POINTS

- One in three adults over the age of 65 falls annually and falls are therefore a significant public health concern.
- Falls in older people are the leading cause of hip fracture – a condition associated with high morbidity, mortality and cost to the NHS.
- Up to 30% of falls can be prevented with targeted multidisciplinary risk factor assessment and intervention.
- Falls prevention should include assessment and treatment of osteoporosis as a means to prevent fracture.
- Any older patient presenting with a fall and an unsteady 'get up and go' test warrants a full multidisciplinary assessment.

FURTHER READING

- American Geriatrics Society, British Geriatrics Society, American Association of Orthopaedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. *J Am Geriatric Soc* 2001; 49:664–72.
- Close J, Ellis M, Hooper R et al. Prevention of falls in the elderly trial (PROFET): a randomised controlled trial. *Lancet* 1999; 353(9147):93–7.
- Department of Health. *The National Service Framework for Older People*. London: Department of Health; 2001.
- National Institute for Health and Clinical Excellence. *Clinical practice guideline for the assessment and prevention of falls in older people. Clinical Guidance 21*. London: NICE; 2004.
- NHS National Patient Safety Agency. *Slips, trips and falls in hospital. The third report from the National Patient Safety Observatory*. London: National Patient Safety Agency; 2007.
- Oliver D, Daly F, Martin FC et al. Risk factors and risk assessment tools for falls in hospital inpatients; a systematic review. *Age Ageing* 2004; 33:122–30.
- Scottish Intercollegiate Guidelines Network. *Prevention and management of hip fracture in older people. SIGN Publication No. 56*. Edinburgh: SIGN; 2002.
- Scottish Intercollegiate Guidelines Network. *Management of osteoporosis. SIGN Publication No. 71*. Edinburgh: SIGN, 2003.
- Smith R. Validation and reliability of the Elderly Mobility Score. *Physiotherapy* 1994; 80:744–7.

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