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What you need to know about falls

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Abstract

Falls are a common presenting complaint, particularly in older patients, and are associated with significant morbidity. Inpatient falls also have financial implications for healthcare systems, including litigation costs.

This article provides an approach to assessing a patient presenting with a fall, encompassing the cause and consequence of the event. It also highlights the need to consider both the acute and chronic factors that predispose a particular patient to fall.

Chronic factors such as frailty, sarcopenia, cognitive impairment, and continence issues are often under-recognised and, as a result, not managed optimally.

A comprehensive geriatric assessment is an ideal structure to identify modifiable risks. Practical interventions that can be of benefit to minimise a patient's risk of falling include a medication review, assessment of their mobility and their environment. In addition, continence review and visual assessment may be appropriate.

Key words: Balance; Falls; Frailty; Medication; Multidisciplinary

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Introduction

Falls are common, particularly in an ageing population, with half of patients over 80 years of age falling at least yearly (Public Health England, 2020). Falls can have a devastating impact on individuals and are associated with significant morbidity and mortality (Anderson, 2008). Patients may lose their premorbid independence and are more likely to require 24-hour care following a fall (Basic and Hartwell, 2015). The National Institute for Health and Care Excellence (2013a) estimate that falls in hospital and the community cost the NHS £2.3 billion annually, including significant litigation costs incurred from inpatient falls.

Humans require a wealth of sensory information to maintain balance; peripheral sensation including proprioception of the lower limbs, vision, and input from the vestibular system. Sufficient attention must also be paid to these inputs. These sources are integrated and coordinated mostly by the brainstem and cerebellum respectively. Movement is generated by the frontal lobe and basal ganglia. This stimulates the lower limb muscles to produce a gait cycle and control core muscles to maintain posture. For these higher functions to be successful, adequate cerebral perfusion must be maintained. Figure 1 summarises these processes.

Presentation with a fall is a key geriatric syndrome and often heralds underlying problems that should be meticulously screened for. When a patient presents with a fall clinicians should ask:

- What are the acute reasons contributing to the fall?
- What are the chronic factors contributing to the fall?
- What can be done about these factors – treat acute and chronic conditions, modify risk?

Although it is not possible to entirely prevent patients from falling, this article examines the assessment of falls, which rarely have a single cause, and how individuals' risk can be reduced as part of a wider comprehensive geriatric assessment. This review does not consider syncope, cardiac or neurological causes which, while important, do not account for most falls in frail older adults.

When assessing a patient, it is vital to assess for injury. Major trauma is increasing in the older population, with falls being the most common cause (Kehoe et al, 2015). The Royal College of Emergency Medicine (2019) emphasised the importance of 'silver trauma' recognition and prompt assessment, highlighting that low impact trauma in frail older adults can also be significant. A guide for assessing a frail, older adult post fall is found in Table 1.

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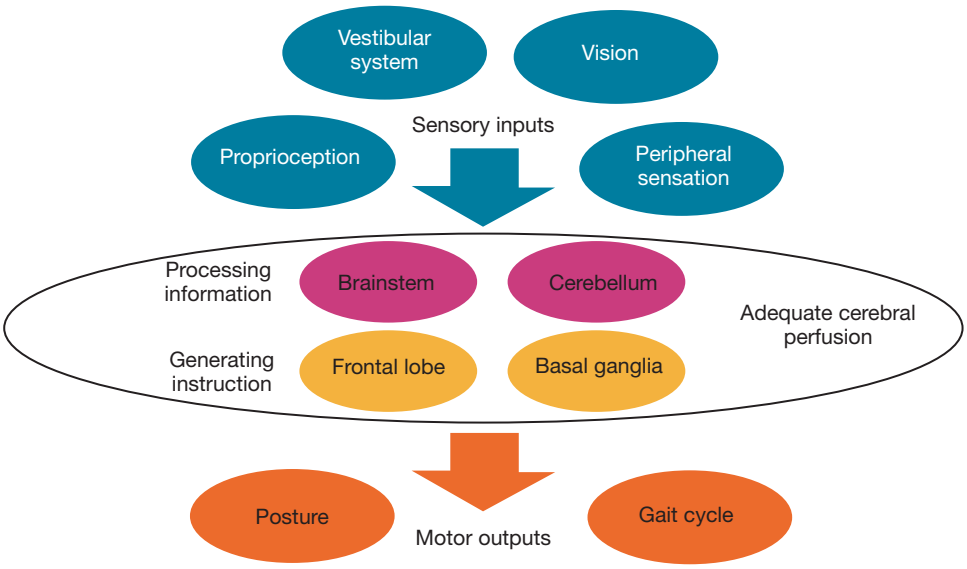

Figure 1. Diagram illustrating the complex processes involved in maintaining humans' upright position and controlling movement.

Table 1. Fall review
Airway, Breathing, Cardiovascular, Disability, Exposure assessment
Detailed secondary survey for injuries (neck, hips, back, lower limbs)
Full examination, eg murmurs, bradycardia, neurological deficit, infection
History and collateral history
Observations including lying and standing blood pressure and blood sugar
Basic investigations (consider bloods, electrocardiogram, X-rays, mid-stream urine)
Does the patient need a computed tomography scan of the brain, eg if on anticoagulation (see National Institute for Health and Care Excellence, 2014)
Medication review
Review for other acute contributory causes and address these
Review for other chronic contributory causes and address these
Does the patient need enhanced falls prevention measures?
Multidisciplinary falls risk assessment

Acute factors precipitating falls

There are many acute factors that may precipitate falls and the list is fairly synonymous with causes of delirium. Infection, stroke, delirium itself, dehydration, constipation, hyponatraemia, vertigo or any another acute illness may cause a fall by impairing the mobility and balance systems, outlined previously. After thorough history and top-to-toe examination, investigations should include a lying and standing blood pressure, routine blood tests, an electrocardiogram and consideration of mid-stream urine and a chest X-ray. A validated screening tool for delirium, such as the 4 'As' Test (4AT) (Royal College of Physicians, 2015), should be completed.

Chronic factors contributing to falls

Frailty

Frailty is a spectrum of vulnerability resulting from a diminishing physiological reserve where minor stressors result in excessive health consequences. Frailer patients are more

prone to falls (Clegg et al, 2013), so it is important to identify this. The Clinical Frailty Scale (Rockwood et al, 2005), which comprises a nine-part frailty score extending from 'very fit' to 'terminally ill', can qualify frailty. Frailty can also be detected using the 'timed up and go test'. This times the patient standing from a chair, walking 3 metres, turning around and sitting back down. A duration of 10 seconds or more is suggestive of frailty (Turner, 2014). A gait speed of less than 0.8 m/s is another practical indicator of frailty (Turner, 2014).

Falls are inextricably linked to many areas of the comprehensive geriatric assessment and therefore all frail patients who fall should have this assessment. Comprehensive geriatric assessment uses a multidisciplinary approach including a functional assessment, medication review including bone health, continence, cognition and mood, to identify problems which can then be managed. Patients who have had this assessment are significantly less likely to fall in the future (Cameron et al, 2018).

Sarcopenia

Sarcopenia is the loss of muscle mass and strength, which occurs with ageing. Core strength is reduced and patients are less able to maintain their balance, which predisposes them to falling (Bijlsma et al, 2013).

Looijaard et al (2018) warn that a single parameter is not sufficient to always identify sarcopenia because of low sensitivity rates. Hand grip strength and chair to stand tests are both recommended by the British Geriatric Society as easy bedside tests to detect sarcopenia (Cruz-Jentoft et al, 2019). Optimising nutrition, including vitamin D levels, and encouraging weight-bearing exercises are key to slowing the progression of sarcopenia (Schneider and Trence, 2019).

Proprioception and balance

Balance is maintained through the synthesis of sensory information from the vestibular system, vision and proprioception. The latter appears to be most crucial in maintaining the upright position and also in adjusting the posture to limit injury if the person were to fall (Le Goic et al, 2018). Ageing affects muscle spindles, which contain proprioceptors, and the afferent pathway becomes progressively atrophied, reducing sensory feedback, rendering a higher chance of falling (Goble et al, 2011). Proprioceptor inputs from the leg are particularly important (Henry and Baudry, 2019) and therefore conditions that cause peripheral neuropathies, such as diabetes and alcoholism, need to be identified. A visual assessment is also essential. Finally, identifying any foot pain or deformity and providing suitable footwear, or orthotics, can improve balance.

Physiotherapy assessment of mobility and, if indicated, the provision of mobility aids is helpful (Hopewell et al, 2018). Strength and balance training is a successful falls prevention intervention, particularly for those living in the community (National Institute for Health and Care Excellence, 2013a). This comprises weekly education and exercise classes for at least 6 weeks and can be tailored to individual needs. An environmental assessment, usually performed by an occupational therapist, is important to minimise potential hazards (Hopewell et al, 2018).

Cognitive impairment

Patients with dementia are more than twice as likely to fall as patients of the same age who do not have cognitive impairment (Allali et al, 2017). This is predominantly the result of a loss of executive function. They are less able to make reasonable judgements when planning movements. Those with cognitive impairment can be eight times as likely to overestimate the distance they could reach (Liu-Ambrose et al, 2008), leading to falls.

Cognitive impairment makes patients less able to remember safety awareness techniques taught to them and less likely to remember how unsteady they are or that they need assistance. These patients are also less able to engage with therapy services, compromising their rehabilitation (Hartley et al, 2016).

The presence and extent of any impairment can be assessed for using collateral history and cognitive assessments. Simple interventions such as written reminders, falls alarms and ensuring possessions, including a phone and mobility aids, are left within reach can help to reduce incidents (Royal College of Physicians, 2015) and ensure help is received as soon as possible.

Fear of falling

Fear of falling perpetuates its risk and this should not be underestimated. Patients with depression are more likely to report fear of falling (Hughes et al, 2015), so it is useful to screen for low mood and anxiety as part of a comprehensive geriatric assessment. A higher self-reported fear of falling is associated with doing significantly less physical activity (Jefferis et al, 2014). It is likely that the de-conditioning which results from reduced activity, along with altered attention caused by anxiety (Young and Williams, 2015), accounts for the increase in falls. Home exercise programmes or Tai Chi boost confidence and reduce fear of falling (Zijlstra et al, 2007).

Higher level gait disorders

This umbrella term covers patients who have abnormal gait without a clear explanation. Central deficits, affecting areas which process incoming sensory information and produce coordinated motor responses, result in apraxia. Small vessel disease is a recognised cause and imaging studies have shown this leads to significantly reduced brain perfusion in areas involved in gait, such as the anterior cerebellum and the medial prefrontal gyrus (Carboncini et al, 2009). Vascular Parkinsonism causing lower limb Parkinsonism is one example; other causes include cerebral atrophy of these structures and normal pressure hydrocephalus.

Orthostatic hypotension

Orthostatic hypotension is defined as a drop of greater than 20 mmHg systolic or 10 mmHg diastolic blood pressure in the first 3 minutes after standing. It can make patients feel light-headed or dizzy and is a significant risk factor for falls in symptomatic patients (van Hateren et al, 2012). There is also a recognised association between postural hypotension and cognitive impairment (Mehrabian et al, 2010), so be mindful that these patients may not be able to recognise or recall these symptoms.

Baroreceptor responses degenerate with age, which diminishes compensatory mechanisms to the drop in blood pressure when a person stands up. It can also be associated with intravascular dehydration or certain conditions resulting in an autonomic neuropathy, such as Parkinson's disease and diabetes. Drugs such as diuretics and alpha blockers are a significant contributor (Figure 2).

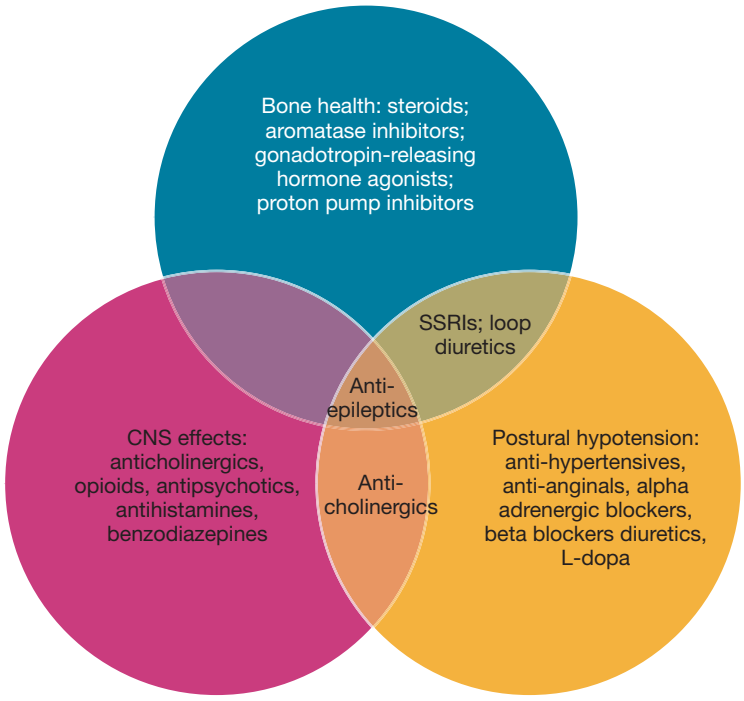

Figure 2. A Venn diagram showing medications that can cause various side effects and should be reviewed in patients who have fallen. SSRIs = selective serotonin-reuptake inhibitors.

Despite hypotension being a known risk factor for falls, the national audit of inpatient falls found only 16% of patients had a lying and standing blood pressure recorded (O'Riordan, 2017). If a postural drop is identified, a medication review is necessary alongside a pragmatic approach to manage blood pressure. Higher systolic blood pressures should be considered acceptable in frail patients, given that those less than 130 mmHg were associated with increased mortality (Masoli et al, 2020). Other measures include maintaining oral hydration (up to 2–3 litres/day if tolerated), avoiding caffeine and educating patients to stand up slowly. Fludrocortisone (mineralocorticoid) or midodrine (alpha agonist) are sometimes prescribed for postural hypotension despite the evidence for efficacy being limited (National Institute for Health and Care Excellence, 2013b). Full-length compression stockings can be trialled as a last resort, although they have limited efficacy (Smeenk et al, 2014) and are often poorly tolerated, with only a third of patients complying with them (Quinn et al, 2015).

Incontinence

Urinary urge incontinence significantly increases the risk of falls (Szabo et al, 2018) and is often neglected; it is underdiagnosed and often poorly managed (Santos and Santos, 2011). Initially, this should be managed with education about lifestyle measures, like increasing fluid intake to reduce the concentration of the urine and reducing caffeine intake. Bladder retraining and pelvic floor exercises are important if patients are able engage and adhere. Anticholinergics can be used but caution should be taken given that these medications significantly increase falls risk and are often ineffective (Szabo et al, 2019). Oxybutinin should be avoided completely in frail adults and any medication trialled should be started at a low dose, reassessed and stopped if there is no significant benefit. In those with cognitive impairment, regular toileting prompting bladder and bowel emptying can help as can having a urinal bottle close by or considering use of a Conveen penile sheath to assist urination.

Past medical history

Chronic health conditions such as previous stroke, osteoarthritis and Parkinson's disease impede function (Anderson, 2008). Management of the underlying condition is vital, twinned with a wider falls risk assessment and care plan.

Polypharmacy

Many medications increase falls risk by contributing to postural hypotension or affecting the CNS, while some impact negatively on bone health, as summarised in Figure 2. Ageing and increasing frailty means that medications that were once appropriate may now cause more harm than benefit. Polypharmacy, defined as four or more prescribed medications, increases falls risk in its own right (Morin et al, 2019). A medication review is essential in patients who have fallen and is a key part of comprehensive geriatric assessment. However, falls are not always a sufficient reason to stop medications and management needs to be carefully individualised.

Inpatient falls

Inpatient falls are common and frequently lead to injury. Many could have been prevented and a fall in hospital with injury requires duty of candour, an investigation as to the root cause and, where there is evidence of a lapse in care, often leads to litigation. Delirium is often a significant contributing factor and may be subtle, leading to it being missed and falls prevention measures not being robustly in place. The hostile and unfamiliar hospital environment can also be significant.

An inpatient fall is a cardinal sign that more falls are likely and should be taken very seriously. A thorough risk reassessment should take place involving the whole multidisciplinary team. Examples of factors and interventions are summarised in Table 2. Considerations for nursing staff are whether the patient would be better placed in a cohort bay, to be more closely observed, have a 1:1 assistant or a falls alarm. From a medical perspective, an inpatient fall should prompt reassessment to screen for any acute precipitant and it provides another opportunity to screen for cognitive impairment and to review the medications. Medication review should include reviewing any anticoagulants or thromboprophylaxis, especially if a head injury is suspected.

Table 2. Multidisciplinary approach to inpatient falls assessment

Contributing factors	Assessment	Intervention(s)
Cognitive impairment	Collateral history Acute: 4AT Chronic: Montreal Cognitive Assessment	Clearly documented mobility level including if needs supervision or assistance Regular reorientation Keeping possessions within reach Falls alarm Cohort bay (eye level supervision) 1:1 supervision
Postural hypotension; more common in inpatients as a result of deconditioning	Lying and standing blood pressures	Safety awareness Medication review Adapted approach to blood pressure management Rehabilitation
Environmental		Lower bed Lighting and signage Appropriate footwear Mobility aid, food and drink within reach
Bladder and bowel	Continence assessment	Rapid response to calls for help Exclude retention Urinal bottle within reach Regular toileting regimen
Medications	Review of drug chart with reference to Figure 2	Consider stopping unnecessary or potentially harmful medications

Conclusions

Falls are rarely a straightforward presentation and require a comprehensive, multidisciplinary assessment to identify areas where it may be possible to mitigate risk of future falls and resultant morbidity. Inpatient falls are a particular concern and require robust and dynamic assessment to ensure ongoing risk assessment and modification.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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Key points

- A falls assessment involves a thorough history, examination, and appropriate investigations to determine contributing factors and any injuries sustained.
- Contributing factors can be divided into acute and chronic.
- Acute factors are extensive, incorporating most acute illnesses.
- Frailty is a significant chronic risk factor for falls and suggests the need for a comprehensive geriatric assessment.
- Many medications can increase the risk of a fall because of their effects on the CNS or by causing hypotension, so a medication review is essential.
- Inpatient falls are best managed through a multidisciplinary team approach.

Curriculum checklist

This article addresses the following requirements from the general internal medicine training curriculum:

- Managing an acute unselected take
- Providing continuity of care to medical inpatients, including management of comorbidities and cognitive impairment
- Managing a multidisciplinary team including effective discharge planning.

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