



# Falls in Older Adults are Serious

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## Abstract

**Background** Falls in older adults are a reasonably common occurrence and about 10% of these experience multiple falls annually. These falls may be serious and may cause significant morbidity and mortality. These can also threaten the independence of older people and may be responsible for an individual's loss of independence and socioeconomic consequences. These falls may add extra burden to the health care and to direct and indirect costs.

**Methodology** An extensive search of literature was done on the important data bases of PubMed, SCOPUS, and Google Scholar on this topic and all the useful information was derived from the relevant articles for this review.

**Results** We found that the falls in older individuals are often multi factorial and hence a multidisciplinary approach is required to prevent and manage these falls. The risk factors leading to the falls could be divided into extrinsic, intrinsic and situational factors. The commonest and serious injuries are to the head and fractures, due to fragility of bones.

**Discussion** The falls in elderly are on rise and taking the shape of an epidemic. Prevention of these falls is far better than the management. Safe living environment of the elderly people helps in prevention of these falls. The management of the falls should focus on the causative factors, apart from treating the injuries caused by the falls.

**Keywords** Fall · Older adults · Geriatrics · Fractures · Prevention · Risk factors

## Background

Falls in older adults are a common occurrence and may lead to serious injuries (like head injury and fractures). Recurrent falls are also frequent and are responsible for significant morbidity and mortality in older adults. It points toward an overall poor physical and cognitive status of the individual. In addition to physical injury, recurrent falls may result in fear and psychological trauma (“post-fall syndrome”), where an elderly refuse to move for fear of recurrent falls and injury. It is estimated that about one-third of these individuals experience one or more falls each year, while 10% experience multiple falls annually [1, 2]. The risk is more significant in Octogenarians and Nonagenarians, in which the annual incidence of falls can reach 50% [3–6]. These falls can have a severe impact on the elderly as these may lead to significant morbidity and may jeopardize their

independence. It may, therefore, lead to a cascade of socio-economic and personal consequences. Moreover, there is a significant impact of falls in older adults to health care and to direct and indirect costs. The direct costs are the payments related to the treatment of falls, and the indirect costs could be related to the financial loss from the absence from work (of the individual and the family caregiver), injuries related disability and dependence. Injuries related to the falls in people of 65 years or more cost \$31 billion (in 2015) and is estimated to cost 74 billion (by 2030), in the USA [6].

## Risk Factors

In older adults, there occur the age-related changes in the nervous system, e.g., impairment of vision and hearing, reduction of proprioceptive and vibratory sensation, increased sway, altered gait, and poor positional control. These changes alone may not be responsible for a fall but significantly contribute to it. Problems like a physical ailment, cognitive decline, medications, and environmental hazards may be responsible factors for it.

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The fall is a symptom and not a disease and is often multifactorial and interrelated. Hence, a multidisciplinary approach is required to prevent and to treat any injuries sustained due to these falls [7]. The falls often occur due to a simple fall (e.g., falling from a standing, or an exposed position such as on the ladders). A history of previous fall is perhaps the best predictor of the falling in elderly, however, these people rarely have a single cause or risk factor (Table 1) and are often multifactorial due to interaction of several factors, as follow:

- Extrinsic factors (environmental hazards).
- Intrinsic factors (age-related decline in function, disorders, and adverse drug effects).
- Situational factors (related to the activity done, e.g., rushing to the bathroom).

The risk of falls is increased by the environmental factors (Table 1) independently or by interacting with the intrinsic factors. The incidence of falls increases substantially when a greater postural control and mobility is required (e.g., walking on an uneven or a slippery surface) and if it is unfamiliar to an elderly (e.g., relocating to a new home). Age-related changes can also impair the nervous system, which is involved in maintaining balance and stability and therefore increase the risk of falls. Age-related decline in vision, changes in muscle power and velocity may impair the ability to maintain or recover balance in response to any perturbation (e.g., stepping onto an uneven or slippery surface). Any muscle weakness is a significant predictor of falls. Some chronic and acute disorders and the use of drugs (Table 1) are responsible risk factors for falls. Certain situational activities may also increase the risk of falls and fall-related injuries. The Morse Fall Scale (MFS) is often used to identify and score fall risk factors. It takes into consideration whether or not the patient has a history of falls, any secondary diagnoses, any intravenous (IV) access, and any use and

type of ambulatory aid, as well as the patient's gait type and mental status [7, 8].

## Injuries Related to the Falls

The older adults most commonly suffer injuries due to falling [9]. The majority of older adults fall due to slipping, tripping, and stumbling. However, fall risks differ based on their living situation. People living in the community may fall from the stairs, getting entangled in loose rugs or electric cords and due to poor lighting [2]. Nursing home residents are also at risk of falls secondary to wet floors, restraints, bed rails, or ties such as tubing and catheters. Even elderly patients in an inpatient hospital setting are at risk of falling.

About 30%–50% of these falls result in minor injuries, but about 10% sustain major injuries. About 1% of all falls in the elderly result in hip fractures, which pose a significant risk for post-fall morbidity and mortality [10, 11]. Around 20% of the falls in the elderly cause a serious injury like a fracture or a head injury. In the United States of America, every year around 800,000 patients need hospitalization for the management of fall-related injuries and 300,000 require treatment of hip fractures [12]. It is estimated that the falls were the leading cause of traumatic brain injury-related deaths in persons aged 65 or older [12]. However, less than half of older patients who fall tell their doctors about these falls [13]. Repeated falls not only increases the risk of injury and hospitalization but may be catastrophic to an older individual. It is because these people are frail and mostly have osteoporosis. It is estimated that over 50% of these falls result in an injury. The major injuries are fractures and head injuries. The fractures sustained due to these falls may be serious, especially of the hip and spine and may require surgical intervention. The head injury may present acutely or delayed, as headache and altered sensorium with or without seizures and minimal focal neurological deficits.

**Table 1** Risk factors for falls in older adults

Extrinsic factors	Intrinsic factors	Situational factors
Poor lighting and glare from the lamps	A disease which alters the gait and mobility (e.g., Parkinson's disease, Knee and Hip arthritis, Feet problems, Neuromuscular and Vestibular diseases)	Walking while talking
Poor or no personal aid equipment	Several medicines (e.g., sedatives and cardiac drugs)	Being distracted by multitasking
Unfavorable flooring (e.g., loose carpets, uneven and slippery floors, low lying objects)	Visual impairment (e.g., Cataract, Glaucoma, Macular degeneration and Retinopathy)	Failing to notice an environmental hazard (e.g., a curb or step)
Obstacles (e.g., electric cords, steps, hedge, low lying furniture, etc.)	Hypotension (e.g., cardiac or postural causes)	Rushing to the bathroom (especially at night)
Slippery shoe wares	Increasing age?	Rushing to answer the telephone

Chronic subdural haemorrhage may also present with progressive dementia.

The severity of an injury and its outcome is determined by an individual's frailty and not the age [14]. Frailty means an older adults' decreased physiologic reserve (e.g., ability to walk up a flight of stairs or carry a bag of groceries, etc.). A frail elder has a higher likelihood of falling and a greater risk of injury from a fall [14]. The patient's frailty index is the most accurate predictor of adverse events after a fall, even more, accurate than the patient's age or injury severity score (ISS) [15].

One significant difference in the geriatric population is skeletal fragility, [16], which occurs as their bones become more susceptible to the mechanical forces of trauma. Consequently, elderly patients will sustain more severe injuries with lower force mechanisms than their younger counterparts, who have greater bone density. Even when a fall does not result in death, fall injuries can cause significant morbidity and impede an older person's functional status and overall health.

Fractures are a major complication of falls in this population, with 10% of falls causing a fracture, and 2% of the fractures involving the hip. An estimated 75% of all vertebral and nonvertebral fractures occur in those aged 65 years or older, and more than 75% of hip fractures affect seniors aged 75 years or older [17]. Fractures are an independent predictor of long-term mortality. After a hip fracture, an elderly person has a 27% chance of dying within one year [18]; following a proximal femur fracture, 50% of affected seniors will experience a functional decline within 1 year [19]. Other post-fall fracture sites in older people include the proximal humerus, pelvis, vertebrae, distal radius, and vertebral bodies [23]. Also, fractures surrounding or involving a prosthesis (periprosthetic fractures) have become increasingly common among older patients [20, 21]. After age 50 years, the lifetime risk for hip fractures ranges from 6 to 17% [16]. In the elderly, more than 95% of hip fractures are caused by falls [22].

The quality of life may deteriorate significantly after a fall, as the majority of older people who were mobile before

a hip fracture related to a fall may not recover the same level of mobility. There may be a fear of repeat fall, in an elderly, especially if they have experienced a fall before. This may lead to reduced mobility due to lack of confidence in them, to the extent that many may avoid activities of daily living like shopping and cleaning. Ultimately, a decreased activity may lead to muscle weakness and stiffness of the joints, which further contribute to their reduced mobility. Therefore, the emphasis should be on maintaining the mobility of the elderly and preventing the falls and their related injuries.

## Preventive Measures

The prevention of fall is not only important clinically, but is an essential public health issue as well since the frequency of falls and their complications are increasing significantly. Several strategies could be used to prevent these falls like fall-related education, environmental assessment, and modification, interventions to improve strength, balance, endurance, and modification of medication regimens. In older adults, prevention of a fall (Table 2) is to be preferred than the treatment of the injuries, sustained by these falls. The risk of fall can be reduced by appropriate correction of the environmental hazards at home and by using an assistive device (e.g., cane or walker). Those with restricted mobility may benefit from the combined use of environmental, rehabilitative, and medical measures. The incidence of hip fractures can be reduced with the use of 'hip protectors', especially in high-risk individuals. An appropriate flooring is crucial in preventing the falls, as a compliant flooring (e.g., firm rubber) can help dissipate the impact force, but a floor that is too compliant (e.g., soft foam) may cause imbalance for an elderly and the risk of fall.

Drugs, known to increase the risk of falls should be stopped, or their dosage adjusted. The optimization of vision and hearing, control of dizziness, and the low heels or rubber soles in the shoes are crucial factors in the prevention of falls [23]. If osteoporosis is noted on evaluation, then it should be treated adequately, to prevent the fractures from

**Table 2** Preventive measures for the falls in older adults

Preventive interventions	Action required
Safety devices	Grab handles, high friction floors, and Footwear, low power lighting at night
Regular exercise	Lower limb muscle strengthening exercises, Other exercises to improve gait, balance, coordination and functional tasks
Review	Monitoring of medications and ongoing medical problems
Supplementation	Vitamin D supplementation in presence of its deficiency
Tackling environmental issues	Review of current living conditions
Minimizing the impact of fall	Hip protectors
Decreasing the risk of fracture	Treatment of Osteoporosis

a fall. Moreover, any other disease or factor which may lead to falling must be identified and corrected in time. The risk of falls may further be reduced with adequate pain control, physiotherapy, and sometimes with joint replacement surgery in patients with severe knee or hip arthritis. The older adults should also be counselled on the ways to reduce the risks arising from the situational factors and are taught about what to do if they fall and cannot get up.

### Management (Table 3)

The management of a fall in an elderly requires a multidisciplinary approach, as these patients are a different subset of individuals compared to the younger population. Their medical problems need to be managed by a Geriatric physician and if surgical management is needed then the services of an Anesthetist and a surgeon (Orthopaedic/Neurosurgeon) is often required. A detailed history should be followed by a targeted physical examination, functional assessment, and appropriate diagnostic tests (if required). Assessment of a fall includes a detailed history pertaining to the circumstances leading to a fall and medical history. Few self-efficacy tests are known to assess the fear of falling. The physical examination should assess the nature of injury along with the patients' vision, gait, balance and condition of the weight-bearing joints like hips and knees. A detailed neurological examination should follow to assess the sensory and motor function of the limb along with the brain functioning. A detailed cardiac assessment is also necessary for older patients.

A good physical therapy and exercise program is extremely beneficial to the individuals who have a history of previous falls and those who have problems of balancing and coordination. In order to optimize the outcomes of hip fractures in the elderly, the priority should be pain control; however, analgesia in this population can be challenging.

The American Academy of Orthopedic Surgeons (AAOS) provides a strong recommendation for regional anaesthesia in their 2015 guidelines for the management of hip fractures in elderly patients [24].

It has been reported that compared to intravenous and oral pain medications in elderly patients with hip fractures, femoral nerve blocks resulted in significant reductions in pain scores and opioid requirements. Lateral cutaneous femoral nerve blocks have also been shown to provide reasonable pain control without systemic side effects. Local anaesthesia offers the benefit of superior pain control with a much smaller side effect profile than that of IV or oral pain medications [25]. Despite the use of local anaesthetics, many individuals may require post-fall systemic pain control. Non Steroidal Anti Inflammatory Drugs (NSAIDs) are the most commonly used drugs because they work quickly and reduce acute inflammation; however, these drugs can also cause renal and gastrointestinal toxicity in older people. Hence, renal function must be checked before giving NSAIDs to older adults. NSAIDs may be used in conjunction with misoprostol to decrease the risk of gastrointestinal bleeding. It is to be kept in mind that many antihypertensive medications function via renal prostaglandins, which NSAIDs inhibit [26].

Acetaminophen is also a common analgesic choice in older patients. However, in the natural course of ageing, hepatic blood flow, and the number of functional hepatocytes decrease. As a result, the elderly are at risk for acetaminophen toxicity owing to a greater than 50% reduction in the metabolism of this drug. There is often a hesitation in prescribing opiate medications in older adults because of their side effects (e.g., constipation, nausea, sedation, delirium). However, these agents are relatively safe, and the side effects can often be managed. Although fears of delirium due to opiate use are well-founded, inadequate pain control has a higher likelihood of causing delirium than narcotic medications [16]. Other causes of delirium include hospitalization,

**Table 3** Management of an elderly due to a fall

History	Identify the cause of fall and elicit any history of recurrent falls Note the existing medical co-morbidities A detailed drug history Find out the living environment, to identify the risk factors
Physical examination	Assessment of the injuries General examination Functional assessment
Investigations	Appropriate laboratory tests Relevant radiological examination (X-ray, CT, MRI, Ultrasound etc.)
Medical management	Physical therapy Pain Control (Oral medications, Regional blocks, etc.) Regulate the ongoing medical treatment, if necessary Splint the fracture
Surgical management	Suturing of the wounds Fractures (e.g. hip) often require internal fixation or replacement Brain injury with significant haematoma requires surgical evacuation

dehydration, and visual/auditory impairment. It is essential to avoid prescribing standing doses of preoperative/postoperative narcotics in elderly patients because of the risks of dehydration, acute kidney injury, and oliguria.

Many elderly patients who suffer falls require surgery. The best way to control pain in patients with a hip fracture is to perform early surgery, if indicated, as delayed surgery is associated with poor outcomes [27]. Studies have shown that geriatric patients with hip fractures are best managed early by a medical team that includes a geriatrician and an orthopaedic surgeon [25]. It is crucial to realize that many older adults take anticoagulants for their cardiac problems, thereby increasing the risks associated with emergency surgery. Also, hip fractures themselves may bleed substantially. Hence, the risk–benefit must be assessed by the treating team to decide about the delay in surgery.

A fall in the elderly can have a devastating effect. It may result in loss of independence, chronic pain, and reduced quality of life. The problem of falls in the elderly has increased due to the increasing ageing population and is likely to reach epidemic proportions, which would consume a considerable amount of health care resources. Hence, immediate action is required to implement effective policies, address this critical public health issue.

## Learning points

- The falls in older adults is quite common (30–50%).
- Falls contribute to frequent hospital admissions and may be quite serious and lethal.
- Causes of these falls are multifactorial and include age- and illness-related decline in function, environmental hazards, and adverse drug effects.
- To prevent the falls, an assessment of the elderly for predisposing factors and the home circumstances are crucial.
- The management of falls should focus on the treatment of causative disorders, correcting the environmental hazards and to change or stop the causative drugs which might lead to a fall.
- Muscle strengthening and gait training exercises are crucial for the people who have fallen more before and have problems in their gait and balancing.
- Teaching and training about what all needs to be done after a fall are useful.

## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical Approval** This article does not contain any studies with human or animal subjects performed by any of the authors.

**Informed Consent** For this type of study an informed consent is not required.

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