It is important to distinguish falls associated with loss of consciousness (syncope, seizure), which require appropriate evaluation and intervention (Chaps. 27 and 445). In most prospective studies, a small subset of individuals experience a large number of fall events. These individuals with recurrent falls often have gait and balance issues that need to be addressed.

Fall Patterns: The Event Description The history of a fall is often problematic or incomplete, and the underlying mechanism or cause may be difficult to establish in retrospect. The patient and family may have limited information about what triggered the fall. Injuries can complicate the physical examination. While there is no standard nosology of falls, some common clinical patterns may emerge and provide a clue.

DROP ATTACKS AND COLLAPSING FALLS Drop attacks are sudden collapsing falls without loss of consciousness. Patients who collapse from lack of postural tone present a diagnostic challenge. Patients may report that their legs just "gave out" underneath them; their families may describe these patients as "collapsing in a heap." Orthostatic hypotension may be a factor in some such falls, and this possibility should be thoroughly evaluated. Rarely, a colloid cyst of the third ventricle can present with intermittent obstruction of the foramen of Monro, with a consequent drop attack. While collapsing falls are more common among older patients with vascular risk factors, they should not be confused with vertebrobasilar ischemic attacks.

TOPPLING FALLS Some patients maintain tone in antigravity muscles but fall over like a tree trunk, as if postural defenses had disengaged. There may be a consistent direction to such falls. The patient with cerebellar pathology may lean and topple over toward the side of the lesion. Patients with lesions of the vestibular system or its central pathways may experience lateral pulsion and toppling falls. Patients with progressive supranuclear palsy often fall over backward. Falls of this nature occur in patients with advanced Parkinson's disease once postural instability has developed.

FALLS DUE TO GAIT FREEZING Another fall pattern in Parkinson's disease and related disorders is the fall due to freezing of gait. The feet stick to the floor and the center of mass keeps moving, resulting in a disequilibrium from which the patient has difficulty recovering. This sequence of events can result in a forward fall. Gait freezing can also occur as the patient attempts to turn and change direction. Similarly, patients with Parkinson's disease and festinating gait may find their feet unable to keep up and may thus fall forward.

FALLS RELATED TO SENSORY LOSS Patients with somatosensory, visual, or vestibular deficits are prone to falls. These patients have particular difficulty dealing with poor illumination or walking on uneven ground. They often report subjective imbalance, apprehension, and fear of falling. Deficits in joint position and vibration sense are apparent on physical examination. These patients may be especially responsive to a rehabilitation-based intervention.

WEAKNESS AND FRAILTY Patients who lack strength in antigravity muscles have difficulty rising from a chair, tire easily when walking, and have difficulty maintaining their balance after a perturbation. These patients are often unable to get up after a fall and may have to remain on the floor for a prolonged period until help arrives. Deconditioning of this sort is often treatable. Resistance strength training can increase muscle mass and leg strength, even for people in their eighties and nineties.

RISK FACTORS FOR FALLS

The most productive approach is to identify the high-risk patient prospectively, before there is a serious injury. Patients at particular risk include hospitalized patients with mental status changes, nursing home residents, patients with dementia, and those taking medications that compromise attention and alertness. Patients with Parkinson's disease and other gait disorders are also at increased risk. (Table 32-3) summarizes a meta-analysis of prospective studies establishing the principal risk factors for falls. It is often possible to address and mitigate some of the major risk factors. Medication overuse may be the most important remediable risk factor for falls.

TABLE 32-3 META-ANALYSIS OF RISK FACTORS FOR FALLS: SUMMARY OF 16 CONTROLLED STUDIES

Risk Factor	Mean RR (OR)	Range
Weakness	4.9	1.9–10.3
Balance deficit	3.2	1.6–5.4
Gait disorder	3.0	1.7–4.8
Visual deficit	2.8	1.1–7.4
Mobility limitation	2.5	1.0–5.3
Cognitive impairment	2.4	2.0–4.7
Impaired functional status	2.0	1.0–3.1
Postural hypotension	1.9	1.0–3.4

Abbreviations: OR, odds ratio from retrospective studies; RR, relative risk from prospective studies.

Source: Reproduced with permission from J Masdeu, L Sudarsky, L Wolfson: *Gait Disorders of Aging*. Lippincott Raven, 1997.

TREATMENT INTERVENTIONS TO REDUCE THE RISK OF FALLS AND INJURY

Efforts should be made to define the etiology of the gait disorder and the mechanism underlying the falls by a given patient. Orthostatic changes in blood pressure and pulse should be recorded. Rising from a chair and walking should be evaluated for safety. Specific treatment may be possible once a diagnosis is established. Therapeutic intervention is often recommended for older patients at substantial risk for falls, even if no neurologic disease is identified. A home visit to look for environmental hazards can be helpful. A variety of modifications may be recommended to improve safety, including improved lighting and the installation of grab bars and nonslip surfaces.

Rehabilitative interventions aim to improve muscle strength and balance stability and to make the patient more resistant to injury. High-intensity resistance strength training with weights and machines is useful to improve muscle mass, even in frail older patients. Improvements realized in posture and gait should translate to reduced risk of falls and injury. Sensory balance training is another approach to improving balance stability. Measurable gains can be made in a few weeks of training, and benefits can be maintained over 6 months by a 10- to 20-min home exercise program. This strategy is particularly successful in patients with vestibular and somatosensory balance disorders. A Tai Chi exercise program has been demonstrated to reduce the risk of falls and injury in patients with Parkinson's disease.