

healthcare-associated infections, delirium, falls, pressure injuries, and venous thromboembolism. Mechanistically, declines in sensory, neurological, and musculoskeletal function-including visual and auditory impairment, slowed reaction time, impaired balance, and reduced muscle strength-predispose patients to falls and bed-related injuries during mobility, transfers, and activities of daily living. Meanwhile, reduced skin elasticity, impaired local circulation, and malnutrition decrease tissue tolerance to pressure and shear, increasing the likelihood of pressure injury development (Alotaibi et al., 2025). In addition, age-related declines in hepatic and renal function and impaired homeostatic regulation may alter pharmacokinetics and pharmacodynamics, rendering standard treatments more likely to cause harm, particularly in the context of polypharmacy, and increasing the risk of adverse drug reactions (ADRs) and adverse drug events (ADEs). Systematic reviews indicate that the pooled incidence of in-hospital ADRs among older patients is approximately 16%-22%, with most being predictable, dose-related, and at least partially preventable; risk factors include polypharmacy, potentially inappropriate medications, and impaired renal or hepatic function.

Psychological and cognitive characteristics also exert a profound influence on the risk of adverse events. Cognitive impairment-including delirium, dementia, and mild cognitive impairment-is common among hospitalized older adults and is associated with a higher likelihood of adverse events, particularly when combined with a high burden of comorbidity. Studies suggest that in cognitively impaired patients, adverse events are more frequently linked to failures in nursing care, allied health management, and organizational processes, such as inadequate supervision, communication breakdowns, and poor care coordination (Schouten et al., 2025). Furthermore, hospitalization itself may initiate a cascade of “hospital-associated harms” that are not fully attributable to the primary illness: functional declines such as confusion, reduced oral intake, incontinence, and falls may trigger further invasive interventions (e.g., restraints, catheterization, enteral feeding), leading to downstream complications such as thromboembolism and infection. Emotional distress, sleep deprivation, sensory overstimulation or deprivation, and unfamiliar environments may exacerbate delirium and behavioral symptoms, thereby increasing the risk of falls, medication errors, and the use of high-risk psychoactive medications (Schattner, 2023).

2.2 Common types of adverse events during hospitalization and their causes

Hospitalized older patients experience a wide spectrum of adverse events, encompassing both traditional medical complications and geriatric syndromes such as falls, delirium, and pressure injuries, as well as infections, medication-related harm, and procedure- or intervention-related complications. Systematic reviews indicate that healthcare-associated infections, delirium, falls, pressure injuries, and venous thromboembolism constitute the most common adverse event profile. In acute geriatric wards, more than half of patients may experience at least one medical adverse event, with infections and delirium being particularly prevalent and often iatrogenic in nature (Alotaibi et al., 2025). Regarding medication safety, reviews suggest that approximately one in every five to six hospitalized older patients experiences an in-hospital adverse drug reaction, manifesting as fluid and electrolyte disturbances, gastrointestinal symptoms, renal impairment, hypotension, or delirium. Diuretics, antimicrobials, antithrombotic agents, and analgesics-particularly opioids and sedatives-are most frequently implicated (Cosgrave et al., 2025).

From an etiological perspective, adverse events typically arise at the intersection of patient vulnerability, care processes, and organizational systems. Patient-related factors such as frailty, advanced age, disease or injury severity, and multimorbidity independently increase the risk of unplanned adverse events, including infections, pressure injuries, malnutrition, and urinary retention (Alotaibi et al., 2025). Medication-related factors-such as polypharmacy, potentially inappropriate prescribing, prior fall history, and poor adherence-can further amplify ADE and ADR risk in the absence of adequate medication review and monitoring (Wang et al., 2025). Organizational factors include missed nursing care, staffing shortages, inadequate monitoring, and failures in care coordination. Particularly among cognitively impaired patients, adverse events are more frequently attributable to nursing and organizational causes and are considered highly preventable (Schouten et al., 2025; Järbrink et al., 2025). Additionally, hospitalization-related stressors-such as restricted mobility, invasive devices, sleep deprivation, and unnecessary tests or procedures-may precipitate delirium, deconditioning, and falls, increasing the risk of post-discharge complications (Schattner, 2023).