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Inpatient falls in acute care hospitals: a narrative review

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Abstract

Introduction. Inpatient falls are a major patient safety problem in acute care hospitals, particularly among older patients, and result from the interaction of clinical and organizational factors. ***Aim.*** This narrative review summarizes evidence on inpatient falls, focusing on risk assessment tools, prevention strategies, and implementation. ***Methods.*** A narrative review of PubMed (2010-2026) was conducted, prioritizing systematic reviews, meta-analyses, and key clinical and implementation studies. ***Results.*** Common risk assessment tools have limited and context-dependent predictive value and should mainly be used for screening. Most single-component interventions, including alarms and isolated deprescribing, do not consistently reduce falls. Patient and staff education is the only intervention supported by higher-certainty evidence, while the effectiveness of multifactorial programmes depends largely on implementation and patient engagement. ***Conclusion.*** Effective prevention relies less on individual tools and more on education, patient engagement, and programmes well integrated into the ward's workflow. *Geriatria 2026;20:5-11. doi: 10.53139/G.20262009*

Keywords: inpatient falls, fall risk assessment, fall prevention programs, acute care hospitals, implementation science

Introduction

Falls are a major global public health problem and the second leading cause of unintentional injury-related deaths worldwide, accounting for approximately 684,000 fatalities and 37.3 million medically treated incidents annually [1]. In healthcare research, a fall is defined as "an unexpected event in which the participant comes to rest on the ground, floor, or lower level" [2]. Fall-related injuries contribute substantially to the global burden of disability and generate considerable healthcare costs, particularly among adults aged 60 years and older [1].

In acute care hospitals, inpatient falls remain among the most common adverse events. Reported incidence varies across departments and care contexts. In a 350-bed urban hospital observed over seven years, the overall fall rate was 0.818% of all hospitalizations, with the highest rates in rehabilitation and internal medicine wards [3]. Most falls occurred at night or in the immediate bedside environment, highlighting the combined influence of patient vulnerability and environmental or organizational factors.

The multifactorial nature of in-hospital falls was confirmed in a large systematic review and meta-analysis including 119 studies [4]. The main predictors and their relative effect sizes are summarized in table I. Strong associations were found for increasing age, selected comorbidities (notably Parkinson's disease, diabetes mellitus, and hyponatremia), and a history of previous falls, moderate associations for mobility disorders and cognitive impairment, and a weak association for male sex. Medication use emerged as one of the most important and potentially modifiable risk factors, with consistently increased odds for antidepressants, benzodiazepines, hypnotic-sedatives, and antipsychotics. Among all predictors, previous falls and psychotropic drug use showed the largest effect sizes. Overall, fall risk in hospitalized patients appears to result from the interaction of chronic vulnerability, acute illness, and treatment-related factors rather than from any single cause.

Table I. Risk factors for inpatient falls grouped according to the strength of reported evidence, based on [3,4]

Weak associacion	Moderate associacion	Strong associacion
Male sex	Diabetes mellitus	Advanced age
	Reduced mobility	Previous falls
	Dementia	Gait or balance impairment
	Polypharmacy	Delirium, confusion
	Inadequate supervision	Parkinson's disease
	Delayed staff response	Psychotropic medication
		Hyponatremia

In addition to clinical determinants, system-level factors and patient perspectives also influence fall occurrence in hospitals. A mixed-methods study identified limited engagement with prevention advice, insufficient awareness of strategies, inadequate bathroom supervision, delayed responses to call bells, and communication breakdowns between nurses and patients as important contributors [5]. The distribution of fall locations observed in this study is highlighting that most falls occurred in or near the bed and during transfers or walking. These findings indicate that organizational, educational, and communication-related factors should be considered alongside clinical risk factors when designing hospital-based fall prevention programmes.

International guidelines consistently advocate a comprehensive, multifactorial, and individualized approach to fall prevention. The World Health Organization promotes such strategies through its Step Safely package and Fall Fact Sheet, recommending medication review, exercise and mobility training, environmental modifications, patient education, and multifactorial programmes, although no hospital-specific acute care guideline is currently available [6]. Similarly, the updated NICE guideline recommends structured risk assessment in hospitalized patients followed by tailored, multicomponent interventions addressing clinical, functional, and environmental factors, with particular emphasis on medication review, mobility, patient education, and continuity of care [7].

The Australian Falls Guidelines for Hospitals translate these principles into a hospital-specific framework, emphasizing early comprehensive assessment, individualized multifactorial interventions, and domains such as sensory impairment, footwear and mobility aids, vitamin D supplementation in selected patients, and supervision of high-risk individuals, as well as post-fall management and discharge planning [8].

A review of 20 international hospital guidelines identified largely consistent recommendations, including education, assistive devices, timely responses to call bells, safe footwear, environmental modifications, exercise, medication management, and management of delirium and dementia, delivered either as single or multifactorial interventions [9]. Although patient education is frequently recommended, patient-centred approaches are rarely addressed explicitly, and implementation in routine practice remains inconsistent. Overall, current guidance shows strong conceptual agreement on principles but a persistent gap between recommendations and their application in clinical practice.

Aim

This narrative review aims to summarize current evidence on inpatient falls in acute care hospitals, particularly in older patients, with a focus on fall risk assessment tools and prevention strategies. It examines why many interventions fail to achieve consistent clinical benefit and highlights the role of implementation and contextual factors.

Methods

A narrative literature review was conducted using PubMed, covering publications from 2010 to 2026 and limited to English-language articles. Search terms included combinations of "inpatient falls", "hospital falls", "falls prevention", "fall risk assessment", and "falls prediction". The review focused on studies from acute care hospitals involving adult patients, with particular emphasis on older adults, prioritizing recent systematic reviews, meta-analyses, and key clinical or implementation studies.

Studies from non-standard settings were included selectively when directly relevant to inpatient practice or guideline development.

Results

Fall risk prediction and assessment tools

Several structured fall risk assessment tools are used in hospitals to identify patients at increased risk of falling and to guide preventive measures. Common instruments, such as the Hendrich II Fall Risk Model, the Morse Fall Scale, and STRATIFY, are brief bedside tools that score a limited number of clinical and functional risk factors and classify patients into predefined risk categories. Their main advantage is simplicity and feasibility for routine use, however, they function primarily as screening tools and require complementary clinical judgment [10].

A systematic review of fall risk assessment scales found no single tool with consistently superior predictive performance in acute care [11]. Widely used instruments, including the Morse Fall Scale, Hendrich II, STRATIFY, and the Johns Hopkins tool, show substantial variability in sensitivity and specificity across studies and settings, and no scale can be considered universally optimal. Combining tools may modestly improve performance, but risk scores should primarily be used for screening and in conjunction with clinical judgment.

Validation studies show that predictive performance is generally modest and highly dependent on chosen cutoff thresholds, with higher sensitivity typically achie-

ved at the cost of poor specificity and overclassification of patients as high risk. For example, the Morse Fall Scale has limited discriminatory ability, and STRATIFY identifies only a minority of patients who subsequently fall, with a high false-negative rate in acute care settings [12-14].

Other screening instruments based on self-perceived risk or general vulnerability also perform poorly in hospital settings. In an emergency department study, neither the Falls Efficacy Scale nor the Vulnerable Elders Survey predicted future falls in patients aged ≥65 years [15].

Overall, widely used scoring tools have limited and context-dependent predictive accuracy and should not be used as sole instruments for fall risk prediction. Key characteristics and limitations of commonly used fall risk assessment tools are summarized in table II.

Machine learning-based models have shown better discriminative performance than traditional tools (pooled AUC ~0.82) in a recent systematic review and meta-analysis [16]. However, most studies were at high risk of bias and lacked external validation, limiting current clinical applicability. While promising, these approaches require further robust validation before routine implementation.

Effectiveness of fall prevention interventions

Evidence from large systematic reviews and meta-analyses consistently indicates that the effectiveness of fall prevention interventions varies substantially across settings, intervention types, and study designs. An early systematic review by Hempel et al. already showed that hospital fall prevention programmes were highly heterogeneous and that multifactorial interventions combining risk assessment with tailored components (e.g. patient and staff education, alert signage, footwear advice, scheduled toileting, and medication review) were more often associated with favourable trends than single-component strategies, although firm conclusions were limited by methodological weaknesses [17].

More recent evidence confirms this pattern. A large systematic review and meta-analysis including 43 studies found that among a wide range of evaluated strategies, only patient and staff education was supported by high-certainty evidence and was associated with a statistically significant reduction in both fall rates and the odds of falling [18]. In contrast, scored fall risk screening tools, bed or chair alarms, and sensor-based systems showed no benefit. Some multifactorial interventions showed favourable effects, typically combining education, improved handover procedures, rapid response to call bells, regular toileting, environmental modifications, assistive devices, exercise, safe footwear, medication management, or management of cognitive impairment. However, results were inconsistent: while some randomized trials reported reductions in falls, a large high-quality cluster RCT of the nurse-led 6-PACK programme showed no benefit over usual care. Evidence for rehabilitation and physiotherapy remained weak and of low certainty, with no consistent effect on falls.

Similarly, the Cochrane review by Cameron et al. reported that multifactorial interventions may reduce fall incidence, mainly in subacute settings, whereas

Table II. Characteristics and performance of selected fall risk assessment tools used in hospitalized patients, based on comparative and validation studies in acute care settings [12-15]

Tool	Primary purpose	Main domains assessed	Performance in acute care settings
Morse Fall Scale	Fall-specific risk screening	History of falls, secondary diagnosis, ambulatory aids, IV therapy, gait, mental status	Widely used and easy to administer; predictive accuracy varies across settings, with limited specificity and frequent overclassification of patients as high risk
Hendrich II Fall Risk Model	Fall-specific risk screening	Confusion/disorientation, depression, elimination, dizziness, male sex, use of medications, mobility (Get-Up-and-Go test)	Feasible for routine clinical use; modest discriminative ability and variable sensitivity depending on cutoff values
STRATIFY	Fall-specific risk screening	History of falls, agitation, frequent toileting, mobility impairment, neurological deficits	Limited sensitivity in acute care; identifies only a proportion of patients who subsequently fall
VES-13 (Vulnerable Elders Survey)	General vulnerability screening	Age, self-rated health, functional limitations, physical performance	Not fall-specific; performs poorly as a predictor of inpatient falls in acute hospital settings

single-component strategies alone did not consistently reduce falls [19].

Trials of environmental and technology-based interventions have yielded consistently negative results. A large cluster-randomized trial showed that increased use of bed alarms did not reduce fall rates, injuries, or restraint use, and a subsequent systematic review and meta-analysis of bed and chair sensor systems not only found no benefit but reported a 20% increase in fall risk [20,21]. These findings suggest that alarm-based technologies are ineffective or potentially counterproductive when used as standalone interventions. In contrast, a before-after study in a rehabilitation setting reported reduced fall rates with continuous video monitoring, although evidence from acute care remains limited [22].

A systematic review and meta-analysis of deprescribing fall-risk-increasing drugs (FRIDs) found no significant reduction in fall rates or fall incidence, suggesting that deprescribing alone is insufficient as an isolated prevention strategy [23]. Finally, a systematic review of U.S. acute care hospital programmes reported a non-significant pooled effect but noted that some multifactorial programmes achieved fall reductions of up to 30%, whereas evidence for single-component interventions remained limited [24].

Implementation, real-world effectiveness, and contextual factors

A retrospective study evaluating implementation fidelity of the multifactorial StuPA programme across 19 acute care wards showed moderate-to-high fidelity, which was higher in wards caring for more dependent patients, suggesting that organisational context influences adherence to prevention measures [25].

A contrasting example of a system-level intervention with proven clinical impact is the Fall Prevention Tool Kit (FPTK) and its successor, Fall TIPS. In a cluster-randomized trial and a large multisite implementation study, these programmes were associated with clinically meaningful reductions in falls (15% overall and 34% in injurious falls) and were shown to be feasible in routine workflows [26-28]. The development and evaluation process for Fall TIPS is depicted in Figure 1, illustrating the structured, multi-phase framework that supported

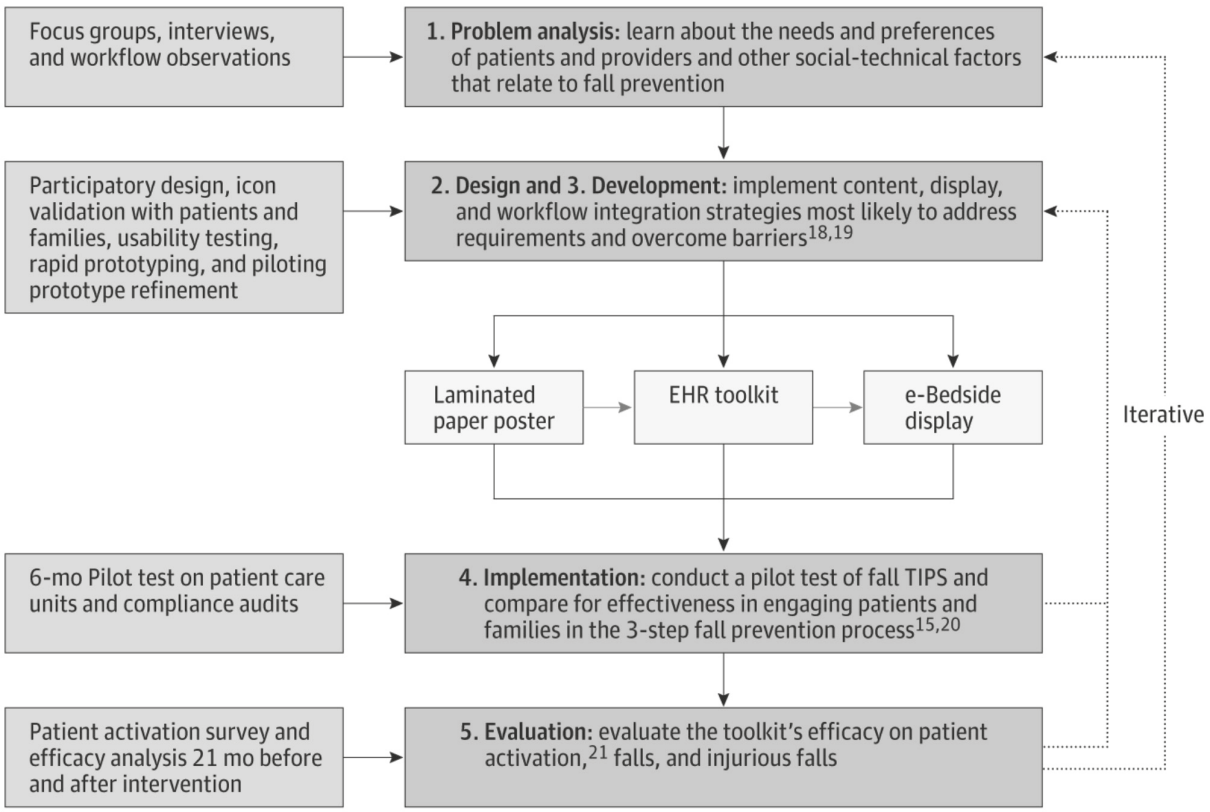

Figure 1. Five-Phase Intervention Development and Evaluation upon [27]

its integration into practice. This structured approach likely contributed to its effectiveness and feasibility in real-world settings.

A recent systematic review of implementation strategies showed that most hospital fall prevention programmes rely heavily on staff education combined with multiple additional components, although reporting of how these strategies were operationalised was often incomplete [29]. A complementary component analysis of 45 randomized trials identified three features most strongly associated with effectiveness: integration with the local clinical context, responsiveness to individual patient needs, and active involvement of patients and families [30].

Together, these findings indicate that real-world effectiveness depends primarily on implementation in everyday clinical practice.

Discussion

Inpatient falls remain a complex patient safety problem in acute care hospitals. Despite the availability of numerous guidelines, risk assessment tools, and preventive interventions, the literature shows that no single strategy reliably reduces falls in hospitalized patients. Instead, prevention depends less on individual tools and more on how strategies are embedded into everyday clinical practice and ward routines.

A central finding is the limited predictive value of commonly used fall risk assessment tools. Instruments such as the Hendrich II Fall Risk Model, the Morse Fall Scale, and STRATIFY are easy to use and widely implemented, yet their discriminative performance is modest and highly dependent on cutoff thresholds. Other screening tools, including FES and VES-13, perform particularly poorly in acute care populations. These findings indicate that risk scores should not be interpreted as reliable predictors of individual fall events and should not replace individualized clinical judgment. Machine learning-based approaches may offer more dynamic risk stratification in the future, but given current methodological limitations and lack of external validation, they should still be regarded as experimental decision-support tools.

Evidence regarding the effectiveness of preventive interventions remains heterogeneous. Large systematic reviews show that most single-component interventions-including technological solutions such as bed or chair alarms or isolated deprescribing of fall-risk-increasing drugs do not produce meaningful or consistent reductions in inpatient falls. Although exercise and physiotherapy are effective in community and long-term care settings, current hospital-based evidence does not demonstrate a clear standalone effect in acute care.

This discrepancy likely reflects fundamental differences between community and hospital populations. Hospitalized patients are often in a transient state of acute vulnerability related to illness, medications, or urgent toileting needs, while judging their abilities based on pre-hospital condition.

The mixed evidence regarding monitoring technologies illustrates this problem. Bed and chair alarms and sensor-based systems have not reduced falls in acute care and in some studies were associated with higher fall rates, possibly by encouraging unsupervised mobilization before staff arrival. In contrast, continuous video monitoring and enhanced supervision may be useful in selected high-risk patients, but only when embedded in a broader care model rather than used as standalone solutions.

Although patient and staff education is the only intervention consistently supported by higher-certainty evidence, the broader literature suggests that the success of hospital fall prevention depends primarily on implementation. Multifactorial programmes can reduce falls, but only when they are well integrated into workflows, adapted to local conditions, and supported by leadership and staff adherence. Studies of programmes such as StuPA and Fall TIPS illustrate that implementation quality and sustainability are critical determinants of effectiveness.

From a practical perspective, hospitals should focus less on tools and more on systems that support reliable implementation and patient engagement.

This narrative review is limited by its reliance on a single database, English-language sources, and heterogeneous evidence from partly different care settings, which precludes quantitative synthesis and limits generalisability.

Conclusion

Inpatient falls remain a complex safety problem, with limited benefit from most single-component interventions and commonly used risk assessment tools. Current evidence suggests that effective prevention relies primarily on patient and staff education and on programmes that actively engage patients and are well integrated into everyday clinical practice.

Conflict of interest
None

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