

Fall risk assessment tools - validity considerations and a recommended approach

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ABSTRACT

Falls in hospital are common and have serious consequences for patients, including physical and psychological harm, increased length of stay, and hospital costs. A systematic approach is required to report and identify factors contributing to in-hospital falls and develop interventions to reduce inpatient fall rates. Different hospital settings have different fall rates and characteristics depending on type of hospital service and admission diagnosis. Screening tools were developed to assess fall risk but are usually insensitive to be useful in reducing falls. There is also a need for prospective validation in each hospital setting to ensure accuracy, resulting in a move away from using such scoring tools. A recommended approach for fall risk assessment is given, which integrates the process for outpatient settings and inpatients.

Introduction

Falls in hospital are common and are the most frequent inpatient safety incident. Reported fall rates range from 3 to 14 per 1000 bed days, with 3 to 20% of inpatients falling at least once during hospitalization.^{1,2} Falls lead to serious consequences, such as physical and psychological harm, impaired rehabilitation, increased length of stay, additional increased healthcare costs (ranging from USD 3500 to USD 16,500) and contribute to morbidity and mortality. Injuries, such as fractures, subdural hematomas and bleeding can occur in 6 to 44% of inpatient falls, and are considered *never events* (serious, largely prevent-

able safety incidents that should not occur if the available preventive measures are implemented).²⁻⁴

The Joint Commission International for Accreditation Standards for Hospitals specifies that hospitals should have a goal to reduce the risk of harm from falls to inpatients and outpatients. Measurable elements for hospitals include screening or assessing fall risks by using appropriate tools, a process for reassessment, especially if there are changes to the patient's condition; and implementing interventions to reduce fall risk.⁵

A systematic approach is required to report and identify factors contributing to in-hospital falls and develop interventions to reduce inpatient fall rates.

Different hospital settings have different fall rates

A National Reporting and Learning System (NRLS) for patient safety incidents in England and Wales compared frequency of falls in approximately 500 hospitals specializing in acute care, rehabilitation and mental health. This identified wide variations in falls recording and reporting, and recorded falls rates, even between institutions of similar case-mix. The reported mean standardized fall rates in mental health units, acute hospitals, and community hospitals at 2.1, 4.8 and 8.4 falls per 1000 bed days respectively.⁶

Specific services within hospitals may have higher fall rates. In a large urban hospital, the highest fall rates were in medicine and neurology services (6.12 falls per 1000 patient day) despite having the highest patient-nurse ratios (6.5 and 5.3 respectively). Most fallers were unassisted, occurred in the patient's room and during

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the evening, with half of the falls related to elimination activities.⁷ Another similar study found significantly higher fall rates in neuroscience and psychiatry departments compared to other adult services, suggesting falls and injury prevention programs may need consideration of clinical departments.⁸ A retrospective cohort study from 9 hospitals with 8974 falls in 7082 patients showed that fall characteristics and type of serious fall-related injuries differed by hospital type. For example, in academic hospitals, falls tend to occur in locations other than patients' room, while in non-academic hospitals, falls were more likely in bathrooms.⁹

In a tertiary Melbourne hospital which classified inpatient fall incidence based on diagnosis related groups (DRGs), the most common fall-associated DRGs were *Dementia and other chronic disturbances of cerebral function* (24%), while three of the top six DRGs had significantly longer length of stay for fallers compared with non-fallers (*Delirium, Stroke and Respiratory conditions*).¹⁰ A 10-year cohort study also identified delirium and dementia as significant fall risk factors with associated mortality and increased length of stay (median 19 *versus* 5 days).¹¹

These findings indicate a pressing need for improvements in local reporting, recording and focused analysis of incident data. These data can be used at the local and national level to better inform and target falls prevention, and explore reasons for large apparent differences in fall rates between institutions.⁶

Fall risk assessment tools: considerations

Screening for fall risk in hospital may identify patients at risk of sustaining injury, and a target for fall prevention intervention. A systematic approach is required to effectively screen patients using risk assessment tools. However, several considerations are required before implementing these tools in any inpatient settings.

Screening tools should be easy and quick to administer. The introduction of assessment tools requires training of clinical staff, and simpler tools will facilitate learning and consistent, accurate application of the tool. This is important in an acute hospital setting, with high workloads, particularly as periodic reassessments are required. For example, a study simultaneously testing four tools (STRATIFY, Tinetti, Downton and Tullamore) found that STRATIFY was completed most easily in the least time (3.85 min *versus* greater than 6.25 min). The other tools could not be completed in all patients, especially Tinetti, which could only be completed in 12.5% of patients.¹²

Design-related bias in evaluating the predictive accuracy of tools can lead to overoptimistic results in study settings, which may not be replicable elsewhere. In a systematic review assessing methodology of publications on fall risk screening tools, comparable ac-

curacy was found for STRATIFY, Morse Falls Scale and nursing staff clinical judgement. However, when taking into account heterogeneity between studies; while the Morse Falls Scale and STRATIFY may be useful in specific settings, widespread adoption of either of them is unlikely to generate benefits significantly greater than that of nursing staff clinical judgement.¹³ A meta-analysis of fall screening tools in acute hospitalized patients also found significant variability in tool performance depending on the population and environment.¹⁴

Table 1 summarizes different fall risk factors assessed by three screening tools; Morse Falls Scale, Hendrich II Fall Risk Model (HFRM II) and St Thomas Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY). This illustrates that each tool assesses different risk factors; how these are predictive of fall risk in each individual setting may be variable, hence the requirement for local validation.

A meta-analysis identified STRATIFY as the best tool to assess fall risk in acutely unwell inpatients, followed by MRS and HFRM II.¹⁴ However, when a meta-analysis of STRATIFY was performed to review its utility in inpatient settings including geriatric rehabilitation patients, the low positive predictive value (23.1%) and total predictive accuracy suggest that it may not be optimal for identifying high risk individuals for falls prevention.¹⁵ When these three tools were applied simultaneously to hospitalized inpatients in an acute hospital in Singapore, HFRM II was found to be the best performing tool (sensitivity =70%, specificity =61.8%). Thus, it is recommended to test validity of these tools in individual settings prior to implementation.¹⁶

Table 1. Fall risk factors identified by Morse Falls Scale, Hendrich II Fall Risk Model and STRATIFY.

| | Morse | Hendrich II | Stratify |
|-----------------------|-------|-------------|----------|
| History of falling | x | | x |
| Secondary diagnosis | x | | |
| Mobility aids | x | | |
| IV/Heparin lock | x | | |
| Gait/Transfer ability | x | | x |
| Cognition | x | x | x |
| Depression | | x | |
| Altered elimination | | x | x |
| Dizziness/Vertigo | | x | |
| Gender | | x | |
| Anticonvulsants | | x | |
| Benzodiazepines | | x | |
| Visual Impairment | | | x |
| Get up and go test | | x | |

Alternatively, a fall prediction tool may be developed within an individual setting. For example, the Hendrich Fall Risk Model was developed and validated through a large case-control study of fall and non-fall patients in an acute care tertiary facility. The enrolled 355 cases and 780 controls were assessed for more than 600 intrinsic and extrinsic risk factors, with the model developed through stepwise logistic regression. The publication specifically states that the validated Hendrich Fall Risk Model with eight assessment parameters for high-fall identification in acute care environments applies to this specific hospital, with a need to confirm this scoring approach is able to predict subsequent episodes of falls in future cohorts.¹⁷

Finally, existing tools may be adapted or modified for local use to improve discriminative validity and internal consistency or reliability. When the Morse Fall Scale was utilized in three Hong Kong rehabilitation hospitals, there was a high rate of inter-rater reliability and repeatability; with a preferred cut-off point of 45, to achieve sensitivity of 31% and specificity of 83%.¹⁸ Two teaching hospitals in Ontario, Canada adapted the STRATIFY tool by adjusting the risk factors using multivariate logistic regression to obtain optimal weights for the risk score, resulting in a 30-point scale risk score (from 5 points in the original STRATIFY). When a risk score of 9 was used, there was good predictive validity for identifying falls (sensitivity 91%, specificity 60%).¹⁹ Similarly, the Falls Risk for Hospitalized Older People (FRHOP) assessment tool developed in a subacute hospital setting in Melbourne, Australia, was adapted to the Western Health Falls Risk Assessment (WHeFRA) for use in acute hospitals. This resulted in improved accuracy in predicting fallers and rate of falls when compared with STRATIFY.²⁰

A systematic review of publications regarding falls risk assessment tools showed that only 12% subjected the tools to prospective validation, with 4% performing validation in two or more patient cohorts.²¹ Effective falls interventions may require the use of better-validated risk assessment tools, or alternatively attention given to common reversible risk factors in all patients. Thus, there is currently a move away from using falls risk prediction tools for adult inpatients, unless the aim is to flag up common risk factors or causes of falls and prompt delivery of interventions. Overall, tools that claim to predict patients' risk of falling as *high* or *low* do not work well and may provide false reassurance that *something is being done*. Falls prevention should focus on a wider range of actions at patient level and across organisations.^{22,23}

Recommended approach

The Centre for Disease Control and Prevention (CDC) developed a Stop Elderly Accidents, Deaths

and Injuries (STEADI) toolkit based on theory and research evidence to help healthcare providers incorporate fall risk assessment, treatment, and referral into clinical practice, and to facilitate patient referrals to community-based fall prevention programmes.^{24,25}

The STEADI approach consists of three steps: Screening to identify patients at risk for falls; Assessment to identify modifiable risk factors, and Intervention. The three screening questions identifies whether a patient has fallen within a year, if they feel unsteady and if they have a fear of falls. If any of these questions results in a positive response, the patient is considered to be at increased risk of falls and requires a fall assessment by the doctor. Referrals to physiotherapy, occupational therapy, podiatry, or geriatric medicine may be considered, with follow-up planned through the STEADI pathway.

As hospital inpatients are usually admitted *via* the Emergency Department or Outpatient clinics, screening questions from the STEADI pathway would already be completed, which should be reviewed on admission. All patients should have universal fall precautions, with a repeat assessment weekly or if there is a change in their condition, fall in hospital or ward transfer. Universal fall precautions include ensuring patients to have items within reach, including footwear and walking aids, brakes for beds and hospital furniture remain locked, and avoiding fall hazards within the patient's immediate environment, such as clutter or spills.

Patients deemed at high risk or aged 65 years and older should have fall risk factors identified, with intervention carried out for each risk factor. A systematic review identified a small number of significant fall risk factors that emerged consistently despite the heterogeneity of settings, namely gait instability, agitated confusion, urinary incontinence/frequency, falls history and prescription of *culprit* drugs (especially sedative/hypnotics).²¹ Table 2 summarizes the common fall risk factors and suggested intervention for each risk factor identified. Scoring to identify level of risk is not required, as this has not been shown to be evidence based.

Gait assessment should also be performed, which can be graded using the Get Up and Go Test. To perform this test, the patient is asked to stand up, walk a short distance, turn around and return to sit back down again. The patient performance is graded, with indicators of possibility of falling, such as undue slowness, hesitancy, abnormal trunk or upper limb movements, staggering or stumbling. This should flag up medical review, and consideration of physiotherapy input to reduce fall risk.²⁶

The recommended integrated approach for fall risk assessment is summarized as a stepwise process in the Appendix.

Table 2. Fall risk factors and suggested intervention for each risk factor identified.

| Risk factor | Management plan for falls risk factors |
|---|--|
| Confusion/Impulsivity* | Frequent checks and close to nursing stations Encourage family to accompany Constant reorientation to time, person, place |
| Depression | Assess mood; consider referral to Psychology/Psychiatry if required |
| Dizziness/Vertigo | Check postural blood pressure |
| Limited mobility Frequent toileting Visual impairment | Regular toileting - Schedule 2-4 hourly Supervise/Assist transfer or mobility - Walking aid at bedside if needed Environmental Assessment/Review for falls risks |
| Medications | Nurses to advise doctor for medication review if patient is on benzodiazepines, sedatives and antiepileptic medications ^o |

*Assess delirium and dementia; ^oBenzodiazepines: Consider taper towards stopping; Sedatives: Consider discontinuing; Antiepileptic medications: Check if this is the lowest effective dose.

Finally, implementing fall prevention initiatives involves more than introduction of fall risk assessment tools. A comprehensive hospital-wide program should be introduced, and it requires administrative support and a multidisciplinary implementation team. The Agency for Healthcare Research and Quality (AHRQ) provides a comprehensive toolkit that may be a useful process to follow when introducing fall prevention initiatives in hospital.²⁷

Fall rates should also be measured and monitored, and any fall prevention practices should be sustainable within the organization. Accuracy and compliance with assessment should also be monitored and require ongoing continued staff education.²⁸

Conclusions

Falls in hospital and associated injuries are potentially preventable. While different fall risk assessment tools are available, they are insensitive and will require prospective validation before use. A recommended pragmatic approach is given, which integrates fall risk assessment in hospital.

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