

A simple tool predicted probability of falling after aged care inpatient rehabilitation

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Abstract

Objective: To develop and internally validate a falls prediction tool for people being discharged from inpatient aged care rehabilitation.

Study Design and Setting: Prospective cohort study. Possible predictors of falls were collected for 442 aged care rehabilitation inpatients at two hospitals.

Results: One hundred fifty participants fell in the 3 months after discharge from rehabilitation (34% of 438 with follow-up data). Predictors of falls were male gender (odds ratio [OR] 2.32, 95% confidence interval [CI] = 1.00–4.03), central nervous system medication prescription (OR 2.04, 95% CI = 1.00–3.30), and increased postural sway (OR 1.93, 95% CI = 1.00–3.26). This three-variable model was adapted for clinical use by unit weighting (i.e., a score of 1 for each predictor present). The area under the receiver operating characteristic curve (AUC) for this tool was 0.69 (95% CI = 0.64–0.74, bootstrap-corrected AUC = 0.69). There was no evidence of lack of fit between prediction and observation (Hosmer–Lemeshow $P = 0.158$).

Conclusion: After external validation, this simple tool could be used to quantify the probability with which an individual will fall in the 3 months after an aged care rehabilitation stay. It may assist in the discharge process by identifying high-risk individuals who may benefit from ongoing assistance or intervention. © 2011 Elsevier Inc. All rights reserved.

Keywords: Accidental falls; Aging; Prediction; Rehabilitation; Postural control; Muscle strength

1. Introduction

Falls present an important challenge to those delivering clinical services for older people as well as for health care policy. The increasing number and proportion of older people in the population means that falls will have an increasing impact on health services in years to come.

Falls are frequent in aged care and rehabilitation settings [1]. Mobility problems have consistently been found to be important predictors of falls [2], and rehabilitation patients often have mobility problems. It is likely that many people discharged from inpatient rehabilitation remain at an increased risk of falls. Previous studies in people recently discharged

from hospital have found an increased risk of falls among people who require help with functional tasks, in people with self-reported confusion [3], among those with previous falls or hospitalization, among those who use tricyclic antidepressants, and among those with delirium or poor balance [4]. Impaired lower extremity function has also been shown to be associated with falls in people in the year after a general medical hospital admission [5]. The well-validated St. Thomas Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY) tool can predict falls among hospital inpatients [6] but does not adequately predict falls after discharge from hospital in people recovering from a stroke [7].

Most fall risk assessment tools classify people as being at “high” or “low” risk. The use of falls risk assessment tools in hospital inpatients has recently been challenged [8] because of the following: the focus on the classification of individuals as “high” or “low” risk, the time required to

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What is new?

Key finding

- This new tool provides a simple way to quantify the probability with which an individual will fall in the 3 months after an aged care rehabilitation unit stay.

What this adds to what was known?

- To our knowledge, no other tools designed for rehabilitation settings enable the estimation of the probability of falling for an individual patient.

What is the implication and what should change now?

- This tool requires external validation but has the potential to assist with discharge planning and future service provision.

complete these assessments, the lack of demonstrated “added value” compared with clinical judgment, the lack of action to address risk factors identified, and uncertainty about whether such a tool is needed to implement an intervention strategy. Most of these criticisms potentially apply to the use of falls risk assessment tools among people leaving hospital. However, we suggest that a tool that could quantify an individual’s risk of falling (rather than simply classifying them as being at “high” or “low risk”) could be useful for clinicians and has the potential to “add value” to clinical judgment. Information about an individual’s probability of falling could be communicated to individuals and their carers and could guide the provision of posthospital interventions. To our knowledge, there are no simple tools that can predict the probability of falling for people discharged from aged care rehabilitation settings.

In this article, we describe the development of an easily applied falls prediction tool for use at point of discharge from rehabilitation settings that provides an individualized estimation of the risk of falls based on the presence of predictors. Our purpose was to identify predictors of falling rather than causes of falling. The issue of confounding is central to studies of causation but not salient to studies of prediction [9,10]. As a history of falls and impaired mobility have been consistently found to be associated with future falls [2], we also compared the predictive ability of this new tool with that of a simple question about previous falls and a simple test of mobility (the Timed Up and Go test [11]).

2. Methods

2.1. Design and recruitment

The study was a prospective inception cohort study in which baseline data were collected from consecutive

consenting new admissions to aged care rehabilitation wards at two metropolitan public hospitals in Sydney, Australia. Falls were assessed at least monthly for 3 months after participants left hospital. Recruitment occurred between August 2005 and April 2007.

All patients admitted to the participating wards during this time period were considered for inclusion in the study unless they were deemed too medically unstable to safely complete the assessments or did not speak conversational English and an interpreter was not available.

Informed consent was sought directly from all eligible patients with a Mini-Mental State Examination (MMSE) score [12] of $\geq 24/30$. For those with lower scores, consent was sought from the patient and the person responsible (usually a family member). The study was approved by Human Research Ethics Committees at the University of Sydney and the two participating hospitals.

2.2. Predictor variables

Medical and sociodemographic data were collected from medical records, discharge summaries, and interviews with participants during the hospital admission. These data included *age*, *gender*, *falls history*, *medical conditions*, and *central nervous system (CNS) medications prescribed on discharge*. The need for *frequent toileting* whilst an inpatient was identified by the primary nurse using the STRATIFY item. *Cognition* was assessed using the MMSE [12]. A physical assessment was conducted by a physiotherapist (E.B. or M.T.) in the 48 hours before discharge from the ward. *Standing balance* was assessed by recording the time that each of five positions (feet apart, feet together, semitandem stance, tandem stance, and single leg stance) could be held without assistance or arm support (maximum of 10 seconds for each position [13]) and with a *postural sway test* [14]. Balance while leaning was assessed with *coordinated stability* and *maximal balance range* [15] tests. *Stepping ability* was assessed using the Hill step test [16] (the number of steps onto a 7-cm block in 15 seconds). *Gait* was assessed using the Timed Up and Go Test [11], which tests the ability to stand up, walk 3 m at usual pace, turn around, return, and sit down again. The time to walk 4 m at a “fast safe” pace was also measured. *Visual contrast sensitivity* was assessed with a low-contrast visual acuity chart and the Melbourne Edge Test [14]. Seated *knee extensor muscle strength* was assessed with a spring balance [14].

2.3. Falls monitoring

A fall was defined as unintentionally coming to rest on the ground or other lower surface without overwhelming external force or a major internal event [17]. Each week, in the month after discharge from hospital, participants were telephoned and asked about their falls. At the end of each subsequent calendar month for a total of 3 months, they were also asked to complete a questionnaire that

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