



The Little Schmidy Pediatric Hospital Fall Risk Assessment Index: A diagnostic accuracy study



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ABSTRACT

Background: Falls are among the most common potentially preventable adverse events. Current pediatric falls risk assessment methods have poor precision and accuracy.

Objective: To evaluate an inpatient pediatric fall risk assessment index, known as the Little Schmidy, and describe characteristics of pediatric falls.

Design: Retrospective case control and descriptive study. The dataset included 114 reported falls and 151,678 Little Schmidy scores documented in medical records during the 5-year study period (2007–2011).

Setting: Pediatric medical and surgical inpatient units of an academic medical center in the western United States.

Participants: Pediatric hospital inpatients <25 years of age.

Methods: Nurses used the 5-item, 7-point Little Schmidy to assess fall risk each day and night shift throughout the patient's hospitalization. Conditional fixed-effects logistic regressions were used to examine predictive relationships between Little Schmidy scores (at admission, highest prior to fall, and just prior to fall) and the patient's fall status (fell or not). The sensitivity and specificity of different cut-off scores were explored. Associations between Little Schmidy scores and patient and hospitalization factors were examined using multilevel mixed-effects logistic regression and multilevel mixed-effects ordinal logistic regression.

Results: Little Schmidy scores were significantly associated with pediatric falls ($p < 0.005$). Maximal performance was achieved with a 4-item, 4-point, Little Schmidy index (LS4) using a cut-off score of 1 to indicate fall risk with sensitivity of 79% and specificity of 49%. Patients with an LS4 score ≥ 1 were 4 times more likely to fall before the next assessment than patients with a score of 0. LS4 scores indicative of fall risk were associated with age ≥ 5 years, neurological diagnosis, multiple hospitalizations, and night shift, but not with sex, length of hospital stay, or hospital unit. Of the 114 reported falls, 64% involved a male patient, nearly one third (32%) involved adolescents (13–17 years), most resulted in no (59%) or mild (36%) injury, and most (54%) were related to diagnosis or clinical characteristics. For 60% of the falls, fall precautions had been implemented prior to the fall.

Conclusions: The revised 4-item Little Schmidy, the LS4, predicts pediatric falls when administered every day and night shift, but identifies most patients (65%) as being at risk for fall. Strategies for improving the accuracy and efficiency of the assessments are proposed. Further research is needed to develop more effective pediatric fall prevention strategies tailored to patient's age, diagnosis, and time of day.

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What this paper adds

- The 5-item Little Schmidy Fall Risk Assessment index with a cut-off score of 3 had limited utility for correctly identifying pediatric patients at risk for fall.
- The revised 4-item, 4-point Little Schmidy (LS4) index demonstrates preliminary utility and improved efficiency for identifying pediatric patients at risk for falls.

What is already known about the topic?

- Falls are among the most common potentially preventable adverse events that may occur during a patient's hospital stay.
- Current pediatric falls risk assessment methods have poor precision and accuracy.

1. Introduction

Falls are among the most common potentially preventable adverse events that may occur during a patient's hospital stay (Currie, 2008; Miake-Lye et al., 2013; Barker et al., 2016). However, there is limited research on pediatric falls assessment and prevention strategies and the research literature focuses primarily on fall prevention in adults and elderly population (Cameron et al., 2012). Fall rates for children are reported to range from 0.56 to 2.19 per 1000 patient days (Harvey et al., 2010; Hill-Rodriguez et al., 2009; Kingston et al., 2010; Schaffer et al., 2012; Schaffer et al., 2012), and this is somewhat lower than the rate for adult patients (1.4–17.9 falls per 1000 patient days) (Lovallo et al., 2010). In 2005 in the United States (US), The Joint Commission (TJC) National Patient Safety Goal was established requiring all its accredited hospitals to implement fall prevention programs for all patients, including pediatric patients (Joint Commission Resources, 2005). In 2015, TJC issued a Sentinel Event Alert on the topic of falls, indicating that patient falls in healthcare facilities continues to be a problem a decade after TJC established this goal (The Joint Commission, 2015).

In 2005, there were very few data about pediatric falls and there were no validated pediatric fall risk assessment methods available. The academic medical center that was the site for the present research uses a validated index, the Schmid Fall Risk Assessment (Schmid, 1990), for assessing falls risk in hospitalized adult patients. After a review of the available literature regarding pediatric falls, the Schmid Fall Risk Assessment index was modified to accommodate pediatric fall risk factors and named the "Little Schmidy". Both the adult and pediatric versions of the tool provide an index of the patient's risk for falls based on five criteria: their fall history, current medications, mobility, mentation, and elimination. For both versions, a score of three or higher indicates that a patient is at high risk for falls and requires implementation of fall prevention measures.

Over the past 10 years, a number of other pediatric fall risk assessment methods have been developed and a body of literature is beginning to grow on the effectiveness of identifying patients at risk to prevent pediatric inpatient falls. A review by Ryan-Wenger et al. (2012) of four pediatric fall risk assessment tools (Cooper and Nolt, 2007; Graf, 2011; Razmus et al., 2006; Ryan-Wenger and Dufek, 2013) found that "these four tools, while well intentioned, have insufficient precision and accuracy to serve as the main plank of a pediatric fall prevention protocol" (p. 165). There are no published studies regarding the validation of the Little Schmidy. Thus, this study used data from hospitalized pediatric patients over a five-year period (2007–2011) to address the following aims and hypotheses:

1. Evaluate the predictive relationship between the Little Schmidy Fall Risk Assessment scores and documented falls among

pediatric inpatients. We hypothesized that the Little Schmidy would significantly predict pediatric falls.

2. Describe the Little Schmidy scores and the patient and hospitalization factors associated with them. We hypothesized that patient and hospitalization factors would influence Little Schmidy scores and fall risk.
3. Describe the characteristics of pediatric hospital inpatients who fell during this 5-year period, as well as the characteristics of their falls. We hypothesized that there would be some common patterns in the characteristics of the patients and their falls.

2. Materials and methods

Given the low frequency of pediatric falls occurrence, this study used a retrospective case-control design to evaluate the Aim 1. A descriptive design was used to evaluate Aims 2 and 3. For the 5-year period between 2007 and 2011, data were extracted from patient electronic medical records. Extracted data included patient age, sex, primary diagnosis, hospital unit, hospitalization dates, and Little Schmidy scores. Pediatric inpatient falls occurring during this same period were abstracted from the University of California San Francisco Medical Centers (UCSF) Incident Report system. The study was approved by the university's Committee on Human Research with waivers of informed consent and HIPAA authorization.

2.1. Sample

All patients regardless of age consecutively admitted to the pediatric medical and surgical inpatient nursing units during the study period were included. Patients with no documented Little Schmidy score were excluded from analyses of Little Schmidy scores, but were eligible for inclusion in the descriptions of patients who fell. The case-control dataset consisted of all patients who fell and had at least one Little Schmidy score prior to their fall, as well as controls who were matched on age (closest match within one year), sex, admission unit, and length of stay (closest match). When multiple potential controls perfectly matched a case for all the matching variables, the patient whose admission date most closely matched that of the case was selected as the matched control.

2.2. Measures

Falls were defined according to the American Nurses Association as "An unplanned descent to the floor (or extension of the floor, e.g., trash can or other equipment) with or without injury. All types of falls are included, whether they result from physiological reasons or environmental reasons." (American Nurses Association, 2005, p. 26). Reported falls (the reference standard) were extracted from the hospital Incident Report system and included the following information: fall date, fall type, situational factors related to the fall, and degree of injury caused by the fall. All falls that were classified as accidental, anticipated physiological, unanticipated physiological or baby/child drop were required to be reported. Developmental falls, defined as falls that are common to infants and toddlers as they are learning to walk, pivot and run or falls during play or physical therapy were only required to be reported if they resulted in injury (American Nurses Association, 2013). Patients with a documented fall in the Incident Report system were considered to have a positive fall status and their first documented fall during the study period was eligible for inclusion as a case in the case-control dataset. Patients without a documented fall in the Incident Report system were considered to have a negative fall status and were eligible to serve as randomly

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