

Brief Report

Risk factors for and prediction of falls in an acute aged care psychiatry unit

Brian Draper

Academic Department for Old Age Psychiatry, Prince of Wales Hospital and School of Psychiatry and School of Public Health and Community Medicine, University of New South Wales, Sydney, New South Wales, Australia

Giselle Busetto

Aged Care Psychiatry, Prince of Wales Hospital, Sydney, New South Wales, Australia

Breda Cullen

Academic Department of Old Age Psychiatry, Prince of Wales Hospital, Sydney, New South Wales, Australia

Objectives: *To evaluate the predictive value of the Aged Care Psychiatry Unit (ACPU) Falls Screen and to describe the outcomes associated with falls in an acute aged care psychiatry unit.*

Methods: *The development of the ACPU Falls Screen for use in an acute aged care psychiatry unit is described. Consecutive admissions to an acute aged care psychiatry unit were assessed prospectively with the ACPU Falls Screen, Health of the Nation Outcomes Scale for older persons (HoNOS 65⁺) and the Resource Utilisation Groups Activities of Daily Living (RUG ADL) Scale. Details of all falls and their consequences were documented on a falls incident form. Other information, extracted from medical records, included psychiatric and medical diagnoses, psychotropic medication prescription, electroconvulsive therapy (ECT), length of stay and demographic data. Multiple logistic regression was used to examine putative predictors of falls.*

Results: *Ninety-five admissions were included in the sample, of which 28 (29%) had falls. Multiple falls occurred in 16% of admissions. No serious injuries were recorded. Falls were associated with significantly higher scores on the ACPU Falls Screen, behavioural overactivity and recent receipt of ECT. However, falls were not associated with significant differences in psychiatric outcome, although multiple falls were associated with an increased length of stay. Receiver operating characteristic (ROC) curves for the ACPU Falls Screen indicated it had poor predictive value for falls.*

Conclusions: *Falls are common in acute aged care psychiatry units. The ACPU Falls Screen was not a good predictor of falls. Universal precautions should be taken to prevent falls,*

particularly after ECT and in admissions with behavioural overactivity.

Key words: *aged care psychiatry, falls.*

Introduction

Falls are a major cause of morbidity and mortality in the elderly. The incidence of falls in hospitals and nursing homes is almost three times that found in the community, with 10–25% of institutional falls resulting in fracture, laceration or the need for hospital care [1]. In acute psychiatric units, falls have been found to occur in 9.5–37% of elderly patients and to be associated with increased length of stay [2,3].

Many of the risk factors for falling are regularly present in patients in an acute aged care psychiatry unit (ACPU), for example, use of psychotropic medication, altered mental state, gait and balance abnormalities. In addition, many falls have multiple interacting risk factors and the risk of falling dramatically increases as the number of risk factors increases [4].

The present project was commenced to identify patients at high risk of falling in our ACPU by developing a falls risk assessment tool (ACPU Falls Screen) that was appropriate to the setting. Existing tools had been developed for community, long-term care or general hospital settings. The aim of this report was to evaluate the predictive value of the ACPU Falls Screen and to describe the outcomes associated with falls in an acute ACPU.

Methods

Development phase

This research was conducted in a 10-bed acute ACPU that was collocated with neuropsychiatry in a 20-bed unit. In the first phase of the project, we retrospectively examined the files of 46 patients who had fallen in the aged care psychiatry ward during the previous year, and compared these with files of patients who did not fall. Based on these findings, a 6-month prospective trial of a draft instrument and a review of the literature, we developed a 10-item ACPU Falls Screen to be administered by nursing staff for all new admissions to the unit (Table 1). This was incorporated in 1996 into our standard assessment of all new patients. Staff require approximately 10 minutes training to administer the screen.

Sample

The present study was based on a sample of consecutive admissions to the unit between September 1997 and April 2000. All

Correspondence to: Dr Brian Draper, Academic Department for Old Age Psychiatry, Prince of Wales Hospital.
Email: b.draper@unsw.edu.au

Table 1: Frequencies of Aged Care Psychiatry Unit (ACPU) Falls Screen items (*n* = 95)

ACPU Falls Screen item	Yes (%)	No (%)
1. Is the patient >75 years old?	74	26
2. Has the patient fallen in the past week?	38	62
3. Is there a history of CVA?	16	84
4. Does the patient have difficulty standing from the sitting position?	31	69
5. Does the patient have difficulty walking 5 m unaided?	34	66
6. Does the patient have difficulty turning around and returning to the sitting position?	28	72
7. Is there behavioural overactivity (pacing, wandering)?	28	72
8. Is there motor agitation/restlessness/repetitive movements?	26	74
9. Is the patient disorientated or confused?	57	43
10. Has the patient been prescribed PRN benzodiazepines or neuroleptics?	57	43

CVA, cerebrovascular accident; PRN, "as required".

patients were psychiatric inpatients, aged 65 years or older. Institutional ethics committee approval was obtained.

Measures

For all admissions to the unit, the following data were collected prospectively:

1. ACPU Falls Screen: rated by nursing staff during the admission process. This comprises 10 items, each rated yes or no, with total scores ranging from 0 to 10.
2. Health of the Nation Outcome Scales for elderly people (HoNOS 65+) [5]: this 12-item scale has been designed specifically to measure the overall severity of psychiatric disturbance in older patients over the previous month. It comprises the following items: behavioural disturbances; non-accidental self-injury; problem drinking or drug taking; cognitive problems; physical illness or disability problems; problems associated with hallucinations or delusions; problems with depressive symptoms; other mental and behavioural problems; problems with relationships; problems with activities of daily living; problems with living conditions; and problems with occupation and activities. This was rated by nursing staff on admission and again on discharge, based on the best available information.
3. Resource Utilisation Groups Activities of Daily Living (RUG-ADL) Scale [6]: this is a 4-item scale that measures activities of daily living (bed mobility, toileting, transfer and eating), and was rated by nursing staff on admission and discharge.
4. Falls Incident Report completed for all falls by nursing staff and a medical officer within 24 h of any fall in which the patient went to ground, as reported by patients or witnessed by staff. It contains information about the circumstances, time, location, severity, treatment and outcome of the fall. Postural blood pressure was checked after each fall.

The above information was supplemented by a retrospective audit of patients' medical records. Clinical psychiatric diagnoses were based on Diagnostic and Statistical Manual (DSM)-IV categories [7]. Medical diagnoses and discharge medications were obtained from the discharge summary completed by the aged care psychiatry registrar. Information on electroconvulsive therapy (ECT), clinical events in the 24 h prior to

each fall, length of stay (LOS) and demographic data were also obtained.

Data analysis

Two-sample *t*-tests were used to compare groups on continuous variables. Multiple logistic regression was used to examine putative predictors of falls. Receiver operating characteristic (ROC) curves were produced to examine the predictive value of the ACPU Falls Screen. The level of significance was set at 0.05, except for the logistic regression where the backward step-wise method uses 0.10 as the threshold for removing variables. All analyses were carried out using SPSS version 11 [8].

Results

Sample characteristics

Data were collected on 100 admissions. Five of these admissions dated from before the ward moved to its new location, and so were excluded. The analyses reported were based on 95 admissions (involving 81 individual patients), 60 (63%) of which were of women. Mean age at admission was 78.6 years (SD = 7.4). Mean total LOS in hospital was 33.2 days (SD = 22.9), of which a mean 30.0 days (SD = 19.8) were spent on the psychogeriatric ward. Depression was the primary DSM-IV Axis I diagnosis in 40 (42%) admissions, followed by dementia (27; 28%), schizophrenia (12; 13%), delirium (5; 5%), other organic diagnoses (2; 2%), drug and alcohol disorders (1; 1%) and other diagnoses (8; 8%). Mean RUG-ADL score at admission was 6.1 (range: 0–18, SD = 3.3). Mean HoNOS 65+ score was 17.3 (range: 0–48, SD = 8.7) at admission and 8.7 (SD = 7.2) at discharge.

Falls screen scores

Mean score on the ACPU Falls Screen was 3.9 (range: 0–10, SD = 2.1, *n* = 95 admissions). Full details are presented in Table 1.

Frequency of falls

Sixty-seven (71%) admissions had no recorded falls. The remaining 28 (29%) admissions had a total of 55 recorded falls. One fall was recorded in 15 (16%) admissions, two falls in seven (7%) admissions, three falls in four (4%) admissions and four falls in one (1%) admission. One further admission had 10 falls; detailed information was collected on only the first five of these falls. Thus, the data reported represent 50

Table 2: Reduced logistic regression model (I) to explain the occurrence of falls ($R^2 = 0.172$)

Variable	β	SE	d.f.	P-value	Odds ratio	95% confidence interval
Constant	-1.821	0.408	1	< 0.001	0.162	–
Fallen in the past week	1.672	0.508	1	0.001	5.324	1.968, 14.399
Behavioural overactivity	1.571	0.664	1	0.018	4.813	1.310, 17.682
Motor agitation/restlessness/repetitive movements	-1.201	0.726	1	0.098	0.301	0.073, 1.248

d.f., degrees of freedom; SE, standard error.

Table 3: Reduced logistic regression model (II) to explain the occurrence of falls ($R^2 = 0.204$)

Variable	β	SE	d.f.	P-value	Odds ratio	95% confidence interval
Constant	-1.961	0.430	1	< 0.001	0.141	–
Fallen in the past week	1.609	0.552	1	0.002	4.999	1.796, 13.912
Behavioural overactivity	1.798	0.689	1	0.009	6.036	1.565, 23.286
Motor agitation/restlessness/repetitive movements	-1.401	0.753	1	0.063	0.246	0.056, 1.077
Electroconvulsive therapy within 48 h prior to fall	1.874	0.992	1	0.059	6.512	0.932, 45.497

d.f., degrees of freedom; SE, standard error.

individual falls from 28 admissions. There were no significant differences in age or gender between admissions with and without falls.

The mean and median day of the admission on which the falls occurred were day 21 (SD = 30.1) and day 13, respectively. The most common location of the fall was the bedroom (17; 34%), followed by the ward (11; 22%), the bathroom (8; 16%) and the corridor (5; 10%). Peak times of the day for falls were 06.30–07.00 hours (5; 10%) and 14.30–17.00 hours (9; 18%). The patient was deemed to have been behaviourally disturbed or emotionally distressed immediately prior to 43 (86%) of the falls. No falls occurred due to the involvement of another patient. Routine or PRN psychoactive medication had been given to the patient within 48 h prior to the majority (49; 98%) of the falls. Postural hypotension was recorded after 11 (22%) falls. Of the six admissions that had ECT, four (66.7%) had a fall. In contrast, there were 24 falls (27%) in admissions that did not have ECT ($\chi^2 = 2.57$, degrees of freedom (d.f.) = 1, $P = 0.06$).

Consequences of falls

Injuries were sustained in 28 (56%) falls. Most injuries were minor, including soft tissue injury (12; 24%) and lacerations (9; 18%). There were no fractures or serious head injuries. Only one fall required a medical ward transfer and another required surgery.

There was no significant difference in the mean LOS on ACPU of admissions during which a fall occurred (35.2 days, SD = 25.8, $n = 28$) compared with fall-free admissions (27.9 days, SD = 16.4, $n = 67$; $t = -1.65$, d.f. = 93, $P = 0.102$). However, the mean LOS on ACPU of admissions with two or more falls (47.9 days, SD = 31.3, $n = 13$) was significantly longer than the rest (27.2 days, SD = 15.9, $n = 82$; $t = -2.33$, d.f. = 13, $P = 0.037$). The occurrence of a fall did not result in less improvement in the HoNOS 65+ score. Mean change in the HoNOS 65+ score for fall-free admissions was 8.4 (SD = 8.6) compared with a mean change of -9.0 (SD = 9.8) for admissions during which a fall occurred ($t = 0.304$, d.f. = 92, $P = 0.762$).

Possible predictors of falls

Admissions during which a fall occurred had a mean total score of 4.75 (SD = 2.12) on the ACPU Falls Screen, which was significantly higher than the corresponding score for fall-free admissions (mean: 3.51, SD = 1.93; $t = -2.78$, d.f. = 93, $P = 0.007$).

A backward, step-wise logistic regression model was constructed with occurrence of a fall (yes/no) as the dependent variable. The individual items from the ACPU Falls Screen were entered as independent variables, with age and sex as covariates. The reduced model is presented in Table 2.

A second backward, step-wise logistic regression model was constructed, with 'fallen in the past week', 'behavioural overactivity', 'motor agitation/restlessness/repetitive movements', HoNOS 65+ score at admission, RUG-ADL score, receipt of ECT within 48 h prior to the fall (yes/no), and presence of dementia (yes/no) as the independent variables, covarying for age and sex. The reduced model ($R^2 = 0.204$) is presented in Table 3.

Receiver operating characteristic curves were produced to investigate the predictive value of the Falls Screen. Area under the curve for the full Falls Screen was 0.665 (95% confidence interval (CI) = 0.546, 0.784). Area under the curve for the three Falls Screen items from the reduced logistic regression was 0.652 (95% CI = 0.529, 0.775).

The relationship between psychoactive medication use and the occurrence of falls was also investigated. Mean number of psychoactive medications at discharge for fall-free admissions was 1.67 (SD = 0.82, $n = 67$ admissions), compared with a mean of 1.88 medications given within 48 h prior to each fall (SD = 0.98, $n = 50$ falls; $t = 1.25$, d.f. = 115, $P = 0.215$).

Discussion

The purpose of the present investigation was to develop a falls risk assessment tool to identify patients at high risk of falling in an acute ACPU. Although patients who fell were rated

significantly higher on the ACPU Falls Screen compared with non-fallers, the predictive value of the screen was poor with only approximately 17% of the variance accounted for. Furthermore, three items alone; 'fallen in previous week', 'behavioural overactivity' and 'motor agitation/restlessness/repetitive movements' accounted for nearly all of this. It is not clear whether this is an inherent weakness in the scale or possibly related to variability in ratings from nursing staff, particularly as some were locums and were unable to be trained. Another possibility is that due to the multifactorial nature of falls risk factors, a 10-item screen was insufficient to detect the potential variation in the sample.

When we developed the ACPU Falls Screen, we felt it was necessary to have our own scale, as we were not convinced that existing instruments would meet our needs. A recent analytical review of falls risk assessment measures has concluded that there are several reliable scales that can be used in a falls prevention program and that there is little need for facilities to develop their own scales [9]. We concur with this viewpoint. We recommend that other falls screening instruments be tested in this population and that, meanwhile, universal precautions be taken to reduce falls risk in acute ACPUs, rather than attempting to identify patients at higher risk. One difficulty is that there is insufficient evidence to make recommendations for or against multifactorial falls prevention interventions in acute hospital settings [4].

As could be expected in this population, 86% of falls occurred when the patient was behaviourally disturbed or emotionally distressed, and nearly all had received psychotropic medication in the previous 48 h. Indeed, behavioural overactivity in combination with a history of recent falls and ECT were the only significant predictors of falling. Electroconvulsive therapy has been previously identified as a risk factor for falls in acute ACPUs [2], so this suggests that extra precautions need to be taken with older patients in the post-ECT period. However, dementia and female sex, which have been previously found to be predictors of falls in this setting [2], were not significant predictors in this study. Multiple falls were associated with increased length of stay, which supports previous studies [2,3].

In conclusion, falls are common in acute aged care psychiatry units and are often difficult to predict. Universal precautions should be taken for all patients, but particular attention should be given to overactive patients with a history of falls and in the post-ECT period.

Key Points

- Falls are common in acute aged care psychiatry units.
- Falls in the previous week, behavioural overactivity, agitation and electroconvulsive therapy (ECT) are predictive of falls.
- Universal precautions should be applied for falls prevention until a reliable screening tool can be demonstrated in acute aged care psychiatry units.
- Multiple falls are associated with prolonged length of stay.

References

- 1 Rubinstein LZ, Powers C. *Falls and Mobility Problems. Potential Quality Indicators and Literature Review (the ACOVE Project)*. Santa Monica, CA: RAND Corporation, 1999: 1–40.
- 2 de Carle AJ, Kohn R. Risk factors for falling in a psychogeriatric unit. *International Journal of Geriatric Psychiatry* 2001; 16: 762–767.
- 3 Greene E, Cunningham CJ, Eustace A, Kidd N, Clare AW, Lawlor BA. Recurrent falls are associated with increased length of stay in elderly psychiatric patients. *International Journal of Geriatric Psychiatry* 2001; 16: 965–968.
- 4 American Geriatrics Society Panel on Falls in Older Persons. Guideline for the prevention of falls in older persons. *Journal of the American Geriatrics Society* 2001; 49: 664–672.
- 5 Burns A, Beevor A, Lelliott P et al. Health of the Nation Outcome Scales for elderly people (HoNOS 65+). *British Journal of Psychiatry* 1999; 174: 424–427.
- 6 Fries BE, Cooney LM Jr. Resource Utilisation Groups. A patient classification system for long-term care. *Medical Care* 1985; 23 (2): 110–122.
- 7 American Psychiatric Association. *Diagnostic and Statistical Manual*, 4th edn. (DSM-IV). Washington: American Psychiatric Association, 1994.
- 8 SPSS Inc. *Statistical Package for the Social Sciences*, Version 11. Chicago, IL: SPSS Inc, 2001.
- 9 Perell KL, Nelson A, Goldman RL, Luther SL, Prieto-Lewis N, Rubinstein LZ. Fall risk assessment measures: An analytical review. *Journal of Gerontology: Medical Sciences* 2001; 56A: M761–M766.