

# Medications and risk factors associated with inpatient falls: a case control study

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## Introduction

Falls, near-miss falls, and fall-related injuries are common in both the community and hospital setting.<sup>1</sup> Falls have been identified as the most common adverse event to occur in hospitals, and primarily affect older patients.<sup>2</sup> Reducing falls in hospital is a high priority to ensure a greater standard of care, patient safety and an overall reduction of medical costs.

Comparative studies conducted on falls are limited because most information collected on falls has been gathered from a community or long-term care facility setting.<sup>3</sup> There is limited evidence available for the particular factors that contribute to falls in the hospital setting. Thus far falls prevention interventions in the hospital setting have failed to show significant benefit in reducing falls, or reducing repeat and injurious falls.<sup>3,4</sup>

There may be additional factors contributing to falls that are not being addressed in current preventative strategies. Given the social and economic cost of inpatient falls, research into identifying risk factors and developing more effective preventative strategies is essential.

## Aim

To identify medication- and patient-related risk factors associated with falls in a hospital inpatient setting to direct future falls prevention interventions.

## Methods

Cases were identified as patients experiencing a fall between 1 November 2017 and 28 February 2018 in the hospital incident reporting system. Cases were matched 1:1 to a control (patient who had not fallen) by sex, age and length of stay. Clinical variables considered as potential risk factors for a fall were collected from scanned medical records.

### Clinical variables collected

Medication classes	
• ACE inhibitors	• Diuretics
• Alpha blockers	• Insulin
• Angiotensin receptor blockers	• Sulfonylureas
• Anti-arrhythmic agents	• Other hypoglycaemic agents
• Antidepressants	• Laxatives
• Antiepileptic medications	• Nitrates
• Antihistamines	• Non-opioid analgesics
• Antipsychotics	• Opioids
• Benzodiazepines	• Other cardiovascular drugs
• Beta blockers	• Zolpidem/Zopiclone
• Calcium channel blockers	

Patient related risk factors	
• Confusion	• Dementia
• Lowest blood pressure reading in previous 24 hours	• Delirium
• Blood pressure reading closest to fall/index time	• Prior stroke
• Haemoglobin level	• Cardiac history
• Bed transfer in previous 24 hours	• Fall in the past 12 months
• Planned admission	• Impaired balance
• Presentation for illicit drug/alcohol issues	• Urinary frequency/incontinence/diarrhoea
• Arthritis	• Requires assistance to ambulate to bathroom
• Cancer	• Requires assistance with ADLs
• Diabetic	• Visual impairment
• Anxiety	• Agitated or uncooperative
• Depression	• Nursing ratio 1:1
	• The Northern Hospital modified STRATIFY falls-risk assessment tool score prior to fall

Univariate conditional logistic regression compared the two groups for each variable of interest, and crude odds ratio (OR), 95% confidence intervals (CI) and two-tailed *P*-values were calculated. All variables with *P*<0.1 in the univariate analyses were considered for inclusion in the multivariate analysis. Backward stepwise multivariate conditional logistic regression was used to identify risk factors independently associated with an inpatient fall, with *P*<0.05 considered to indicate significance.

## Results

### Summary of patient characteristics

	Cases (n)	Controls (n)	%
<b>Sex</b>			
Male	92	92	58
Female	67	67	42
<b>Age (years)</b>			
<60	37	37	23
60-69	29	29	18
70-79	39	39	25
80-89	44	44	28
>89	10	10	6
<b>Length of stay (days)</b>			
0-3	53	53	33
4-7	32	32	20
8-14	29	29	18
15-28	12	12	8
29-56	19	19	12
>56	14	14	9

### Univariate analysis

Comprehensive results of the univariate analyses are not presented due to space limitations. Univariate analysis of select medication-related variables which did not appear in the final multivariate model are presented below.

Variable	Case n (%)	Control n (%)	OR (95% CI)	<i>P</i> -value
Alpha blocker	8 (5)	8 (5)	1.00 (0.38–2.66)	1.00
Antipsychotic	18 (11)	8 (5)	2.43 (1.01–5.86)	0.05
Pregabalin/gabapentin	29 (18)	18 (11)	1.73 (0.92–3.27)	0.09
Antiepileptic (other)	11 (7)	9 (6)	1.22 (0.51–2.95)	0.66
Benzo-diazepine	24 (15)	17 (11)	1.54 (0.77–3.09)	0.23
Diuretic	46 (29)	35 (22)	1.5 (0.87–1.77)	0.14
Sulfonylurea	13 (8)	11 (7)	1.22 (0.51–2.95)	0.66
Zopiclone/zolpidem	2 (1)	0 (0)	-	-

### Multivariate analysis

Results of the multivariate conditional logistic regression are presented below.

Patient variable	OR	95% CI	<i>P</i> -value
Requiring assistance with ADLs	5.41	2.59 – 11.31	<0.001
Bed transfer in previous 24 hours	6.64	1.53 – 28.75	0.011
Polypharmacy (≥5 medications)	2.89	1.23 – 6.79	0.015
Agitated or uncooperative	10.10	1.43 – 71.54	0.021
Antidepressant	2.51	1.13 – 5.62	0.025
Impaired balance	2.00	1.07 – 3.73	0.029
Opioids	2.05	1.04 – 4.02	0.038

### What is already known on this topic:

- Inpatient falls cause **significant morbidity and mortality** and are associated with substantial social and economic costs.
- Risk factors for falls include intrinsic and extrinsic elements
- Current **falls interventions have limited evidence** of efficacy.

### What this study adds:

- This study found **polypharmacy, opioid and antidepressant** usage to be medication related factors associated with inpatient falls.
- **Recent bed transfer, agitated or uncooperative behavior, impaired balance and requiring assistance with ADLs** were all independently associated with an increased incidence of inpatient falls.

## Discussion & Conclusion

This study suggests that polypharmacy, the use of opioids, antidepressants, impaired balance, requiring assistance with activities of daily living, agitated or uncooperative behaviour, and a recent bed transfer are risk factors for inpatient falls. These factors should be considered when implementing falls reduction interventions for hospitalised patients.

Benzodiazepines and other sedatives which have shown to be risk factors in prior studies were not found to be a significant risk factor in this study. The lack of significance in association may be due to low numbers of patients taking these medications due to increased awareness of the risks associated with the use of these drugs in the elderly. Only 4% of patients over the age of 60, in both the case and control groups were found to be on a benzodiazepine.

This study has several limitations. Data collections was reliant on accessing scanned medical records – these records were not always complete. Human error in interpretation and collection of data was controlled for by completion of inter-observer reliability testing. Patients from psychiatric wards were excluded from this study due to differing risk factors in this population compared to the general inpatient population.

By developing a greater understanding of how these factors impact upon patients' risk for falls, more effective falls preventative strategies can be developed and implemented with the aim of decreasing the social and economic burden of inpatient falls.

## References

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