



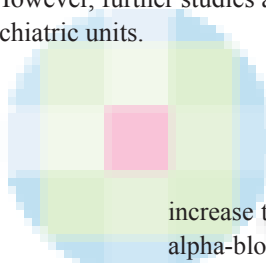
Influence of Medications and Psychotic Symptoms on Fall Risk in Acute Psychiatric Inpatients

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Objective: In this study, we investigated the incidence rate and risk factors related to falls among acute psychiatric inpatients in a regional hospital. **Methods:** We included 521 patients who were admitted to the acute psychiatric ward in Taoyuan Armed Forces General Hospital from January 2015 to January 2016 and analyzed their medical records within a 1-year period. We compared differences between the fall and nonfall groups in demographic characteristics, psychiatric diagnoses, medication use, psychotic symptoms, and Timed Up and Go scores. Chi-square tests were used for comparison of categorical variables and *t*-test was used for continuous variables. **Results:** A total of 521 patients with an average age of 38.9 years were included in our study; 167 (32.1%) patients were female. Among the inpatients in our study, 3.07% were fallers. Patients with female gender, older age, psychotic symptoms, and use of more types of medication, especially mood stabilizers, laxatives, and other classes of medications, were significantly more likely to experience falls ($P < 0.05$). **Conclusion:** Determining the risk factors for falls in an acute psychiatric ward is useful for clinical care. As we identified patients in a high-risk group, fall prevention can be performed to help them to avoid possible injury. However, further studies are needed to determine more quantitative measures to evaluate or predict the risk of falls in acute psychiatric units.

Key words: Psychiatry, inpatient, falls



INTRODUCTION

Falling is a serious problem in health-care services and may lead to injuries of varying severity, especially in older adults. Moreover, both fatal and nonfatal fall injuries are associated with economic costs.^{1,2} Patients in psychiatric units take more kinds of medication, which can easily cause falls. Falling patients in psychiatric units are younger than those in medical units.³⁻⁶ Falls are generally more common in psychiatric units (overall rates of 4.1–6.4/1000 occupied bed days) than in other age-matched units (3.1–3.7/1000 occupied bed days), especially in psychogeriatric units (9.0–17.1/1000 occupied bed days).⁷ Therefore, falls prevention is a major task in psychiatric units.

Medical disease, gait or balance impairment, cognitive impairment, medication use, and falling history might

increase the risk of falls.⁸ Among medications and diagnoses, alpha-blockers, nonbenzodiazepine (non-BZD) sleep aids, BZDs, H2-blockers, lithium, antipsychotics, atypical antidepressants, anticonvulsants or mood stabilizers, laxatives or stool softeners, and a diagnosis of dementia or Alzheimer's disease increase the risk of falling in psychiatric inpatients.⁴

In Taiwan, male patients of 60 years of age or older with bipolar disorder at a mental hospital were significantly more likely to experience repeated (3 or more) falls, but more serious injuries were significantly more common in female patients.⁶ Previous studies have compared patients' characteristics, diagnoses, and medication use to determine the risk of falls in psychiatric wards.^{4,6} To the best of our knowledge, this study is the first to use an objective measurement method

Received: October 13, 2017; Revised: December 15, 2017;
Accepted: February 09, 2018

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How to cite this article: Lu SH, Chen KH, Pan YC, Yang SN, Chan YY. Influence of medications and psychotic symptoms on fall risk in acute psychiatric inpatients. J Med Sci 2018;38:117-21.

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(Timed Up and Go [TUG] test) to evaluate the gait of psychiatric inpatients. For a more comprehensive assessment of the risk of falls, the aim of this study was to identify underlying risk factors for falls, including age, gender, diagnosis, medications, and measures associated with gait, in an acute psychiatric ward.

METHODS

Subjects

The study protocol was approved by the Institutional Review Board of Tri-Service General Hospital, National Defense Medical Center in Taiwan (TSGHIRB No. 2-106-05-102). The study was conducted in the acute psychiatric ward of the Department of Psychiatry at Taoyuan Armed Forces General Hospital, a regional teaching hospital in Taiwan.

This retrospective case study included 521 participants who were admitted between January 26, 2015 and January 25, 2016. All patients were eligible for the study inclusion without regard to gender, ethnicity, mental status, or diagnosis.

Procedures and study tools

We collected existing data, such as gender, age, diagnosis, kinds of medications, psychotic symptoms, and TUG scores, from chart review. The diagnoses were classified according to the International Classification of Disease 9th Revision (ICD-9), and we divided them into the following subgroups: major depressive disorder (ICD-9: 296.2, 296.3), bipolar disorder (ICD-9: 296.0, 296.1, 296.4–296.9), schizophrenia or psychosis (ICD-9: 295, 297, 298), neurosis or adjustment disorder (ICD-9: 300, 311, 308, 309), and others. Patients with psychotic symptoms were classified according to the diagnoses of ICD-9: 290, 294, 295, 296.*4, 297 and 298.

We calculated the kinds of medication used and divided them into the following groups: antipsychotics, antidepressants, hypnotics, mood stabilizers, anticholinergics, cardiovascular agents, laxatives, and others. In addition, psychiatric inpatients received the TUG test weekly during their occupational therapy activities. Many tests or scales are available to evaluate gait and balance or even predict falls, such as the Berg Balance Test (BBS), Tinetti test, and functional reach test.^{9–11} Among these tests, the TUG test is very useful and convenient.^{12–15} The TUG test can be used as a simple measure of balance that is comparable to the BBS, based on the moderate significant correlation between these tests. The TUG test is not only used for elderly adults but also used to predict falls for patients with specific medical illnesses, such as stroke, Parkinson's disease, and arthritis.^{16–18} Before the test, the patients sat in an arm chair (45-cm height). They were asked to stand up from the chair, walk 3 m to a line on the floor at their usual speed, walk

back, and sit down. We measured the time from the command “start” to the patient's return to a seated position.

We divided all participants into falls and nonfall groups and explored the possible risk factors for falls between the two groups. A fall is defined as “an unexpected event, in which the participant comes to rest on the ground, floor, or lower level.”¹⁹ A patient was categorized as a faller if he or she fell during the study period. We also collected information associated with the fall, including the time, related activities, and injuries sustained.

Statistical analysis

All continuous variables are presented as the mean $\pm$ standard deviation. All categorical variables are expressed as numbers (percentage). Chi-square tests were used for comparison of categorical variables and *t*-test was used for continuous variables.

Statistical analyses were performed using Statistical Product and Service Solutions version 22.0 for Windows (SPSS, Inc., Chicago, Illinois, USA). The differences between the falls and nonfall groups were considered statistically significant if $P < 0.05$.

RESULTS

In this study, 521 patients were divided into two groups. Table 1 compares the demographic and clinical characteristics of the patients between the falls and nonfall groups. Table 2 shows that the use of more kinds of medication was found in the falls group ($P = 0.008$). Regarding the different classes of medications, patients taking fewer antidepressants ($P = 0.019$), more mood stabilizers ($P = 0.049$), more laxatives ($P < 0.001$), and more other classes of medications ($P = 0.015$) were more likely to fall. Table 3 describes the diagnoses and psychotic symptoms of the patients between the two groups.

DISCUSSION

This study was a 1-year, retrospective survey of risk factors for falls in acute psychiatric inpatients. During this period, 16 of 521 (3.1%) hospitalized patients experienced falls [Table 1]. The percentage of patients who experienced falls (3.1%) in this study was lower than that in Schwendimann *et al.*'s study (7.5%)²⁰ and Tseng *et al.*'s study (9.2%).⁶ The lower rate may be due to differences in patient characteristics. Schwendimann *et al.* enrolled inpatients across internal medicine, geriatrics, and surgery departments in an urban public hospital. The participants in Tseng *et al.*'s study were enrolled from a psychiatric hospital including acute beds and chronic beds. However, in our study, medical records were collected from

Table 1: Comparisons of demographic and clinical characteristics of patients in the nonfall and falls groups

	Mean±SD		
	Nonfall	Falls	Total
<i>n</i> (%)	505 (96.93)	16 (3.07)	521 (100)
Age (years)	38.52±14.46	51.38±17.16*	38.92±14.79
Female <i>n</i> (%)	158 (31.3)	9 (56.3)*	167 (32.1)
Admission times in the year	1.38±0.75	1.56±0.89	1.38±0.75
Average TUG score (s)	10.58±5.56	16.50±12.05	10.77±5.94
Factors associated with falls			
Time <i>n</i> (%)			
06:00-14:00	-	5 (31.3)	-
14:00-22:00	-	4 (25.0)	-
22:00-06:00	-	7 (43.8)	-
Related activities <i>n</i> (%)			
On or off bed	-	6 (37.5)	-
Walking	-	5 (31.3)	-
In bathroom	-	1 (6.3)	-
On or off wheelchair	-	1 (6.3)	-
Other	-	3 (18.8)	-
Injury <i>n</i> (%)			
No injury	-	7 (43.8)	-
Minor injury	-	9 (56.3)	-
Major injury	-	0	-

**P*<0.05. SD=Standard deviation; TUG=Timed Up and Go Test

Table 2: Patient medications between the nonfall and falls groups

	Mean±SD		
	Nonfall (<i>n</i> =505)	Falls (<i>n</i> =16)	Total
Kinds of medications			
Total (<i>n</i>)	5.25±2.96	7.25±2.82*	5.31±2.97
Antipsychotics	0.90±0.76	1.00±0.73	0.91±0.75
Antidepressants	0.46±0.70	0.19±0.40*	0.45±0.69
Hypnotics	1.57±0.95	1.81±0.91	1.58±0.95
Mood stabilizer	0.40±0.58	0.69±0.70*	0.40±0.58
Anticholinergic	0.42±0.52	0.56±0.63	0.42±0.53
Cardiovascular agents	0.27±0.61	0.37±0.50	0.27±0.60
Laxatives	0.43±0.62	0.94±0.57*	0.45±0.62
Others	0.80±1.42	1.69±1.85*	0.83±1.44

**P*<0.05. SD=Standard deviation

patients admitted to acute psychiatry wards in the general hospital.

As shown in Table 1, female gender and older age were associated with falls. One study in a psychogeriatric inpatient population found that falls are associated with female gender,²¹

but another study in a psychiatric institution showed that male patients are more likely to fall.²² Other studies showed no difference in falls between both genders.^{6,23}

In our study, most patients fell at 22:00pm-06:00am (43.8%) while getting on and off the bed (37.5%) and sustained minor injuries (56.3%). Similarly, in previous studies, most fallers also sustained minor or moderate injuries.^{6,7} In Scanlan *et al.*'s study, the most common fall-related activity was walking (41.0%) and falls were most common in the bedroom (30.5%).⁷

The risk of falls is significantly increased for patients with schizophrenia, bipolar disorder, dementia, and substance dependence.⁶ There was no significant difference between diagnoses in our study. Nevertheless, when we divided the patients into groups based on the presence or absence of psychotic symptoms, the patients with psychotic symptoms had a higher risk of falls. It is reasonable to assume that patients with psychotic symptoms have worse executive function, which may cause falling.²⁴

In our study, patients using more kinds of medications had a higher risk of falls, which is consistent with previous studies. Compared with the use of 4 or more medications, the use of the general category of psychotropic medications increases the risk of 1 or more falls among women.²⁵ Alpha-blockers, non-BZDs, BZDs, H2-blockers, lithium, antipsychotics, atypical antidepressants, mood stabilizers, and laxatives also increase the risk of falling in psychiatric inpatients.⁴ We revealed a similar finding in our study; the risk of falls was significantly increased when patients used more kinds of mood stabilizers or laxatives. In our study, taking more "medications of other classes" may indicate that the patients had more medical diseases. This idea is consistent with a previous study that demonstrated an increased risk of falls in patients with other medical problems, such as cardiac arrhythmia, Parkinson's disease, and dementia, in a psychogeriatric unit.²¹

A meta-analysis of 21 studies showed that the mean TUG time for individuals at least 60 years of age was 9.4 s.²⁶ In our study, the mean TUG score of all patients was 10.77 s and that of those at least 60 years of age was 18.84 s. Compared with the individuals in the meta-analysis, the patients in our acute psychiatric units had a markedly worse TUG score. Some possible reasons for this discrepancy are as follows: First, the patients in the acute psychiatric ward may take more kinds and higher dosages of psychotropic medications due to the acute phase of mood or psychotic symptoms. Almost all these medications are associated with an increased risk of falls and may worsen the TUG score.⁵ Second, executive dysfunction is associated with a range of disorders, including psychiatric disorder. Executive dysfunction may cause slower than usual gait speed in older adults with amnesic mild cognitive

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Table 3: Diagnoses and psychotic symptoms of patients in the nonfall and falls group

	Nonfall, (n=505) (%)	Falls, (n=16) (%)	Total, (n=521) (%)
Diagnosis			
Major depressive disorder	71 (14.1)	0	71 (13.6)
Bipolar disorder	80 (15.8)	4 (25.0)	84 (16.1)
Schizophrenia	209 (41.4)	10 (62.5)	219 (42.0)
Neurosis	105 (20.8)	2 (12.5)	107 (20.5)
Others	40 (7.9)	0	40 (7.7)
Psychotic symptoms	278 (55.0)	13 (81.3) *	291 (55.9)

*P<0.05

impairment.²⁷ Thus, it is reasonable to infer that patients in an acute psychiatric ward also have a slower gait speed due to their impaired executive function.

A systematic review showed that the TUG test is associated with falls, but its predictive ability for further falls remains limited.²⁸ Our study showed no significant difference between the mean TUG scores of the falls group and nonfall group. The value of the TUG test lies in the inability of participants to complete the test and the reasons for this inability rather than the time recorded.²⁹ However, 17 patients in our study could not finish the TUG test, and they were all in the nonfall group. The possible reason why these patients could not finish the test is their major or even irreversible physical problems. Therefore, personal nursing care, which lowers the rate of falls, is needed.

Study limitations

- Participants in this study were recruited from only two acute psychiatric wards of the same hospital, which limits the generalization of these findings. Further studies from other psychiatric units are needed to determine if the same results can be obtained
- Another limitation of this study is the small sample size, which included only 16 fallers. A small sample size may make it difficult to obtain statistical significance when comparing possible risk factors. For example, this issue may lead to difficulties in determining other significant risk factors between the falls and nonfall groups
- Once a patient is admitted to a psychiatric unit, the patient is considered at a high risk of falls if he or she is older and has history of falls or unstable gait. Falls interventions, such as falls prevention education, high-risk red bracelets, or medication adjustment, may be applied to these patients. Therefore, there might be more falls in the high-risk group without these falls interventions
- We collected discharge medications as a representation of the patients' medications. Therefore, we might have overlooked

that possibility that the patients might fall when their medication is adjusted or increased. However, designing a study to find associations between medication changes and falls is difficult because patients experience different medication effects or side effects even when taking the same medication

- Finally, we collected TUG scores weekly to determine the changes in TUG scores in the acute psychiatric ward. These scores might have been influenced by different kinds or dosage of medications or unstable psychiatric conditions. However, there were not enough falling cases to determine if there were specific patterns in the changes in TUG scores among the falls group. Thus, we could not determine the changing risk of falls during patient admission. Moreover, performing the TUG test weekly might not be sensitive enough to detect a patient's gait or balance. Further studies are needed to clearly elucidate the changes in gait and balance in psychiatric inpatients during their admission.

We suggest that the future studies need to be designed to address these five limitations, achieve definitive validity and strengthen the results.

CONCLUSION

Risk factors for falls among acute psychiatric inpatients in this study included female gender, older age, use of more kinds of medications, and psychotic symptoms. Moreover, use of fewer kinds of antidepressants and more kinds of mood stabilizers, laxatives, and other classes of medications increased the risk of falls. Further research is required to identify more quantitative measures for falls and develop better fall prevention strategies.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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