

Falls Among Psychiatric Inpatients: A Systematic Review of Literature

ABSTRACT

Background: Falls among psychiatric inpatients are common and have significant health consequences. The purpose of this study is to systematically review the published research on risk factors and consequences.

Methods: PubMed and Embase were searched for relevant studies. A total of 18 studies were included in this systematic review. The heterogeneity and low quality of the reviewed studies limit the generalizability of the results.

Results: Several intrinsic and extrinsic factors are reported. Some of these factors are unique to psychiatric inpatients such as acute mental state, psychotic symptoms, and bipolar disorder leading to cognitive distortions and risk-taking; psychotropic medications inducing side effects like sedation and orthostatic hypotension; while others are similar to those found among general medical inpatients.

Conclusion: Given the clinical importance of a fall and its implication on residential treatment, there is a need for targeted fall prevention programs. In order to further identify and quantify these risks and consequences, prospective research and additional study designs, describing and recording risk factors in a systematic and standardized way with the underlying etiological processes in mind, are needed.

Keywords: Falls, inpatients, hospitalization, psychiatric department, hospital, hospitals, psychiatric

Introduction

Falls among hospitalized patients are common and can be associated with an increase in morbidity and mortality.¹ Research regarding falls is mostly performed among elderly patients hospitalized on medical or surgical wards, who are at a higher risk of falling due to multiple underlying patient-related and environmental factors, such as somatic comorbidity and being in an unfamiliar environment. Patients hospitalized in psychiatric wards might be at higher risk of falling as well, given the similarity in medications and multiple medical comorbidities to the medical and surgical patient population.²

Studies on elderly patients investigate intrinsic and extrinsic risk factors for falling.³ Intrinsic risk factors for falling mainly concern somatic comorbidity, age, and a history of previous falls. Extrinsic risk factors concern environmental factors like clothing, place, time of day, walking aids, nearby staff, and medication. These risk factors are also present in psychiatric inpatients; therefore, one can expect an increase in fall risk as well. Consequences of falling vary, which may be fall-related injury like bruising and soft tissue damage, but fractures and even death are reported. Psychological trauma and fear of falling are underreported consequences and contribute to secondary functional decline.³

The hypothesized risks of falling in psychiatric patients were confirmed in different studies.^{4,5} The available research among psychiatric inpatients is still limited. This is an important subgroup of patients, however, because falls among hospitalized psychiatric patients



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might be more frequent than falls among general medical or surgical populations. According to a study by Blair et al.⁶ there are 3-4 falls per 1000 hospital days among patients in a general hospital, while falls in a psychiatric hospital can reach 13-25 falls per 1000 hospital days.⁶ Recently, Turner et al.⁴ found a fall rate of 8.1 falls per 1000 hospital days.

There may be unique factors associated with the increased faller status in this population.⁴ Psychiatric inpatients have specific properties not found in other medical or surgical populations.⁷ Psychiatric patients are prescribed more psychotropic medication with side effects like dizziness, lowered blood pressure, orthostatic hypotension, decreased alertness, and sedation. Depression, agitation, and cognitive distortions like delusions, hallucinations, decreased attention, racing thoughts, slowed or chaotic thinking can influence behavior and increase risk-taking, which in turn can contribute to increased fall risk.^{6,7} However, medication might indirectly improve fall risk by treating the underlying psychiatric disorder.⁸ Psychiatric patients have higher mobility than medical inpatients, which puts them at risk for falling. Among patients with severe psychiatric illness, there is decreased self-care which can influence fall risk by malnutrition, dehydration, and muscle atrophy.^{6,7}

In this study, we want to systematically review available literature for intrinsic and extrinsic factors contributing to falls among psychiatric inpatients as well as the outcome of a fall.

Methods

A systematic review following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines was conducted. Studies eligible for inclusion concerned psychiatric inpatients only (of any age and diagnosis) who reported on risk factors, fall status, or impact of falling. Studies concerning outpatients not reporting on the outcome of interest were excluded. Cohort studies, case-control studies, and case series were included. Study designs of lower quality were excluded.

The search engines PubMed and Embase were used to search for relevant studies until March 2021. Following search terms and Mesh terms were used within PubMed: "Falls," "Accidental falls," "Inpatients," "Hospitalization," "Psychiatric department, Hospital," "Hospitals, Psychiatric." Within Embase, the following standardized search terms were used: "mental patient" and "falls."

Studies were first selected on the title alone, followed by the screening of the abstract, and lastly included after reading the full text.

One relevant study published after conducting the search was added to the final review through manual searching.⁴

The systematic approach and flowchart can be found in Figure 1.

MAIN POINTS

- *Falling among psychiatric inpatients is frequent and can lead to injury*
- *Several factors unique to psychiatric patients are found*
- *Further investigation is needed to apply these factors to prevention programmes*

Quality Assessment of Studies

To assess the quality of the included studies, the Newcastle-Ottawa Scale was used. Only 2 of the studies achieved an acceptable aggregate score,^{9,10} mostly due to a better selection of patients. However, aggregate scores do not always reflect the overall quality of a study. Most studies were limited by the broad but undifferentiated selection of patients, reliance on self-report tools, or not correcting for important confounders (age and history of falling).

The quality assessment per study can be found in Table 3.

Given the heterogeneity and low quality of the reviewed studies, the results were described in a qualitative and descriptive way.

Results

Among the 18 included studies, there were 4 prospective cohort studies,¹¹⁻¹⁴ 8 retrospective cohort studies,^{10,15-20} 3 case-control studies,²¹⁻²³ and 3 case series.^{4,24,25} The oldest study dates back to 1975 while the most recent was published in 2020.

The summary of the reported risk factors and consequences for the individual studies can be found in Table 1.

Risk Factors

Risk factors for falling are traditionally divided into intrinsic and extrinsic factors. For the purpose of this study, we decided to keep this division.

The different intrinsic and extrinsic factors are summarized in Table 2.

Intrinsic Risk Factors

When looking at intrinsic factors associated with falls, we found most studies reported dementia, history of previous falls, and somatic comorbidities (cardiovascular disease and Parkinson's disease). These are known risk factors from previous studies in a medical or surgical population. Some studies reported factors that we deem more or less unique to psychiatric inpatients like acute mental state (acute confusional state and delirium) and psychotic symptoms.^{9,13,14,16,25} A specific psychiatric diagnosis like bipolar disorder was also reported.^{21,23} Several studies reported conflicting results. For example, 2 studies found the male sex to be associated with falling,^{13,17} while several studies found opposite results with the female sex.^{10,16,18} Tängman et al.¹² found no difference between younger and older patients, while most studies found old age to be associated with falling.^{13,16,19,21,22} The study by Aso and Okamura¹¹ was the only study that investigated "postural instability," defined as total sway length and ellipse area, as a novel factor and as a potential risk factor for falling among schizophrenic patients and found significant differences in the presence or absence of a fall.¹¹

Extrinsic Risk Factors

Extrinsic risk factors concern medication and environmental factors like clothing, place, time of day, walking aids, and nearby staff. Studies reporting on medication found general psychotropic medication to be associated with falling^{9,12,15,16,21} with some studies specifically reporting mood stabilizers,^{10,16,21,23} lithium,^{19,23} and benzodiazepines^{16,22,23} as a risk factor. Specific somatic medication was reported as well, like laxatives,¹⁶ antihypertensives,^{21-23,25} and alpha blockers.^{23,25} Heslop et al. reported COX inhibitors as a risk factor for falling. Lavsa et al. also found antihistamines to be contributing to

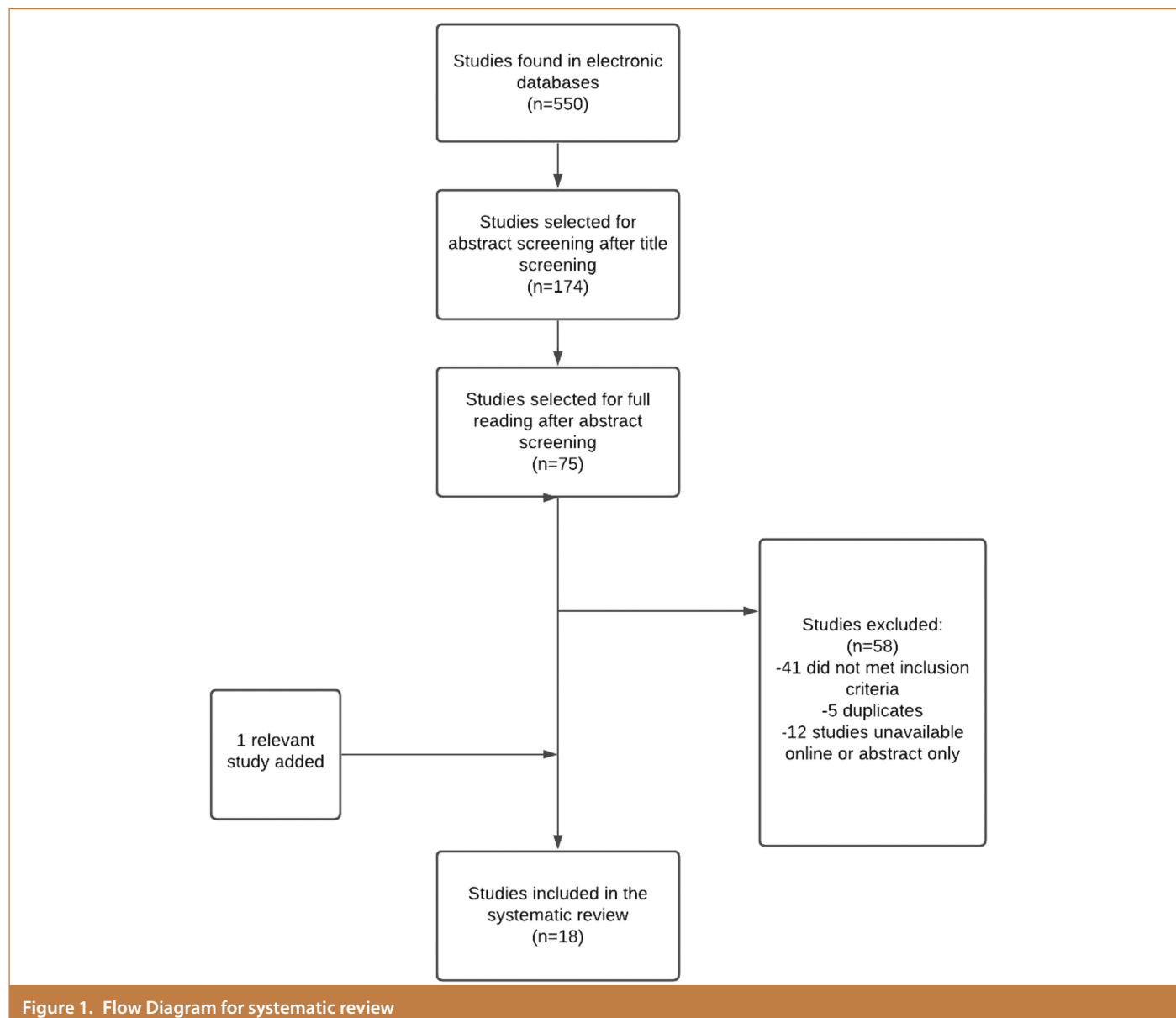


Figure 1. Flow Diagram for systematic review

faller status. Two studies reported that fallers received psychotropic medication within 24 hours before the fall but did not differentiate between acute changes in medication or chronically administered medication.^{15,25} Chan et al²¹ reported that changes to medication within 24 hours were associated with falling but did not specify which kind of medication. Vaughn et al¹⁹ reported that involuntary hospitalized patients fell more than voluntary patients.

Studies reporting on the location of a fall found the bedroom^{9,13,25} and the bathroom^{9,13} to be associated with falling. Edelstein and Brown⁹ also found the hallway to be associated with falling. Tängman et al. and Brown et al. reported on the time of day as a risk factor, specifically evening⁹ and nighttime.¹² Length of stay was also found as an extrinsic risk factor associated with falling.^{13,17} Heslop et al²⁵ found the use of a mobility aid contributed to faller status.

Consequences

Only 3 studies reported on the consequences of falling. Oepen et al²⁴ reported on the outcome after a fall, finding that 73.5% of fallers

sustained no injury, 13.1% had mild injury, 11.6% had moderate injury, and 1.8% suffered severe injury. Turner et al⁴ reported an injurious fall rate of 1.9 injurious falls per 1000 hospital days. Heslop et al²⁰ found that sustaining a fall during admission negatively affected the outcome on mental health.

Discussion

To our knowledge, this is the first systematic review reporting on risk factors for falling among psychiatric inpatients.

When looking at the literature in this study, we see that the reported data overall match the unique factors described above. Acute mental state like delirium, psychotic symptoms, and bipolar disorder are frequently reported.

The other way around, one might speculate that there are unique factors to the general medical and surgical population as well; however, no study adequately compares the 2 populations.

Table 1. Reported Risk Factors and Consequences of Falls

Study	Type	Patients	Duration	Methodology	Associated Factor to Faller Status
An et al ¹⁷	Retrospective cohort	N = 7921 (fallers n = 96)	3 years	Descriptive and statistical analysis of risk factors	Male sex, age >60, length of stay
Aso et al ¹¹	Prospective cohort	N = 120 (fallers n = 16) Age >20	3 months	Descriptive analysis Measurement of postural sway and step length	Longer postural sway
Ballinger et al ¹⁵	Retrospective cohort	N = unknown = 236 falls Mean age 65.7	2 years	Assessment of drugs	In 75% of cases, the patient received psychotropic drugs within 24 hours of accident
Brown et al ⁹	Retrospective cohort	N = 144 (fallers n = 84) Mean age 73.33	1-21 months	Descriptive and statistical analysis of risk factors	Cardiovascular disease, psychotic disorder, and antipsychotic medication are predictors of falling Evening time, bedroom, hallway, bathroom Walking and standing
Chan et al ²¹	Prospective case-control	N = 290 (fallers n = 145) Mean age 47	1 year	Sex, room-matched Statistical analysis of risk factors	Old age, bipolar disorder, manic episode, psychiatric comorbidities, history of fall More drug side effects, not higher doses; within 24 hours of fall event Benzodiazepines, mood stabilizers, antihypertensive medications
De Carle & Kohn ¹⁰	Retrospective cohort	N = 1832 (fallers n = 175) age > 60	4 years	Descriptive and statistical analysis	Female sex, M. Parkinson, dementia ECT, mood stabilizers
Estrin et al ²²	Retrospective case-control	N = 148 (fallers n = 74) Mean age 38.1	4 years	Diagnosis matched Statistical analysis of risk factors	Age, number of physical complaints, clonazepam, antihypertensive medication
Furness et al ¹³	Prospective cohort	N = 482 (fallers n = 70) Mean age 75.4	18 months	Descriptive and inferential analysis of risk factors and predictors	Age over 82 years, psychotic disease, length of stay Bed- and bathroom location
Heslop et al ²⁵	Retrospective cohort	N = 65 (fallers n = 65) Mean age 76	12 months	Descriptive analysis of mental health-specific factors	Bedroom location Concomitant medications to psychotropics like ACE-inhibitor, alpha-blockers, COX-inhibitors Disoriented/confused state, unsteady gait, and mobility aid
Heslop et al ²⁰	Retrospective case-control	N = 138 (fallers = 65) Age >65	19 months	Age, sex, diagnosis matched Statistical analysis of risk factors	Sustaining a fall during admission negatively affects mental health outcome
Lavsa et al ²³	Retrospective case-control	N = 774 (fallers n = 387) Mean age 60	5 years	Age, sex, admission year matched Statistical analysis of risk factors	Bipolar disorder, dementia, M. Alzheimer Alpha-blockers, sleeping aids (not benzodiazepines), antihistamines, lithium and mood stabilizers, laxatives, anti-epileptics
Lu et al ¹⁶	Retrospective cohort	N = 521 (fallers n = 16) Mean age 38.1	1 year	Statistical analysis of risk factors	Female sex, older age, psychotic symptoms, more types of medication like mood stabilizers, laxatives
Oepen et al ²⁴	Retrospective cohort	N = 853 (fallers n = 217) Age >65	1 year	Descriptive and statistical analysis of consequences of falls	73% no injury 13.3% mild injury 11.6% moderate injury 1.8% severe injury
Tängman et al ¹²	Prospective cohort	N = 223 (fallers n = 91) Age 60-94	2 years	Descriptive analysis of risk factors Precipitating factors	Nighttime Acute disease and acute medication side effects
Tsai et al ¹⁴	Prospective cohort	N = 197 (fallers n = 12) 15% of >65	7 months	Comparison of fallers and non-fallers	History of previous fall, confused state/delirium, muscle weakness, difficulty walking, incontinence, and raised temperature
Turner et al ⁴	Retrospective cohort	N = unknown = 119 246 falls	6 years	Incidence of falls Consequences of falls	8.6 falls per 1000 hospital days 1.9 injurious falls per 1000 hospital days
Vaughn et al ¹⁹	Retrospective cohort	N = 968 (fallers = 37)	16 months	Descriptive analysis of risk factors	History of previous fall, anxiety, agitation, involuntary admission, antidepressants, major tranquilizers, sedatives, laxatives, lithium, age >65
Wong et al ¹⁸	Retrospective cohort	N = 93 (fallers n = 11) Mean age 75.1	1 year	Descriptive and statistical analysis of risk factors Assessment of fall risk using own tool	Female sex, dementia

Table 2. Summary of Intrinsic and Extrinsic Risk Factors^a

Intrinsic Risk Factors	Extrinsic Risk Factors
History of previous falls ³	Location (e.g., bedroom, bathroom, hallway) ³
Somatic comorbidity ⁴	Time of day (e.g., evening, night) ²
Cognitive state (e.g., acute, confused, delirium) ²	Somatic medication (e.g., laxatives, antihypertensives, Alfa blockers) ⁵
Age ⁶	Psychotropic medication (lithium, benzodiazepines, mood stabilizers, antipsychotics, ...) ⁸
Male or female gender ⁴	Mobility aid ¹
Dementia ⁴	Involuntary admission ¹
Psychiatric diagnosis (e.g., anxiety, bipolar, psychosis) ⁵	ECT ¹
Postural instability ³	Walking or standing ³

ECT, ElectroConvulsive Therapy

^aThe number of studies per risk factor is listed between brackets.**Table 3. Quality Assessment of Studies According to the Newcastle-Ottawa Scale^(a)**

Study	Design	Selection	Comparability	Outcome	Aggregate Score
An et al ¹⁷	Retrospective cohort	**	**	**	6
Aso et al ¹¹	Prospective cohort	**	-	**	4
Ballinger et al ¹⁵	Retrospective cohort	**	-	**	4
Brown et al ⁹	Retrospective cohort	***	**	**	7
Chan et al ²¹	Prospective case-control	**	*	*	4
De Carle & Kohn ¹⁰	Retrospective cohort	***	**	**	7
Estrin et al ²²	Retrospective case-control	**	*	**	5
Furness et al ¹³	Prospective cohort	**	-	**	4
Heslop et al ²⁵	Case series	N/A	N/A	N/A	6
Heslop et al ²⁰	Retrospective cohort	**	**	**	6
Lavsa et al ²³	Retrospective case-control	**	**	*	5
Lu et al ¹⁶	Retrospective cohort	**	*	**	5
Oepen et al ²⁴	Case series	N/A	N/A	N/A	6
Tängman et al ¹²	Prospective cohort	**	-	**	4
Tsai et al ¹⁴	Prospective cohort	**	**	*	5
Turner et al ⁴	Case series	N/A	N/A	N/A	6
Vaughn et al ¹⁹	Retrospective cohort	**	*	**	5
Wong et al ¹⁸	Retrospective cohort	*	-	**	3

^aThe higher number of asterisk (*), the better quality of a given criterion. The maximum asterisks possible for the involved criteria are 4 in selection, 2 in comparability, and 3 in outcome/exposure. For case series, a proposed modified tool of the Newcastle-Ottawa scale according to Murad et al²⁸ was used.

As for the consequence of falls, Kwan et al²⁶ found in 2011 that 10% of fall-related injuries among the general population are considered to be severely injured, with 6-8% being fractures. Only Oepen et al²⁴ reported on the severity of injury and found that only 1.8% sustained severe injuries, such as fractures and cerebral hemorrhages. Unique to the psychiatric inpatient, Heslop et al reported the negative impact of falls on mental health outcome, stating that older adults generally experience improvement with routine mental health care except for the patients who fell. They could not determine the exact reasons for this outcome.

A recent cohort study by Romano et al. investigated the consequences of falls among psychiatric outpatients, finding incidence rates of 8.3 falls leading to hospitalization and 0.8 falls leading to a hip fracture per 1000 person-years.²⁷

The included studies were composed of Western and Asian studies. Interestingly, there might be a difference between these populations. In this regard, Rao et al⁵ performed a systematic review on the incidence of falls in China and found a significantly lower incidence of falls when compared to Western studies. They speculated that

there is a growing attention on falls in research and clinical practice in China that might explain this discrepancy. However, Rao et al also stated that falls could be viewed as minor accidents in some Chinese hospitals, leading to underreporting.

However, there are several limitations among the included studies.

Each of the studies uses its own methodology (e.g., diagnose-matching vs. gender-matching) and endpoints (intrinsic factor, extrinsic factors, consequence of falling). Most studies included patients of older age, leaving little information on falls among adult patients. There is a large difference between the included number of patients and the actual number of fallers within a study. The number of fallers is usually significantly lower than the number of included patients; however, the reliability of the results is limited when comparing the 2 groups without consistent matching.

Studies are mostly descriptive, while the etiology of the risk factors of falling remains speculative (orthostatic imbalance due to medication, estimation errors due to distorted thought processes, etc.).

The current study has its own limitations. First, full-text sources of 12 studies were not available online or were published online with abstract only and had to be excluded. Secondly, the found data of the included studies were largely descriptive, limiting the generalizability of the results within this study.

Conclusion

Falls among psychiatric inpatients seem to have several underlying risks and lead to injury. There are unique factors associated with psychiatric care and worth investigating, though research is still very limited.

Given the clinical importance of a fall and its implication on residential treatment, there is a need for targeted fall prevention programs. In order to further identify and quantify these risks and consequences, prospective research and additional study designs, describing and recording risk factors in a systematic and standardized way with the underlying etiological processes in mind, are needed.

Peer-review: Externally peer-reviewed.

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