

Assessing the Risk Factors of Fall among Hospitalized Adult Patients: A Scoping Review

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ABSTRACT

Contents: Falls have been widely observed among admitted patients that substantially influence their recovery from illness. Also, the fall events significantly contribute to their prolonged hospital stay and increased healthcare costs. Furthermore, patients' fall incidents have proved to be quite costly due to the adverse consequences of fall-related injuries.

Aim: This review aims to identify and analyze the risk factors of falls among adult patients during hospitalization in the relevant research findings.

Methods: The scoping review of the relevant research findings of the risk factors of falls among hospitalized adult patients included 11 relevant studies that were reviewed critically to identify the potential factors increasing patient falls risk. These studies published between 2013-2019 were recruited from authentic databases like MEDLINE, PubMed, CINAHL, and EBSCO. The quality of the included studies was also appraised.

Results: This review revealed different factors contribute to increased risk of falls among hospitalized patients like the age of patients, chronic disease, psychotropic and narcotic drugs, urologic conditions, limb amputation, increased use of anti-epileptics, and environmental factors.

Conclusion: Falls are attributable to both intrinsic and extrinsic factors during hospitalization. Identifying the significant factors leading to falling can help nurses and other healthcare staff to develop preventive strategies to alleviate these falls' physical, psychological, and social consequences.

Keywords: Risk factors, falls, hospitalized adult patients

1. Introduction

Falls are considered indicators of patient safety and quality of nursing care (Florence et al., 2018; Kistler et al., 2018; Swartzell et al., 2013). However, inpatient fall is still one of the highest reported adverse events in all health care settings (Guillaume et al., 2016). A patient fall is an unintentional incident that may lead to severe injury. The fall of patients during hospitalization can negatively affect both the financial and clinical outcomes. Fall among hospitalized patients contributes to more extended hospital stays, increased healthcare costs, higher mortality, and morbidity rates (Burns et al., 2016; Florence et al., 2018).

Fall frequency varies between 1 and 13 falls for every 1,000 patients each day (Severo et al., 2018). According to a recent study by Cigolle et al. (2015), the prevalence of inpatient falls in America in 2010 increased to 36.3% from 28.2%. Further, England and Wales reported 283,438 fall events between 2008 and 2009, while in the Netherlands, the admissions due to falls rose to 141.2 per 10,000 individuals in 2008 from 87.7 per 10,000 individuals in 1981 (Severo et al., 2018). Moreover, an Austrian study

conducted on 3,648 hospitalized patients found out that 38.5% of these patients suffered fall-related injuries. Almost similar findings were established in Switzerland, where the prevalence rates were found to be at 34.7% (Severo et al., 2018).

Risk factors for falls can be intrinsic or extrinsic. For instance, the intrinsic factors for in-hospital falls among adults include dizziness, agitation, muscle weakness, unstable gait, confusion, and hypotension (Guillaume et al., 2016). Extrinsic factors include environmental factors where the patients stay, any hazards from the slippery floor, unfunctional equipment, and poor lighting. These factors may lead patients to fall (Basic & Hartwell, 2015; Silva et al., 2019).

Inpatient falls in older age patients are common and can lead to severe complications, including fractures, injuries, brain injuries, immobility, and the fear of falling again (Kistler et al., 2018). The incidence of in-hospital fall of adult patients is associated with several factors. The physiological change due to senescence, increased number of chronic diseases, and the consequences of using various medications are among influencing factors contributed to in-hospital fall (Silva et al., 2019).

In-hospital patient falls are a particular concern of

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about 20-30% of the hospital's entire reported incident (Kobayashi et al., 2018). Few studies identified the incidence of falls in a developing nation (Williams et al., 2015; Hestekin et al., 2013). The previous study conducted in Saudi Arabia was revealed that 2.4% of the reported incident was sustained inpatient fall, of which 70.4% of these cases occurred at the medical ward, and 29.6% of them were observed at the surgical ward (Al Jhdali et al., 2012).

The fall's contributing factors were the number of medications each day, assistive devices usage, and inactive lifestyle (Al Saif et al., 2012). However, most of the studies focused on older adults, and still, there is a paucity of evidence about risk factors associated with in-hospital falls among adult patients.

A study conducted by Aranda-Gallardo et al. (2013b) indicated that falls are a serious challenge among the hospitalized patients characterized by a reduction in quality and duration of life. For instance, it is estimated that more than 84% of all the fatal events among hospitalized patients have been significantly related to falls.

Research suggests that even though many assessment instruments have often been developed to identify hospitalized patients at the risk of falling, their generalizability has often been limited. Only a few of them have been tested in settings beyond where they were developed. Various instruments have been developed to carry out a risk assessment. For example, the STRATIFY scale is the best tool for assessing the risk of falls among hospitalized acutely ill adult patients (Aranda-Gallardo et al., 2013a).

This review findings can add to the body of literature and contribute to the increasing knowledge about patient safety issues regarding risk factors of falls among hospitalized adult patients. Every healthcare provider must recognize all factors that increase the falls risk amongst patients to increase patient safety and improve care quality. The current review findings could improve fall prevention strategies, which should be built on accurately identifying and assessing risk factors of falls.

3. Aim of the study

This review aims to identify and analyze the risk factors of falls among hospitalized adult patients in the relevant research findings.

4. Subjects & Methods

4.1. Search Strategy

The search strategy allows the researcher to gather the relevant research material that fulfills the research topic

(Pagatpatan & Arevalo, 2016). It also facilitates systematically reviewing the relevant literature. The searched databases to find relevant literature include EBSCO, PubMed, MEDLINE, and CINAHL. Grove and Gray (2018) emphasize the benefits of using appropriate keywords (search terms) to help researchers to find the relevant studies. Thus, the keywords of "risk", "risk factor", "fall," "acute care", "hospitalized", "inpatient" and "admitted" were used in searching. Furthermore, Boolean operators like 'AND,' 'OR' and 'NOT' were used to obtain more focused results (Barker & Barker, 2013). The search was limited to original journal articles published from 2013 until December 2019 because the last review was carried out in 2012 done by Severo et al. (2014). Therefore, this review is to build upon and extend the knowledge of previous work.

4.2. Selection of the Studies

Preferred Reporting Items guided the selection of included studies in this review for Systematic reviews and Meta-Analyses (PRISMA). This review's inclusion criteria are all articles written only in the English language and focused on adult patients who fell while hospitalized. While the meta-analyses, systematic and narrative reviews were excluded.

Besides, the reference list of each identified article was searched further to select the eligible articles. Figure 1 shows that 167 abstracts were found from the initial searching; then, 80 articles were removed for a duplication reason. After that, the screening of all abstracts was performed, and accordingly, only 20 studies were retained. These studies' full-text articles were further screened in-depth to ensure they fulfill the review's inclusion criteria. Therefore, only 11 studies were found fit to be used in this review.

4.3. Inclusion and Exclusion Criteria

The most relevant articles were identified following these inclusion criteria:

- Articles study risk factors for falls among hospitalized patients.
- Articles available in the English language.
- Articles focus on adult patients >18 years.
- Articles published in the last five years between 2014-2019.

Exclusion criteria: The meta-analyses, systematic and narrative reviews and the studies on pediatric patients were excluded.

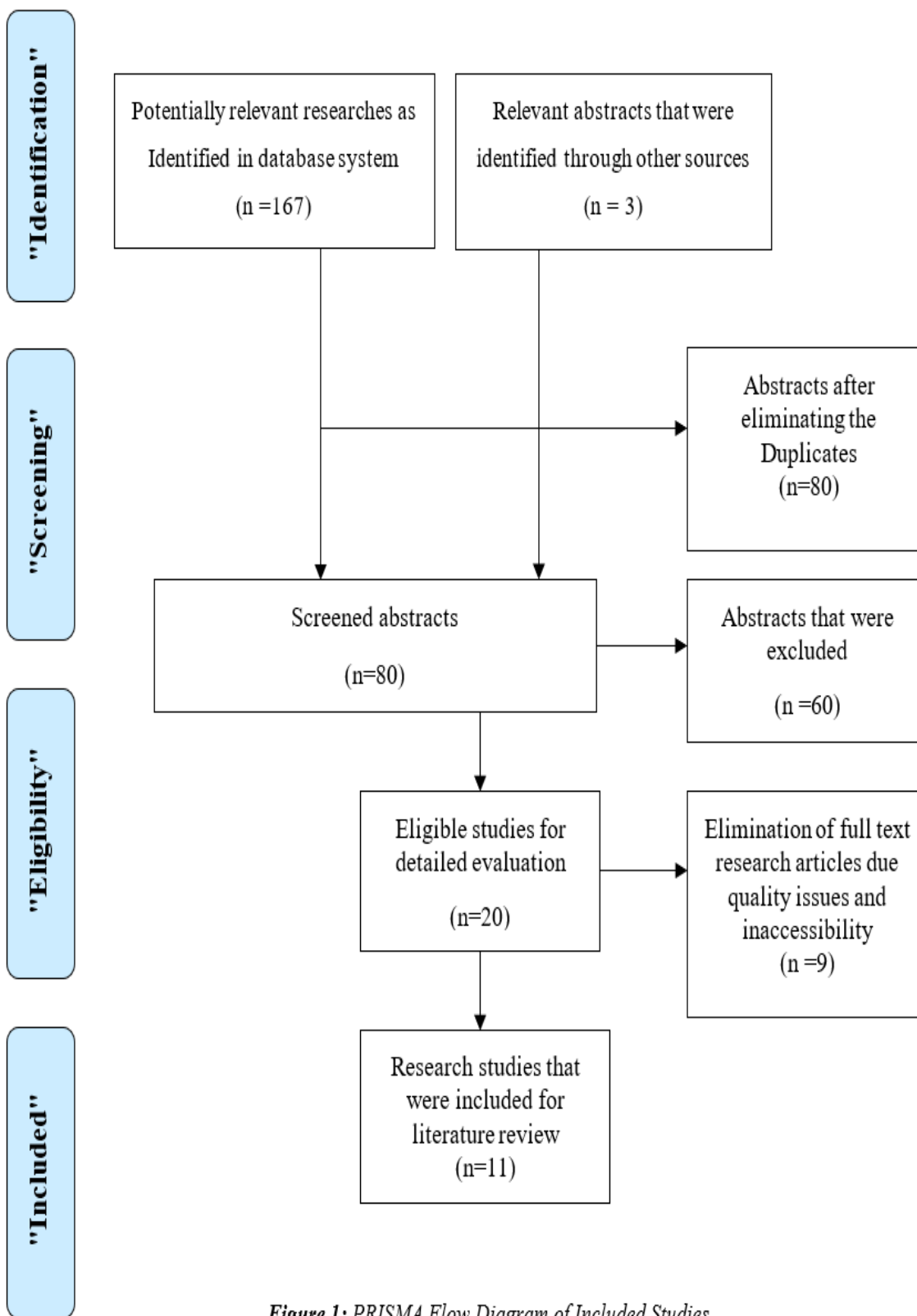


Figure 1: PRISMA Flow Diagram of Included Studies

4.5. Appraisal of Quality

The 11 articles found from the search were appraised in terms of their quality using an assessment scale adapted from Barra et al. (2008) as cited in Garcia-Llana et al. (2014). This assessment scale appraises ten aspects of the study concerning the research design, definition, and measurement of proposed variables, data collection method and analysis, and quality of results and discussion (see Table1). The possible scores for the quality appraisal of any study range from 1 to 10, in which scoring of 1- 3 means low quality, scoring of 4-7 means moderate quality, and scoring higher than eight is considered high quality (García-Llana et al., 2014).

Table 2 shows the quality appraisal for all the studies. In this review, the scores for the included studies are ranged from 7 to 9. There was no study found to be classified as low quality (1-3). One study, i.e., Kobayashi et al. (2018) was classified as moderate quality (4-7), while the majority of the studies met the high-quality criteria, i.e., Aryee et al. (2017); Basic and Hartwell (2015); Majkusová and Jarošová (2014); Swartzell et al. (2013), Hayakawa et al. (2014); Pierce et al. (2013); Cox et al., (2015); Guillaume et al. (2016); Silva et al. (2019); Gringauz et al. (2017). Only two studies, Basic and Hartwell (2015); Kobayashi et al. (2018), did not describe the implications of nurses' and patients' findings.

Table (1): Aspects of a studied appraisal.

Research design and selection
1. Inclusion criteria for patients are indicated clearly.
2. Selection of sample is specified.
3. Research design is specified in the paper.
4. Information about comparisons of the group is mentioned.
Definition and measurement of proposed variables
5. A clear definition of study variables is mentioned.
6. Use of validated instruments to study the proposed variables.
Data collection method and analysis
7. Appropriate sample size.
8. Specification about statistical tests.
Quality of results/discussion
9. Clear reporting of results.
10. Practical implications of the findings and benefits for patients.

Table (2): Quality Assessment of The Included Articles.

	1	2	3	4	5	6	7	8	9	10	Total	Quality
Aryee et al. (2017)	+	+	+	+	-	+	+	+	+	+	9	High
Basic & Hartwell (2015)	+	+	+	+	+	+	-	+	+	-	8	High
Majkusová & Jarošová (2014)	+	+	+	+	-	-	+	+	+	+	8	High
Swartzell et al. (2013)	+	+	+	+	-	+	-	+	+	+	8	High
Kobayashi et al. (2018)	+	+	+	-	-	+	+	+	+	-	7	Moderate
Hayakawa et al. (2014)	+	+	+	+	-	+	+	+	+	+	9	High
Pierce et al. (2013)	+	+	+	-	+	+	-	+	+	+	8	High
Cox et al. (2015)	+	+	+	+	+	+	-	+	+	+	9	High
Guillaume et al. (2016)	+	+	+	+	-	+	+	+	+	+	9	High
Silva et al. (2019)	+	+	+	-	-	+	+	+	+	+	8	High
Gringauz et al. (2017)	+	+	+	+	-	+	-	+	+	+	8	High

4. Data Analysis

The review matrix was applied to represent the included studies and their respective characteristics (see Appendix 1). This matrix summarizes the study location, aim, design, sample, tool, strengths, limitation of each study, and conclusion.

4.1. Characteristics of the included studies

The majority of the studies found in the literature review (8 out of 11 studies) have undertaken the retrospective research design (Aryee et al., 2017; Cox et al., 2015; Gringauz et al., 2017; Guillaume et al., 2016; Majkusová & Jarošová, 2014; Pierce Jr., 2013; Silva et al.,

2019; Swartzell et al., 2013). However, only three research studies have used a prospective research design (Kobayashi et al., 2018; Basic & Hartwell., 2015; Hayakawa et al., 2014). Most of the studies (n=5) were conducted in the USA (Aryee et al., 2017; Cox et al., 2015; Guillaume et al., 2016; Pierce Jr. et al., 2013; Silva et al., 2019). The largest sample size was found in the study by Kobayashi et al. (2018), which examined risk factors of falls among 212,617 inpatients, whereas the smallest sample size was found in a study conducted by Swartzell et al. (2013) who included 107 patients.

4.2. Risk Factors Associated with falls during hospitalization.

Injury prevention and reduction of falls can only be achieved by identifying risk factors and preventive interventions. As identified in the literature review, different factors contribute to the increased risk of falls among hospitalized patients. The increased number of inpatient falls can be attributed to the failure to identify the high-risk group of patients using different risk assessment tools for hospitalized patients. A case-control study conducted by *Aryeet et al. (2017)* emphasized that the injury prevention from in-hospital falls among the patients cannot be achieved without the sufficient identification of the risk of fall. Thus, identifying the risk of injuries should be one of the leading nursing priorities when caring for hospitalized patients (*Hayakawa et al., 2014*). The risk of injuries associated with inpatient falls can be reduced by focusing on the target group by identifying high-risk patients and creating tools for risk assessment (*Arye et al., 2017; Hayakawa et al., 2014*).

A significant risk factor highlighted in the literature relates to the demographics of the patients. The majority of the studies examine how age can be associated with the incidence of falls in hospitalized patients (*Cox et al., 2015; Guillaume et al., 2016; Kobayashi et al., 2018; Majkusová & Jarošová, 2014; Pierce Jr. et al., 2013; Silva, Costa, & Reis, 2019*). *Majkusová and Jarošová (2014)* analyzed the trends of fall-associated factors and revealed that most inpatient fall incidences recorded were of patients aged above 80 years. Similarly, *Cox et al. (2015)* indicated that the risk of falls is associated with increased age. In contrast, *Pierce Jr. et al. (2013)* found no significant relationships between age and incidence of inpatients' fall.

The injury-related to fall is seemed to be more severe among older patients. *Swartzell et al. (2013)* also asserted that patients are likely to develop injuries of fractures in acute care settings, excessive bleeding, subdural hematomas, and, eventually, death. There is a high likelihood of older adults towards mortality and morbidity due to their declining physiologic reserve and frailty. Therefore, there is a need to factor age as a risk factor and develop related interventions.

There are variations in reports regarding gender as a risk factor for inpatient falls. Some studies found that gender has no relationships with in-hospital falls

(*Hayakawa et al., 2014; Majkusová & Jarošová, 2014; Pierce Jr. et al., 2013; Swartzell et al. 2013*). However, contrary to this, two studies revealed that males experience more falls than female's inpatients (*Silva et al., 2019; Guillaume et al., 2016*). However, it is still to be studied whether the nurses address males' fall differently from females when designing a patient care plan.

Besides, chronic diseases like diabetes mellitus, hypertension also enhance the risk of falls among older patients (*Silva et al. 2019*). A study was done by *Cox et al. (2014)* observed that the most common comorbidities being attributed to fallers were cardiovascular, musculoskeletal/neurologic diseases. Comorbidities such as hypertension, ischemic heart disease, and diabetes mellitus were the most associated diagnoses with faller patients (*Gringauz et al., 2017*).

Besides, studies indicated the use of medication was likely to increase the chance of falls among hospitalized patients (*Silva et al., 2019; Majkusová and Jarošová, 2014; Guillaume et al., 2016; Cox et al., 2015*). For example, *Silva et al. (2019)* reported that opioids and anxiolytics medications were the most frequently used drugs among in-hospital fall-related cases. Another study conducted by *Cox et al. (2015)* documented that cardiac, anticoagulant, and narcotic/sedative drugs were the most frequently used fallers medication. Also, *Cox et al. (2015)* found that the sedatives' use was significantly contributing to the inpatient fall. *Cox et al. (2015)* suggest that the evening shift has not contributed to falls incidence. Another published study in the United States *Guillaume et al., (2016)* accounted majority of the cases that happened during the morning or night shift and fewer falls in the evening.

The environmental factors are considered among the essential factors indicated in the literature to contribute to an increased incidence of inpatient fall (*Guillaume et al., 2016; Hayakawa et al., 2014; Silva et al., 2019*). These included falling while attempting to get up from the bed, falling directly from the bed, when trying to walk and while moving from wheelchairs to beds, caused by the instability in movements (*Guillaume et al., 2016; Hayakawa et al., 2014; Silva et al., 2019*). The long-term care patients also fell when waking up in the non-halted mobile wheelchair and due to instability in the walk (*Cox et al., 2015; Hayakawa et al., 2014*).

Table 3: Summary of The Findings

No.	Author	Main Findings
1	Pierce Jr. et al. (2013)	<ul style="list-style-type: none"> - Narcotic administration had a significant effect on the fall and severity of injury among fallers. - Age and gender had no significant effect on the rate of falling among inpatients. - The fall risk factors identified include toileting, severe medical conditions. - Some falls were related to an injury such as laceration requiring repair or closure. - In patients who had a recent narcotic or suffering from a pre-fall confusion suffered from severe injuries, while most of the falls apart from the ones resulting from the above two factors (receiving narcotic and pre-fall confusion) caused minor injuries.
2	Swartzell et al. (2013)	<ul style="list-style-type: none"> - Older people at the age of 70 and above become more susceptible to falls. - There was no significant difference between the fall and non-fall groups based on their sex or age. - Patients who are in acute care hospitals were likely to fall. Patients receiving psychologically altering medications and treatments are likely to experience fatigue, anxiety, sleep disturbance, and other side effects that affect their cognitive and physical functioning, thus exposing them to high fall risks.
3	Majkusova & Jarosova (2014)	<ul style="list-style-type: none"> - The incidence of falls was high among inpatients aged 80 years and above. - Gender was found to show no significant effect on the incidence of falls. - Length of hospitalization, the patient's health condition, and the self-sufficiency of the admitted patient affect the incidence of falls among inpatients and increase the risk of falls. - Movement from the wheelchair to bed, getting up from bed, and instability in walking are factors that contribute to falls.
4	Hayakawa et al. (2014)	<ul style="list-style-type: none"> - No gender differences noted between faller and non-faller patients, but there were significant differences in age. - Medication; using psychotropic medication increases the fall risk in men, whereas hypnotic medication and cognitive dysfunction increase women's falling risk. - History of fall increase the risk of patients to fall. - Patients who are getting used to being helped for the activity of daily living (ADL) and the use of a wheelchair were at higher risk of falls than others.
5	Basic & Hartwell (2015)	<ul style="list-style-type: none"> - The previous history hence the fear of falls, was also found to result in higher incidences of falling.
6	Cox et al. (2015)	<ul style="list-style-type: none"> - Factors such as age, narcotic/sedation use, overnight shifts among the health care personnel are great predictors of patient falls during hospitalization. - The most common comorbidities being attributed to fallers were cardiovascular, musculoskeletal/neurologic diseases. - Neurological, as well as psycho impairment, increased the likelihood of falls. - Environmental factors were accounted for 25% of falls inside hospitals.
7	Guillaume et al. (2016)	<ul style="list-style-type: none"> - 44.8% of fall was at the age of 65-90, which considered the oldest age group. - Males had more falls than females. - The risk factors of falls were identified to include alcohol and other substance use, morbidity conditions such as hypertension, depression, and anxiety. - The individual becomes vulnerable to falls after suffering from acute illnesses.
8	Aryee et al. (2017)	<ul style="list-style-type: none"> - Joint replacement, history of falling, psychotropic agents, and male gender significantly affected the fall's injury. - Toileting was witnessed as one risk factor for inpatient falls. - Some patients also fell while resting on the bed. - History of recent surgery was a significant predictive factor.
9	Gringauz et al. (2017)	<ul style="list-style-type: none"> - Patients who exhibited a large Modified Morse Fall Scale showed a high prevalence of falling. - The use of aids, such as wheelchairs, was found to reduce falls among hospitalized adult patients with acute illnesses. - Fallers, in addition to having higher MMFS, portrayed a high degree of mild dependence, use of a cane, or no use of a walking device at all. - Smoking, lower calcium serum levels, lower potassium serum levels, and a higher treatment rate with anti-epileptics, oral hypoglycemic agents, and hypothyroidism were independently associated with an increased risk of in-hospital fall. - Comorbidities as: hypertension, ischemic heart disease, and diabetes mellitus were the most associated diagnosis with faller patients.

No.	Author	Main Findings
10	Kobayashi (2018)	<ul style="list-style-type: none"> - Old age accounts for high incidences of falls. - An orthopedic condition contributed significantly to an increase in falls among inpatients with a background of musculoskeletal disorders in these patients. - Advanced age fall with an adverse event was significantly more likely at late-night to early morning.
11	Silva et al. (2019)	<ul style="list-style-type: none"> - A high incidence of falling was prevalent among patients with high-risk scores. - Gender was found to suggest an insignificant relationship to fall. 73.6% of the patients were males. - Drugs use, including drugs like opioids and anxiolytics, were positively affecting the rate of falls among inpatients. - Anemia, age over 65 years, difficulty in performing activities of daily living (ADL), abnormal gait, and previous history of falls were also risk factors. - The female gender, severe pain, lower limb amputation, and patients seen by the vascular surgery team were the factors leading to high fall risks. The physiological change due to senescence, increased number of chronic diseases, and the consequences of using various medications are among the influencing factors contributing to in-hospital falls.

6. Discussion

This comprehensive review underlines the risk factors for admitted patients' falls, and each study identified several fall risk factors. Understanding these significant factors can help nurses improve their skills and practices to identify at-risk patients and reduce hospitalized patients' fall rates to deliver high-quality care.

Demographic factors contribute to high fall risk and incidences among hospitalized patients. The study by *Majkusová and Jarošová (2014)*, which was based on the analysis of fall trends and associated factors, concluded that patient fall incidences increased with patients aged 80 years and above. Similarly, the study by *Cox et al. (2015)* also indicated increased age as a risk factor associated with increased fall incidences, noting that the elderly patients were likely to experience falls.

Additionally, *Silva et al. (2019)* also reported that patients aged 65 years and above were likely to experience high rates of falls in hospital settings. In their study, *Hayakawa et al. (2014)* reported that patients with age ranging from 70 years and above are likely to experience adverse impacts of falls within hospital environments.

Moreover, the most significant predictors for inpatient falls were found to be age as older patients are professed to be more vulnerable to functional disability; besides, the likelihood of fractures, immobility, brain injuries, and the fear of falling is even higher (*Silva et al., 2019*). Older people also suffer from arthritis and pain and physical weakness, which increases the chances of falls. A previous study conducted in Jeddah, Saudi Arabia, assessed the risk factors associated with body injuries due to falls. They observed that patients older than 60 were more likely to fall (*Yamani et al., 2018*). Therefore, it is essential to factor in age as a risk factor when designing a fall-risk management program or interventions.

Illness is also reported as a significant factor in increased incidences of falls in hospitalized patients. *Majkusová and Jarošová (2014)* found that acutely ill inpatients are vulnerable to falls while getting up from beds and instability while walking. They also depicted inpatient

falls incidence when one is sick worsened by their age, length of stay, self-sufficiency, and patients' health. Chronic diseases and comorbidity increase the risk of falls among hospitalized patients (*Gringauz et al., 2017*). It was found that the most common comorbidities related to fallers were cardiovascular, musculoskeletal, neurological, stroke, and gait disorders. These were the most commonly known diseases that have been reported with falling incident cases (*Najafpour et al., 2019*). Therefore, if not given the support they require, the patients will most likely fall as they attempt to walk. The general body weakness resulting from chronic illnesses and the medications side effects represent a significant contributor to hospital falls. Nurses should provide more attention required for patients with chronic diseases.

Researches also indicate that drug usage causes frailty, cognitive and physical limitations, and reduced physiological reserves primarily in old patients, which predisposes them to high risk of falls in hospital settings (*Kobayashi, 2018; Silva et al., 2019*). For instance, this is the sole reason why monitoring of the use of psychotropic and hypnotic medications should be done by nurses to reduce fall rates. The medications have also been found to affect such body functions by leading to dizziness or impaired cognition (*Silva et al., 2019*). The side effects of drugs such as unstable gait, hypotension, dizziness, and agitation among adult inpatients are likely to increase the fall rates.

Furthermore, medications such as narcotics and depressants that are implied to reduce pain and anxiety are also implicated in the increasing incidence of falls among hospitalized patients (*Kobayashi, 2018; Silva et al., 2019*). The effect of such drugs on the patients' overall health is intrinsically related to the rate of falls among patients hospitalized for acute illnesses and those admitted for chronic conditions (*Kobayashi, 2018*). They trigger a lot of bodily disorders that prevent a patient from standing and walking without needing support. Therefore, patients' close supervision must be maintained due to drugs' effect, especially when under medications or immediately after

they are served with their injections (Silva et al., 2019). Therefore, medication monitoring should be part of a fall prevention plan.

Moreover, most of the falls were found to be the outcome of hospitals' physical environment, the riskiness of patient's behavior, and interaction between hospital staff and hospitalized patients (Basic & Hartwell, 2015). Factors such as engineering design, lighting, and positioning of beds, among other environmental factors within the hospital settings, contribute to falls among hospitalized patients (Basic & Hartwell, 2015; Silva et al., 2019). Measures need to be taken to ensure the environment is designed to offer patient support. For instance, side rails should be up all the time, and wheelchairs need to be availed when needed. There should also be appropriate lighting within the clinical settings to mitigate the chances of falls among patients. Also, ensure the bed is at the right level, with the side rail kept up, may reduce patient falls and injuries (Al Saif et al., 2012).

Moreover, a history of falls in the past among hospitalized patients was suggested to result in increased tendencies of falling (Pierce Jr et al., 2013; Hayakawa et al., 2014; Basic & Hartwell, 2015). That is because of the injuries, which result from these falls. A patient may sprain an arm or leg and choose to remain silent about it. Those who get treatment may not recover fully, which is what may trigger the possibility of yet another fall. Besides, the patient fell before shows that there may be an underlying problem, such as cognitive or musculoskeletal disorders, which may trigger the same occurrence.

The development of fall assessment techniques, including Medication Fall Risk Score (MFRS), have had less impact on reducing the rate of fall as the number of falls occurring within the hospital environment has been found to increase over the years (Koyabashi, 2018; Pierce Jr. et al., 2013; Silva et al., 2019). Therefore, studies aimed at improving knowledge on fall prevention and reducing injuries from falls should be a progressive task as little has been achieved concerning the prevention of falls under inpatient care. Additionally, there is a need to utilize registered nurses in a hospital environment to offer close monitoring of inpatients, thus prevent adverse falls from occurring. On the contrary, gender in some studies was found to have no significant effect on the rate of falls among hospitalized patients (Pierce Jr et al., 2013; Swartzell et al., 2013; Hayakawa et al., 2014; Majkusova & Jarosova, 2014). Both genders experienced falls equally, with some hospitals recorded higher rates due to specific circumstances. There are some instances where more males were identified with falls than females and times when more females were identified.

7. Conclusion

In conclusion, the present review has examined the fall risk factors common among hospitalized adult patients. It was found that fall risks are attributable to both intrinsic factors such as age, history of falls, sedative and drug use,

among others, and extrinsic factors such as the environment during hospitalization.

8. Recommendations

Identifying the significant factors leading to falling can help nursing and other healthcare staff to develop preventive strategies to alleviate these falls' physical, psychological, and social consequences. Moreover, the role of nurses in reducing the fall rates of hospitalized patients is crucial. Therefore, nursing skills and practices should be improved to achieve desired clinical and patient outcomes.

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The Risk Factors of fall among Adult Patients during Hospitalized in the Relevant Research Findings

Appendix 1: Review Matrix.

Author (s) and year	Country	Aim (s)/Purpose	Study Design	Sample Participants/Setting	Tools	Strengths	Limitation	Conclusion
Aryee et al. (2017)	USA	To identify the risk factors for injurious falls for acute care inpatients.	Retrospective case-control	117 injured fallers, 320 controls, academic, tertiary-care center in New England.	The retrospective chart was used to abstract fall cases. Review of the medical record and electronic database.	Injurious fall cases were identified from the available data. Accurate data were obtained about inpatients' falls with injury. The enrollment of the sample was larger and representative. The study design is beneficial in obtaining the injurious fall data of inpatients.	A single academic center was assessed that comprised of acute patients from both surgical and medical inpatients. Findings cannot be generalized to other hospitals due to patients' different demographics and prevention strategies for falls.	In the study, variables within the ABCs parameters formed the variables that were less useful in identifying inpatients who were more at risk of injuring themselves in a fall. However, the other variables not within ABCs, portrayed a correlation with injurious falls.
Basic & Hartwell (2015)	Australia	To investigate the link between in-hospital falls and new placement of acute patients in nursing homes.	Prospective cohort study	2945 older patients discharged alive, age 84 above, acute geriatric setting, Liverpool Hospital (Sydney)	Fall data was retrieved from the incident reporting database. Information about patients was collected from their demographics, referral source, medical diagnoses, Length of Stay (LOS), premorbid frailty, and in-hospital mortality. However, the study does not mention the tools used.	The retrospective data about inpatient falls were established prospectively. The sample was large, and representative obtained through consecutive sampling. Use of Chinese Canadian Study of Health and Ageing- Clinical Frailty Scale (CSHA- CFS) to measure frailty and other unmeasured variables that might impact the patients' falls.	A diverse and large population of older patients compared to the study sample and thereby limiting the generalizability of findings. Study results cannot be extrapolated beyond older patients. The association between falls of patients and nursing home placement cannot easily be determined. Several risk factors were not measured and, thereby, may confound findings.	The study involving older people in acute care indicates that falls within the hospitals are linked with some new placement within a nursing home.
Cox et al. (2015)	USA	To investigate the extrinsic, intrinsic, and employee	Retrospective correlational design	One hundred sixty inpatients in the medical-surgical unit, in a 500-bed Magnet	Fall data was abstracted from Electronic medical record	Objective data was obtained from patient reporting and EMR (electronic medical	A disproportionate ratio (i.e., 2:1) of non-fallers to fallers depicts the sample was not representative.	Many factors affect the occurrence of a fall among hospitalized patients.

			factors involved in inpatient falls.	teaching hospital in northeastern New Jersey.	(EMR) with the help of nurses. There are, however, no tools mentioned.	record) system. Internal as well as external risk factors of inpatient falls were assessed through past medical records.	Only one research site was used that limits the generalizability of research findings.	Assessment of the fall risk and the implementation of some fall implementation strategies, are both efficient strategies within the clinical area in decreasing the likelihood of a fall.
Gringauz et al. (2017)	Israel	To examine the specific patients' characteristics in the stratification of falls risk in the modified Morse fall scale (MMFS) among admitted patients.	Retrospective cohort analysis	428 patients (aged 14-76), 139 (fallers) and 289 (non-fallers), adult patients admitted to the internal medicine department. Sheba Medical Center, a large tertiary medical center	Morse Fall Scale scores of patients with fall cases during hospitalization and admission.	Objective data about fall records of patients. Cohorts were assessed concerning their disease, age, previous history of falls, and walking aids to further stratify the fall risks among inpatients.	The sample size was small, and one single center was studied. Study findings cannot be generalized to larger patients' populations. The disproportionate ratio of fallers and non-fallers control group as it was twice larger.	More risk stratification of hospitalized patients who are known to have increased Modified Morse scores should be attained.
Guillaume et al. (2016)	USA	To describe the characteristics of middle age and risk factors of falls and injuries.	Retrospective chart review	439 Middle-age (45-64) inpatient fallers, academic teaching hospital.	An Incident-reporting database was used to collect patient fall data. No tools are, however, mentioned in the study.	The study revealed that fall incidence is similar in middle-aged and is influenced significantly by age and diseases. Objective data was obtained from records through the medical record.	Only one academic hospital was used to obtain retrospective data. Fall records were dependent on clinical documentation. Many fall events were not profiled in EMR documentation. Some elements were missing. Thus, fall injury risks cannot be discussed.	Acute illness in middle-age inpatients makes them vulnerable to fall and injury as the older population.
Hayakawa et al. (2014)	Japan	To explain the fall risk factors and propose the use of factors that identify the high-risk patients at the time of admission.	Prospective cohort study.	9975 consecutive adult inpatients, Fukushima Medical University Hospital.	Clinical records were used to collect information about falls. Face-to-face interviews with patients were also conducted. No tools are mentioned in the study.	Risk factors for inpatient falls were clarified. For instance, recurrent falls are cognitive impairment and dysfunction that affect short-term memory and visuospatial perception. A long-term study that continued for one year (2008-2009) offered reliable results.	The type of disease that patients had was not mentioned that could help evaluate preventive factors. Maintenance of follow-up might be difficult for nurses and doctors who conducted interviews with patients at their admission. Interviews might involve subjective interpretation of the observer.	To prevent falls in inpatients, it is essential to identify the high-risk persons. For instance, age, need for help, history of falling are some of the most important information that ought to be obtained from the patients at the point of admission.
Kobayashi et al. (2018)	Japan	To examine the falls in	Prospective study.	212,617 inpatients in the orthopedic	The fall assessment sheet	Details of orthopedic patients were assessed	The validity of the scoresheet used for risk assessment was	Age and fall rates were both at higher

		orthopedic hospitalized patients.	department.	was used. Fall incidents were abstracted from the reporting database of the hospital. A fall risk score was developed to evaluate inpatient falls.	prospectively in entire fall cases. Findings are considered as reliable as long-term follow up that continued for five years (2012-2017). Prospective study design involves the real-time participation of subjects in a post-falls' analysis.	uncertain as it has not been used in other hospital settings. The records of inpatient falls can be biased due to the uncertainty of risk assessment scorecards' validity. Fall rates of non-orthopedic inpatients were not included, and therefore a clear picture of risk factors cannot be presented, and the results cannot be generalized.	levels among the orthopedic patients, regardless of the reduced risk management score. This finding implies that the regular evaluation within a short-term interval and fall risk assessment mechanism for hospitalized patients for orthopedic surgery is essential. In the prevention of falls in inpatients, it is essential to identify the high-risk persons. Again, the length of stay at the hospital and age are some of the factors leading to falls.	
Majkusová & Jarošová (2014)	Czech Republic	To analyze inpatient falls trends and determine the falls risk factors and related injuries in acute patients.	Retrospective study.	Three thousand four hundred seventy-seven inpatient records from 2004-2009, 1485 patient records were of male, and 1992 were of females, patients above age of 18, Municipal Hospital Ostrava.	The Ostrava Municipal Hospital (MHO) forms were filled by nurses who discovered patient falls to collect data on fall cases.	Retrospective data of inpatient falls from age group 18 to 90 was used as the incidence of falls increases with age and worsening health status. The division of patients in age groups depicted the high fall incidence is found among people of age group (81-90). Risks of falls were identified through age-groups.	Findings cannot be extrapolated for patients hospitalized in hospital units other than acute care. The research studied only one hospital and, therefore, cannot be transferred to other hospitals. This conclusion is because preventive strategies differ hospital wise.	
Pierce Jr. et al. (2013)	USA	To identify the factors predicting the fall-related injuries in hospitalized patients.	Retrospective records review.	Two hundred fifty-one inpatients with reported fall with injuries, University of New Mexico Hospital.	Medical Records of reported falls were used to collect fall data. No tools for data collection are mentioned in the study.	Risk-factors of fall in narcotic patients were assessed. Retrospective data provided information about clinical factors involved in injurious falls.	Impact of antihistamines, benzodiazepines, Alternatively, zolpidem in fall-related injury was not examined. The sample size was small, and only one institution was selected, limiting its generalizability to other institutions with different patients. Selection bias might have occurred in acquiring inpatients fall data. This study may also be subjected to accuracy, completeness, and human error, as mentioned by the author.	In the single-institution study, about 25% of the patients who had fallen suffered an injury while 4% suffered severe injury. In evaluating the inpatients who had fallen, healthcare providers ought to be vigilant about the injuries in patients who have always experienced pre-fall confusions, have received narcotics, or hit their head.

Silva et al. (2019)	Brazil	To investigate the use of fall-risk-increasing drugs among patients with falls reported to the Patient Safety Office of a hospital, and to identify the factors associated with high risk for fall.	Retrospective cross-sectional study.	One hundred twenty-five inpatients fall records, 38 reports in 2014, 26 in 2015, 61 in 2016, Brazilian Unified Health System.	MFRS (Medication Fall Risk Score) scale was used to subdivide the drugs into low risk, medium, and high-risk drugs resulting in inpatient falls.	Both drug and non-drug related factors associated with falls were investigated. The sample is comprised of fall-reported inpatients that are representative. The study covers three years' tracing.	Male fall records were in the majority as compared to the female counterpart. Only one reference center was included that limits the generalizability of findings for other patients. The retrospective study might underestimate the results due to uncertainty in data. Lack of a control group limits the understanding of adverse fall events.	Medications are essentially some crucial contributors to in-hospital falls, and the medication fall risk score could be useful in identifying the patients who are at high risk of falls.
Swartzell, et al. (2013)	USA	To examine the relationship between fall occurrence and scores on the Hendrich II Fall Risk Model (HIIFRM) in an acute care setting.	Retrospective descriptive study.	107 patients selected Fifty-four fall cases and 53 control cases, a random sample of diabetic (25 fall cases and non-fall controls), heart failure (26 cases of fall and 24 non-falls), and stroke patients (3 fall cases and four non-fall) hospitalized in the acute care department. 750-bed acute care hospital in the Midwest	Standard medical records, as well as an electronic record. Fall cases were collected through the data software of the hospital. An investigator developed instrument was used to record data. The demographic information included age and sex. HIIFRM data included the patient's total score on the HIIFRM	The study contributed to knowledge about risk factors of falls. The differences in patient groups based on their disease represented that HIIFRM does not correspondingly for nursing skill levels and patient groups.	The quality of retrospective medical records depends on the documentation of records. A smaller sample size as 40% of the fall records was excluded because of inadequate documentation. A disproportionate number of fall records for stroke patients were eliminated, resulting in fewer cases.	In the study, Hendrich II Fall Risk Model scores were linked to falls among the inpatients with the acute-care hospital who had diabetes diagnosis and not diagnosed with heart failure.