Assessing the Risk Factors of Fall among Admitted Patients

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Abstract

The risk of falls has been widely observed among admitted patients that substantially influence their recovery from illness. In addition, the fall events greatly contribute to their prolonged stays in hospitals, as well as increased healthcare costs. Furthermore, the fall incidents of patients have proved to be quite costly due to adverse consequences of fall-related injuries for patients. Considering the significance of this issue, present document is aimed at conducting the systematic review of the available information pertaining to the risk factors of falls among hospitalised patients. In this account, a maximum of 11 relevant studies were reviewed in a critical manner to identify the potential factors that increase the likelihood of patient falls. These studies, published between years 2013-2019, were recruited from authentic databases like Embase, PubMed, Web of Science, and Google Scholar. This review revealed that majority of the studies identified that new placement in nursing homes, psychotropic and narcotic drugs, urologic conditions, limb amputation, and increased use of anti-epileptics are likely to elevate the risk of fall among patients.

Keywords: risk factors, falls, admitted patients, hospital .

الملخص

لوحظ خطر السقوط على نطاق واسع بين المرضى المقبولين وهو ما يؤثر بشكل كبير على شفائهم من المرض. بالإضافة إلى ذلك ، تساهم أحداث الخريف بشكل كبير في إطالة إقامتهم في المستشفيات ، فضلاً عن زيادة تكاليف الرعاية الصحية. علاوة على ذلك ، ثبت أن حوادث سقوط المرضى مكلفة للغاية بسبب العواقب السلبية للإصابات المرتبطة بالسقوط على المرضى. بالنظر إلى أهمية هذه المسألة ، تهدف هذه الوثيقة إلى إجراء مراجعة منهجية للمعلومات المتاحة المتعلقة بعوامل خطر السقوط بين المرضى في المستشفى. في هذا الحساب ، تمت مراجعة 11 دراسة ذات صلة كحد أقصى بطريقة حرجة لتحديد العوامل المحتملة التي تزيد من احتمالية سقوط المريض. تم تجنيد هذه الدراسات ، التي نُشرت بين الأعوام 2013-2019 ، من قواعد بيانات أصلية مثل Embase و PubMed و Web of Science و Google Scholar. كشفت هذه المراجعة أن غالبية الدراسات حددت أن التنسيب الجديد في دور رعاية المسنين ، والأدوية العقلية والمخدرة ، وحالات المسالك البولية ، وبتر الأطراف ، وزيادة استخدام مضادات الصرع من المرجح أن تزيد من خطر السقوط بين المرضى.

الكلمات المفتاحية: عوامل الخطر ، السقوط ، المرضى المقبولين ، المستشفى.

Introduction

In-hospital falls among the patients are among the utmost adversative events contributing to longer hospital stays, increased healthcare costs, higher mortality and morbidity. A patient fall is an inadvertent descent, with or without causing injury, to the floor. The most adverse events occurring at the hospitals that are highly reported, costly and have grave consequences include in-patient falls sustaining injuries (Guillaume, Crawford & Quigley, 2016). Falls of patients during hospitalization lead to both financial and clinical outcomes. The prime victims of the in-hospital fall of the patients are found to be adults since there are changes in senescence and senility, an increase in chronic diseases and the subsequent use of various medications (Silva, Costa & Reis, 2019). There is a greater impact of these in-patient falls on the older age patients as it can lead to severe complications including fractures, injuries and brain injuries, immobility and the fear of falling down again. The risk of in-patient falls can be led by frailty, drug usage, and physiological factors. The intrinsic factors for in-hospital falls among adults include dizziness, agitation, muscle weakness, unstable gait, confusion, and hypotension.

In-hospital patient falls are of particular concern as 20-30% of all the reported incidences at hospitals to account for the elderly in-patient falls (Kobayashi et al., 2018). Falls are considered indicators of patient safety, levels of care and morbidity risks. In-hospital fall among patients in the developing countries such as Saudi Arabia is concerning to the researchers and determination of in-patient fall in two wards at King Abdul-Aziz University Hospital (KAUH). It was revealed that 2.4% of the considered cases sustained in-patient fall, of which 70.4% were for medical ward and 29.6% were observed art the surgical ward (Al Jhdali, Al Amoudi & Abdulbagi, 2012). The mean age for fall among the hospitalized patients at KAUH was 48.59 years. The causes contributing to the fall at hospitals in Saudi Arabia include number of medications each day, assistive devices usage and inactive lifestyle (Al Saif, Waly & Alsenany, 2012). The main objective of this study is to identify the factors contributing to patient falls and the consequences of these fall at King Abdul-Aziz Specialist Hospital in Taif, Saudi Arabia, during hospitalization. Research on the factors leading to in-patient fall and the identification of the consequences can help in preventive measures by the hospitals, leading to a reduced risk of falls (ROF)and the associated clinical and financial outcomes.

Literature Review

Injury prevention and reduction of falls stress the identification of risk factors and preventive interventions. Hospitalized patients who fall and sustain injuries incur escalated costs, mortality, and morbidity. It is identified that the risk assessment tools for these in-hospital falls have been ineffective mostly and the researchers are aiming for successful risk assessment tools to identify the jeopardy of injurious falls. A case-control study conducted by Aryee, James, Hunt & Ryder, (2017) concluded that the injury prevention from in-hospital falls among the patients is not possible by the identification of ROF. Thus, there is a need to identify the risk of injuries (Hayakawa et al., 2014).

The risk of injuries associated with the in-patient falls can be reduced by a high focus on the target group through identification of high-risk patients and creation of tools for risk assessment. Majkusová and Jarošová (2014) analyzed the trends of fall, associated factors, and revealed that majority of the inpatient fall incidences recorded were of senior patients aged above 80 years. However, no significant difference in the fall of patients on the basis of gender. The most frequent instances of in-patient fall included falling down while attempting to get up from the bed, falling down directly from the bed, when attempting to walk and while moving from wheelchairs to beds, caused by the instability in movements. The long-term care patients also fell when waking up in the non-halted mobile wheelchair and due to instability in walk.

Furthermore, the factor that is found to have no impact on the in-hospital fall of patients is gender. However, contrary to this, the conducted research revealed that males experienced more frequent falls compared to the female inpatients (Guillaume et al., 2016). Though it is still to be studied whether the nurses address the fall of males differently than the fall of females when designing a patient care plan. Despite the preventive measures and the efforts that the hospitals make to reduce the risk of inpatient falls, it is still a recurrent instance with around 700,000 to 10,00,000 hospitalized patients experiencing a fall during the visit or stays at hospital every year. The study by Cox et al. (2015) also attempted to identify the contributing factors of falls among adult inpatients and found factors such as age, overnight shift, and the use of sedatives to be significantly contributing to the inpatient fall.

However, the factors contributing to a reduction in the fall likelihood included evening shift, fall prevention strategies, cardiovascular diseases, and neuromusculoskeletal diseases.

Moreover, in-patient falls of older people with the acute illness are also very likely to occur during new placement. The study of Basic and Hartwell (2015) has proclaimed that majority of the in-hospital falls are due to placement in nursing homes. Murray, Cameron, and Cumming (2007) have also cited that almost 33% of the patients with proximal femoral fractures were those who were discharged to nursing homes. In addition, prevalence rate of chronic diseases such as hypertension, diabetes increases the ROF (Kobayashi et al., 2018). Furthermore, most of the falls were found to be the outcome of physical environment in hospitals, riskiness of patient's behavior, and interaction between hospital staff and hospitalized patients (Basic & Hartwell, 2015). More particularly, in-patient falls end up in severe injuries such as hip fractures; in addition, injuries of soft tissues result in impairment of older patients (Pierce Jr, Johnson, & Kang, 2013). It was also revealed that patients who fell tend to have longer LOS (length of stay) in hospitals that ultimately increase the healthcare cost. This finding is also supported by Vassallo et al (2002) as they found that single fallers, as well as recurrent fallers hospitalized in geriatric nonacute hospitals, had prolonged LOS.

Additionally, falls are commonplace among older patients and almost 20 to 30% of hospital incidents are due to fall (Majkusová & Jarošová, 2014; Basic & Hartwell, 2015). Besides, acute illness of inpatients makes them vulnerable for falls. Swartzell, Fulton, and Friesth (2013) also asserted that in acute care settings, patients are likely to develop injuries of fractures, excessive bleeding, subdural hematomas, excessive bleeding, and eventually death. Since there is high likelihood of older adults towards mortality and morbidity due to their declining physiologic reserve and frailty. Furthermore, patients who fall are probable to develop fear of falls, and thereby, due to this self-imposed fear reduce their mobility.

Methods

Search Strategy and Study Selection

The search strategy allows the researcher to find out and gather the relevant research material that fulfills the requirement of research topic (Pagatpatan & Arevalo, 2016). It also facilitates the researcher to execute systematic literature review. Since the present study is based on systematic reviews, PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) will be used. More specifically, databases that will be used to find relevant literature include PubMed, Embase, Web of Science, and Google Scholar. Of note, the search will be limited to authentic journal articles that were published within the year range (2013-2019). The articles written only in English language will be considered. Parahoo (2014) suggested that appropriate keyword (Search terms) aid researchers in finding relevant studies. Thus, pertinent to the topic, keywords of risk, risk factor, fall, acute care, hospitalized, case-control, inpatient, admitted, were used. Furthermore, Boolean operators like 'AND', 'OR' will be used to generate a relationship between various research variables. Moreover, obtained records will be screened by two researchers independently; in addition, a reference list of articles will be searched further to select the eligible articles. In case of any disagreement, researchers will resolve the issue through discussion.

Eligibility Criteria

The current study has included studies with case-control design. In particular, only those patients who fell while being hospitalized were recruited. Also, observational cohort studies were considered eligible for review. Of note, studies that recruited a representative sample (n=50 patients) were included. Furthermore, meta-analyses, systematic and narrative reviews were excluded. Additionally, studies that employed particular predictive models with no focus on logistic regression analysis were disqualified.

Outcomes

All the studies that were included had reported risk factors for fall of inpatients. These were expressed as odds ratios (OR) as well as their particular 95% confidence intervals (CIs) were revealed by logistic regression analyses. Furthermore, all the studies with non-significant and significant risk factors were used in order to synthesize the main structure of the systematic review.

Data Extraction

Data that was collected from the different databases included authors' data, country, year of publication, the research setting, targeted population that was limited to the particular departments (general acute care), characteristics of patients such as their mean age, gender in both case and control groups, in addition, ORs and CIs of both univariate and multivariate regression analysis were included.

Quality Assessment

Quality Assessment of the 11 Articles reviewed												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**	**Quality**
Aryee, James, Hunt, & Ryder (2017)	+	+	+	+	-	+	+	+	+	+	9	High
Basic & Hartwell (2015)	+	+	+	+	+	+	-	+	+	-	8	High
Majkusová & Jarošová (2014)	+	+	+	+	-	-	+	+	+	+	8	High
Swartzell, Fulton, & Friesth (2013)	+	+	+	+	-	+	-	+	+	+	8	High
Kobayashi et al. (2018)	+	+	+	-	-	+	+	+	+	-	7	Moderate
Hayakawa et al. (2014)	+	+	+	+	-	+	+	+	+	+	9	High
Pierce Jr., Shirley, Johnson, & Kang (2013)	+	+	+	-	+	+	-	+	+	+	8	High
Cox et al., (2015)	+	+	+	+	+	+	-	+	+	+	9	High
Guillaume, Crawford & Quigley (2016)	+	+	+	+	-	+	+	+	+	+	9	High
Silva, Costa, & Reis (2019)	+	+	+	-	-	+	+	+	+	+	8	High
Gringauz et al. (2017)	+	+	+	+	-	+	-	+	+	+	8	High

Research Design and Selection:
    1. Inclusion criteria for patients is indicated clearly.
    2. Selection of sample is specified.
    3. Research Design is specified in paper.
    4. Information about comparisons of 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 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.
Quality
    1-3 points (Low)
    4-7 points (Moderate)
    8-10 points (High)

Scores for the included studies have been ranged from 1-10, in addition, there was no study classified as low quality (1-3). There was only one study of moderate quality (4-7), while majority of the studies were of high quality (8-10). Aforementioned table shows the quality criteria for all the studies. Only 2 studies did not describe the implications of findings for nurses and patients.

Results

Results of the Search Process

Based on the guidelines of PRISMA, the articles were screened, included, and excluded. The duration of the review instigated from January 2019 to October 2019. Below mentioned is the PRISM flow diagram depicting the screening process.
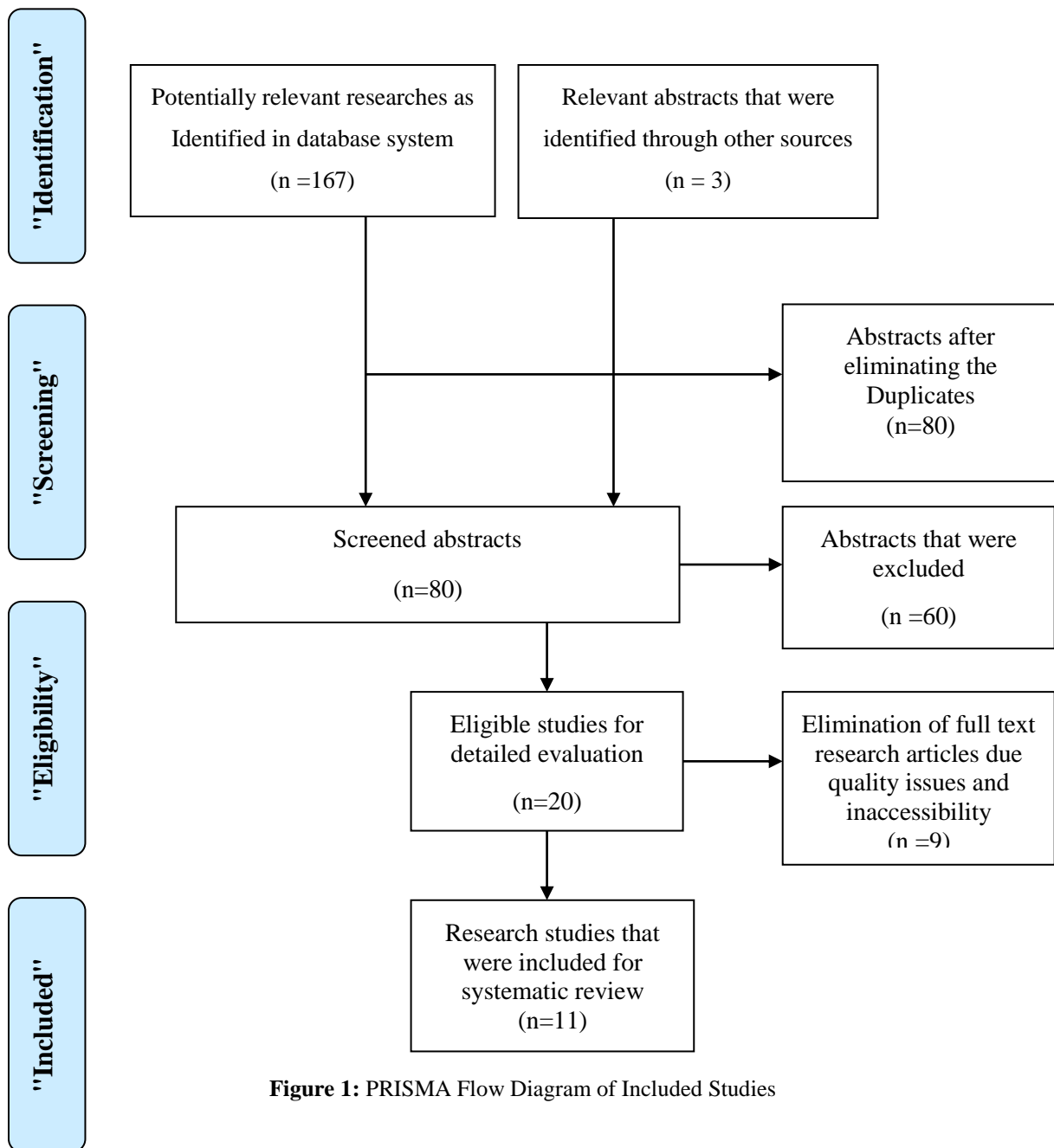

Figure 1: PRISMA Flow Diagram of Included Studies

A total of 170 articles showing relevant titles and abstracts were reviewed initially. On the basis of review criteria, 80 were excluded. A total of 80 full-text articles were reviewed and 60 were excluded that did not fulfill review criteria. After that 20 articles were included that were fulfilling the criteria, amid them, 9 articles had weak rigor so these were excluded. Consequently, there remained total 11 articles that were published between 2013-2019 and satisfied the inclusion criteria for review.

Characteristics of the Included Studies

To represent the included studies and their respective characteristics, the review matrix was applied. This matrix contains information about research aim, study setting, sample, findings, along with the strengths and limitation of each study. This synthesis of selected studies develops an understanding and facilitate in assessing the risk factors of fall amid hospitalized patients.

Author (s) and year	Country	Aim (s)/Purpose	Study Design	Sample Size/Context/Setting	Tools	Strengths	Limitations
Pierce Jr., Shirley, Johnson, & Kang (2013)	USA	To identify the factors predicting the fall-related injuries in hospitalized patients	Retrospective records review.	251 inpatients with reported fall with injuries, University of New Mexico Hospital.	Medical Records of reported falls were used to collect fall data (152 falls occurred in males and 99 falls in females)	Risk factors of fall in narcotic patients were assessed. Retrospective data provided information about clinical factors involved in injurious falls.	Impact of antihistamines benzodiazepines, or zolpidem in fall-related injury was not examined. The sample size was small and only one institution was selected that limits its generalizability on other institutions with different patients. Selection bias might have occurred in acquiring inpatients fall data. Also, this study may be subjected to issues of accuracy, completeness, and human error.
Swartzell, Fulton, & Friesth (2013)	Indianapolis	To examine the relationship between fall	Retrospective descriptive study	54 fall cases and 53 control cases, a random sample of diabetic (25 fall	Standard medical records as well as electronic record. Fall cases were	Study contributed to knowledge about risk factors of falls.	The quality of retrospective medical records depends on the

		occurrence and scores on the Hendrich II Fall Risk Model (HIIFRM) in an acute care setting.		cases and non-fall controls), heart failure (26 cases of fall and 24 non-falls) and stroke patients (3 fall cases and 4 non-fall) hospitalized in acute care department.	collected through data software of hospital.	The differences in patient groups based on their disease represented that HIIFRM does not perform correspondingly for nursing skill level and patient groups.	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 smaller number of cases.
Majkusová & Jarošová (2014)	Czech Republic	To analyse the trends of inpatient falls and determine the falls risk factors and related injuries if acute patients.	Retrospective study	3477 records of inpatient fall from 2004-2009, 1485 patient records were of male, and 1992 were of females, patients above age 18, Municipal Hospital Ostrava.	To collect data of fall cases, MHO forms were filled by nurses who discovered patient falls. Recorded data was then entered into EpiData software. Falls occurring in internal medicine, surgery, and acute care departments were included.	Retrospective data of inpatient falls from age group 18 to 90 was used as the incidence of falls increases with the increase in age and worsening health status. The division of patients in age	Findings cannot be extrapolated for patients hospitalized in hospital units other than acute care. Research studied only one hospital and therefore cannot be transferred to

					groups depicted the high fall incidence is found among people of age group (81-90). Risks of falls were identified through age groups.	other hospitals. This is because preventive strategies differ hospital wise.
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 from patients were also conducted.	Risk factors for inpatient falls were clarified. For instance, recurrent falls are due to cognitive impairment and dysfunction that affect short-term memory, visuospatial perception. A long-term study that continued for 1 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 from patients at their admission. Interviews might involve subjective interpretation of the observer.

| 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 incident reporting database.

Information about patients were collected from their demographics, referral source, and medical diagnoses, LOS, premorbid frailty, in-hospital mortality. | The retrospective data about inpatient falls were established prospectively. Sample was large and representative obtained through consecutive sampling. Use of (CSHA-CFS) to measure frailty and other unmeasured variables that might impact the patients' falls. | A diverse and large population of older patients as compared to 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 be equated with causality. Several risk factors were not measured and thereby, may confound findings. |
| Cox et al., (2015) | USA | To investigate the extrinsic, | Retrospective correlational | 160 inpatients of medical-surgical | Fall data was abstracted from Electronic medical | Objective data was obtained from | There was a disproportionate |

					record (EMR) with the help of nurses.	patient reporting and EMR (electronic medical record) system. Internal as well as external risk factors of inpatient falls were assessed through past medical records.	ratio (i.e. 2:1) of non-fallers to fallers that depicts the sample was not representative. Only one research site was used that limits the generalizability of research findings.
		intrinsic, and employee factors involved in inpatient falls.	design	unity,			
Guillaume, Crawford & Quigley (2016)	USA	To describe the characteristics of inpatients of middle age and risk factors of falls and injuries.	Retrospective review	439 Middle-age (45-64) inpatient fallers, academic teaching hospital.	Incident-reporting database was used to collect patient fall data. Data sets of fall occurrence were used for comparing fall with injurious falls among middle age population.	Study revealed that fall incidence is similar in middle-aged and older patients despite difference in age and diseases. Objective data was obtained from past records through EMR.	Only one academic hospital was used to obtain retrospective data. Fall records were dependent on clinical documentation that might be biased. Many fall events were not profiled in EMR documentation. Thus, fall injury risks cannot be discussed.

Aryee, James, Hunt, & Ryder (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,	Injurious falls of inpatients were entered into electronic adverse event tracking system. Retrospective chart was used to abstract fall cases.	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.	The use of psychotropic drugs might have mobility-related side effects leading to inpatient falls. The 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 different demographics of patients and prevention strategies for falls.
Gringauz et al. (2017)	Israel	To examine the specific patients' characteristics	Retrospective cohort analysis	428 patients (aged 14-76), 139 (fallers) and 289 (non-fallers),	Morse Fall Scale scores of patients with fall cases during hospitalization and	Objective data about fall records of patients. Cohorts were	The sample size was small and one single center was studied.

		in the stratification of risk falls in modified Morse fall scale (MMFS) among admitted patients.		adult patients admitted in the internal medicine department.	admission. EMR of patients were reviewed.	assessed with respect to their disease, age, previous history of falls, and walking aids helped in further stratifying the fall risks among inpatients.	Study findings cannot be generalized to larger patients' populations. The disproportionate ratio of fallers and non-fallers control group as it was twice larger.
Kobayashi et al. (2018)	Japan	To examine the falls in orthopedic hospitalized patients	Prospective study	212,617 inpatients in the orthopedic department. The fall assessment sheet was used to evaluate fall risks at admission and during hospitalization.	Fall incidents were abstracted from reporting database of hospital. Fall risk score was developed to evaluate inpatient falls.	Details of orthopedic patients were assessed prospectively in entire fall cases. Findings are considered to reliable as long-term follow up that continued for 5 years (2012-2017). Prospective study design involves the real-time participation of subjects in a post-falls analysis.	The validity of the scoresheet used for risk assessment was uncertain as it has not been used in other hospital settings. The records of inpatient falls can be biased. Fall rates of non-orthopedic inpatients were not included and therefore a clear picture of risk factors cannot be presented.
						Both drug and	Male fall records

| Silva, Costa, & Reis (2019) | Brazil | To examine the use of drugs that increase the fall risks among patients and to identify the | Retrospective cross-sectional study | 125 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 into inpatient falls. A number of drugs were prescribed to patients to identify the fall risks. Drugs increasing the fall risks were elected in accordance with pharmacological and anatomical groups. | non-drug related factors associated with falls were investigated. Sample is comprised of fall-reported inpatients that are representative. | 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. Retrospective study might underestimate the results due to uncertainty in data. The lacking of a control group limits the understanding of adverse fall events. |

No.	Title of Study	Findings of the Studies and Identified Fall Factors
1	Narcotic administration and fall-related injury in the hospital: Implications for patient safety programs and providers (Pierce Jr et al., 2013)	Narcotic administration was the key predictor of fall injuries such as hip fractures in older patients. The fall risk identified through this study include toileting, in addition, some falls were related to an injury such as laceration requiring fracture or closure. Also, patients who received narcotics were more vulnerable to injurious falls. Inpatients with fall injuries suffered from severe medical conditions with no difference in gender and age.
2	Relationship Between Occurrence of Falls and Fall-Risk Scores in an Acute Care Setting Using the Hendrich II Fall Risk Model (Swartzell et al., 2013)	There was no significant difference between the fall and non-fall groups on their sex or age. HIIFRM scores were significantly related to diabetic patients only. Patients aged above 75 years tend to have a high risk of falls due to frailty and reduced physiologic reserve. Injurious falls such as hip fractures are more common.
3	Falls Risk Factors In An Acute-Care Setting: A Retrospective Study (Majkusová & Jarošová et al., 2014)	This study revealed that admitted patients are likely to fall while getting up from their beds, due to instability while walking and waking up from wheelchairs. Age, LOS, self-sufficiency of patients influences the incidence of falls, except for gender.
4	Risk factors of falls in inpatients and their practical use in identifying high-risk persons at admission: Fukushima Medical University Hospital cohort study (Hayakawa et al., 2014)	History of falls, age, need of inpatients for ADL (activities for daily living) are significant pieces of information at the time of admission. Study found that psychotropic medication increases the fall risk in men whereas, the use of hypnotic medication and cognitive dysfunction increase falling risk in women.
5	Falls in hospital and new placement in a nursing home among older people hospitalized with acute illness (Basic & Hartwell, 2015)	This study revealed that the majority of inpatient falls are due to the new placement of patients regardless of injurious falls. Deconditioning, urine retention and increased frailty are linked with both falls in the hospital and nursing home placement. Also, inpatient fallers had prolonged LOS.

6	Factors associated with falls in hospitalized adult patients (Cox et al., 2015)	Factors like age sedative/narcotic use, overnight shifts of nurses, increase the probability of inpatient falls. Also, diseases like Cardiovascular and neuromusculoskeletal, evening shifts of nurses, fall prevention strategies and a higher ratio of Registered Nurses to assistive personnel decrease the probability of in-hospital falls.
7	Characteristics of the middle-age adult inpatient fall (Guillaume et al., 2015)	Middle age inpatient falls ended in injuries akin to the older age adult. They are more vulnerable to falls and injuries. This study has characterised fall risk factors into three categories of socioeconomic (marital status, insurance type, language), environment (clutter, ripped and wet floors, location, activity, lighting), and behavioural risks (use of alcohol, drug, footwear, history of fall, physical limitations).
8	Identifying protective and risk factors for injurious falls in patients hospitalized for acute care: a retrospective case-control study (Aryee et al., 2017)	Age and anti-coagulation use and recent surgery were risk factors for both injurious fallers and non-falling controls. Male patients, having a history of falls, patients with joint replacement, gait disturbance, psychotropic drugs were risk factors for frequent falls. Also, toileting was witnessed as one risk factor for inpatient fall, in addition, patients also fell while resting on the bed. Injured fallers had high LOS as compared to matched controls.
9	Risk of falling among hospitalized patients with high modified Morse scores could be further Stratified (Gringauz et al., 2017)	Fallers with high MMFS were found to have a high prevalence of mild dependence, also, the use of the cane was high among those inpatient fallers than non-fallers. Identified risk factors include anti-epileptic drugs, use of a wheelchair, and other walking aids.
10	Characteristics of falls in orthopedic patients during Hospitalization (Kobayashi et al., 2018)	Inpatients for orthopedic surgery had higher fall rates. Fall risks were more frequent in older patients due to progressing frailty, in addition, location for ROF includes bathrooms, rehabilitation wards, and corridors.
11	Risk factors associated with in-hospital falls reported to the Patient Safety Commitee of a teaching hospital (Silva et al., 2019)	Medications were found to be a substantial contributor to in-hospital falls. This study revealed that age of patient, health status, history of medication, functional impairments, comorbid conditions alongside environmental issues are likely risk factors of fall. Lower limb amputation, severe pain, and female sex were the factors leading to high fall risks.

A-List of The Obtained Risk Factors

The review matrix has assisted in representing the important data about risk factors of falls. The synthesis of the included articles encompassed different risk factors that are mentioned below:

- Subsequent fractures due to inpatient falls have urologic conditions such as the overactive bladder, benign prostatic hyperplasia, urinary tract infection, and tumors, etc (Basic & Hartwell, 2015; Soliman, Meyer, & Baum, 2016).
- Falls while the new placement of patients in nursing homes due to functional disability and frailty (Chen et al., 2013).
- The use of psychotropic drugs poses side effects on mobility of patients leading to falls.
- Inpatients with cognitive impairment tend to have unsafe gait and therefore, have increased risks of injurious falls (Vassallo et al., 2009; Hayakawa et al., 2014).
- A significant association is found between fall risks and the use of narcotics, hypnotics, sedatives and other drugs (De Jong, der Elst, & Hartholt, 2013; Pierce Jr. et al., 2013).
- Hospitalized patients with lower limb amputation are vulnerable to more falls (Hunter et al., 2017; Silva et al.., 2019).
- Hospitalized patients with lower levels of calcium, potassium, and patients who are treated with anti-epileptics increase the ROF (Cheema & Chaudhry, 2016; Gringauz et al., 2017).

Discussion

In summary, the studies mentioned above underlines the risk factors for the fall of admitted patients and a number of fall risk factors were identified by each study. The understanding of these significant factors can help nurses in improving their skills and practices to reduce the fall rates of hospitalized patients so as to deliver quality care. 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 that the incidence of inpatient falls depends on their age, LOS, self-sufficiency, and health of patients. Besides, these risk factors for falls impact the length of stay at hospital, age, health of patient, and patient's self-sufficiency.

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, in addition, the likelihood of fractures, immobility, brain injuries, and the fear of falling down is even higher (Silva, Costa & Reis, 2019). Besides, chronic diseases like diabetes mellitus, hypertension also enhance the ROF among older patients (Kobayashi et al., 2018). New placement in nursing homes was found to exacerbate the ROF (Basic & Hartwell, 2015). It was also noted that frailty, usage of drugs,

cognitive impairment, reduced physiological reserve due to ageing were risk factors that amplify the inpatient falls. Also, the unstable gait, hypotension, dizziness, agitation, and increased use of psychotropic drugs among adult inpatients were likely to increase the fall rates.

Nevertheless, all the included studies were found to have certain limitations. Relating to the research approach (i.e. retrospective study), the most common methodological limitation was the selection and observation bias, low control of researcher on extraneous variables, missing fall records, and difficulty in validating obtained information about inpatient falls. Similarly, it was difficult for researchers to identify the rate of disease among inpatients that were exposed to falls. Besides, there were studies that had small sample size that limits the generalizability of their findings. Furthermore, included studies have focused on single hospital and therefore, the transferability of research is limited to other hospitals as they might have different risk factors for inpatient falls. Based on the consequences of increased injurious falls among admitted patients, effective prevention strategies are crucial to identify risks and reduce inpatient falls.

In particular, fall risks should be identified with respect to the age and disease of patients and care plans should be devised for fall prevention (Hayakawa et al., 2014). Similarly, monitoring of use of psychotropic and hypnotic medications should be done by nurses to reduce fall rates.

Conclusion

In conclusion, the present review has thoroughly examined the fall risk factors that are commonplace among adult admitted patients. It was observed that fall risks are attributable to both intrinsic and extrinsic factors during hospitalization. The identification of the significant factors leading to serious injuries can help nursing and other healthcare staff to develop preventive strategies to mitigate the physical, psychological, and social consequences of these falls. Moreover, the role of nurses in reducing the fall rates of hospitalized patients is crucial and therefore, the nursing skills and their practices should be improved to achieve desired clinical and patient outcomes.

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