

Incidence of Fall and its Associated Factor: A Single Centre Experience

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ABSTRACT

INTRODUCTION: Patient falls during hospitalisation can cause catastrophic injuries and remain one of the major patient-safety issues faced by hospitals. This study was designed to determine the inpatient falls rate and the association between fall-related injury and sociodemographic variables. **MATERIALS AND METHODS:** A retrospective record review was conducted for a one-time inpatient fall in a single centre between January 2017 and December 2019. Pearson chi-square or Fisher's exact test were performed to assess association between the categorical variables. **RESULTS:** There were 44 inpatient falls who fell one time between January 2017 and December 2019. The inpatients fall rate was 3.0 per 10000 patient-days from 2017 to 2019. Overall, the patients who fell experienced an injury (n=24, 55%). There was no significant difference between age group, gender, time of fall, assisted type, history of fall, fall risk assessment, mental status, the department involved, and injurious fall outcome. **CONCLUSION:** Our study showed a low incidence of fall rate per 10000 patient-days for 2017-2019. More than half of the fallers experienced an injurious fall. The highest fall rate was noted in the surgical based departments. However, there was no significant difference between injurious fall outcomes and sociodemographic variables. Risk assessments and management strategies should focus on education, particularly bed safety.

Keywords

Inpatient, Safety, Injury, Hospital, Fall

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INTRODUCTION

Patient falls in hospital settings are the commonly reported adverse events among older patients. Falls may lead to injuries, prolonged hospitalisation, and legal liability.^{1,2} Injuries resulting from inpatient falls can further increase healthcare utilisation,¹ medical expenses^{3,4} and in some cases, may lead to lawsuits.⁵ About 30–50% of inpatient falls result in some form of physical injury, and 1–3% of those injuries were fractures.^{6,7} Therefore, the prevention of falls is an important issue for medical safety. Despite significant efforts, falls in hospitals have not been substantially controlled. In the United States, about 700 000 to 1 000 000 hospital patients have falls each year.⁸ Western studies point to a wide variation in the rates of inpatient falls, with values ranging from 3 to 11 falls per 1000 patient-days.^{9–11} Fall rates in hospitals vary greatly depending on the unit type. Previous studies showed that neurosurgery, neurology, and medicine units have the highest fall rates within hospitals.^{7,9,12,13} In contrast, surgical and intensive care units tend to have lower fall rates than other units.^{7,9,13} Furthermore, the rate is much lower in Asian countries. For example, in Singapore and South Korea, the rate of falls in acute care hospitals was between 0.55–1.44 per 1000 patient-days.^{14,15} Similarly, in Turkey, there was about 0.89 per 1000 patient-days¹⁶ and in Malaysia, the incidence of falls or near falls was 1.0 per 1000 patient-days among hospitalised older patients.¹⁷ Previous researchers provided little explanation on why they discovered such a broad variance in fall rates and hypothesised that it is likely a complicated pattern of varying intrinsic (i.e., patient-related) and extrinsic

components (i.e., environment-related).¹⁴ The variations of fall rates among these studies are due to differences in the patient selection criteria, health status, and observation period.¹⁴⁻¹⁷

Most local research on falls have been conducted in elderly populations from the community, nursing homes, and among outpatients.¹⁸⁻²⁰ Little is known about falls among hospitalised patients in Malaysia. A few local studies described the characteristics of the fall in a single centre experience.^{21,22} Across all study populations (i.e., community-based, nursing home, outpatient, and inpatient settings), there has been more emphasis on the identification of fall rates, injury rates, predictors of falling, usage of psychoactive medication, and prevention of the injurious fall.^{1,23-28} Falls are multifactorial in nature.²⁸⁻³⁰ The risk factors of falls such as individual, environmental, nurse staffing, and even organisational characteristics were included as essential variables in the previous studies to determine the association of fall severity and fall rates.²⁸⁻³⁰

In Malaysia, a patient safety guideline was introduced in 2013 in the hospital setting to reduce falls among adult and paediatric patients. However, it excludes those paediatric falls such as a non-injurious developmental fall for infants or toddlers as they are learning to walk. The guideline stated a total of 10% reduction based on the previous year's data as a baseline as a target to achieve in a hospital setting.³¹ However, the data on inpatients falls in Malaysian hospitals and the association with fall-related injuries are still scarce. The current study can be used as a quality improvement strategy to train the healthcare staff to properly report on any fall or near fall events that occur in the hospital setting and mitigate the risk of falls. The purpose of this study was to determine the inpatient falls incidence, the characteristics of the fall, and the association with the fall outcome among inpatients at our hospital setting.

MATERIALS AND METHODS

Design

This study was conducted in an acute care 795-bed hospital located in the East Coast region of Malaysia. Data

collection was conducted between June 2020 and February 2021 via retrospective record review of the reported fall cases and the information from the hospital's standardised incident reporting (IR) form from January 2017 until December 2019.³²

Research Question(s)

- (I) What is the fall rate in an acute healthcare setting?
- (II) Is there a relationship between the sociodemographic variables and fall-related injury?

Sample

This research included all reported inpatient fall cases in our hospital between 1st January 2017 and 31st December 2019. Data were obtained for inpatients that confirmed to have fallen based on the hospital's fall incident reporting policy and the IR form

Eligibility Criteria

We included those falls in the inpatient care units from 1st January 2017 and 31st December 2019 and one-time fallers. Unrecorded falls and patients who experienced a fall as an outpatient, or in the psychiatric ward, emergency department, or rehabilitation clinics were excluded from the analysis. Any reported patient falls as an unplanned descent to the floor with or without injury to the patient³¹ will be collected in this study.

Data Collection

Researcher collected the following information from the hospital's IR form and patient's medical records: age, race, gender, history of fall, incident date, admission date, discharge date, type of fall, mental status, and assisted types which are categorised into assisted fall, non-assisted fall or unknown. Assisted falls are falls that occur with a hands-on assist from another person or an object.³³

We also collected the ward information, location of the fall, time of fall, fall risk assessment before the fall, type of injury sustained, and outcome of falls (i.e., injurious or non-injurious). An injurious fall is when the patient is harmed by the fall, which ranges from minor injury to death. In contrast, a non-injurious fall is when the patient

is not harmed by the fall. Minor injury: resulted in bruise, abrasion; needs dressing, ice, limb elevation, and require topical medications. Moderate: fallers who needs sutures, Steri-Strips™, splint, or resulted in muscle or joint strain. Major: faller who needs surgery, cast, traction; and results in neurological or internal injury. Death: the patient died as a result of injuries sustained from the fall.³⁴

Statistical Analysis

Several types of software such as Microsoft Excel (2013) and IBM SPSS version 25 were used for the data analysis. Descriptive statistics were presented as mean, standard deviation (SD), and percentages to describe the characteristics of the sample. The crude inpatient fall rate per 10000 patient-days were calculated using the equation: number of patients who fell divided by the number of inpatient-days and multiplied by 1000. Association of fall outcomes and selected variables were analysed using Pearson chi-square or Fisher's exact tests. A *p*-value <0.05 was considered statistically significant.

RESULTS

Inpatient Fall Rates

A total of 44 inpatient falls cases were reviewed for three years. The cases were non-repeated fallers. The incidence fall rate were described in Table I from 2017-2019 and by department. There were nine cases of fall reported in 2017 and 2019, respectively (Table I). The highest number of falls was reported in 2018 with 26 cases. The inpatients fall rate for the study period (2017-2019) was 3.0 falls per 1000 patient-days. The highest fall rate was noted in the surgical based departments such as general surgery, neurosurgery, and orthopaedics, which is 7.1 falls per 1000 patient-days, followed by anaesthesiology with 6.4 falls per 1000 patient-days (Table I). As depicted in Figure 1, there was no specific pattern observed in the fall rates during the study period. The highest fall rate was noted in April 2018 with 11.1 falls per 1000 patient-days. From March 2018 to April 2018, the crude fall rates rise by four times (Figure 1).

Table I: Incidence Rate of Inpatient Falls from 1st January 2017 through 31st December 2019

Variables	No. of inpatient-days	No. of falls ^a	Fall rate per 1000 patient days ^b	Percentage of fall (%)
Incidence of fall (Total)	165582	44	0.27	-
2017	56453	9	0.16	20.5
2018	52790	26	0.49	59.1
2019	56339	9	0.16	20.5
Incidence of fall by department				
Obstetrics & Gynaecology	31843	5	0.16	11.4
Paediatrics/Neonates	30261	5	0.17	11.4
Medical & Cardiology	29564	16	0.54	36.4
Anaesthesiology	1563	1	0.64	2.3
Surgery, Neurosurgery & Orthopaedic	23978	17	0.71	38.6

^aOne time faller, ^bFall rate per 1000 patient-days was calculated using the equation (total no. of who fell divided by no. of inpatient-days and multiplied by 1000)

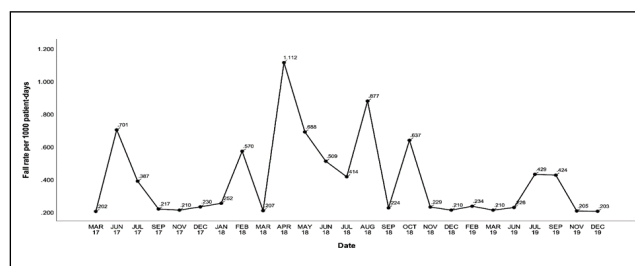


Figure 1. Inpatient fall rate per 1000 patient days from January 2017 – December 2019. 297x210mm (300 x 300 DPI)

Sample and Falls Characteristics

The sociodemographic of the inpatients and the person who fell are shown in Table II. More than half of the patients who fell were male (n=24, 55%). The participants' mean (SD) age was 47.2 (27.3) years. Study patients are consist of newborn up to elderly (0-84 years). The highest percentage of falls occurred from 21:00 to 07:00, in relation to the nursing night shifts (n=18, 41%). More than half (n=24, 55%) of the patients fell with injury. Details of the injury sustained from falls are shown in Table II. Six (25%) of them had pain/swelling. The proportions of the patients who sustained bleeding and laceration were 21%, respectively.

Association of Sociodemographic Variables and Fall Outcome among Fallers

Age group, gender, time of fall, mental status, history of fall, fall risk assessment score, assisted type, and department involved were not significantly associated with falls outcome.

Table II: Characteristics of Inpatients Who Fell from 1st January 2017 through 31st December 2019, (n=44)

Variables	n (%)	Median (IQR)
Age (year)		46 (42)
Gender		
Male	24 (54.5)	
Female	20 (45.5)	
Unit/Department where the fall occurred		
Medical / Cardiology	16 (36.4)	
Surgical / Orthopaedic / Neurology	17 (38.6)	
Obstetrics and Gynaecology	5 (11.4)	
Intensive Care Unit/Anaesthesiology	1 (2.3)	
Paediatric/Neonate	5 (11.4)	
Time of fall ^a		
Morning shift (07:00-14:00)	15 (34.1)	
Afternoon shift (14:00-21:00)	11 (25.0)	
Night shift (21:00-07:00)	18 (40.9)	
Fall risk assessment at time of fall ^b		
Low (<=24)	17 (38.6)	
Moderate (25-50)	14 (31.8)	
High (>=51)	2 (4.5)	
Missing	11 (25.0)	
Mental status		
Alert and oriented	32 (72.7)	
Confused	2 (4.5)	
Unknown	10 (22.7)	
Length of stay ^c		6 (11)
Location of fall		
Bedside/chairside	23 (52.3)	
Hallway	3 (15.9)	
Toilet/Bathroom area	15 (34.1)	
Others/Outside area	3 (6.8)	
Assisted type at the time of fall		
Assisted by relative, visitor, employee, or device	18 (40.9)	
Unassisted	21 (47.7)	
Unknown	5 (11.4)	
History of fall		
No	16 (36.4)	
Yes	8 (18.2)	
Unknown	20 (45.5)	
Conditions leading to fall		
Collapses	9 (20.5)	
Dizziness	1 (2.3)	
Falling while getting up from bed/chairside	21 (47.7)	
Slid to the floor	5 (11.4)	
Fitting	1 (2.3)	
Fall while standing up	2 (4.5)	
Fall backward	2 (4.5)	
Unknown	3 (6.8)	
Injurious fall outcome		
No injury	20 (45.5)	
With Injury	24 (54.5)	
Severity of injury, (n=24)		
Minor	19 (79.2)	
Moderate	5 (20.8)	
Type of injury sustained, (n=24)		
Pain/Swelling	6 (25.0)	
Abrasion/skin tear	3 (12.5)	
Bleeding	5 (20.8)	
Hematoma	4 (16.7)	
Laceration wound	5 (20.8)	
Redness on wounded area	1 (4.2)	

^aTime of fall was coded referring to the nurses working shift, ^bMorse Fall Scale Score was used for the fall risk assessment, ^cLength of stay=days from admission to date of discharge

DISCUSSION

The present study adds to the current literature in several ways. Compared to 2017 and 2019, the number of reported falls increased in 2018. The possibility is that healthcare workers are reporting these events due to

Table III: Association Between Injurious Falls Outcome and Sociodemographic Variables Using Univariate Analysis

Variables	No injury n (%)	With injury n (%)	c ² (df)	p-value
Gender				
Male	12 (50.0)	12 (50.0)	0.440 (1)	0.507
Female	8 (40.0)	12 (60.0)		
Time of fall				
Morning shift	6 (40.0)	9 (60.0)	0.554 (2)	0.758
Afternoon shift	6 (54.5)	5 (45.5)		
Evening shift	8 (44.4)	10 (55.5)		
Age group (years)				
<18	6 (66.7)	3 (33.3)	7.113 (3) ^a	0.063 ^a
19-39	6 (66.7)	3 (33.3)		
40-60	5 (45.5)	6 (54.5)		
>61	3 (20.0)	12 (80.0)		
Mental status				
Alert	15 (46.9)	17 (53.1)	0.442 (2) ^a	>0.950 ^a
Confused	1 (50.0)	1 (50.0)		
Unknown	4 (40.0)	6 (60.0)		
Unit/Department				
Medical/Cardiology	4 (25.0)	12 (75.0)	6.546 (4) ^a	0.128 ^a
Surgical/Orthopaedic/Neurology	8 (47.1)	9 (52.9)		
Obstetrics and Gynaecology	4 (80.0)	1 (20.0)		
Intensive Care Unit	1 (100.0)	0 (0.0)		
Fall risk assessment at time of fall (n=33)				
Low (<=24)	8 (47.1)	9 (52.9)	0.366 (2) ^a	>0.950 ^a
Moderate (25-50)	6 (42.9)	8 (57.1)		
High (>=51)	1 (50.0)	1 (50.0)		
Assisted type				
Assisted by relative, visitor, employee, or device	8 (44.4)	10 (55.6)	0.587 (2) ^a	0.831 ^a
Unassisted	9 (42.9)	12 (57.1)		
Unknown	3 (60.0)	2 (40.0)		
History of fall				
Yes	4 (50.0)	4 (50.0)	0.194 (2) ^a	>0.950 ^a
No	7 (43.8)	9 (56.3)		
Unknown	9 (45.0)	11 (55.0)		

^aFisher's Exact test. p-value in bold indicates significant association

increased awareness of the necessity of writing each case and new guidelines implemented at the end of 2017 based on the open reporting system by any healthcare staff.³² This guideline is a critical preventative measure to ensure the safety of patients. However, the overall hospital crude fall rate was lower than those reported in the previous studies^{2,7,16,20,35}, aligning with the targeted Key Performance Indicator rate of patient falls, which is less than or equal to 5 per 1000 patient-days by Malaysian Patient Safety Goals & Indicator.³¹ This discrepancy could be attributed to our study data depending on retrospective records on staffs' documented manner. The fall rates in previous studies vary according to the institution's characteristics and the unit (i.e., physical structure or work processes).. There could be some barriers which could affect their attitude in reporting such as lack of feedback on the incidents, fear of being punished, and attribution of blame which were not assessed in the current study.³⁶⁻³⁸

The finding of this study is similar with prior studies observed that men were more frequent to fall than women.^{16,25,28} During their stay in the hospital, most of the patients had a higher frequency of falls in the night shifts, unassisted during falls, and falls from beside or chairside, which was consistent with the current study.^{16,25,28} These findings raised an essential issue of whether the current prevention strategies, such as education on fall prevention among patients and healthcare staff, modification in the hospital's physical design and environment, and internal audit on post-fall, played an influential role in the study setting. In practice, this study may devise measures to reduce inpatient falls and prevent serious complications and unnecessary extension of hospitalisation. The reporting methods should be made available, convenient, and not punitive-oriented to ensure that all incidents are accurately documented and analysed for improvement opportunities without fear of repercussions that may lead to under reporting.³⁹ Our study showed that the surgical-based department, such as general surgery, neurosurgery, and orthopaedics has a higher fall rate than the intensive care unit and medical-based. This result is similar to previous studies that showed the critical units for falls are from clinical and surgical-based units.^{6,9,13} The lower incidence of fall in ICU may be attributed by constant monitoring by staff and restricted mobility of patient due to their critical condition. There was a high percentage of unassisted falls noted in the current study. It could be that the patients were unfamiliar with the environment and had limited assistive devices for patients or no healthcare staffs or caretaker available to assist at time of falls.^{16,21,25} Therefore, the empowerment of patients' caretakers, family members, and relatives also plays a significant role in reducing the fall rate.

Although there was no significant association between the assisted type and injurious falls, there could be mechanism to prevent the injurious falls through education and awareness of risk of fall among patients and caretakers. More emphasis should be placed on ensuring a good standard of care, adequate staffing, and vigilant reporting of inpatient fall cases.¹⁶ Age is considered an important intrinsic factor causing falls, and it has been stated that older age is associated with

a greater possibility of further falls.^{36,37} The current study found that a significant proportion of injurious falls occurred among patients in the 51 years and over age group. The tendency to fall rises with age due to physiological and health-related variables.⁴⁰ Some of the factors such as gender, time of falls, unit type, and mental status were not associated with injurious falls, consistent with other studies.^{24,25} Additionally, most of the patients in this study fell despite being assessed as "moderate risk" before the event and were alert. Therefore, continuous monitoring by using video devices can improve the reduction of fall rates^{41,42} and assisting patients in following daily schedules are necessary for the patients at risk to reduce fall. Suggestions for purposeful rounding, mobility aid, and bed alarms must be planned and communicated to the patients, family or relatives, and healthcare providers to mitigate the risk of fall.²⁵ Our findings also noted that the common types of injuries sustained after inpatient falls were hematoma, bleeding, and soft-tissue swelling, similar to the previous research findings which may prolong duration of hospital stay and incur more treatment cost and resources.^{2,6,16}

Strengths and Limitations

This study adds to the relative gap in the hospital-level analysis, shedding light on trends, injuries across various departments, and differences in incidence among departments. There were some limitations to this study. First, there were few reported cases in 2017 and 2019; some fall cases may have been missed. Secondly, the study team relied on hospital incident reports, and some medical notes were unable to be traced. These reports may have a limited amount of information and may be incomplete.¹⁴ Furthermore, this analysis involves a single setting which may not be generalisable to other settings.. Many critical variables such as the nature of the falls, patient's condition before fall, medication taken before fall, and discovery type when the patient falls were not captured in the hospital incidents reporting form.

Implications for Practice

A contribution of the present study was the suggestion to devise and implement safety measures primarily with older individuals identified at moderate or high risk of falls in

the ward. Pamphlets or posters that showed "dangerous movement" and tagging patients with coloured wristbands for the "at risk" patients are several approaches to prevent falls by the unit in each ward.^{8,27} Our setting started with the no tag for low-risk, yellow tags for moderate-risk, and red tags for high-risk patients on top of the patient's bed in 2017, and the coloured wristbands were introduced a year later to identify patients with a high risk of falls. The current study showed no significant relationship between fall risk assessment and injurious falls. However, sample of fallers are mainly from low and moderate-risk patients. These fallers are also susceptible to falls due to multiple factors such as patient condition after surgeries or medication they took and the ward environment and facilities. Therefore, nurses working during the night and morning shifts need to be more alert in identifying incidents of falls. Besides, patients and relatives or caretakers should also be made aware of the risk of falls. Meaningful engagement of patients, families, and communities can enhance healthcare quality and safety by incorporating their perspectives, experiences, and insights into the healthcare system, in line with the WHO's Patients for Patients Safety (PFPS) program.⁴³

This was an observational study based on the incident reporting and retrospectively analyse the outcome of inpatient falls data. Currently, we are not aware of any other local studies that has reported the incidence of inpatient fall and determined its association with fall outcome. Further work must be done to establish a comprehensive data collection instrument and consistent training for incident reporting through continuous medical or nursing education. Qualitative findings on the root cause analysis of post-fall audits can further provide information for falls' intrinsic and extrinsic factors, such as the hospital's environment. Besides, further in-depth interviews among fallers enable the quality unit to identify the patient's circumstances and effective communication between the hospital staff and patients before the fall.^{24,25,44}

CONCLUSION

In conclusion, our study showed a low incidence of fall rate for 2017-2019. The highest fall rate was noted in the

surgical based departments. However, there was no significant difference between age, gender, time of fall, mental status, assisted type, the individual department involved, history of fall, fall risk score assessment, and fall outcome. The efforts in educating the healthcare staff to constantly report any falls or near falls incidents and to risk-stratify patients with the use of preventative measures at local settings may help identify interventions to determine the 'patients at risk'. The reduction of patient injury should be our aim in the fall prevention programme. Thus, this study serves as a quality improvement initiative to improve patient safety in our hospital.

CONFLICTS OF INTEREST

No conflict of interest has been declared by the authors.

INSTITUTIONAL REVIEW BOARD (ETHICAL COMMITTEE)

The study was approved by the Medical Research and Ethics Committee, Ministry of Health with reference number NMRR 20-801-54613. Collected data were kept confidential and no identifying information were collected when reporting the results. Researchers obtained secondary data from medical records thus, there was no written or verbal consent from participants.

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