Root Cause Analysis of Falls Occurred and Presenting Fall Prevention Strategies Using Nominal Group Technique

Zhila Najafpour[1], Ali Movafegh[2], Arash Rashidian[3], Mohamadreza Jafari[4], Ali Akbari Sari[3] and Mohammad Arab[3, *]

[1]Department of Health Care Management, School of Public Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[2]Tehran University of Medical Sciences, Tehran, Iran
[3]School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[4]Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran

[*] *Corresponding author*:Economic and Health Management Group, School of Public Health, Tehran University of Medical Sciences, Pour Sina St., 16 Azar St., Tehran, Iran. Tel: +98-2142933078, Fax: +98-2188989129, Email: arabmoha@tums.ac.ir

Abstract

Background: Patients' fall is considered as a challenge to patient safety, which entails not only prolonged hospital stays and higher costs, however, it may also result in injuries and even death.

Objectives: This study aimed to identify attributed root causes and to develop preventive strategies.

Methods: The present study is a multiphase qualitative study in which all fall incidents were studied deploying a root cause analysis process in accordance with the modified NPSA protocol in an educational hospital within a 9-month period. The contribution and association of risk factors attributed to each fall incident were analyzed using descriptive and analytical statistics. Finally, a nominal group technique was used, with specialist and holding three separate rounds, for determining preventive strategies of falling in health care facilities.

Results: Out of a total of 110 fall incidents, 657 root causes were identified. Three groups of attributed causes, including patient, task, and education factors were found to have a greater share in the patient falling. Based on the identified root causes, fall prevention interventions were selected by members as specialized panels, who rated the solutions in several sessions. Ultimately, interventions agreed less than 70% were removed, and other potential preventive interventions were implemented in the form of a hospital-based trial.

Conclusions: We found that a fall is the result of intrinsic and extrinsic risk factors. The first step in preventing falls is proper assessment of the patient in terms of clinical condition. Evaluation of the environment of the hospital is also essential to identify problems as well as developing amendment programs. Due to missing data on falls reported by nurses, it seems unwise to solely rely on the submitted reports.

Keywords: Patient Fall, Root Causes, Nominal Group Technique, Patient Safety

1. Background

Patient safety means protecting the patient from any injury during health care (1). Brennan et al. has indicated that adverse events occurred in 3.7% of the hospitalizations, among which 27.6% were due to negligence (2). A patients fall is considered as the most prevailing patient-safety problem in hospitals. However, the rate of falls varies depending on the type of hospital (3). Several reports have indicated that 2% - 15% of patients have experienced a fall during their hospital stay, 15% resulted in serious injuries (4, 5), which not only entails prolonged hospital stays and higher costs, however, it may also result in sustained injuries and even death (6). It is estimated that fall related injuries could be attributed to approximately $15000 and by 2020, the total number of related injury is estimated to reach $58.27 billion among Americans on an annual basis (7).

However, falling is one of the most frequent events in the hospital and is defined as an accidental and unexpected shift in the body posture, which may result in injuries (8); yet, statistics have shown that 78% of in-hospital falls are avoidable (9). Different intrinsic and extrinsic factors have been identified to be contributing to falls in hospital such as the patient's clinical condition, medication, as well as extrinsic factors such as lack of proper maintenance and design of medical equipment, failures in communication, education, and team working (10).

Several mechanisms have been incorporated to reduce patient falls. Faults have been traditionally interpreted as a failure on the part of individual providers. However, nowadays, the responsibility of medical faults has shifted towards the system. Thus, it is necessary for the hospitals to assess the adverse incidents leading to unexpected injuries to patients and developing preventive action plans (11). This study investigated the contributing factors of fall incidents to determine the share attributed to each factor for developing preventive strategies.

2. Methods

The present study was conducted in a multi-phases qualitative method, in a 600-bed hospital in Tehran, during a 9-month period within 2015. The process of analyzing the root causes was conducted in compliance with the modified protocol of National Patient Safety Agency (NPSA) (12). Data collection process for each case of fall incident was implemented as below:

2.1. Incident Identification

Data on the fall was collected through voluntary error-reporting system. In addition, daily round of raters and interviewing all discharged patients during their stays in hospital was performed in parallel over the course of study.

2.2. Data Collection

Following identification of all individuals involved in the fall incident, the necessary information was extracted by interviewing the personnel and fallers (an interview guide is shown in the additional file). Data including age, sex, Morse fall scale, place and time of fall, the patient's activity during fall, medications, and environmental factors were collected. The patients' clinical condition after the fall and the type and severity of injury were rated by physicians in five levels ranging from no injury to death (13). In order to identify high-risk patients, all patients were assessed by two supplementary scales, namely Stratify and Handritch, in addition to Morse scale.

2.3. Developing a Summary of the Fall Incident

At this phase, the timeline of the incident was prepared using findings of last sections. Multiple sessions were held in the cases of sentinel events resulting in death or serious injury caused by inpatient fall.

2.4. Recognizing Challenges

Identifying problems related to falls were performed after data gathering. These problems consist of all errors that take place during a patients' fall such as failure to monitor, observation. The question 'why' was asked repeatedly until the root of the cause of fall was identified. Factors that may have contributed to this rooted cause were also noted. This phase was conducted by two researchers, well-versed with error analysis. The root causes were determined separately by two raters. In case of consensus between two raters, the share of that attributed factor in the fall incidents was accepted. However, in case of divergent scores by two raters, a third rater was consulted.

2.5. Preparing a Fall Incident Report

In this phase, a report of the fall incident was prepared in which the root causes were identified and recorded.

2.6. Operational Plan Development

Nominal group technique (NGT) was used in this phase. The group consisted of 12 hospital experts who were selected based on their expertise and experience including physicians (Neurologist, Orthopaedic, Cardiologist, Anaesthesiologist, General Medicine), nurses, hospital directors, and a number of scientific advisors in the field of patient safety.

At first panel, the root causes of fall incidents, analyzed in previous stages, were provided. Then, the members were asked to draft their suggested strategies without any limitation. Thence, all suggestions were considered, and similar ones were merged together. Finally, a list comprised of 29 strategies was concluded to be discussed in the next meeting.

In the second round, the list was disposed to the expert team members, and they were asked to rate the priority order of interventions according to the importance and feasibility of implementation in form of the Likert scale. After the initial rating, the principal investigator entered all of the raw data into the software program, and numeral difference was controlled by the assistant researcher. The results of analysis were made available and presented to the members at the subsequent meeting, in which the cases with the consensus less than 70% were discussed in details by the members. In the third round, the members were asked to rerate the interventions to remove interventions with consensus less than 70%. Those interventions with a consensus of greater than 70% were considered on the agenda of implementation, which would be run in form of a clinical trial.

2.7. Data Analysis

Data on root causes was collected and analyzed by SPSS 15 Software. Statistical methods were used in this study including descriptive tests in NGT phase, Pearson test, and ANOVA to investigate the relationship between attributed factors and other variables.

3. Results

3.1. Characteristics of Fallers

The average age of patients was 53.7 years (SD = 18.44, range = 17 - 89), and the average length of stay was calculated 12.44 days (SD = 11.74, range = 1 - 63).

A total of 55% of falling incidents occurred among women, and 17% of fallers had a history of previous falls in the past preceding 3 months. The majority of fallers were reported to suffer from cardiovascular diseases and cancer (Table 1).

3.2. Fall Reports

Among the fall incidents, 80% (90 cases) have resulted in minor to major injuries, of which 57% (63 cases) were patients diagnosed as high risk by Morse risk assessment scale (Table 3). In this study, patients were assessed by two supplementary tools (Handrixh and Stratify tools) in addition to Mores tool, so that 70% of patients were identified as high risk (Table 2).

A total of 67% of falls occurred when the patient was alone. Out of total falls, 60% of the actual fall incidents were reported by nurses, of which 86% resulted in minor to major injuries. Based on Pearson test, a significant relationship was found between the severity of injury and the fall incident reports by nurses (Table 3).

Activity restriction had been prescribed by a physician in almost 16% of fallers. The analysis of ANOVA test revealed

Table 2. Patient Falls by Risk Score Tools for the Sample[a]

Level of Risk	Morse	Stratify	Handritch
No risk	26 (23.6)	13 (12)	-
Low risk	21 (19)	20 (18)	34 (31)
High risk	63 (57.2)	77 (70)	76 (69)

[a]Values are expressed as No. (%).

no significant association between the level of activity prescribed by the physician and scores of the Mores tool (F = 0.75, DF = 109, P value = 0.4).

Patient's activities before or at the time of fall are presented in Figure 1.

3.3. Root Causes of Falls

A total of 657 root causes were identified, which forms 5.9 causes for each fall. Root causes identified for inpatient fall and the resulting injuries were representing weakness in 9 related domains (Figure 2). The contribution and the details of factors are illustrated in Figure 3.

3.4. Developing Preventive Strategies

Following the expert meetings held, preventive interventions including physical exercises, examination of visual impairment, keeping floor surfaces dry, placing high risk patients near the nurse's station, using non-skid slippers, toilet scheduling, and the patient's justification on not to bathe without assistance obtained consensus less than 70%, therefore, they were discussed in details in the second panels (Table 4).
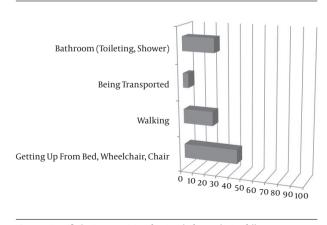
Table 1. Main Diagnosis Fallers at Hospital

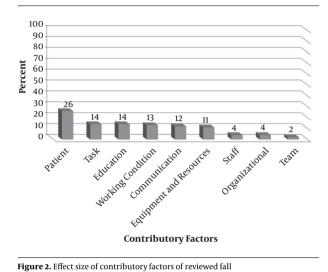| Diagnosis	No. (%)
Cardiovascular	24 (22)
Cancer	16 (15)
Urologic	13 (12)
Neurodegenerative	11 (10)
Cerebrovascular	9 (8)
Respiratory	5 (5)
Gastrointestinal	5 (5)
Osteoarticular	4 (4)
Gynecology	3 (3)
Others disease	24 (22)

Figure 1. Specified primary activity of patient before or during fall

Table 3. Gap and Correlation Between Fall Reporting by Nurses and Assessors

Severity	Number of Total Falls	Fall Reported[a]	Fall Identified[a]	Pearson Chi-Square	P Value
None	22	9 (13.8)	13 (28.9)		
Minor	80	48 (73.8)	32 (71.1)	8.882	0.064
Major	8	8 (12.3)	0 (0)		
Total	110	65 (59)	45 (41)		

[a]Values are expressed as No. (%).

Figure 2. Effect size of contributory factors of reviewed fall

4. Discussion

4.1. Characteristics of Fallers

Based on the findings, the inpatient falls seem to be resulted as a combination of patient-related factors and extrinsic factors. Various literatures have studied the impact of age and sex on the possibility of fall. Ganz et al. and Hendrich reported that the age singly may not be effective on the fall (14, 15). However, other studies have verified the effect of age (16, 17). In the meanwhile, fall incidents in men were lower than women. In contrast to what concluded in our study, Hendrich claimed a higher rate of fall incidents among men due to their incompliance with the instructions (15). Chen and Dunlop concluded that women, particularly following delivery, are more susceptible to fall incident (18, 19). Similarly, there is a consensus that the effect of age and sex can strengthen other contributing factors.

The study demonstrates a higher rate of fall incidents among patients with cardiovascular diseases. Some other studies have confirmed the effect of OH and hypertension in falling incidents (20, 21). Patients cancer was identified as a risk factor to fall incidents, 40% of fallers were identified at low risk or even no risk. Capone and Spolesra

confirmed the higher risk of fall in patients with cancer and have introduced factors such as the level of pain, type of cancer, metastases, and medications as the factors contributing to fall incidents (22, 23). We think that it is critical to develop a specific or supplementary instrument to come with a more precise prediction of fall risk among cancer patients.

4.2. Fall Reports

The results indicate that the primary activities before or during fall included getting up from bed and using the toilet, which is confirmed in another study (24-27). Some interventions, including scheduled toileting and regular round of nurses can be effective (4, 28, 29).

Due to the lack of reporting, approximately half of the falls occurred by nurses, therefore, it seems that a reporting system should be developed that is capable of providing an accurate view of the type, nature, and severity of incidents at a reasonable cost (30, 31).

4.3. Root Causes

A total of 5 domains of top contributing factors were found to play greater roles in fall incidents including patient related factors, task, education, environment, and communications.

Among the attributed factors patient-related factors had the greatest share, which included demographic variables (age, sex), systemic variables (balance, strength, sight, cognition), type of diseases (cardiovascular disorders), clinical conditions (blood pressure, hypoxia, delirium, history of falls), not asking for help to get out of bed, and sedation medications. Therefore, interventions such as moderating visual impairment (32), management of delirium (33), hypoxia (33), and medication adjustment are recommended.

Another factor associated with the risk of falling was task factor. Nurses should provide the patients with training at the time of their admission (34) and reassess the risk of fall in patients after falling or changed situation (13). In addition, the majority of fall incidents, the patients, and their families were not well trained on how to consider fall
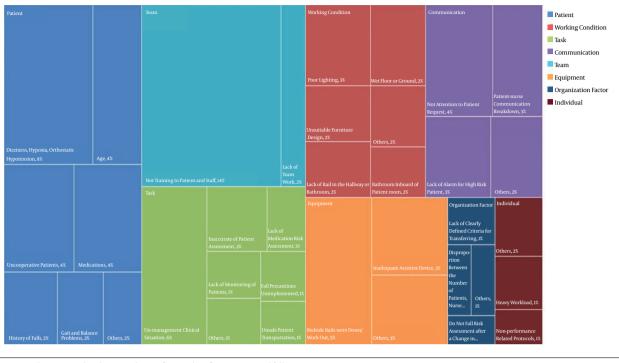
Figure 3. Subcategory related to contributory factors classification surveyed fall

safety precautions, and the patients prescribed to bed rest were not aware of the scope of their activity restrictions.

Environmental factors included inappropriate facility design of the patient's room, long distances between bathroom and patient's bed, lack of adequate lighting at night (35), and failure to communicate implying failure in establishing inter-professional relationships between health care providers as well as relationship with patients (36, 37). Greenberg et al. and Vealey et al. reported the highest rate of communication fault during handoffs or transferring the patient to a new ward (8, 38).

In 49% of fallers, a history of taking sedatives and antihypertensive drugs was reported, which correspond to the previous literature (10, 39, 40). For this reason, pharmacological interventions such as caution in prescribing drugs affecting the risk of fall and monitoring, modification of dosages, and the time of taking are recommended.

This study has a few limitations. First, this study was conducted in only one hospital, which may affect the generalizability of the results. Another limitation was the recall bias in case of elderly fallers.

Patient fall is attributable to intrinsic and extrinsic causes. The first and foremost preventive step is an accurate assessment of the patient in terms of clinical conditions and fall contributing factors as well as taking a history of previous falls performed by well trained nurses. Preventive strategies should be selected based on a patient condition and hospital, which is done following a selective and purposeful approach by nurses. With respect to the extrinsic factors, hospitals are suggested to run an environmental analysis and develop amendment plans based on the audit results.

Supplementary Material

Supplementary material(s) is available here [To read supplementary materials, please refer to the journal website and open PDF/HTML].

Acknowledgments

Footnotes

Table 4. Ranking Score of Fall Intervention[a]

Category	Ranking	
	Importance	**Possibility**
Environment		
Proper lighting	100	92
Toilet floor dry	84	100
Keep pathway clear	100	91
Embedding wall side rail in corridor	100	94
Walking aids		
Safe footwear	100	88
Enough number of walking aids	97	92
Care of plan		
Pain management	94	72
Management of delirium	89	72
Management of hypoxia	100	89
Toileting schedule	69	52
Medication		
Intake vitamin D	91	56
Medication adjustment	94	86
Communication		
Placement of a alert sign	94	94
Yellow wristband	89	94
Bed alarm system	100	92
Equipment		
Bed pressure sensor, hip protector	83	51
Placing the bed rails raised and low bed	100	81
Patient participant		
Do not leave patients unattended	94	69
Encourage patients to empty their bladder prior to bedtime	83	72
Encouragement of patients not to leave a bed or chair without assistance	100	94
Encouragement of use of eyeglasses, hearing aids, footwear	100	93
Nursing supervision		
Placing high risk patients near station	86	58
Increase frequency of patient rounds	100	75
Safety in transfer and handoff	100	92
Assessment of patient		
Reassessing of patients after a fall	97	86
Refer to physiotherapist		
Exercise program	64	65
Refer to optometrist		
Treatment of visual impairment	86	66
Training		
Patient education	100	92
Staff education	100	94

[a]Values are expressed as percentage.

References

1. Rothschild JM, Landrigan CP, Cronin JW, Kaushal R, Lockley SW, Burdick E, et al. The critical care safety study: The incidence and nature of adverse events and serious medical errors in intensive care. *Crit Care Med*. 2005;**33**(8):1694–700. doi: 10.1097/01.CCM.0000171609.91035.BD. [PubMed: 16096443].

2. Brennan TA, Leape LL, Laird NM, Hebert L, Localio AR, Lawthers AG, et al. Incidence of adverse events and negligence in hospitalized patients: Results of the harvard medical practice study I. 1991. *Qual Saf Health Care*. 2004;**13**(2):145–51. discussion 151-2. doi: 10.1136/qshc.2002.003822. [PubMed: 15069223]. [PubMed Central: PMC1743811].

3. von Renteln-Kruse W, Krause T. Incidence of in-hospital falls in geriatric patients before and after the introduction of an interdisciplinary team-based fall-prevention intervention. *J Am Geriatr Soc*. 2007;**55**(12):2068–74. doi: 10.1111/j.1532-5415.2007.01424.x. [PubMed: 17971140].

4. Oliver D, Healey F, Haines TP. Preventing falls and fall-related injuries in hospitals. *Clin Geriatr Med*. 2010;**26**(4):645–92. doi: 10.1016/j.cger.2010.06.005. [PubMed: 20934615].

5. Vassallo M, Vignaraja R, Sharma JC, Hallam H, Binns K, Briggs R, et al. The effect of changing practice on fall prevention in a rehabilitative hospital: The Hospital Injury Prevention Study. *J Am Geriatr Soc*. 2004;**52**(3):335–9. doi: 10.1111/j.1532-5415.2004.52102.x. [PubMed: 14962145].

6. Koh SL, Hafizah N, Lee JY, Loo YL, Muthu R. Impact of a fall prevention programme in acute hospital settings in Singapore. *Singapore Med J*. 2009;**50**(4):425–32. [PubMed: 19421690].

7. Fonda D, Cook J, Sandler V, Bailey M. Sustained reduction in serious fall-related injuries in older people in hospital. *Med J Aust*. 2006;**184**(8):379–82. [PubMed: 16618235].

8. Amato-Vealey EJ, Barba MP, Vealey RJ. Hand-off communication: A requisite for perioperative patient safety. *AORN J*. 2008;**88**(5):763–70. quiz 771-4. doi: 10.1016/j.aorn.2008.07.022. [PubMed: 19024783].

9. Loria G, Bhargava A. Prevention of patient falls – A case study. *Apollo Med*. 2013;**10**(2):175–80. doi: 10.1016/j.apme.2013.02.006.

10. Deandrea S, Lucenteforte E, Bravi F, Foschi R, La Vecchia C, Negri E. Risk factors for falls in community-dwelling older people: A systematic review and meta-analysis. *Epidemiology*. 2010;**21**(5):658–68. doi: 10.1097/EDE.0b013e3181e89905. [PubMed: 20585256].

11. Teixeira TC, de Cassiani SH. [Root cause analysis: Evaluation of medication errors at a university hospital]. *Rev Esc Enferm USP*. 2010;**44**(1):139–46. Portuguese. doi: 10.1590/S0080-62342010000100020. [PubMed: 20394231].

12. Taylor-Adams S, Vincent C. Systems analysis of clinical incidents: The London protocol. *Clin Risk*. 2016;**10**(6):211–20. doi: 10.1258/1356262042368255.

13. Schwendimann R, Buhler H, De Geest S, Milisen K. Falls and consequent injuries in hospitalized patients: Effects of an interdisciplinary falls prevention program. *BMC Health Serv Res*. 2006;**6**:69. doi: 10.1186/1472-6963-6-69. [PubMed: 16759386]. [PubMed Central: PMC1534028].

14. Ganz DA, Bao Y, Shekelle PG, Rubenstein LZ. Will my patient fall? *JAMA*. 2007;**297**(1):77–86. doi: 10.1001/jama.297.1.77. [PubMed: 17200478].

15. Hendrich A. How to try this: Predicting patient falls. Using the Hendrich II Fall Risk Model in clinical practice. *Am J Nurs*. 2007;**107**(11):50–8. quiz 58-9. doi: 10.1097/01.NAJ.0000298062.27349.8e. [PubMed: 18075342].

16. Rubenstein LZ. Falls in older people: Epidemiology, risk factors and strategies for prevention. *Age Ageing*. 2006;**35 Suppl 2**:ii37–41. doi: 10.1093/ageing/afl084. [PubMed: 16926202].

17. Blalock SJ, Casteel C, Roth MT, Ferreri S, Demby KB, Shankar V. Impact of enhanced pharmacologic care on the prevention of falls: A randomized controlled trial. *Am J Geriatr Pharmacother*. 2010;**8**(5):428–40. doi: 10.1016/j.amjopharm.2010.09.002. [PubMed: 21335296].

18. Chen KH, Chen LR, Su S. Applying root cause analysis to improve patient safety: Decreasing falls in postpartum women. *Qual Saf Health Care*. 2010;**19**(2):138–43. doi: 10.1136/qshc.2008.028787. [PubMed: 20351162].

19. Dunlop DD, Manheim LM, Sohn MW, Liu X, Chang RW. Incidence of functional limitation in older adults: The impact of gender, race, and chronic conditions. *Arch Phys Med Rehabil*. 2002;**83**(7):964–71. doi: 10.1053/apmr.2002.32817. [PubMed: 12098157].

20. Gangavati A, Hajjar I, Quach L, Jones RN, Kiely DK, Gagnon P, et al. Hypertension, orthostatic hypotension, and the risk of falls in a community-dwelling elderly population: The maintenance of balance, independent living, intellect, and zest in the elderly of Boston study. *J Am Geriatr Soc*. 2011;**59**(3):383–9. doi: 10.1111/j.1532-5415.2011.03317.x. [PubMed: 21391928]. [PubMed Central: PMC3306056].

21. Freeman R, Wieling W, Axelrod FB, Benditt DG, Benarroch E, Biaggioni I, et al. Consensus statement on the definition of orthostatic hypotension, neurally mediated syncope and the postural tachycardia syndrome. *Clin Auton Res*. 2011;**21**(2):69–72. doi: 10.1007/s10286-011-0119-5. [PubMed: 21431947].

22. Capone LJ, Albert NM, Bena JF, Tang AS. Predictors of a fall event in hospitalized patients with cancer. *Oncol Nurs Forum*. 2012;**39**(5):E407–15. doi: 10.1188/12.ONF.E407-E415. [PubMed: 22940520].

23. Spoelstra SL, Given BA, Schutte DL, Sikorskii A, You M, Given CW. Do older adults with cancer fall more often? A comparative analysis of falls in those with and without cancer. *Oncol Nurs Forum*. 2013;**40**(2):E69–78. doi: 10.1188/13.ONF.E69-E78. [PubMed: 23448747].

24. Kim EK, Lee JC, Eom MR. [Falls risk factors of inpatients]. *J Korean Acad Nurs*. 2008;**38**(5):676–84. Korean. doi: 10.4040/jkan.2008.38.5.676. [PubMed: 19114756].

25. Blair E, Gruman C. Falls in an inpatient geriatric psychiatric population. *J Am Psychiatr Nurses Assoc*. 2016;**11**(6):351–4. doi: 10.1177/1078390305284659.

26. Hignett S, Masud T. A review of environmental hazards associated with in-patient falls. *Ergonomics*. 2006;**49**(5-6):605–16. doi: 10.1080/00140130600568949. [PubMed: 16717012].

27. Salgado RI, Lord SR, Ehrlich F, Janji N, Rahman A. Predictors of falling in elderly hospital patients. *Arch Gerontol Geriatr*. 2004;**38**(3):213–9. doi: 10.1016/j.archger.2003.10.002. [PubMed: 15066308].

28. Perell KL, Nelson A, Goldman RL, Luther SL, Prieto-Lewis N, Rubenstein LZ. Fall risk assessment measures: An analytic review. *J Gerontol A Biol Sci Med Sci*. 2001;**56**(12):M761–6. doi: 10.1093/gerona/56.12.M761. [PubMed: 11723150].

29. Scheffer AC, Schuurmans MJ, van Dijk N, van der Hooft T, de Rooij SE. Fear of falling: Measurement strategy, prevalence, risk factors and consequences among older persons. *Age Ageing*. 2008;**37**(1):19–24. doi: 10.1093/ageing/afm169. [PubMed: 18194967].

30. Shorr RI, Mion LC, Chandler AM, Rosenblatt LC, Lynch D, Kessler LA. Improving the capture of fall events in hospitals: Combining a service for evaluating inpatient falls with an incident report system. *J Am Geriatr Soc*. 2008;**56**(4):701–4. doi: 10.1111/j.1532-5415.2007.01605.x. [PubMed: 18205761]. [PubMed Central: PMC2361382].

31. Khammarnia M, Ravangard R, Barfar E, Setoodehzadeh F. Medical errors and barriers to reporting in ten hospitals in Southern Iran. *Malays J Med Sci*. 2015;**22**(4):57–63. [PubMed: 28729811]. [PubMed Central: PMC5499771].

32. Patino CM, McKean-Cowdin R, Azen SP, Allison JC, Choudhury F, Varma R, et al. Central and peripheral visual impairment and the risk of falls and falls with injury. *Ophthalmology*. 2010;**117**(2):199–206 e1. doi: 10.1016/j.ophtha.2009.06.063. [PubMed: 20031225]. [PubMed Central: PMC2819614].

33. Rheaume J, Fruh S. Retrospective case reviews of adult inpatient falls in the acute care setting. *Medsurg Nurs*. 2015;**24**(5):318–24. [PubMed: 26665867].

34. Najafpour Z, Jafary M, Saeedi M, Jeddian A, Adibi H. Effect size of contributory factors on adverse events: An analysis of RCA series in a teaching hospital. *J Diabetes Metab Disord.* 2015;**15**:27. doi: 10.1186/s40200-016-0249-3. [PubMed: 27471680]. [PubMed Central: PMC4964171].

35. Ambrose AF, Paul G, Hausdorff JM. Risk factors for falls among older adults: A review of the literature. *Maturitas.* 2013;**75**(1):51–61. doi: 10.1016/j.maturitas.2013.02.009. [PubMed: 23523272].

36. Sutcliffe KM, Lewton E, Rosenthal MM. Communication failures: An insidious contributor to medical mishaps. *Acad Med.* 2004;**79**(2):186–94. doi: 10.1097/00001888-200402000-00019. [PubMed: 14744724].

37. Rabol LI, Andersen ML, Ostergaard D, Bjorn B, Lilja B, Mogensen T. Descriptions of verbal communication errors between staff. An analysis of 84 root cause analysis-reports from Danish hospitals. *BMJ Qual Saf.* 2011;**20**(3):268–74. doi: 10.1136/bmjqs.2010.040238. [PubMed: 21209139].

38. Greenberg CC, Regenbogen SE, Studdert DM, Lipsitz SR, Rogers SO, Zinner MJ, et al. Patterns of communication breakdowns resulting in injury to surgical patients. *J Am Coll Surg.* 2007;**204**(4):533–40. doi: 10.1016/j.jamcollsurg.2007.01.010. [PubMed: 17382211].

39. Neutel CI, Perry S, Maxwell C. Medication use and risk of falls. *Pharmacoepidemiol Drug Saf.* 2002;**11**(2):97–104. doi: 10.1002/pds.686. [PubMed: 11998544].

40. French DD, Campbell R, Spehar A, Cunningham F, Bulat T, Luther SL. Drugs and falls in community-dwelling older people: A national veterans study. *Clin Ther.* 2006;**28**(4):619–30. doi: 10.1016/j.clinthera.2006.04.011. [PubMed: 16750473].