

Retrospective analysis of falls in selected hospitals of the Czech Republic

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Abstract

INTRODUCTION: Hospitals strive, over the long term, to reduce the incidence of falls of hospitalized patients. Falls are monitored, analyzed, and regularly evaluated and corrective and preventive actions are established based on the findings. To establish preventive actions, it is essential to determine the circumstances under which the patient fell and in what type of health care facility.

OBJECTIVES: The goal of the study consisted in retrospectively analyzing falls in selected hospitals of the South Bohemian Region in 2014 and 2015.

METHODS: Our retrospective analysis of 1101 patient falls was reported by the health care staff from 4 hospitals of the South Bohemian Region. The data from the reported incidents (i.e., falls) from individual hospitals were encoded and entered in a database using the SASD statistical program and subsequently subjected to statistical analysis.

RESULTS: The highest frequency of falls was found on internal wards, 565 (51.3%) with the second highest frequency found on subsequent care wards, 267 (24.3%). The study showed that the risk of falls increases with patient age; more than 60% the hospitals, in the monitored period, involved patients over 70 years of age. Falls occurred most frequently in patient rooms and in bathrooms. Statistically significant relationships were identified between the type of ward and the time of the fall, between the type of the ward and the location of the fall, between patient age and the time of the fall, between patient age and the location of the fall, between the time of fall and the location of fall, and between the location of fall and the patient mobility before the fall.

CONCLUSION: Intensive monitoring of patient falls and the circumstances under which the falls occurred are needed to fully understand the epidemiology of hospital falls.

INTRODUCTION

Patient safety, efficient patient care and quality patient care are top priorities of healthcare organizations (Mha *et al.* 2012; Bártlová *et al.* 2014; Healey *et al.* 2014; Brabcová *et al.* 2015b). Falls are the most commonly reported patient safety incident in hospitals (Sutton *et al.* 1994; Perell *et al.* 2001; Healey and Scobie 2007; Currie 2008; Oliver 2008; Liu *et al.* 2012). The occurrence of these incidents has been monitored by care providers in the Czech Republic since 2002 (Svobodová and Jurásková 2010). At present, information regarding falls that occurred in individual hospitals of the Czech Republic is monitored at a central level within the National Incident Reporting System. Falls can result in fractures, lacerations, or internal bleeding, leading to increased health care utilization; falls can also complicate patient therapy, the course of basic disease processes, and in the worst cases, even lead to patient death (Binder 2002; Ganz *et al.* 2013). Falls can also lead to extended hospitalization, which then leads to increased health care costs (Halfon *et al.* 2001; Wong *et al.* 2011).

Despite hospital efforts to identify patients at risk of falls and to prevent such incidents, falls are not infrequent among hospitalized patients (Currie 2008; Healey *et al.* 2008; Weil 2015). In fact, falls occur frequently among hospitalized patients, with some patients falling repeatedly (Healey 2016).

Elderly and frail patients with fall risk factors are not the only ones who are vulnerable to falling in health care facilities. Any patient of any age or physical ability can be at risk for a fall due to physiological changes linked to a medical condition, medications, surgery, procedures, or diagnostic testing, which can leave them weakened or confused (The Joint Commission 2015). Most definitions describe a fall as an unexpected, sudden incident leading to a change of the individual's position and ending with the individual landing on the floor, on an item, or at a lower level than where the individual started; incidents are reported by witnesses, or by the individuals themselves (Joint Commission Resources 2007).

Hospitals strive, over the long term, to reduce the incidence of patient falls during hospitalization. Falls are monitored, analyzed, and regularly evaluated and corrective and preventive actions are established based on the findings (Gu *et al.* 2016). It is very important to determine the cause or causes of a fall. Morse (2009) describes three basic categories of falls: accidental, unpredictable physiological falls, and predictable physiological falls. Nurses play a key role in fall prevention in hospitalized patients (Johnson *et al.* 2011, Titler *et al.* 2011; Häggqvist *et al.* 2012). When a patient is admitted to a ward, a nurse assesses each patient's risk of fall. "Nurses must ensure that all patients are assessed and re-assessed for fall related risk factors and nurses are responsible for initiating a comprehensive plan of care to aid in the safety of hospitalized patients" (Callis 2016).

Falls in hospitalized patients have many causes. Falls are often the result of interactions between patient-specific risk factors and the physical environment (Miake-Lye *et al.* 2013). Factors such patient age, health status, medication history, comorbid conditions, functional abilities as well as environmental issues must all be considered when determining fall risks for persons who are hospitalized (Tideiksaar 2010, pp. 13–26; Cox *et al.* 2015). Fall rates have been associated with severity of illness and patient age (Titler *et al.* 2016). Related injuries and the circumstances of inpatient falls varied among clinical departments, probably due to differences in patient characteristics (Schwendimann *et al.* 2008). Cooperation between hospital staff and patients is indispensable for successful fall prevention, as evidenced by Tzeng and Yin (2014) and Shuman *et al.* (2016).

The goal of the study was to retrospectively analyze falls in four selected hospitals in the South Bohemian Region of the Czech Republic in the years 2014 and 2015.

MATERIALS AND METHODS

A quantitative study was implemented using a retrospective analysis of hospitalized patient falls in four hospitals in the South Bohemian Region of the Czech Republic in 2014 and 2015. The four hospitals studied were: České Budějovice Hospital (Nemocnice České Budějovice, a. s.) (with 1700 beds, it is the fourth largest hospital of the Czech, treating about 53,000 in-patients per year); Jindřichův Hradec Hospital (Nemocnice Jindřichův Hradec, a. s.), Tábor Hospital (Nemocnice Tábor, a. s.), and Písek Hospital (Nemocnice Písek, a. s.). The hospitals were owned by the regional government of the South Bohemian Region. They are public organizations charged with providing the citizens of the South Bohemian Region with accessible and high-quality care. The subject of the study was an analysis of a report entitled "Report of falls of hospitalized patients". The report described 'fall' incidents at the individual hospitals. These incident reports were encoded and entered in a database for analysis. Data analysis was done using the statistical analysis of social data (SASD 1.4.10) program. The relationships were tested using the χ^2 – Pearson's chi-squared test, Spearman's correlation coefficient, and the Student's *t*-test. The α significance level was established at 0.05, 0.01, and 0.001. The incident reports included the following data:

- the specific hospital where the fall occurred;
- the date and time of the fall;
- the type of ward where the fall occurred, the type of care provided on the ward (e.g., standard ward, intensive care ward, outpatient's department);
- the location, within the hospital, of fall;
- the patient's age;
- how the incident was reported;
- the patient's risk medications from the perspective of the fall (e.g., antipsychotic drugs, antianxiety/hyp-

notic drugs, antidepressants, diuretics, cardiovascular drugs, insulin or peroral antidiabetic drugs and other drugs);

- compensation aids available to the patient (canes, crutches, walkers, hearing aids, glasses);
- the patient's mental condition before the fall;
- the patient's mobility before the fall;
- whether the patient was at risk for a fall;
- during which activity the fall occurred;
- the influence of the environment;
- the mechanism of the fall (external and internal causes);
- fall prevention interventions enforce at the time of the fall;
- consequences of the fall (without injury/consequences, light injury (not requiring medical treatment, surface grazes, bruises), medium-serious injury (requiring medical treatment, e.g. fractures, unconsciousness, CNS concussion, CNS contusion);
- serious injury (risk of lasting consequences of fall, danger to life), death;
- post-fall examination (e.g. medical consultation, RTG, CT, MRI, etc.);
- post-fall treatment (by nurse, physician, required surgery), and influence of the fall on hospitalization (e.g., extended hospitalization, transfer to another ward, etc.).

RESULTS

Our retrospective analysis of falls included 1101 falls that occurred in 4 hospitals in the South Bohemian Region in 2014 and 2015. In 2014, there were 577 (52.4%) patient falls and in 2015, there were 524 (47.6%) patient falls. From 1101 falls, the following numbers were analyzed: 400 falls (36.3%) in České Budějovice Hospital, 300 falls (27.2%) in Tábor Hospital, 226 falls (20.5%) in Písek Hospital, and 175 falls (15.9%) in Jindřichův Hradec Hospital. The highest number of falls was found in the month of October, followed by March and January. Missing data in the individual records are marked as missing data or no data.

Incidence of falls and wards by specializations

The highest frequency of falls was found in internal specialization wards, 565 (51.3%), next was subsequent care wards, 267 (24.3%), followed by surgical specializations wards, 255 (23.2%), with children's wards seeing the fewest falls 14 (1.3%).

Incidence of falls based on wards and type of care provided

The highest frequency of falls, 1043 (94.7%), was found in wards providing standard care, followed by intensive care wards [39 (3.5%)], and outpatient care wards [19 (1.7%)].

Age of patients who fell

Age is one of the risk factors for patient falls (Fischer *et al.* 2005; Krauss *et al.* 2007; Mion *et al.* 2012; Titler *et al.* 2016) and the frequency of hospital falls is related to patient age. In seniors, falls constitute a serious complication, which can seriously impact their quality of life. The patients were divided by age into six age categories [1–19 years old (yo), 20–60 yo, 61–70 yo, 71–80 yo, 81–90 yo, ≥ 91 yo]. The greatest number of falls, 357 (32.4%) were recorded in the 81–90 yo group, followed by the 71–80 yo group [314 (28.5%)], and the 61–70 yo group [179 (16.3%)]. The frequency of falls vs. individual age categories is shown in Table 1. The average age of patients who fell was 79 yo and the range was from 1 to 101 yo.

Time of fall

Determining the time of a fall is an important factor in preparing fall prevention measures. Most falls, 380 (34.5%), took place between 22:00–05:59, followed by 06:00–11:59 [287 (26.1%)], next was between 17:00–21:59 [232 (21.1%)], with the fewest falls occurring between 12:00–16:59 [202 (18.3%)]. Statistically significant relationships between the type of ward and the time of fall were identified. On surgical wards, falls occurred considerably more frequently in the evening hours, while less frequently in the morning hours. On internal wards and on subsequent care wards, falls were consid-

Tab. 1. Patients' age.

Feature	Absolute frequency	Relative frequency	Valid relative frequency	Histogram
1–19 years	16	1.5%	1.5%	
20–60 years	148	13.4%	13.8%	
61–70 years	179	16.3%	16.7%	
71–80 years	314	28.5%	29.3%	
81–90 years	357	32.4%	33.4%	
≥91 years	56	5.1%	5.2%	
No answer	31	2.8%	0.0%	
Total	1101	100.0%	100.0%	

erably more frequent in morning hours and on internal wards, also at night ($p < 0.05$). Further, statistically significant relationships between the patient age and the time of fall were identified. We found a correlation between the time of fall and patient age. Patients under 60 yo fall considerably more frequently during morning hours, while the oldest patients (≥ 91 years) fall considerably more frequently during the evening ($p < 0.01$).

The records provided by the individual hospitals differed and did not include identical information; the missing information from individual records is marked as missing data (no data). The total number of 100% equals the 1101 analyzed falls.

Location (within the hospital) of falls

From 1101 (100%) falls, 742 (67.4%) occurred in patient rooms, 178 (16.2%) occurred in WCs or in bathrooms, 123 (11.2%) occurred in corridors, and 'other' was stated in 38 (3.5%) falls. Missing data was observed for 20 (1.8%) falls. Statistically significant relationships between the type of ward and the location of the fall were identified. In subsequent care wards, falls occurred considerably more frequently in patient rooms; while on internal and surgical wards, falls occur more frequently in WCs or bathrooms ($p < 0.001$). Statistically significant relationships were identified between patient age and the location of the fall. Patients under 60 years fall considerably more frequently in corridors or 'other' locations, while older patients, > 80 yo, fall considerably more frequently in the patient's room ($p < 0.001$). Statistically significant relationships between the time of fall and the location of fall were also identified. Falls in patient rooms occurred considerably more frequently in the evening and at night, while falls in corridors and 'other' locations occurred more frequently in the morning; falls in bathrooms and WCs occurred mainly at night and in the morning ($p < 0.05$).

Incident (fall) reporting methods

Incident reports for falls took the following four forms: (1) staff heard or saw the fall [257 (23.3%)], (2) the fall was reported by non-staff (e.g., another patient) [122 (11.1%)], (3) the fall was reported by the fallen patient [81 (7.4%)], or (4) the fall was reported by 'other' [20 (1.8%)]. Missing data was found in 621 (56.4%) falls.

Activities during which patient falls were likely to occur

Knowing the activity associated with a patient fall is a key piece of information. Most falls were associated with beds [387 (35.1%)], followed by falls during independent walks [270 (24.5%)], falls during assisted walks – with an aid or escort [110 (10.0%)], and falls during patient transfers (i.e., between bed and chair, wheelchair, or portable toilet) [106 (9.6%)]. There were 38 (3.5%) falls associated with bending forward or reaching out for something, 15 (1.4%) falls involved falls from a standing position, with 32 (2.9%) falls being described as 'other'. Missing data was found in 143 (13.0%) falls.

Fall mechanism – internal (medical) causes

The internal causes contributing to patient falls were found to be a balance disorder or vertigo [287 (26.1%)], loss of balance while walking [54 (4.9%)], loss of consciousness [39 (3.5%)], unspecified weakness [15 (1.4%)], paroxysmal disease [11 (1.0%)], hypotension [8 (0.7%)], dehydration [5 (0.5%)], and 'other' [31 (2.8%)]. The internal causes of falls were related to the type of ward where the fall occurred. In subsequent care wards, falls occurred considerably more often due to the patient losing their balance while walking ($p < 0.001$).

Fall mechanism – external causes

The external causes that contributed to falls were analyzed for 1128 falls. External causes, from most common to least common were (1) getting out of bed [202 (18.3%)], (2) falls caused by slipping [152 (13.8%)], (3) falls caused by stumbling [91 (8.3%)], (4) falls caused by 'other' [48 (4.4%)], and (5) falls caused by leaning against an unstable support [43 (3.9%)].

The causes of falls were multifactorial, with the environment and other factors also playing a role. Our analysis of the influence of the environment found the following: slippery, uneven, or wet floors, poor lighting or excessive reflection, lack of proper use of bed rails, defective equipment or aids, non-functional walkers/sticks, and unsuitable patient shoes. Out of 1101 (100%) falls, the factors most frequently reported included bed side-rails [113 (10.2%)] and slippery, uneven, or wet floors [46 (4.2%)].

People with prior falls had a greater likelihood of falling again. Of 376 patients, 203 (18.4%) were found to have prior falls in their medical history. No information was available for 725 (65.8%) cases.

Patient's mobility before fall

Out of 1101 (100%) falls, 208 (18.9%) falls occurred in independently walking patients, 194 (17.6%) in patients walking with an aid or using a wheelchair, 174 (15.8%) falls occurred in patients walking with help or with an escort, 81 (7.4%) patients were lying but able to move on bed, and 16 (1.5%) were lying and immobile. Statistically significant relations were found between the location of the fall and patient mobility before the fall. Patients walking with help or with an escort fell significantly more often in rooms, while patients walking independently or with an aid fell more often in corridors, bathrooms or WCs ($p < 0.001$).

Mental condition before falls

This information was available for 1133 falls. Patients showed no signs of mental or psychiatric symptoms [296 (26.9%)], patients were described as confused or disoriented before the fall [145 (13.2%)], patients described as restless [31 (2.8%)], and patients described as demented [29 (2.6%)].

Use of medicines

Pharmacotherapy plays an important role with regard to falls. Falls occur most frequently when medicines are used that influence stability, cognitive qualities and attention, lead to dramatic changes in blood pressure or blood sugar, have sedative effects, lead to displays of Parkinsonism, or affect sight and hearing. The most commonly used drugs, at the time of a fall, were cardiovascular drugs, followed by diuretics, anxiolytics, and hypnotics. Patient primary diagnoses were evaluated as well and cardiovascular diseases were the most common.

Consequence of fall (injury)

Falls can cause traumas as well as serious injuries, or even death. Many falls [363 (33.0%)] ended without injury or consequences, while 566 (51.4%) falls caused light injury, 117 (10.6%) falls caused medium-to-serious injuries, and 8 (0.7%) falls caused serious injury. There was no data regarding consequence for 47 (4.3%) falls.

Examination

A total of 1234 examinations were related to falls (the higher number is due to multiple examinations), in 459 (41.7%) falls the physician did not require any additional examinations, in 141 (12.8%) falls a consultation was made, in 207 (18.8%) falls an X-ray examination was ordered, and in 68 (6.2%) falls computer tomography or magnetic resonance was ordered.

Treatment

Out of 1106 falls, treatment was not needed in 332 (30.2%) falls, 307 (27.9%) falls were treated by a nurse, 114 (10.4%) falls were treated by a physician, and 17 (1.5%) falls required surgery.

Influence of falls on hospitalization

Falls often lead to extended hospitalization and/or increased costs to health care payers or providers. It is known that falls can subsequently complicate the therapy of basic illnesses. Increasing age leads to increasing risk of falls as well as the seriousness of their consequences. Out of 1122 falls, 563 (51.1%) did not influence the duration of the patient's hospitalization, 71 (6.4%) falls contributed to extended hospitalization, and 28 (2.5%) falls required that the patient be transferred to another ward.

DISCUSSION

A leading goal of the patient safety movement is the reduction and eventual elimination of falls that result in injury. Therefore, falls prevention programs should focus on factors associated with a high risk of injury. Krauss *et al.* (2007) looked at whether reported fall circumstances differed among hospitals and tried to identify predictors of fall-related injuries. In a retro-

spective cohort study of nine Midwestern U.S. hospitals, Krauss found that injuries were associated with older age, unescorted falls, bathroom falls, and in care areas outside of the patient's room (Krauss *et al.* 2007). Our study also showed that the risk of falls increased with patient age, with more than 60% of falls, during the monitored period, occurred in patients over 70 years of age. Falls occurred most frequently in patient rooms and bathrooms. It is very helpful to know the circumstances under which falls occur. Tzeng (2010) focused on the relationship between falls and using the toilet. Tzeng found that of all falls, 45.2% were related using the toilet. The most common theme was falling while moving from bed or chair to the bathroom. Our study also showed that getting out of bed and moving to the toilet was a high-risk movement, which occurred mainly during the night, when patients slipped, stumbled, or tripped. More than one-third of patient falls occurred between 22:00–06:00. It is important for nurses to encourage patients to call them at any time (even at night!) if they need to be escorted to the toilet. A retrospective observational study of 1,082 patients who fell (1,235 falls) between January 2001 and June 2002, at an urban academic hospital, was performed by Fischer *et al.* (2005). The median age of patients who fell was 62 yo (interquartile range, 49–77 yo), 50% were women, and 20% were confused. The most common serious fall-related injuries were bleeding/lacerations (53.6%), fractures/dislocations (15.9%), and hematomas/contusions (13%). A positive finding in our study was that one-third of falls were without injuries and half the falls, only light injuries (hematomas, scrapes, surface grazes) were sustained. Approximately 10% of the patients who fell suffered a medium-to-serious injury requiring medical treatment. They included fractures, unconsciousness, or brain concussion or contusions. Less than one percent of falls resulted in life threatening or very serious injuries. Mion *et al.* (2012) analyzed the records of patients who sustained a fall (first fall, if more than one) during hospitalization, over a 26-month period, involving 16 adult general medical and surgical units in an urban university-affiliated community hospital. In total, 784 patients were studied, with a median age of 63.5 years, 390 (50%) were women, and 526 (67%) were black. Some 228 (29%) patients sustained some degree of injury during their fall. Those more likely to sustain an injury included white patients or those taking a selective serotonin reuptake inhibitor, antipsychotic agents, opiates, or diuretic non-antihypertensive agents. Seventy-nine percent of the patients had been designated as “high” fall-risk in the 24 hours prior to the fall.

Our study included the following internal (medical) mechanisms that contributed to falls of hospitalized patients: balance disorder, unbalance walking, sudden loss of consciousness, paroxysmal disease (epilepsy), and hypotension or dehydration. Polypragmasy was also linked with a higher risk of falls. Our study showed

that patients who fell were primarily using diuretics, anxiolytics, hypnotics, and cardiovascular drugs. As Brabcová *et al.* (2014) noted, it is very important for patients to know the drugs they use and to be interested in the potential side effects of those drugs.

Staggs *et al.* (2014) were the first to estimate the effects of falling during unescorted movement (versus during escorted movement) on the likelihood of specific levels of injury. Unescorted falls were more likely than escorted falls to result in injury and should be considered a target for future prevention efforts (Staggs *et al.* 2014).

Degelau *et al.* (2012) pointed out the importance of an interprofessional assessment after a patient fall and the subsequent implementation of targeted and well planned interventions aimed at reducing the risk of falls within a comprehensive plan of care.

LIMITATIONS

This retrospective analysis of falls from 4 hospitals of the South Bohemian Region during a two-year period provides useful information on the falls of patients and of their circumstances. The limit of the analysis consists in the fact that the records of the falls suffered by patients in the above stated hospitals are not identical; therefore, some of the data could not be fully analyzed.

CONCLUSION

Based on the findings from several studies carried out recently and of their systematic analysis, the most appropriate approach to fall prevention in the hospital environment includes multifactorial interventions with multiprofessional input (Cameron *et al.* 2010; Oliver *et al.* 2010). Knowledge of risk factors associated with patient falls and the circumstances under which the fall took place are key pieces of information that are essential when designing fall prevention programs (Hitcho *et al.* 2004). As Du Pree *et al.* (2014) and Brabcová *et al.* (2015a) emphasized that transparent and honest reporting of all falls is imperative. All hospitals monitored this study have implemented a unified procedure to prevent falls among hospitalized patients. The program consists of an evaluation of fall-risk for all patients and the introduction of preventive interventions for high fall-risk patients. It is noteworthy that although all the hospitals in question have implemented a unified system of incident reporting that meets the requirements of the National Reference Centre for Incident Reporting, the content and report forms still differ among the individual hospitals. While České Budějovice Hospital uses an electronic fall reporting system, the other three hospitals use a printed form to report falls. Jindřichův Hradec and Písek Hospitals have more comprehensive fall reporting systems. They focus on risk factors that can be very efficiently minimized through nursing interventions. The quality managers of all the hospitals

mentioned in this study have the authority to monitor and evaluate falls and to determine preventive and corrective actions. Nevertheless, only Tábor Hospital performs a Root Cause Analysis of falls that resulted in serious consequences, to an effort to effectively understand the real (root) causes of falls.

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