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FALLS RISK FACTORS IN AN ACUTE-CARE SETTING: A RETROSPECTIVE STUDY

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Abstract

Aim: The aim of this retrospective study was to analyze the trends of patient falls in Municipal Hospital Ostrava, and to determine the factors which affect the incidence of falls and related injuries. *Methods*: All record forms of patients who fell in the years 2004-2009 during hospitalization in MNO have been included in the set. The final file was created from 3 477 records of fall. *Results*: The largest incidence of falls was recorded among older seniors aged over 80 years. Statistically significant difference was not found in the incidence of falls between men and women. Most of falls occurred at patients hospitalized in long-term care and internal wards. Patients hospitalized in the acute care wards often fell down when getting up from bed, directly from the bed and due the instability when walking. In long-term care institutions there was the highest incidence of falls when moving from wheelchair to bed, when waking up from not halted mobile wheelchair and for the instability when walking. *Conclusion*: The incidence of falls of hospitalized patients is dependent on age, length of hospitalization, patient´s health and self-sufficiency, it is not dependent on patients´ gender.

Key words: falls, patient, hospital, retrospective analysis.

Introduction

Falls of patients hospitalized in health care facilities are adverse and hazardous events. They frequently complicate treatment, mainly in the elderly, causing injuries, prolonging therapy and worsening the underlying disease (Hitcho et al., 2004; Butler et al., 1996). Apart from associated morbidity and mortality, there is a factor of mental reaction due to a fall. Fear from falls significantly influences the quality of life of many elderly. It often plays a key role in making decisions about hospitalization in aftercare or social care facilities (Joint Commission Resources, 2007, p. 7). Although falls in health care facilities cannot be completely prevented, certain measures and interventions may reduce their number and severity of their consequences. Fall is untoward events resulting in the patients coming to rest unintentionally on the ground or other lower surface (Joint Commission Resources, 2007, p. 21).

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Falls are common in the elderly and their incidence increases with age. They affect 20-30% of persons aged 65-69 years and up to 50% of those over 85 years of age. Higher rates of falls are observed in both acute and chronic hospital patients as well as in those in long-term institutional care (Hitcho et al., 2004; Morgan et al., 1985; Nurmi, Luthje, 2002; Roudsari et al., 2005).

In the Ostrava Municipal Hospital (MHO), falls have been monitored and reported as adverse events in the form of records since 2000. The aim is to find ways to pre-vent patient falls. The obtained data are used to identify patients at risk of falls and to identify the causes, consequences and economic impact of falls for the MHO. These cases are analyzed so that corrective and preventive measures could be adopted. Since 2003, fall monitoring has been one of nursing care quality indicators used in the MHO. Fall and injury rates may be decreased by effective preventive programs of fall reduction. The procedure must include identification and assessment of all cases of falls, steps taken to lower their incidence and monitoring of the program effectiveness including the staff's adherence to the policy (Joint Commission

Resources, 2007, p. 94). Preventive measures may only be developed and applied if accurate data on fall numbers and causes are available (Lindus, 2012; Jones, Whitaker, 2011; Rubenstein et al., 1990). Patient falls in Czech health care facilities have been monitored at the national level since 2002 (CzechMed, 2010, p. 6). The aims are to determine the number of falls, to analyze the severity of injuries, circumstances of falls, dependence of falls in patients over 65 years of age, and to determine the quality of care indicator level (Nurmi, Luthje, 2002; Masud, Moris, 2001). The studied indicator, i.e. rates of falls and injuries due to falls, is always determined as the proportion of injuries from falls per 1,000 nursing days. Patients are divided into two age groups, under 65 years and over 65 years of age, so that results may be compared to those published in the literature. Further, the indicator is related to specialty groups, with hospital departments being divided based on the inpatients' age and basic diagnoses as follows: internal medicine, surgery, pediatrics and aftercare (CzechMed, 2010, p. 6).

In 2008, a uniform method for the assessment of falls and their consequences was developed and made mandatory for all health care facilities participating in the national program of fall monitoring (ČAS, 2008). Monitoring of patients injured by falls is absolutely crucial. Health professionals must strive to reduce not only falls but especially their health consequences. Moreover, continuous fall monitoring allows to compare the patients' quality of life indicator (patient falls) and to find clear associations with the age of inpatients. The above indicator of quality (Milutinovic et al., 2009; Heaton, 2012) is a valuable parameter assessing the preventive measures. To make an effective use of the indicator, benchmarking assessment is advisable.

Aim

The aim of this retrospective study was to analyze the trends of the incidence of patients´ falls in Municipal Hospital Ostrava (acute and long-term care departments) in period 2004-2009, and to determine the factors which affect the incidence of falls and related injuries.

Methods

Sample

The sample comprised all records of patients over 18 years of age who suffered falls during their stay in the MHO between 2004 and 2009. Of the total of 3 477 records, 1 485 (43%) were falls in males and 1 992 (57%) were falls in females. The records were subdivided into two groups based on the sites of falls – internal medicine and surgery acute care departments (1 895; 55%) and long-term care departments (1 582; 45%).

Data collection

To report falls and other adverse events over the studied period (2004-2009), an MHO form called Report on an adverse event and the circumstances found was used. The forms were filled in by nurses who discovered the falls or were informed about them. Data from the forms were coded and entered in the EpiData statistical software template as sixteen basic items further specified according to the national methods for monitoring falls in the Czech Republic (Jurásková, 2008, p. 58-75; Svobodová, 2010, p. 29-33). For statistical purposes, patients' demographic data, condition prior to falls (mental state, self-sufficiency, sensory barriers, use of aids and medicines increasing the risk of falls), condition after falls with characteristics of injuries resulting from falls (minor, serious) and fate following their falls were recorded. Entered in the template were data on falls occurring in internal medicine (internal medicine, neurology, dermatology and venereology, rehabilitation) and surgery (surgery, orthopedics, neurosurgery, otorinolaryngology, gynecology, urology) acute care departments as well as long-term care departments.

Data analysis

To analyze the data, descriptive statistics was used (frequency tables with absolute and relative frequencies, arithmetic mean for age assessment). To assess the correlation between falls and selected factors (age, gender, department type, injury type/severity, fall circumstances, fall time), a chi-square test was used. A t-test was used for age assessment. All tests were evaluated for significance at a level of 5%.

Results

Incidence of falls

A retrospective analysis was carried out in 3 477 falls reported in 146 778 patients hospitalized in the MHO in 2004-2009. The highest frequency of falls with respect to the highest absolute number of patients hospitalized over the studied period was in long-term care departments, with 1 569 falls in a total of 6 446 inpatients (24.3%), followed by internal medicine departments (1 528 falls in 63 769 patients; 2.4%) and surgery (366 falls in 76 070 patients; 0.5%). Most frequently, falls were observed in males over 65 years of age (82%). The mean age of falling patients

was 75 years (72 years in males and 78 years in females). The youngest and oldest patients suffering falls were 18 and 100 years old, respectively.

Risk factors for falls

The hazard for falls stems from risk factors and their causes. Risk factors allow identification of patients at risk for falls. The results suggested that most falling patients had no impairment of their mental state (2 398; 69%). Nearly one half of them (1 509; 43%) were in self-sufficiency regimen no. 3 (MZ ČR, Vyhláška č. 439/2008 Sb., p. 69), that is, requiring increased supervision. Sensory impairments as another risk factor were noted in more than one half of patients with fall records (1 916; 55%). These were mainly visual impairments (1 351; 39%), with nearly all patients wearing eyeglasses, and hearing impairments (701; 20%). Risk factors also involve the use of mobility and walking aids. A total of 2 330 (67%) of falling patients extensively used at least one type of such aids, most frequently crutches (655; 19%). One of key risk factors is the use of high-risk medicaments (Krauss et al., 2005; Oliver et al., 2004). Falling patients were more frequent users of antihypertensive (1 642; 65%) and psychiatric (1 192; 48%) drugs.

Complications from falls

One of important studied complications from falls is the number of injuries caused by falls. This figure, assessed as a quality or safety indicator, is defined as the proportion of patients injured by falls per 1 000 nursing days. In accordance with the methods, injuries were classified as minor (superficial abrasions, hematomas, unspecified pains in the limbs and other parts of the body) or serious (unconsciousness, cerebral concussion or contusion, fractures, lacerations). Over the studied period injuries were sustained in 1 388 cases (40% of all falls); of those, 1 124 (81%) were rated as minor. The most frequent sites of injuries due to patients' falls were the head (652; 47%), upper (382; 28%) and lower (363; 26%) extremities.

Falls and patient age

Age is one of factors contributing to falls of hospitalized patients. For statistical analysis, patients suffering falls were distributed into five age groups (Table 1). Falls were most frequent in the 81-90 years age group, with 1 330 (7%) patients falling over the studied period. The second group most threatened by falls was that of patients aged 91 years or more, with 6% rate of falls.

Statistical analysis was carried out to compare the rates of falls in individual age groups and the relative risk (RR) of falls with the first age group of falling patients, i.e. 18-60 years of age. In the 61-70 years age group, the risk for falls was significantly higher, more that 3-fold, when compared with the first age group (18-60 years). The significance of risk is

Table 1 Incidence of falls by age of patients (2004-2009)

Age	Patients N	Falls N (%)	$\chi 2$ (p)	RR
18 – 60	69 949	430 (0.6)		1
61 – 70	26 221	514 (2.0)		3.19
71 – 80	28 415	1 046 (3.7)	2 900	5.99
81 – 90	19 682	1 330 (6.8)	(**0.000**)	10.99
Above 90	2 511	143 (5.7)		9.26
Total	146 778	3 463 (2.4)		

$\chi 2$ – chí-square test, p – statistical significance ($\alpha = 0.05$), RR – relative risk

derived from the confidence interval (CI) not involving a value of 1 (the same risk). In the 71-80 years age group, the risk was even higher, 5.99-fold, as compared with the first group. The highest risk of falls (10.99-fold) was in the 81-90 years age group.

Falls and patient gender

No significant difference in the incidence of falls was found between males and females. The relative frequencies of falls with respect to the number of hospitalized patients were the same in both males and females (2.3% for both groups). The same was true for patients older than 65 years of age (4.5% for both groups).

Immediate circumstances of falls

There was a significant differences in circumstances under which falls occurred, depending on the type of department (acute vs. long-term care departments).

Patients hospitalized in acute care departments most frequent fell when getting up from beds (25%), directly from beds (20%) and due to gait instability (21%). Long-term care patients most frequently fell under other circumstances (25%), such as wheelchair-to-bed transfer, getting up from an unbraked wheelchair and gait instability (24%) (Table 2).

Fall times

Fall records may help to determine at which time of the day patients fall most frequently. There was a statistically significant difference in fall times

Table 2 Circumstances of falls (2004-2009)

Circumstances of falls	Acute care falls N (%)	Long term care falls N (%)	Total falls N (%)	χ2 (p)
Falls out of bed	382 (20)	186 (12)	568 (16)	
Getting out of bed	464 (25)	316 (20)	780 (22)	
Resting on the unstable support	89 (5)	149 (10)	238 (7)	110.593
Instability hen walking	388 (21)	365 (24)	753 (22)	**(0.000)**
Tripping, slipping when walking	235 (12)	138 (9)	373 (11)	
Other	314 (17)	380 (25)	694 (20)	
Total	1 872 (100)	1 534 (100)	3 406 (100)	

χ2 – chí-square test, p – statistical significance (α = 0.05)

between department types (Table 3). In internal medicine departments, most falls occurred during evening and night hours. Surgery patients most frequently fell in the morning. Long-term care patients suffered falls mostly during the daytime, especially in the afternoon.

Injuries due to falls

The chi-square test suggested that age was a factor influencing the incidence of injuries due to falls (Table 4). There were significant differences in injury rates between patients aged 65-74 years

Table 3 Incidence of falls by time and departments (2004-2009)

Fall times	Internal departments N (%)	S departments N (%)	LTC departments N (%)	Total N (%)	χ2 (p)
00:00–03:59	284 (58)	56 (11)	150 (31)	490 (100)	
04:00–07:59	246 (39)	77 (12)	305 (49)	628 (100)	
08:00–11:59	167 (31)	66 (12)	303 (57)	536 (100)	190.6626
12:00–15:59	220 (36)	51 (9)	335 (55)	606 (100)	**(0.000)**
16:00–19:59	244 (40)	54 (9)	312 (51)	610 (100)	
20:00–23:59	356 (61)	61 (10)	172 (29)	589 (100)	
Total	1 517 (44)	365 (10)	1 577 (46)	3 459 (100)	

χ2 – chí-square test, p – statistical significance (α = 0.05), LTC – long term care

(37% of injuries) and those older than 75 years (42% of injuries). No differences in the severity of injuries were found between the age groups.

Discussion

The retrospective study of records reporting falls of hospitalized patients aimed at analyzing trends in the incidence of patient falls in both acute and long-term care departments of the MHO. The results suggest that the highest frequency of falls was observed in long-term care departments. Acute care patients suffered most falls in internal medicine departments as compared with surgery departments where the incidence was the lowest. Similar data were published by Schwendimann (2006, p. 8), with relative frequencies of falls of 1.9%, 8.8% and 24.8% in departments of surgery, internal medicine and geriatrics, respectively. According to the authors, the results were most common among geriatric patients.

The retrospective analysis of falls was carried out with the assumption that the incidence of falls would

increase with age due to the worsening of patients' health status resulting from senior citizens' fragility,

comorbidities and geriatric symptoms including comparable with global data showing that falls are

Table 4 Incidence of fall injuries by age of patients (2004-2009)

Age (year)	No injuries N (%)	Injuries due to fall N (%)	Total N (%)	χ2 (p)
18 – 64	390 (64)	220 (36)	610 (610)	
65 – 74	408 (63)	235 (37)	643 (100)	11.1976
75 and more	1 276 (58)	928 (42)	2 204 (100)	**(0.004)**
Total	2 074 (60)	1 383 (40)	3 457 (100)	

χ2 – chí-square test, p – statistical significance (α = 0.05)

instability and falls. The highest relative frequency of falls was noted in the 81-90 years age group, followed by patients aged 91 years or more. There was a statistically significant difference in the incidence of falls between patient age groups. The statistical analysis compared proportions of falls in individual age groups and the relative risk of falls (RR) as compared with the lowest age group (18-60 years). The significance of risk is derived from the confidence interval (CI) not involving a value of 1 (the same risk). The highest risk of falls was in the elderly aged 81-90 years. Patients most at risk were those over 80 years of age.

Knowing the age of patient risk groups is very important for identification of the risk for falls. Age is usually included in screenings carried out to assess patients' risk for falls, with two age limits determining the risk for fall as a risk factor. In her modification of the Conley Scale for fall risk assessment (Conley et al., 1999) considered patient age of 65 years or more as a risk factor for falls. A clinical practice guideline for fall prevention (Grey-Micelli, 2008) defined the age limit for fall risk assessment in order to prevent falls at 75 years or more. The same age of 75 years or more was reported as one of risk factors for falls by Fuller (2000). This is consistent with our results suggesting that patients older than 75 years are at higher risk for falls. As in previous our studies (Jarošová, 2005; Jarošová et al., 2012), patients' falls were associated with their age – the older the patients were, the higher the incidence of falls was.

Given the structure of hospitalized patients and fragility of males whose life expectancy is lower than that of females (Kron et al., 2003), a higher incidence of falls was expected in males younger than 65 years of age. In the elderly aged 65 years or more, falls were expected to be more common in females, due to their higher mean age and a higher rate of hospitalized females in this age group. The data

analysis confirmed that the relative frequency of falls was lower in hospitalized males than in females. When subdividing the group based on gender and department types, there were differences in relative frequencies of falls between males and females. There was no difference in the relative frequency of falls between males and females staying in internal medicine departments. In surgery and long-term departments, falls were more common in females than in males. According to CDC data (Overcas, Beckstead, 2008), more males die due to falls. Yet women fall more frequently, suffering more serious injuries (Davis, 1999). Campbell a Robbins (in Todd and Skelton, 2004) claimed that in young seniors, there was no difference in the incidence of falls between males and females. Among older seniors, however, falls were more common in females. Our retrospective analysis compared the obtained data with numbers of patients who did not fall. There were no statistically significant differences in falls between males and females or between age groups (18-64 years and 65 years or more).

Independently mobile patients were most likely to fall from tripping, slipping or gait instability. Patients who were mobile with help suffered falls due to gain instability, whereas immobile, sitting patients fell when getting up from their beds and lying patients frequently fell directly from their beds. (Masud, Moris, 2001; Hitcho et al., 2004; Morgan et al., 1985) Our analysis focused on the association between fall circumstances and department types. The circumstances and situations under which falls occurs point to hazardous places and situations or activities in which a high risk for falls may be expected. When knowing the situations, targeted prevention of falls is possible. Patients in acute care departments most frequently fell when getting up from their beds due to gait instability or directly from their beds. Long-term care patients fell under circumstances other than those predefined in the forms for reporting falls. The

most frequent situations were transfers from wheelchairs to beds and back or from portable toilets to beds and back, getting up from unbraked wheelchairs or transfers from toilets to wheelchairs. These were followed by gait instability and getting up from beds. The differences in situations under which falls occur may result from various circumstances. Due to their condition, acute care patients spent most of their time in beds. Therefore, their frequent falls from beds may be due to a delirious state (Lakatos et al., 2009) in which they attempt to leave the bed with railings installed. Acute care patients' delirious state often results from their transfer to a new place and acute condition itself. Since long-term patients are expected to undergo early rehabilitation and self-sufficiency training, they spend more of their daytime outside their beds. Long-term care means prolonged hospitalization, patients' better adaptation to a new setting and fewer falls at nighttime as compared with acute care. Our study revealed a significant difference in the frequency of falls under various circumstances between acute and long-term care. Acute care patients suffered falls in different situations than those staying in long-term care departments.

Recording fall times allows to determine at which time of the day falls occur most frequently. Based on these findings, preventive measures may be introduced specifically with respect to daily time periods. To identify differences in falls during different daily time periods, the group was subdivided into falls occurring in internal medicine, surgery and long-term care departments. Patients in internal medicine wards most frequently fell between 8 p.m. and midnight. This incidence of falls may be ascribed to frequent delirious states of the so-called sundown syndrome (Pellfolk et al., 2009) observed in the elderly with acute diseases who develop delirious states after sunset within a few days spent in a new setting. Surgical patients most frequently fell between 4 a.m. and 8 a.m. These are times when patients are most frequently "verticalized" following surgeries. Patients may also collapse as the effects of anesthesia wear off. In long-term care departments, falls significantly increase in numbers during the day as patients rehabilitate and train self-sufficiency. Moreover, frequent falls in long-term care patients were observed in the afternoon (12 a.m. to 4 p.m.), that is at the time when patients are visited by their relatives. This may be explained by the fact that at this time, nurses are less frequently present in patients' rooms and the relatives are unable to anticipate and prevent falls of the patients they visit.

A significant marker of fall severity is the resulting injuries. It was reported that 5-15% of falls lead to serious injuries including those affecting the head and soft tissues, fractures and luxations (Joint Commission Resources, 2007, p. 30). Most frequently, femoral neck fractures, Colles fractures of the radius and vertebral compression fractures are reported (Nurmi, Luthje, 2002) Femoral neck fractures are the most important injuries due to falls, almost invariably leading to surgery and subsequent prolonged hospital stay associated with increased treatment costs. These are the most serious fractures caused by falls, with the highest rates of mortality and health complications (Butler et al., 1996). Bartley and Shiflett (2010) pointed to the severity of fall consequences which may be devastating for the elderly, affecting their quality of life and potential independence. Our retrospective analysis of records showed an association between injuries sustained by falls and the age of falling patients. Injuries due to falls were most frequently observed in patients older than 75 years of age.

Conclusion

Patient falls in health or institutional care facilities are a serious issue that has to be addressed. For patients, falls have severe health, mental and social consequences. For health care facilities, falls mean increased care costs and the risk of legal actions following complaints and accusations resulting from providing patients with care of low quality and safety, causing potential damage to them. Patient safety should be a priority for health care providers. It is necessary to use the maximum amount of information that will provide a report of falls. Information provided by fall reports must be fully utilized. Patients at risk must be identified and hazardous situations must be analyzed to introduce corrective and, especially, preventive measures. The aim of fall reports is not only data collection but also their analysis and assessment. But even these cannot be sufficient for any health care facilities unless they have an opportunity to compare their results with those of others. Benchmarking of monitoring of patient falls at the national level is the source of these information for health care providers.

Ethical aspects and conflict of interest

The authors stated that there are no conflicts of interest regarding the publication of this article.

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