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ORIGINAL ARTICLE

ANALYSIS OF SELECTED CASES OF FALLS OF HOSPITALIZED PATIENTS

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Abstract

Contemporary state: The falls of hospitalized patients are the most frequent adverse events in the hospital environment that prolong hospitalization and increase treatment costs.

Goal: The goal of this study is to identify the causes and other factors causing falls regarding the selected group and recommend preventative and remedial measures.

Materials and methods: It is a qualitative analysis of two casuistries of patients who fell during the hospitalization period. In both cases, we analyzed the root causes of falls (Root Cause Analysis).

Results: In the first case, the cause of the fall was a sudden collapse of the patient, which resulted in the loss of balance. The collapse was caused by an infection, dehydration and the subsequent orthostatic hypotension. Other factors were the high-risk time (early morning) and insufficient bathroom lighting. In the second case, the fall was caused by the patient's loss of balance during their morning hygiene regime. In both cases, the subsidiary factors were high age (80+), polymorbidity and pharmacotherapy.

Conclusions: Falls, especially in elderly patients, are multifactorial. Preventative and remedial measures should be complex. In both cases, it is necessary to carry out the nursing plan with regards to the current changes in the health condition of hospitalized patients, and to share information on such changes among medical workers.

Keywords: *Falls; Hospital; Patients; Prevention; RCA; Risk factors*

INTRODUCTION

A fall can be defined as an adverse event which leads to a person unexpectedly finding themselves on the ground (Jarošová et al., 2014; JCR, 2007; Morris and Isaacs, 1980). The causes of falls can be external and internal. The external causes of so-called 'mechanical falls' are a high-risk external environment or activities, unsuitable footwear, clothes or compensation aids (Rubenstein and Josephson, 2006). On the contrary, symptomatic falls are the result of internal causes. The risk factors of somatic falls include age, neurologic and cerebrovascular illnesses, illnesses of the motor apparatus, sensory and cognitive disorders, psychiatric illnesses,

cardiovascular illnesses, metabolic disorders, acute disorders or negative side-effects of medication (Rubenstein and Josephson, 2006; Slouka et al., 2018). It is obvious that the risk of falls increases with age and polymorbidity. Falls are also multifactorial. Their poly-causality is typical, e.g. a senior stumbles over a doorstep and falls due to an unsteady gait, balance disorder, peripheral neuropathy and impaired vision (Slouka and Frei, 2016). The risk factors also include medication. The risk groups of medication which increase the probability of falls (Fall-Risk Increasing Drugs, FRID) include sedatives, hypnotic drugs, antipsychotic drugs, anticholinergic drugs, opioids, antipsychotic or antihypertensive drugs (Lee and Holbrook, 2017; Woolcott et al., 2009). We cannot leave out iatrogenic causes of falls, when the falls are caused by the mistakes of medical workers. Falls are the second most frequently reported adverse event (decubitus ulcer is more frequent) (IHIS, 2017). The consequences are somatic (injury) and psychosocial (depressions, fear of falling, anxiety, restriction of mobility, immobility syndrome, decondition or social isolation). Falls prolong the hospitalization period and require more health care. For this reason, the prevention of falls should be complex and not focused on only one risk factor (Oliver et al., 2010). It is obvious that a simplified and direct view of the issue is not appropriate. Reporting falls is one of the crucial indicators of the quality of care. The health service provider should follow one method to identify the level of fall risk and prevention and solution to ease the consequences after the fall. The data analysis should serve for the improvement of care, i.e. the identification of high-risk methods and the definition of effective preventative measures (MZ ČR, 2011). For the analysis of severe adverse events, the Ministry of Health recommends analyzing their root causes (MZ ČR, 2012). The Root Cause Analysis, RCA, is a standardized retrospective method which identifies the root causes and subsidiary factors of the past adverse event and suggests remedial measures which would prevent a repeat of it and lead to the improvement of the organizational performance.

The goal of this study is to carry out an analysis of selected falls, identify their causes and subsidiary factors, and suggest preventative and remedial measures.

MATERIALS AND METHODS

We used the qualitative method and content analysis of selected reports of falls.

As part of the project *The Analysis of the Factors Affecting Fall Risk – Options for the Inclusion of Nurses and Pharmacists in Minimizing This Risk*, carried out by the Faculty of Health and Social Sciences, University of South Bohemia in České Budějovice and the Faculty of Pharmacy, Charles University in Hradec Králové under the Czech Health Research Council (HRC), the web database *"Monitoring of the Risk Factors of Falls and Their Analysis"* was created in 2016. Four hospitals in South Bohemia are included in the project. Teams of experts (doctors and nurses) uploaded the data about falls to the database in 2017. They monitored all patients at wards with the highest number of falls. Mostly, these were internal wards, subsequent care wards, facilities for the long-term ill, rehabilitation wards, as well as psychiatric, surgical or pulmonary wards. The data from the database enabled establishing the risk factors before a fall and the assessment of patients after a fall, including the suggested measures. The indisputable advantage of the electronic database is its interactivity. The information about the risk of falls regarding the used pharmacotherapy was immediately assessed by a clinical pharmacist, who determined the population and individual risks of such pharmacotherapies regarding the occurrence of falls and suggested a possible change in the therapy. Based on such analysis, a doctor could suggest preventative and remedial measures. In 2017, the database included 280 cases of falls.

We selected two casuistic cases of falls from the database. We established the root causes of falls, subsidiary factors and preventative and remedial measures using the analysis of root causes of adverse events. The RCA includes several related phases. The first step is the identification and description of the problem. It is followed by the collection of complex relevant information about the adverse event. The subsequent phase includes the establishment of causes and subsidiary factors. The last phase suggests preventative and remedial measures and their practical use.

Ethical aspects of the research

The research was approved by the Ethical Committee of the Faculty of Health and So-

cial Sciences, University of South Bohemia, and the managements of the included hospitals. We dealt with the data very carefully, complying with act No. 101/2000 Coll. on the protection of personal data. We ensured confidentiality and anonymity. The database has been protected from misuse (confidential data leak).

RESULTS

In two cases, we analyzed the root causes of falls. We identified the reasons for falls and suggested remedial measures.

Case study 1

The doctor's assessment of the patient's health condition

A patient (85) was hospitalized for diarrhoea, weight loss, anaemia, elevated CRP (C-reactive protein). The patient stated night sweating and fever. She suffers from hypotension, underwent heart and lung x-ray, which was not the nidus and did not contain any infiltrative changes. The laboratory examination found an elevated level of CRP but a negative PCT (Procalcitonin), mild hypokalaemia and anaemia, and a considerably elevated tumour marker Ca 19-9.

Mineral disbalance remedied, the treatment for suspected insufficient pancreas with pancreatic enzymes commenced. An abdominal ultrasound was added, and a tumour of the pancreas, liver function nidus and dilated bile ducts were found. Endoscopic retrograde cholangiopancreatography was not carried out due to the absence of icterus and the signs of cholangitis. Considering the age and the advanced state of the oncological illness, a conservative procedure was chosen.

During the hospitalization, hemocultures and empirically applied antibiotics for the suspected cholangitis were collected.

Diagnoses

- pancreatic head tumour with a metastatic liver function – the symptomatic procedure is indicated;
- acute cholangitis;
- normocytic anaemia, secondary to neoplastic disease;
- intermittent diarrhoea for pancreatic insufficiency in primary illness;
- suspected post- medication hypokalaemia and diarrhoea;
- arterial hypertension;
- tachycardia rhythm disorders (atrial fibrillation).

Medication

- Kalnormin 1 g tab. [1-1-1]
- Furon 40 mg tab. [1-0-0]
- Euthyrox 50 mcg tab. [1-0-0]
- Entizol 250 mg tab. [6-14-22]
- Citalec 20 mg tab. [1-0-0]
- Helicid 20 mg cps. [1-0-0]
- Amoksiklav 1.2 g i.v. [6-14-22]
- Bisoprolol 5 mg tab. [1-0-0]

The nurse's assessment of the patient's health condition

The patient stated that she had fallen in the last 12 months. The level of self-sufficiency at admission was good. The Barthel test value was 95 points (mild dependence). The patient had no psychological and sensory problems. She did not need compensation aids for walking. Her insurance company included her in the 2nd category (partially independent). The patient did not smoke or abuse alcohol. Physiological functions at admission: systolic BP was 130/80 mm Hg (normotensive value), her pulse was 70/min. (normal), BMI 29.24 kg/m^2 (overweight). The patient felt tired. The nurse informed the patient about fall prevention. The signalling device was placed in reach.

Fall description

The patient lost balance on her way to the bathroom and fell to the bathroom floor. She did not suffer any injuries; she only leaned on her left upper limb during the fall. She called for help but her co-patient did not hear her. The fall was recorded on the fifth day of the hospitalization at 3:30 a.m. The collapse probably occurred due to orthostatic hypotension because of dehydration. After the fall, the patient was conscious and well oriented. She complained about the pain in her left wrist, which was swollen. Her doctor sent her for an x-ray, which confirmed the fracture of the distal radius on the left. Surgical treatment was carried out.

The direct cause of the fall and its subsidiary risk factors

The collapse occurred due to orthostatic hypotension because of dehydration and the ongoing infection due to the total asthenia during the neoplastic pancreas.

The subsidiary factors included the patient's age (85). The high-risk diagnoses in relation to falls include anaemia, arterial hypertension and tachycardia rhythm disorders. The patient was using six types of medication, two of which might have increased the fall risk. They were furosemide, which can intensify dehydration and cause hypotension, and bisoprolol. The time of the fall (3:30 a.m.) and the insufficient bathroom lighting also seem risky (Table 1).

Preventative and remedial measures

Regarding the use of high-risk groups of medication, it would be suitable to consider a change in the patient's medication or a decrease in the use of furosemide, or even to stop using it if her health condition allows this. Due to hypotension, it would be suitable to consider the necessity of bisoprolol. From the nursing point of view, it is necessary to inform the patient about the importance of the increase in fluid intake or the possibility of asking a nurse to accompany her to the toilet. It would also be suitable to consider monitoring her fluid intake and dispensing, her physiological functions and to carry out a fall risk rescreening. Last but not least, ensuring sufficient night lighting in her room and bathroom would also be suitable (Table 1).

Table 1 – The analysis of the causes of the fall 1

RCA 1		
The direct cause of the fall: the patient's collapse followed by the loss of balance and fall		
Subsidiary factors		**Suggestions of remedial measures**
High-risk diagnoses	Anaemia Arterial hypertension Tachycardia rhythm disorders Intermittent diarrhoea	Stabilization of health condition, monitoring BP
High-risk groups of medications	Furosemide Bisoprolol	Consider decreasing or ceasing to use furosemide and bisoprolol
Orthostatic hypotension	Due to dehydration	Change in medication, informing the patient about the mechanism of orthostatic hypotension and its prevention, monitoring BP
Dehydration	Related to diarrhoea, infection, possibly suspected post-medication dehydration	Monitoring the fluid intake and dispensing, increase in fluid intake, change in medication
High-risk time of fall	3:30 a.m.	Informing the patient about the possibility of calling a nurse Ensuring the signalling device is in reach
High-risk environment	Insufficient bathroom and toilet lighting	Ensuring night lighting

Case study 2

The doctor's assessment of the patient's health condition

The patient (84) was at home after the fall. She suffered a concussion and a fracture of the C6 vertebra and was hospitalized.

Diagnoses

Fracture of the C6 vertebra at conservative therapy, arterial hypertension, osteoporosis, diabetes mellitus type II on diet, chronic venous insufficiency, chronic pyelonephritis, hypercholesterolemia, chronic obstructive pulmonary disease.

Medication
Kalnormin 1 g tab. [1-1-1]
Clexane 0.4 ml s.c. in the morning
Tenoloc 200 mg tab. [1-0-0]
Prestarium neo 5 mg tab. [1-0-0]
Propycil 50 mg tab. [0.5-0-0]
Gabanox 100 mg cps. [1-0-1]
Euphyllin 200 mg cps. [1-0-1]
Tiapra 100 mg 1 tab. before sleep
Controloc 20 mg 1 tab. in the morning
Timoptol 0.5% into the left eye in morning and evening

The nurse's assessment of the patient's health condition
The patient fell off her bed during her morning hygiene routine. Her medical history recorded a fall. The fall was the reason for hospitalization.

At the admission, a fall risk screening was carried out. It identified a high level of fall risk. The Barthel test at the admission showed a low level of self-sufficiency (10 points – high level of dependence), and rescreening was not carried out. The patient does not suffer from psychological problems, but she does suffer from vision illness. The patient moves without compensation aids; however, accompaniment is necessary. Her insurance company included her in the 3rd category (increased supervision required). The patient does not smoke and does not abuse alcohol. Physiological functions at admission: BP 135/85 mm Hg (boundary normotensive value), her pulse was 78/min. (normal), BMI 23.51 kg/m^2 (normal). The nurse informed the patient about fall prevention. The signalling device was placed in reach. For the prevention of fall, brackets were used. The patient suffers from urinal incontinence.

Fall description
The fall occurred on the 20th day of hospitalization. The patient lost balance during her morning hygiene routine at 7:00 a.m. She slipped from her bed, fell on her buttocks and hit her head. She did not vomit and did not lose consciousness. She was well-oriented and was able to explain how she had fallen. There were no signs of trauma; the fall was without consequences and observation was recommended.

The direct cause of the fall and its subsidiary risk factors
She was an elderly frail patient with high-risk illnesses in terms of falls (arterial hypertension, diabetes mellitus, instability, glaucoma, urinal incontinence). The influence of medication cannot be excluded regarding her fall (lower BP). Perindopril can be considered high-risk medication. Tiaprid, which has a sedative effect, could have still been in effect.

Preventative and remedial measures
Monitoring of blood pressure is recommended and it would also be suitable to consider the reduction of antihypertensive medication in case of hypotension. From the nursing point of view, frequent checking on the patient is necessary, as well as ensuring brackets on the bed and informing the patient. Before discharge to home care, it is necessary to re-inform the patient on the ways of behaving in case of a fall at home and on changes in the home environment. Educating family members is also suitable (Table 2).

DISCUSSION

The falls of hospitalized patients are one of the most frequent adverse events in the hospital environment and can significantly affect expected therapeutic outcomes. A fall can be the cause of trauma, as well as a more serious injury or death. The risk of falls and the severity of their consequences increase with age, so it is necessary to find ways to prevent them (Bennet et al., 2014).

We carried out an analysis of two cases of falls. It is clear that falls (especially regarding elderly patients) are caused by internal and external risk factors. It is a process of several related negative factors that lead to a fall. In the first case, it was a combination of severe chronic and acute illness. The result was dehydration, hypotension, fatigue and weakness. When these internal factors were followed by external negative circumstances as well (waking at early morning hours, drowsiness, the need to go to the toilet, insufficient bathroom lighting), a fall occurred. From the nursing point of view, it is necessary to inform the patient about the increased fluid intake or

Table 2 – The analysis of the causes of the fall 2

RCA 2		
The direct cause of the fall: loss of balance during morning hygiene routine followed by a slip and fall		
Subsidiary factors		**Suggestions of remedial measures**
Risk diagnoses	Arterial hypertension Diabetes mellitus Instability Glaucoma	Monitoring of BP, ensuring a secure environment, increased supervision, physiotherapy, support of secure mobility
High-risk groups of medications	Perindopril Tiaprid	Change in medication
Orthostatic hypotension	Loss of balance during morning hygiene, a slip from the bed	Monitoring of BP, informing the patient about the mechanism of orthostatic hypotension and its prevention, exercising verticalization with a physiotherapist
High-risk activity	Morning hygiene	Increased supervision during personal hygiene, assistance from the nursing personnel
High-risk environment	Unknown environment, elderly patient	Ensuring a secure environment (suitably placed aids in reach, individual setting of the right bed height, ensuring brackets)

the option of asking a nurse to accompany her on her way to the toilet, as well as monitoring the patient's fluid intake and dispensation, her physiological functions and re-screening the fall risk. Last but not least, it is necessary to ensure quality night lighting in her room and toilet.

In the second case, the patient was an elderly woman at high risk of falling due to repeated falls in her medical history. During her morning hygiene routine, she probably lost balance and fell off her bed due to orthostatic hypotension. The influence of pharmacotherapy cannot be excluded (anti-hypertensive medication). Using medication that belongs to high-risk groups is one of the main risk factors that are possible to have an effect (de Vries et al., 2018; Seppala et al., 2018a, b). It is recommended (besides changing medication) to monitor the patient's blood pressure. From the nursing point of view, it is necessary to support secure mobility and ensure a safe environment (specifically, placing the aids for personal needs in reach, individual adjustment of bed height, and raising brackets). It is important to educate the patient about the mechanism of orthostatic hypotension and its prevention.

CONCLUSIONS

The results show that the characteristics of falls are a combination of internal and external risk factors. On the one hand, higher age, co-morbidity or the side effects of medication increase the risk of falls. However, we cannot ignore the influence of high-risk activities or environment while analyzing the cases (insufficient bathroom lighting, unfamiliar hospital environment, high-risk activity). The success rate regarding the reduction of falls can be related to the preventative programmes, which simultaneously include several intervention steps. It is necessary for all members of the hospital staff to apply these programmes (multidisciplinary teams which take care of their patients) at all levels in the hospital environment. Teamwork, sharing and handing of the information about the risk factors of individual patients and functional communication among medical workers are necessary for reducing the occurrence of falls. One of our project's goals is to contribute to a better co-operation of multidisciplinary teams of doctors, nurses and clinical pharmacists in order to minimize the risk of falls in hospital care.

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Conflict of interests
The authors have no conflict of interests to disclose.

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