Analysis of fall risk factors in adults within the first 48 hours of hospitalization

*Análise dos fatores de risco para queda de adultos
nas primeiras 48 horas de hospitalização*

*Análisis de factores de riesgo para las caídas de adultos
en las primeras 48 horas de hospitalización*

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ABSTRACT

Objective: To analyze fall risk factors in the first 48 hours of hospitalization and to associate them with the occurrence of falls. Method: Cohort study conducted at a hospital in Porto Alegre/RS, Brazil. A sample of 556 patients from an adult in-patient study population were evaluated within the first 48 hours of hospitalization for factors associated with falls, based on the Morse Fall Scale (MFS) and muscle strength, among others. Results: Evidence showed that the classification of high-risk according to the MFS and, more specifically, the items history of falls, ambulatory aid, impaired gait and overestimation of walking ability, were associated with falls during hospitalization (p≤0.005). In addition to these risk factors, reduced muscle strength and visual deficit also contributed to the occurrence of this safety incident. Conclusion: The analysis of fall risk factors in patients evaluated within 48 hours of hospitalization may contribute to minimizing these occurrences and preventing injury.
Descriptors: Accidental falls. Patient safety. Hospitalization. Risk factors. Nursing.

RESUMO

Objetivo: Analisar os fatores de risco para quedas nas primeiras 48 horas de hospitalização e associá-los com a ocorrência de quedas. Método: Estudo de coorte, realizado em um hospital de Porto Alegre/RS. A população do estudo foram os pacientes adultos hospitalizados, e a amostra configurou-se em 556 pacientes avaliados quanto aos fatores associados a quedas em até 48 horas do início da internação, como a Morse Fall Scale e a força muscular, dentre outros. Resultados: Evidenciou-se que a classificação de risco elevado pela Morse Fall Scale (MFS) e, especificamente, os itens história de quedas, auxílio na deambulação, marcha comprometida/cambaleante e superestimar capacidade para deambulação estavam associados com as quedas na hospitalização (p≤0,005). Além desses fatores de risco, a força muscular reduzida e o déficit visual contribuíram para a ocorrência desse incidente de segurança. Conclusão: A análise dos fatores de risco para quedas dos pacientes avaliados nas primeiras 48 horas de hospitalização pode contribuir para a minimização dessas ocorrências e prevenir eventuais danos.
Descritores: Acidentes por quedas. Segurança do paciente. Hospitalização. Fatores de risco. Enfermagem.

RESUMEN

Objetivo: Analizar los factores de riesgo para caídas en las primeras 48 horas de hospitalización y asociarlos con el acontecimiento de caídas. Método: Estudio de corte, realizado en un hospital de Porto Alegre/RS. La población del estudio fue de pacientes adultos hospitalizados y la muestra fue de 556 pacientes evaluados con relación a los factores asociados a caídas en hasta las 48h del inicio de la internación, ya que la Morse Fall Scale (MFS) y la fuerza muscular, entre otros. Resultados: Se ha evidenciado que la clasificación de riesgo alto por la MFS y, específicamente, los ítems historiales de caídas, auxilio en la deambulación, marcha comprometida/tambaleante y sobreestimar capacidad para la deambulación estaban asociados con las caídas en la hospitalización (p≤0,005). Además de estos factores de riesgo, la fuerza muscular reducida y el déficit visual también contribuyeron para el acontecimiento de ese incidente de seguridad. Conclusión: Análisis de los factores de riesgo para caídas de los pacientes evaluados en las primeras 48 horas de hospitalización puede contribuir para la minimización de esos acontecimiento y prevenir eventuales daños
Descriptores: Accidentes por caídas. Seguridad del paciente. Hospitalización. Factores de riesgo. Enfermería.

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■ INTRODUCTION

Hospitalization is a process that requires patients to adapt to physical structures, routines and standards and, above all, forces patients to establish relationships with other people. In addition to these changes to their everyday lives and environment, health aggravations can abruptly reduce autonomy and functionality, which is not always comprehended by patients, their family members and healthcare providers.

In this scenario, and considering the actual risks of hospitalization, safety incidents may occur and result in injury that often impairs or reduces the quality of life of patients. This is the central topic of worldwide debates and, in Brazil, has become a priority in the agenda of healthcare managers and professionals since Ordinance 529, of April 2013, that established the *Programa Nacional de Segurança do Paciente* (National Patient Safety Programme) – PNSP, in Brazil [1].

Patient safety, defined as the reduction of unnecessary risks associated to healthcare to an acceptable minimum [1-2] in hospitals, has generated much debate and alerts in the healthcare sector with the aim of reducing unsafe care actions and improving the quality of services provided to patients.

Among these safety incident reduction strategies, fall prevention during hospitalization is one of the goals established by the PNSP[1], and is defined as an event in which an individual inadvertently falls to the ground or to lower levels, excluding intentional change of position for resting on furniture, walls or other objects [3]. Data of current studies of the Fall Prevention Protocol of the Brazilian Ministry of Health indicate that the patient fall rate in hospitals in developed countries ranges from 3 to 5 falls per 1000 patients/day and that injuries occur in up to 50% of cases [4].

The risk of falling in a hospital environment can be monitored using the appropriate scales, such as the Morse Fall Scale – MSF[5], which was translated and adapted for Brazil in 2013[6]. This scale classifies patient fall risk into low, moderate and high categories [5-6].

Falls can be classified into three types: Accidental Fall that occurs when a patient slips or trips and is usually caused by environmental factors; Anticipated Physiological Fall, defined as a predictable fall when the patient shows signs that indicate the probability of a fall, estimated using the Morse Fall Scale risk score; and the Unanticipated Physiological Fall, defined as unpredictable, established prior to the first occurrence, and generally associated to convulsions, fainting, hip fractures, and others [7]. The ability to di-

fferentiate these three types is essential in order to predict and prevent each type of fall with different strategies [7].

The investigation of fall risks within the first 48 hours of hospitalization aims to identify patients who are more prone to anticipated physiological falls and other aspects that can prove relevant and contribute to the construction of strategies that predict, warn against and reduce these incidents that can seriously aggravate the health of patients.

The research question of this study was thus defined as: Is the risk of falling within the first 48 hours of admission associated to falls of adult during hospitalization? To answer this question, the aim of this study was to analyse fall risk factors within the first 48 hours of hospitalization and associate these factors with the occurrence of falls.

■ METHOD

This prospective cohort study was conducted at a large hospital in the metropolitan region of Porto Alegre, Rio Grande do Sul, Brazil, from November 2013 to March 2014.

The study population consisted of adult in-patients that met the following inclusion criteria: over 18 years of age; hospitalized in clinical or surgical units; and assessed in terms of factors associated to falls within the first 48 hours of hospitalization.

Data were collected by a team that was trained to use a collection instrument and a manual. The instrument consisted of two parts. The first part contained age, sex, date of admission, release date, musculoskeletal problems, visual deficit and hearing loss and reason for hospitalization. The second part included muscle strength, the Morse Fall Scale translated and adapted to Portuguese [6] and fall occurrence.

The Portuguese version of the Morse Fall Scale comprises six assessment items: history of falls (yes, fell in the last three month: 25 points; no, did not fall in the last three months: zero points); secondary diagnosis (yes, has more than one diagnosis: 15 points; no, does not have more than one diagnosis: zero points); ambulatory aid (does not use: zero points; fully bedridden: zero points; walks with the help of a healthcare professional: zero points; uses a crutch/cane/walker: 15 points; clutches onto furniture/wall: 30 points); endovenous therapy/saline or heparin intravenous device (does not use: zero points; yes, uses: 20 points); gait (normal/does not ambulate/fully bedridden/uses wheelchair: zero points; weak gait: 10 points, unsteady/impaired gait: 20 points); mental state (oriented/aware of abilities/limitation: zero points; overestimates ability/forgets limitations: 15 points)[6]. The sum of points for each item creates a score that classifies risk as Low Risk (0 – 24 points), Moderate Risk (25 – 44 points), and High Risk (≥ 45 points)[5].

Muscle strength was evaluated using the Rossi and Mistrorigo Scale[8] with the following scores: level 5 (normal or 100%) for full joint movement and enough strength to support the pull of gravity and high applied resistance; level 4 (good or 75%) for full movement and enough strength to support the pull of gravity and some applied resistance; level 3 (regular or 50%) for full movement and enough strength to support the pull of gravity only; level 2 (weak or 25%): for complete movement, but movement is not possible against gravity; level 1 (minimal or 10%) when there is no evidence of small contractions or use of joints; level 0 (zero or 0%) when there is no evidence of muscle contraction. Classifications were preserved strength (level 5), diminished strength (levels 2, 3 and 4) and absent strength (levels 0 and 1).

Musculoskeletal problems were defined as present or absent based on the patient assessment and visual deficit and hearing loss were self-referred by patients. Medical diagnoses were collected directly from the patient files and grouped into one or more than one medical diagnosis.

Data were entered in an Excel® spreadsheet by means of duplicate data entry and the verification of inconsistencies. Data related to the first assessment and the occurrence of falls were used for this study. Data were analysed with the Statistical Package for the Social Sciences (SPSS 17.0) using descriptive statistics (absolute and relative frequency and variability) and analytic statistics (Chi-Squared or Fischer tests to assess the association between variables). The adopted decision criterion was a level of significance (α) of 5%. This research project was approved by the Research Ethics Committee of the Pontifícia Universidade Católica do Rio Grande do Sul (OF. CEP – 1272/09) and participants signed an informed consent statement.

RESULTS

The sample for this study totalled 556 in-patients. Average age was 58.14±15.6 years, with a median age of 59 (18-97). Most patients were men older or equal to 58 years of age. During their hospital time, 44 (7.9%) patients suffered from falls. Data on musculoskeletal problems, visual deficit and hearing loss, muscle strength and the presence of more than one medical diagnosis and their association with falls are shown in Table 1.

Table 2 shows the items and risk classifications for falls of the MFS during patient admission and their association with the occurrence of falls during hospitalization. Average MFS score was 39.10 ±24.89, with a median of 35 points (0 – 125 points).

DISCUSSION

This study analyses risk factors within the first 48 hours of hospitalization and their association with the occurrence of falls of in-patients. Evidence showed the association of visual deficit, diminished muscle strength based on the MFS and the high fall risk classification with the occurrence of falls in the studied patients.

The investigation of these factors is extremely important, considering that injuries caused by falls are unfortunately becoming routine in the hospital environment, leading to problems for patients and the increased concern of care providers and managers. Consequently, prevention becomes the focus of care and enables nursing and healthcare professionals to correctly identify high risk patients during admission. The planning of preventive measures is also necessary, as some falls of in-patients are predictable and avoidable.

In terms of age and sex, studies have shown a greater relation of falls among women over 65[9-12], and that the elderly who need help with their daily activities are 14 times more prone to falls. [9]. This study did not find a significant statistical association of age and sex with the occurrence of falls. However, descriptive data show that, of all the patients who fell, there was a higher percentage of male patients that were 57 years old or under.

Visual deficit also showed a statistical association with the occurrence of falls. Of those who fell, 88.6% had this aggravating factor. This aspect is scarcely documented in existing studies that discuss fall risk factors. A study that analysed factors associated to falls in elderly residents of a community showed that deficient sight is one of the fall risk factors among these individuals. Elderly people with mildly, moderately and severely impaired sight are, respectively, 1.4 (95% IC 1.1-2.0), 1.0 (95% IC 0.4-2.2), and 2.2 (1.1-4.3) more likely to fall. Elderly people with diminished sensitivity were 1.1 more likely to fall (95% IC 1.0 – 1.2); and elderly people with visual abnormalities were 1.5 times more likely to fall recurrently than elderly people without visual abnormalities [13].

The natural aging process is associated to diminished visual acuity due to physiological alterations of the intraocular lens, visual deficit and retinal disorders. Around 90% of elderly people need corrective glasses to see properly [14].

Acuity and visual alterations, cataract, glaucoma and macular degeneration are correlated with the risk of falls. This loss of visual acuity can cause loss of balance, as the eyes are sensorial organs that provide most environmental information [9]. In addition, studies on the elderly identified a high prevalence of visual deficit (81.4%) and a high fall rate (54.2%) among those with this deficit [15].

Table 1. Association of variables age, sex and clinical characteristics with the occurrence of falls. Porto Alegre/RS, 2014 (n=556).

| | N (%) | Fall | | p |
		No n (%)	Yes n (%)	
Sex				
Female	256 (46.0)	235 (91.8)	21 (8.2)	0.815*
Male	300 (54.0)	277 (92.3)	23 (7.7)	
Age				
Up to 57	248 (44.6)	228 (91.9)	20 (8.1)	0.906*
58 or more	308 (55.4)	284 (92.2)	24 (7.8)	
Musculoskeletal problems				
No	385 (69.2)	360 (93.5)	25 (6.5)	0.063*
Yes	171 (30.8)	152 (88.9)	19 (11.1)	
Visual deficit				
No	134 (24.1)	129 (96.3)	5 (3.7)	0.025**
Yes	422 (75.9)	383 (90.8)	39 (9.2)	
Hearing loss				
No	437 (78.6)	404 (92.4)	33 (7.6)	0.544*
Yes	119 (21.4)	108 (90.8)	11 (9.2)	
Muscle strength of right arm				
Preserved	325 (58.5)	308 (94.8)	17 (5.2)	
Diminished	224 (40.3)	197 (87.9)	27 (12.1)	0.019**
Absent	7 (1.3)	7 (100.0)	-	
Muscle strength of left arm				
Preserved	329 (59.2)	310 (94.2)	19 (5.8)	
Diminished	214 (38.5)	189 (88.3)	25 (11.7)	0.039**
Absent	13 (2.3)	13 (100.0)	-	
Muscle strength of right leg				
Preserved	343 (61.7)	328 (95.6)	15 (4.4)	
Diminished	195 (35.1)	167 (85.6)	28 (14.4)	≤0.001**
Absent	18 (3.2)	17 (94.4)	1 (5.6)	
Muscle strength of left leg				
Preserved	333 (59.9)	317 (95.2)	16 (4.8)	
Diminished	200 (36.0)	173 (86.5)	27 (13.5)	0.001**
Absent	23 (4.1)	22 (95.7)	1 (4.3)	
More than 1 medical diagnosis				
No		163 (92.1)	14 (7.9)	0.998*
Yes		349 (92.1)	30 (7.9)	

Source: Research data.
* Pearson's Chi-Squared Test; **Fisher's Exact Test

Table 2. MFS items and classification within the first 48 hours of patient admission and their association with the occurrence of falls during hospitalization. Porto Alegre/RS, 2014 (n=556);

	n (%)	Fall		p
		No n(%)	Yes n(%)	
History of falls				
No	407 (73.2)	389 (95.6)	18 (4.4)	<0.001**
Yes	149 (26.8)	123 (82.6)	26 (17.4)	
Secondary diagnosis				
No	181 (32.6)	167 (92.3)	14 (7.7)	0.914*
Yes	375 (67.4)	345 (92.0)	30 (8.0)	
Ambulatory aid				
None	374 (67.3)	358 (95.7)	16 (4.3)	
Fully bedridden	99 (17.8)	90 (90.9)	9 (9.1)	
Aided by healthcare professional	34 (6.1)	26 (76.5)	8 (23.5)	<0.001**
Uses Crutch/Cane/Walker	24 (4.3)	20 (83.3)	4 (16.7)	
Clutches to Furniture/Wall	25 (4.5)	18 (72.0)	7 (28.0)	
Endovenous therapy				
No	185 (33.3)	173 (93.5)	12 (6.5)	0.240**
Yes	371 (66.7)	339 (91.4)	32 (8.6)	
Gait				
Normal	284 (51.1)	278 (97.9)	6 (2.1)	
Does not walk/Bedridden	99 (17.8)	90 (90.9)	9 (9.1)	
Does not walk/Wheelchair	4 (0.7)	2 (50.0)	2 (50.0)	<0.001**
Weak	106 (19.1)	95 (89.6)	11 (10.4)	
Impaired	63 (11.3)	47 (74.6)	16 (25.4)	
Mental state				
Aware of capacity/limitation	453 (81.5)	431 (95.1)	22 (4.9)	<0.001**
Overestimates ability/Forgets limitation	103 (18.5)	81 (78.6)	22 (21.4)	
MFS				
Low Risk	177 (31.8)	175 (98.9)	2 (1.1)	
Moderate Risk	167 (30.0)	161 (96.4)	6 (3.6)	<0.001**
High Risk	212 (38.1)	176 (83.0)	36 (17.0)	

Source: Research data.
* Pearson's Chi-Squared Test; ** Fisher's Exact Test

Patients with diminished muscle strength in their arms and legs showed an association with falls during hospitalization. A longitudinal study conducted on in-patients also identified diminished muscle strength in patients who fell [12]. Additionally, a study found that 92.3% of women and 94.1 % of men [16] suffered from diminished muscle strength.

The loss of muscle strength can impair mobility, leading to functional dependence, which is related to falls [4,17]. Findings on muscle strength suggest that, despite slight variations, there are differences in the strength of all four limbs, resulting in the need for adequate and individual evaluations.

Analysis of the in-patients, in terms of MFS items, showed an association between history of falls, ambulatory aids, gait and mental state. Secondary medical diagnosis and endovenous therapy, despite the higher percentages among patients who fell, were not statistically significant.

A study conducted with 45 elderly in-patients reported 114 falls in the study period, with a prevalence of 37.2 %. Among those who fell, 21 (46.7%) suffered more than one fall during the study period [18]. History of previous falls was described as important to predict a new fall [9,18]. Another study also identified, during patient admission, that 30.3% had a history of previous falls [11]. In terms of ambulatory aids, a study with institutionalized patients showed that 62.2% of elderly patients requires some form of aid [18].

Although the absolute frequency of patients was the same, both for patients who were aware of their abilities and those who overestimated their ability to walk alone, the frequency of those who overestimated their ability was much higher, showing that this aspect must be monitored during hospitalization and may show a higher propensity to falls among these patients. The study of patients for the construction of an MFS found a similar frequency (18.1%) of patient who overestimated their ability to walk among patients who fell [19].

Impaired gait was also relevant to establish high risk and was equally described in another study that found a higher prevalence of walking difficulties in 55% of patients [20].

In relation to MFS risk classification, moderate risk and, above all, high risk are associated to the occurrence of falls, showing that, as stated previously, anticipated physiological falls can be prevented using the MFS based on the identification of its items [5]. As shown in the study for the construction of the MFS, high fall risk classification was also more frequent, with 76.9% of patients, followed by moderate risk with 16.4% [5].

Patients with the highest scores were those who fell the most, meaning that nursing actions and interventions should target these patients. Educational intervention for the healthcare team that focuses on evaluating these patients within the first 48 hours are essential for early planning and implementation to reduce risk, prevent unnecessary patient suffering and ensure their safety and the provision of quality care. The existence of several risk factors is a strong indication of falls and can also compromise the performance of the patient's daily activities [16]. This study portrayed the association of several identifiable risk factors within the first 48 hours of patient hospitalization and this evidence can contribute to minimize possible injuries caused by this safety incident.

This investigation is an important tool to help modify the behaviour of nursing teams by means of identifying mechanisms to implement qualified and effective care plans that can revert the statistics of falls and injury to patients, thus contributing to increase patient safety and ensure quality care.

■ CONCLUSION

This study was an initial step towards analysing fall risk factors of patients within the first 48 hours of hospitalization, based on the MFS. Evidence showed that diminished muscle strength, visual deficit, high MFS risk classification, and, above all, the items history of falls, ambulatory aid, impaired gait and overestimating the ability to walk were associated with falls during hospitalization.

Findings of this study may serve as a basis for planning future studies or for implementing actions to reduce, to an acceptable minimum, the occurrence of falls and prevent possible injuries by assessing patients during admission. Providing a safe environment for patients in a location outside their living environment should be a constant concern of nursing teams.

Another relevant aspect is continuous monitoring of risk evaluations and the adopted measures. Use of the MFS to identify fall risk proved effective, as most patients who fell presented a high fall risk classification. This configures an anticipated physiological fall, which can be predicted using MFS. Moreover, it is important to train healthcare professionals in terms of its application to prevent erroneous interpretations that can compromise the risk classification.

Study limitations were the restricted number of articles with MFS evaluations, which hinders a discussion on the study topic that evaluates the MFS during patient hospital admission.

An important factor is the need to invest in further studies that apply preventive measures, analyse the effectiveness of these measures to prevent falls, and more consistently analyse the effectiveness of the MFS.

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