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RESEARCH ARTICLE (ORIGINAL)

Application of the Medication Fall Risk Score in patients will fall notification: A retrospective analysis

Aplicação da Medication Fall Risk Score em doentes com notificação de incidente de queda: Análise retrospetiva

Aplicación de la Medication Fall Risk Score en pacientes con incidente de caída notificado: Análisis retrospectivo

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Abstract

Background: Falls in hospital settings are frequent adverse events, with medications contributing significantly.

Objective: To analyze inpatient fall notifications and characterize fall risk with a focus on drug therapy by applying the Medication Fall Risk Score.

Methodology: An observational, descriptive, and retrospective study was conducted in a Portuguese hospital center. The Medication Fall Risk Score was applied to a sample of 183 patient fall notifications in the first quarter of 2021.

Results: The Medication Fall Risk Score identified 60.6% of patients with "yes" for high fall risk. Regarding fall risk assessment recorded in the notifications using another scale, 65.8% of patients were classified as "low risk" or "no risk." Of these, 53.9% were classified as "yes" for high risk using the Medication Fall Risk Score.

Conclusion: The Medication Fall Risk Score may help to improve the detection of patients at "high risk" of falling, allowing safer medication practices for fall prevention.

Keywords: accidental falls; drug therapy; patient safety; risk management

Resumo

Enquadramento: As quedas em contexto hospitalar são eventos adversos frequentes, sendo os medicamentos um importante fator contribuinte.

Objetivo: Analisar notificações de queda de doentes internados e caracterizar o risco de queda com foco na terapia farmacológica, através da aplicação da *Medication Fall Risk Score*.

Metodologia: Estudo observacional, descritivo e retrospetivo realizado num centro hospitalar português. Aplicada a *Medication Fall Risk Score*, numa amostra de 183 notificações de queda ocorridas no primeiro trimestre de 2021.

Resultados: A *Medication Fall Risk Score* identificou 60,6% dos doentes com "sim" para o alto risco de queda. Relativamente à avaliação de risco de queda registada nas notificações com recurso a outra escala, identificou-se que 65,8% dos doentes foram classificados como "baixo risco" ou "sem risco". Desses, 53,9% foram classificados com "sim" para o alto risco através da *Medication Fall Risk Score.*

Conclusão: A *Medication Fall Risk Score* poderá contribuir para melhorar a deteção de doentes com "alto risco" de queda, permitindo uma gestão mais segura dos medicamentos para a prevenção das quedas.

Palavras-chave: acidentes por quedas; tratamento farmacológico; segurança do paciente; gestão de riscos

Resumen

Marco contextual: Las caídas en los hospitales son eventos adversos frecuentes y la medicación es un factor importante.

Objetivo: Analizar las notificaciones de caída de pacientes hospitalizados y caracterizar el riesgo de caída centrándose en el tratamiento farmacológico, mediante la aplicación de la *Medication Fall Risk Score*.

Metodología: Estudio observacional, descriptivo y retrospectivo realizado en un centro hospitalario portugués. Aplicada la *Medication Fall Risk Score* en una muestra de 183 notificaciones de caída ocurridas en el primer trimestre de 2021.

Resultados: La *Medication Fall Risk Score* identificó al 60,6% de los pacientes con un "sí" para riesgo de caída elevado. En cuanto a la evaluación del riesgo de caída registrada en las notificaciones mediante otra escala, el 65,8% de los pacientes fueron clasificados como de "riesgo bajo" o "sin riesgo". De ellos, el 53,9% se clasificaron con un "sí" para riesgo elevado a través de la *Medication Fall Risk Score.*

Conclusión: La *Medication Fall Risk Score* podría ayudar a mejorar la detección de pacientes con "riesgo elevado" de caída, lo que permitiría una gestión más segura de los medicamentos para prevenirla.

Palabras clave: accidentes por caídas; farmacoterapia; seguridad del paciente; gestión de riesgos

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Introduction

Falls and their consequences are a public health issue with a vast social impact worldwide, mainly in countries with significant population aging (Organização Mundial de Saúde [WHO], 2010).

In recent years, several studies have been developed in different countries, including Portugal, to estimate the rate of inpatient falls and characterize the nature of this type of incident (Severo et al., 2018; Sousa et al., 2018). Global statistical data indicate that the frequency of inpatient falls ranges between 1.3 and 13.0 per thousand patients per day (Severo et al., 2018). A study on adverse events in Portuguese hospitals identified that 7% were related to patient falls (Sousa et al., 2018). In this context, data from the Portuguese Directorate-General of Health for 2017 and 2018 point to a stabilization in the number of patient fall notifications in hospitals, with an annual average of eight thousand notified cases. According to the national incident notification system, falls represent 21% of all reported incidents (Serviço Nacional de Saúde [SNS], 2019).

This type of incident may arise from a single factor and a complex interaction between several risk factors (WHO, 2010). Physiological changes, environmental and behavioral risk factors, and the use of medications are often related to falls (Jehu et al., 2021; Lucero et al., 2019).

Thus, considering the use of medication as one of the factors contributing to the occurrence of falls, this study aims to analyze fall notifications of patients who were admitted to a Portuguese public hospital center and characterize the drug-related fall risk through the application of the Medication Fall Risk Score (MFRS).

Background

Falls are one of the most commonly reported adverse events in hospital settings, and their harmful consequences can significantly compromise inpatients' quality of life due to their severity (Silva et al., 2019). There are specific scales with a scoring system to assess the risk of falling associated with the use of medications in hospital settings, such as the MFRS (Beasley & Patatanian, 2009; Costa-Dias et al., 2014; Instituto para Práticas Seguras no Uso de Medicamentos [ISMP], 2017). The MFRS categorizes drugs in risk levels and is used upon a patient's admission to a hospital and periodically at previously defined intervals (Beasley & Patatanian, 2009; ISMP, 2017). However, it is essential to emphasize that using the MFRS should complement other assessment tools, such as environmental risk assessment and fall prevention scales (Costa-Dias et al., 2014; ISMP, 2017).

Therefore, several studies developed on this subject have shown that there is an association between falls and various risk factors, including medications (Costa-Dias et al., 2014; Jehu et al., 2021; Lee & Holbrook, 2017; Lucero et al., 2019; Michalcova et al., 2020; Silva et al., 2019). In this sense, pharmacotherapy and its possible adverse effects should always be subject to analysis by health professionals for safe medication management to prevent falls (ISMP, 2017).

Because safe medication practices take into account the adverse effects of medications, healthcare professionals should pay particular attention in the fall risk assessment to medications with effects such as orthostatic hypotension, cognitive impairment, balance disorders, dizziness, drowsiness, motor dysfunction, visual disturbances, and parkinsonism (ISMP, 2017). Drugs that increase the risk of falls are opioid analgesics (60%), antidepressants (57%), anticonvulsants (55%), antipsychotics (54%), benzodiazepines (42%), and diuretics (36%). In polymedicated patients, where four or more of these medications are prescribed, the risk of falling increases to 75% (Canadian Medication Appropriateness and Deprescribing Network, n.d).

It should be noted that the increase in older populations and the rising prevalence of multimorbidity have contributed to polypharmacy (Dhalwani et al., 2017; IMSP, 2018). Concerning polypharmacy, a survey with over five thousand participants revealed that almost one-third of the population used five or more medications and a significant association regarding a 21% increase in falls (Dhalwani et al., 2017). Polypharmacy can contribute to drug interactions and adverse drug reactions, leading to falls and harmful consequences (IMSP, 2018).

Considering that polypharmacy and medication-related incidents are areas of concern for healthcare safety, the WHO launched in 2017 the third Global Patient Safety Challenge under the theme "Medication Without Harm" to reduce by 50% severe and avoidable medication-related harm (ISMP, 2018).

Research question

Will medication-related fall risk assessment in inpatients contribute to more effectively detecting patients at high risk of falling?

Methodology

An observational, descriptive, cross-sectional, retrospective study with a quantitative approach was conducted in a public university hospital center in the region of Lisbon and Tagus Valley, Portugal.

The population of this study consisted of all patients with fall incidents reported in the hospital's electronic patient safety incident reporting system in the first quarter of 2021. A total of 236 notifications were extracted in the Patient Fall category, according to the WHO International Classification of Patient Safety (Direção-Geral da Saúde, 2011). The sample was composed against the inclusion and exclusion criteria, and patients with reported falls in outpatient settings, individuals with falls aged under 18 years, and electronic medical records of patients with falls that were not accessible at the time of data analysis were excluded from the study. The non-probability convenience sampling method was

used to select the sample composed of 183 reports on 155 patients.

First, the Patient Fall notifications were analyzed regarding the patient's characterization data (age, gender) and fall risk assessment. Secondly, the clinical record was analyzed, and information on medications administered in the 24 hours before the fall incident was collected from the Integrated Medication Circuit Management System. Thirdly, medication-related fall risk was calculated using the MFRS scale (Table 1), developed by Beasley and Patatanian (2009) and recommended by the Agency for Healthcare Research and Quality (AHRQ). This study used the scale's Portuguese version published by ISMP Brazil (ISMP, 2017).

Table 1

Medication Fall Risk Score

Point value (risk level)	Drug class
3 (high)	Opioid analgesics, antipsychotics, anticonvulsants, benzodiazepines and other sedative-hypnotic drugs
2 (medium)	Antihypertensives, cardiac drugs, antiarrhythmics, antidepressants.
1 (low)	Diuretics

Source: Institute for Safe Medication Practices Brazil (ISMP, 2017) ISMP Medications Associated with Fall Risk Bulletin. Volume 6, Issue 1, February.

As recommended by the MFRS, the medications were scored according to their risk level. The score obtained in patients who used more than one medication of the same level was multiplied by the number of medications used. Patients with a level ≥ 6 are classified as "high risk," according to the cut-off point suggested by the scale's authors. Thus, this study classified the variable "high risk according to MFRS" as "yes" (score ≥ 6) or "no" (score ≤ 5).

The information regarding the study's variables of interest was organized in a datasheet using the Microsoft Office Excel 2010® program and later transferred to the IBM SPSS Statistics, version 20.0. Descriptive statistical analysis showed the results in absolute frequency (*n*) and relative frequency (%). The mean, median, standard deviation (SD), and minimum-maximum values are also presented for some variables.

This research project received a favorable opinion from the hospital center's Board of Directors after evaluation by the Health Ethics Committee and the Research Center, under internal opinion no. 1059/2021.

Results

In this study, 183 Patient Fall" notifications were analyzed regarding 155 patients who had a fall in the first quarter of 2021. It was found that 62 (33.9%) falls were documented in January, 56 (30.6%) in February, and 65 (35.5%) in March. Furthermore, 13.5% (21) of all notifications were of patients with more than one fall episode during their hospital stay in that first quarter.

In male patients, there was a higher frequency of fall incidents (68.4%; *n* = 106) compared to female patients (31.6%; *n* = 49). The mean age found was 73.51 years (*SD* ± 14.135). Patients aged ≥ 65 years accounted for 77.4% (*n* = 120) of falls, with individuals in the 80-89 years age group (31%) being the most affected.

As for the fall risk assessment collected from the fall incident notification record, "high-risk" patients accounted for 34.25% (*n* = 53). Those classified as "low-risk" accounted for 55.5% (*n* = 86), and "no risk" for 10.3% (*n* = 16; Table 2).

Table 2

Fall risk assessment categorization as documented in the "Patient Fall" notification (n = 155)

	n	%
Fall risk assessment		
No risk	16	10.3
Low risk	86	55.5
High risk	53	34.2

Note. *n* = Absolute frequency; % = Relative frequency.

Table 3 shows the results of the MFRS application. Of all patients, 60.6% (*n* = 94) were categorized as "yes" for "high risk" of falling. The mean calculated risk was 6.85 (*SD* ± 3.825), with the scores ranging from 0 and 18.

Table 3

Fall risk level according to the Medication Fall Risk Score (MFRS) (n = 155)

	n	%	Mean	Median	*SD*	Min-max
High risk, according to MFRS			6.85	6	3.825	0-18
Yes	94	60.6				
No	61	39.4				

Note. MFRS = *Medication Fall Risk Score*; *n* = Absolute frequency; % = Relative frequency, *SD* = Standard deviation; Min-max = Minimum and Maximum.

Table 4 shows that "low fall risk" and "no fall risk" patients totaled 65.8% in the fall risk assessment variable (*n* = 102). Of this part of the sample, 53.9% (*n* = 55) were classified as high risk by the MFRS. The mean calculated risk was 6.13 (*SD* ± 3.477), with the score ranging between 6 and 15.

Table 4

Risk level according to the Medication Fall Risk Score (MFRS) for the sample of patients identified as "no risk" and "low risk" by the fall risk assessment (n = 102)

	n	%	Mean	Median	*SD*	Min-max
High risk, according to MFRS						
Yes	55	53.9	6.13	6	3.477	6-15
No	47	46.1				

Note. MFRS = *Medication Fall Risk Score*; *n* = Absolute frequency; % = Relative frequency, *SD* = Standard deviation; Min-max = Minimum and Maximum.

Considering that prescription was reviewed in some patients with recurrent fall episodes, the pharmacotherapy analysis revealed that the most frequent drug classes were antihypertensives (23.0%; *n* = 106), antipsychotics (17.2%, *n* = 79), diuretics (13.7%, *n* = 63), antidepressants (13.5%, *n* = 62), and anticonvulsants (11.3%; *n* = 52), as shown by Table 5.

Table 5

Prescription drug classes as categorized by the Medication Fall Risk Score (MFRS)

	n	%
Drug classes		
Antihypertensives	106	23.0
Antipsychotics	79	17.2
Diuretics	63	13.7
Antidepressants	62	13.5
Anticonvulsants	52	11.3
Sedative-hypnotic drugs	39	8.5
Cardiac drugs	35	7.6
Opioid analgesics	22	4.8
Antiarrhythmics	2	0.4

Note. *n* = Absolute frequency; % = Relative frequency.

Table 6 presents the number of medications prescribed according to the MFRS. It was identified that 94.8% (*n* = 147) of patients used at least one medication associated with fall risk. Of those 147 patients, 33.5% (*n* = 52) were prescribed four or more medications. For patients with recurrent falls (*n* = 21), after the fall incident, 38.09% (*n* = 8) had their prescriptions reviewed with a reduction in the medications associated with fall risk. The item prescription review was not assessed for patients with evidence of a fall.

Table 6

Number of drugs prescribed as categorized by the Medication Fall Risk Score (MFRS)

	n	%
Number of drugs		
None	8	5.2
1	18	11.6
2	37	23.9
3	40	25.8
4 or more	52	33.5

Note. *n* = Absolute frequency; % = Relative frequency.

Discussion

This study observed a higher frequency of falls in patients aged ≥ 65 years (77.4%; *n* = 120) and in male patients (68.4%).

These results are corroborated by other studies (Costa-Dias et al., 2014; Michalcova et al., 2020; Sousa et al., 2018). In this sense, older patients present a natural aging process with some reduced capacities and physiological changes. Those with more fragile health conditions present a greater number of risk factors associated with comorbidities, so they need multiple treatments, take multiple medications, and stay longer in hospitals for treatment (ISMP, 2018; Michalcova et al., 2020; Sousa et al., 2018). Therefore, they may be more likely to fall, have a drug interaction, or have an adverse drug reaction.

Regarding the fall risk assessment documented in the "Patient Fall" incident, 65.8% (*n* = 102) of patients were identified as "no risk" or "low risk." When analyzing the risk associated with drug therapy, 53.9% (*n* = 55) of these same patients were classified with "yes" for "high-risk," according to the MFRS. These data indicate that the MFRS may be a complementary, helpful tool in identifying patients at high risk of falling. In the MFRS development study, Beasley & Patatanian showed that the application of this instrument decreased the number of falls, thus promoting a considerable improvement in patient safety (Beasley & Patatanian, 2009).

Another study that analyzed clinical information and the type of medication used by older people who had fallen at least once during hospitalization found that estimating the risk of falling without considering medication underestimates the actual risk of falls. The results indicated that 46% of patients, almost half of the sample, were classified as "medium risk," "low risk," or "no risk" for falls (Michalcova et al., 2020). Considering that, in this study, the MFRS was able to identify 60.6% (n = 94) of patients with high fall risk, the use of a fall risk assessment scale that includes medications and is complementary to other fall risk assessment tools may refine risk assessments, identifying patients who would benefit from specific clinical assessment regarding pharmacotherapy contributing to fall prevention.

Regarding pharmacotherapy, more potentially dangerous drug classes increase the risk of falling (Costa-Dias et al., 2014; Michalcova et al., 2020; Silva et al., 2019). This study evidenced that antihypertensives (drug class belonging to the cardiovascular system) and antipsychotics (drug class belonging to the central nervous system) were the most frequently prescribed, followed in descending order by diuretics, antidepressants, anticonvulsants, sedative-hypnotic drugs, cardiac drugs, opioid analgesics, and antiarrhythmics. Similar studies have concluded that the association of medication use with falls has been consistently reported, mainly for medications that act on the central nervous and cardiovascular systems, although the medications that increase the risk of falling have been presented in a different order (Costa-Dias et al., 2014; Michalcova et al., 2020; Silva et al., 2019). Therefore, we reinforce that certain medications have a significant risk for falls.

Knowing that some medications have a higher risk for falls and that polypharmacy can potentiate adverse effects, this study identified that 33.5% (*n* = 52) of the studied sample had four or more prescribed medications associated with the risk of falling. Previous studies on this theme have also proven that medications associated with the risk of falling are more likely to be prescribed along with multiple medications. That is, the greater the number of medications prescribed, the more likely it is that among them are prescribed medications associated with fall risk (Dhalwani et al., 2017; Silva et al., 2019).

One study highlights that as the number of prescribed medications associated with fall risk increases, so does the risk of falling with serious harm (Silva et al., 2019). A prescription review is recommended to decrease the risk of medication-related falls (ISMP, 2017). It is suggested that medication-related interventions be combined with other interventions, as fall incidents are multifactorial (Beunza-Sola et al., 2018). A systematic review study on the effectiveness of deprescribing medications associated with fall risk for incident prevention identified that optimizing pharmacotherapy by reviewing or completely deprescribing these medications has been a frequently used fall prevention strategy. However, their effectiveness could not be confirmed (Lee & Holbrook, 2017). The fact that medications are associated with other risk factors that potentiate patient falls increases the complexity of the analysis of this type of incident, making it necessary to conduct further studies on this topic.

Given this complexity, professionals in the area of healthcare quality and patient safety also indicate essential strategies for a safe healthcare practice: the promotion of an incident reporting culture that facilitates the detection, analysis, and follow-up of these events, thus allowing organizations and professionals to learn from them; feedback of the analysis of the incident to the reporting clinician and the professionals responsible for implementing the action plan, thus contributing to the prevention of new incidents (Pedroso et al., 2021).

This study has some limitations, such as the non-use of a probabilistic sample and a control group, which limits understanding the determinants for the type of adverse event studied. In addition, because this is a retrospective study, there was difficulty in collecting some data, which may underestimate the results. Another limitation is the use of the MFRS, which, despite being recommended by the AHRQ for fall prevention in hospital settings, needs to be validated appropriately in Portugal. Future studies should be developed to obtain a higher specificity and sensitivity of the application of the MFRS to promote safer care in hospital settings.

Conclusion

Falls in hospital settings and their consequences remain a significant public health problem and a major challenge for patient safety in the Portuguese health system. The results found in this study are in line with other investigations on this topic and are a small but essential step toward increasing safety in pharmacotherapy in hospitalized patients.

Using a medication-related fall risk assessment tool, such as the MFRS, with other fall risk assessment tools contributes to more effective detection of patients at high fall risk, allowing for safer medication practices and adverse event prevention.

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