

FALL AMONG HOSPITALIZED PATIENTS AND THE USE OF DRUGS THAT INCREASE THE RISK

Queda entre pacientes hospitalizados e o uso de medicamentos que potencializam o risco

Caída de pacientes hospitalizados y uso de fármacos que aumentan el riesgo

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ABSTRACT

Objectives: to estimate the prevalence and rate of falls in the study setting; describe the clinical-epidemiological profile of patients who suffered falls; estimate the odds ratio of falls among elderly and non-elderly patients who used central nervous system depressant medications, diuretics or both, compared to those who did not use these medications. **Method:** quantitative, cross-sectional study conducted in a medium-sized general hospital located in the city of Rio de Janeiro. **Results:** the prevalence of falls was 0.08% and the rate of falls was 1.11 per 1000 patient-days. Falls were more prevalent among elderly patients (70.76%). **Conclusion:** the results of this study suggest that managing the use of medications should be one of the strategies to be adopted for preventing falls in the hospital environment, especially in the elderly, and the involvement of the multidisciplinary team becomes essential to achieve this goal.

DESCRIPTORS: Fall accidents; Patient safety; Risk management.

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RESUMO

Objetivos: estimar a prevalência e o índice de quedas no cenário do estudo; descrever o perfil clínico-epidemiológico dos pacientes que sofreram queda; estimar a razão de chance de quedas entre os pacientes idosos e não idosos que fizeram uso de medicamentos depressores do sistema nervoso central, diuréticos ou ambos, comparado àqueles que não utilizaram esses medicamentos. **Método:** estudo quantitativo, transversal, realizado em um hospital geral de médio porte, localizado na cidade do Rio de Janeiro. **Resultados:** a prevalência de quedas foi de 0,08% e o índice de quedas foi de 1,11 por 1000 pacientes-dia. As quedas foram mais prevalentes entre os pacientes idosos (70,76%). **Conclusão:** os resultados desse estudo sugerem que o gerenciamento do uso de medicamentos deve ser uma das estratégias a serem adotadas para a prevenção de quedas no âmbito hospitalar, especialmente em idosos, e o envolvimento da equipe multidisciplinar torna-se imprescindível para o alcance desse objetivo.

DESCRITORES: Acidentes por quedas; Segurança do paciente; Gestão de riscos.

RESUMEN

Objetivos: estimar la prevalencia y la tasa de caídas en el ámbito del estudio; describir el perfil clínico-epidemiológico de los pacientes que sufrieron caídas; estimar la odds ratio de caídas entre los pacientes ancianos y no ancianos que utilizaron medicamentos depresores del sistema nervioso central, diuréticos o ambos, en comparación con los que no utilizaron estos medicamentos. **Método:** estudio cuantitativo, transversal, realizado en un hospital general de tamaño medio ubicado en la ciudad de Río de Janeiro. **Resultados:** la prevalencia de las caídas fue del 0,08% y la tasa de caídas fue de 1,11 por 1000 pacientes-día. Las caídas fueron más frecuentes entre los pacientes de edad avanzada (70,76%). **Conclusión:** los resultados de este estudio sugieren que el manejo del uso de la medicación debe ser una de las estrategias a adoptar para prevenir las caídas en el ámbito hospitalario, especialmente en los ancianos, y la implicación del equipo multidisciplinar se hace imprescindible para conseguir este objetivo.

DESCRIPTORES: Accidentes por quedas; Seguridad del paciente; Gestión de riesgos.

INTRODUCTION

Falls in hospitalized patients are an event that deserves much attention from healthcare teams in institutions around the world. The Ministry of Health (MOH) defines “fall” as the unintentional displacement of the body to a level below the initial position, caused by multifactorial circumstances, resulting or not in injury.¹

Falls are the most prevalent non-fatal injury event during hospitalization and can cause physical and/or psychological harm to patients, as well as increase length of stay and hospitalization costs. It has been documented in the literature for at least 15 years as an event that mostly affects elderly patients.¹⁻²

Hospitalization seems to increase the risk of falling, since patients are in unfamiliar environments, and commonly present risk factors that predispose them to the occurrence of the event, such as neurological, senile and orthopedic diseases, besides the use of multiple medications. Falls are associated with the occurrence of injuries in 30% to 50% of

the cases, and of these, between 6% and 44% are classified as severe injuries, which could potentially result in death.²⁻³

The rate of patient falls in hospitals in developed countries can vary from 3 to 5 per 1,000 patient-days. Each year, an estimated 700,000 to 1,000,000 people fall in hospitals in the United States.⁴ In England data from the National Reporting and Learning System, between 2015 and 2016; the rate was 5.9 falls per 1,000 patient-days in the period.^{2,4-5}

The MS recommends the use of the rate of falls [(no. of events / no. of patient-days)*1000] as one of the indicators for monitoring this incident, but the body does not establish a reference value adjusted to the reality of Brazil and that can be used by health institutions in the country.^{1,6}

Data from the National Health Surveillance Agency (ANVISA) from the System of Notifications in Health Surveillance (NOTIVISA) report that patient fall was the second most reported healthcare-related incident of specific cause in the year 2018, accounting for 11,372 notifications in Brazil of which, 0.13% resulted in death.⁷

Given the magnitude of this problem, a series of initiatives have been proposed worldwide. ANVISA and the Oswaldo Cruz Foundation (FIOCRUZ), proposed in 2013 a Falls Prevention Protocol as part of the National Program for Patient Safety, prepared together with the technical team of the Collaborating Center for Quality and Patient Safety (PROQUALIS), highlighting the importance of multicomponent prevention strategies that aim to ensure multiprofessional care.^{1,8}

Among the multiple risk factors associated with the occurrence of falls, advanced age requires the health team's attention, since about 30% of elderly people fall each year, and this rate increases to 40% among individuals older than 80 years. Some causal factors such as decreased balance, slow gait and short steps, low physical fitness, visual deficit, cognitive changes, polypharmacy, and the use of sedatives, hypnotics, and anxiolytics are worth mentioning.⁹

The use of certain classes of medications, especially in elderly individuals, must therefore be considered in the stratification of the risk of falls. Thus, the question of this research was defined as follows: what is the magnitude of the effect of exposure of hospitalized patients to CNS depressant medications and diuretics, and the chance of falls?

The objectives of the research were to estimate the prevalence and the rate of falls during the period of stay in the study setting; to describe the clinical-epidemiological profile of patients who suffered falls; to estimate the odds ratio (OR) of falls among elderly and non-elderly patients who had used CNS depressant drugs, diuretics or both. (NC), diuretics or both, compared to those who did not use these drugs.

The study is justified by the urgent need to define measures to be adopted to reduce the rate of falls in hospitalized patients, considering the multifactorial character of this event and the local context of the health service. Therefore, knowing the prevalence of the event and the clinical and epidemiological profile of patients who suffer falls should be the basis for the definition of effective prevention strategies.

METHOD

The method is quantitative, designed as a cross-sectional study. The study population was composed of patients who remained in care at the hospital for at least 12 hours. The sample was defined by convenience and composed of adult patients aged 18 years or older, with no upper limit, who suffered a fall during the period they were being assisted in the different inpatient units of the hospital in which the study was developed. For the purposes of age group classification, individuals aged 60 years or older were considered elderly.

The study setting was a medium-sized general hospital, located in the city of Rio de Janeiro and linked to the network of federal hospitals of the Ministry of Health. Data were obtained retrospectively from a database of the hospital's NSP, prepared from the investigation of patient falls notified to Risk Management, in the period from January 2017 to May 2018. Only the information obtained from the medical records was extracted. The total number of hospitalizations and number of patient-days were made available by the statistics sector of the Unit.

The variables of interest were: age, gender, medical diagnosis, days of stay until the fall occurred, unit/sector of hospitalization, shift in which the fall occurred, and use of risk medications in the 24 hours prior to the event (diuretics and CNS depressants). Of these classes of drugs, their main representatives were tracked according to the historical consumption of the Unit; among the diuretics: spironolactone and furosemide, among the CNS depressants: clonazepam, diazepam, phenobarbital, and tramadol.

Descriptive statistics were used to describe the distribution of variables, using measures of central tendency and dispersion. Analytical statistics was used to estimate the prevalence and the odds ratio of falls.

To calculate the prevalence of falls, we considered the total of admissions in the period, in all inpatient units, including emergency and intensive care units, except pediatric inpatient units. The rate of falls was calculated according to the MH recommendation: $[(\text{no. of events} / \text{no. of patient-days}) * 1000]$.

The odds ratio (OR) of falls was estimated among the 62 patients who suffered the event, considering the age group, represented in this study by two groups (elderly and non-elderly) and the exposure (use) or not to CNS depressant drugs, diuretics or both classes of drugs. In this study, both age group and the use of one or both of these classes of medications were considered risk factors for falling.

The data were analyzed using the statistical software R, and the results were presented as graphs. The study protocol was approved by the Research Ethics Committee of the proponent institution (CAAE 90395518.0.0000.8066).

RESULTS

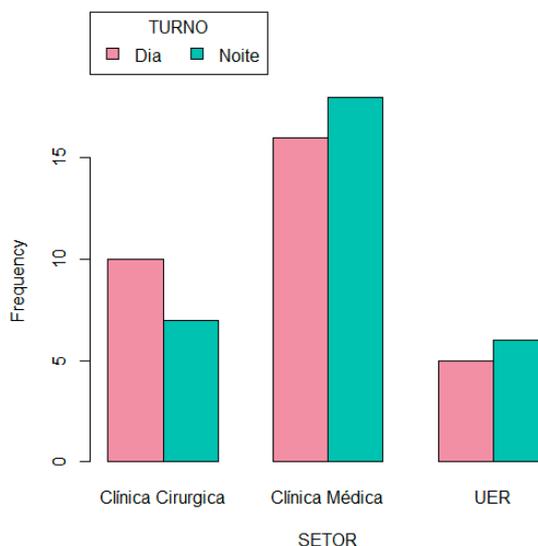
In the period from January 2017 to the first half of May 2018, 7,293 adult patients were admitted to the hospital, who remained in the different inpatient units, for at least 12 hours. During this period, 62 patients suffered falls, which represents

a prevalence of 0.08% of falls in the analyzed period. The rate of falls was 1.11 per 1000 patient-days.

Of the patients who suffered falls, 21 were female and 41 were male. Falls were more prevalent among elderly patients (70.76%) and the mean age was 63.82 years. Skin and subcutaneous tissue diseases (11.29%), circulatory system (14.52%), neoplasms (22.58%) and diseases of the genitourinary system (25.81%) were the most prevalent among the 62 individuals who comprised the sample.

Considering the absolute frequency of falls per admission unit, it was found that the clinical inpatient unit was the sector with the highest prevalence of falls (54.8%), with 34 events, followed by the surgical inpatient unit, with 17 events (27.4%) and by the emergency referred unit (ERU), with 11 events (17.7%).

Figure 1 - Distribution of falls according to the shift and the inpatient unit where they occurred.



Source: The authors with the help of the statistical software R.

As for the shift in which the event occurred, there was no difference in the overall compilation, registering 31 falls per period (daytime/nighttime). However, although with a small difference in absolute numbers, falls in the night shift prevailed in the clinical inpatient unit and EBU.

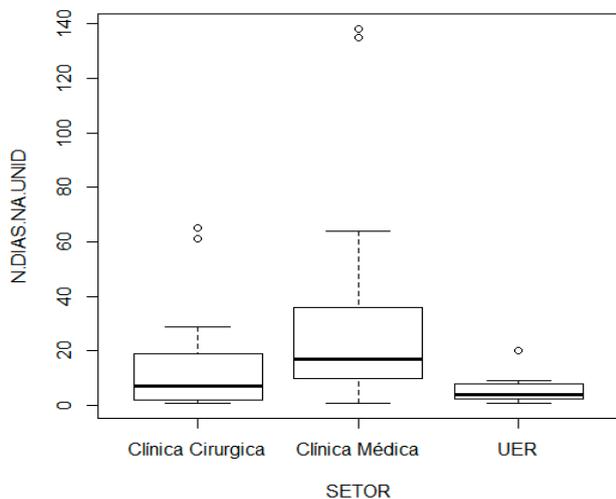
The median number of days of stay until the occurrence of the fall, considering the three units analyzed, was 10.50 days (IQR= 19.5). It was found that 25% of patients had a fall up to 3.25 days of stay (1st quartile) and other 25% (3rd quartile) with 22.75 days or more. The range was 134 days of stay (minimum of 1 day and maximum of 135 days).

The medians of the number of days the patient stayed in each of the units until the fall occurred were 7 days (IQR= 17), 17 days (IQR = 24.75) and 4 days (IQR= 5.50), for the surgical inpatient unit, clinical inpatient unit and EBU, respectively.

It was found that 25% of the patients who fell in the surgical admission unit had up to 2 days of stay in the sector, and those who fell in the clinical admission unit had up to 10.25 days (25%). In the EBU, 25% of the patients who had a fall had up to 2.50 days of hospitalization in the sector.

The 3rd quartile revealed that 25% of patients suffered falls from the 19th, 35th and 8th day of stay in the respective units.

Figure 2 - Distribution of falls among inpatient units according to length of stay and number of days until the occurrence of the event.



Source: The authors with the help of the statistical software R.

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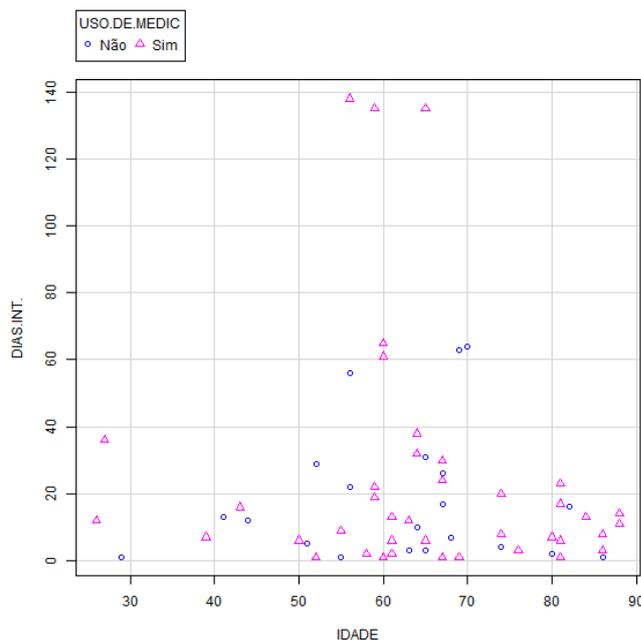
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These findings suggest that the first 20 days of hospitalization are critical for the occurrence of falls among elderly individuals. In this age group, 20 falls were recorded among patients who used risk medications compared to 9 falls among individuals who did not use these medications.

Figure 3 - distribution of falls according to age, number of days in the unit, and use of risk medications.



Source: The authors with the help of the statistical software R.

The chance of falls in the group of elderly patients was 3.81 times higher (OR 3.81; 95% CI 1.81 - 8.02) than in the group aged less than 60 years, with statistical significance ($p= 0.0004$). Although without statistical significance, patients who used risk medications were 1.62 times more likely to fall in the elderly patient group (OR 1.62; 95% CI 0.55 - 4.79) when compared to those who did not use these medications ($p= 0.39$).

The use of CNS depressant drugs alone was associated with a 1.77-fold increase in the chance of falls in the group of elderly patients, when compared to those younger than 60 years old (OR 1.77; 95% CI 0.57 - 5.50). The use of diuretics appeared to protect patients aged 60 years and older (OR 0.66; 95% CI 0.18 - 2.40), but all estimates were not statistically significant ($p= 0.53$).

When both classes of risk medications are used by elderly patients, the chance of falls may be 2.16 times higher in this group than in the group of patients aged less than 60 years (OR 2.16; 95% CI 0.23 - 20.67), but without statistical significance ($P= 0.50$).

DISCUSSION

A systematic review based on analytical observational studies conducted in Brazil showed that the use of some medications by the elderly, especially diuretics and benzodiazepines, represents a potential risk factor for falls. Thus, even though no association was observed in this study at p -value level, it is important to consider the clinical significance and the negative outcomes eventually caused by the use of these medications, especially in the elderly population.¹⁰

From this perspective, several studies show that certain classes of drugs are associated with a significant increase in the risk of falls in patients and are called “fall-risk increasing drugs” or FRID. These drugs can cause a series of effects in patients, such as orthostatic hypotension, cognitive dysfunction, balance disorders, dizziness, drowsiness, motor dysfunction, and visual alterations, potentiating and inducing the occurrence of falls.¹¹

It is also possible that medications contribute even indirectly with falls, as is the case of the diuretic class, due to polyuria (especially if it also causes nycturia) expected during the administration of these medications.¹²⁻¹³

In a systematic review on the subject, the authors found a significant correlation between patient falls and nine classes of medications: antihypertensives, diuretics, beta blockers, sedatives/hypnotics, neuroleptic/antipsychotics, antidepressants, benzodiazepines, narcotics/analgesics, and nonsteroidal anti-inflammatory drugs (NSAIDs). This study expanded an initial list of drugs already presented in 1999, updating it using Bayesian statistical methods.¹⁴

At the time, the researchers demonstrated that patients using sedatives/hypnotics, antidepressants, and benzodiazepines had an increased risk of experiencing falls. However, it is unclear whether the occurrence of falls is actually related to the use of these medications or to the medical conditions whose medications they are treating.¹⁵

The rate of falls found in the present study (1.11) was lower than those found in international studies, which vary between 3 and 5 per 1,000 patient-days.¹⁻² It is also lower than the Brazilian studies carried out in a specialized cardiology hospital and university hospital that found rates of 2.04 and 1.7 falls per 1,000 patient-days, respectively.^{6,16}

However, due to the heterogeneity of these studies and the scarcity of multicenter and more comprehensive data in the Brazilian scenario, a more in-depth comparative analysis of these results is not feasible. We emphasize, however, that the culture of reporting falls is well disseminated in the healthcare institution where the study was carried out. Thus, we believe that although the data regarding the number of falls were obtained from voluntary notifications, the underreporting of the event was minimal. Furthermore, some measures to mitigate the occurrence of falls (such as fall risk assessment, use of visual alerts and education of patients/assistants) were previously adopted in the institution, which can justify the rate below those mentioned in the aforementioned studies.

Although the prevalence of falls estimated in this study may also seem low (0.08%), the event was more prevalent among elderly patients (70.76%), a fact that deserves the health team's attention, since the consequences of falls in aged individuals tend to be more severe.

The findings of this study also reveal that the estimated chance of falling among patients aged 60 years or more can be on average, 8 times higher than the chance of falling in the non-elderly group, with huge statistical significance at the p-value level ($P=0.0004$).

Such results corroborate other studies that suggest an association between advanced age and the occurrence of falls. In this sense, considering that falling is an event of

multifactorial causes, it seems reasonable to think that the hospitalization of elderly individuals associated with the use of multiple medications can amplify this risk; especially when these patients are submitted to the use of sedative, hypnotic and anxiolytic drugs.^{1,9,13,18-19}

Even though there is no statistical significance that would allow us to state that there is an association, in p-value level, between the use of risk drugs analyzed in this study and the chance of falling among elderly patients, it was found that, although in the best scenario these drugs may act as a protective factor for the risk of falling among the elderly, in the worst scenario, they may increase more than 4 times the chance of falling in this group (OR 1.62; 95% CI 0.55 - 4.79 / $P=0.39$).

The results of the study suggest that CNS depressant medications may increase the chance of falling by 1.77 times in the elderly group when compared to those aged less than 60 years without statistical significance (OR 1.77; 95% CI 0.57 - 5.50). The association between the use of this class of drugs and the occurrence of falls is well established in the literature, and involves both elderly and non-elderly individuals, hospitalized or not.

Due to effects such as dizziness, sedation, postural disorders, altered gait and balance, and cognitive deficit, the use of CNS-acting drugs must be considered a potential risk factor for falling.^{1,13,20}

A recent systematic review with meta-analysis found a significant association between antipsychotics, antidepressants and benzodiazepines and increased risk of falls in the elderly, data that corroborate the findings of this study.¹⁹

Interestingly, even assuming that there is no statistical significance that allows us to state that diuretics protect elderly patients from falls ($P=0.53$), the study showed that the use of drugs of this class can act as a protective factor, reducing, on average, 34% the relative risk (RR), if we admit an “elegant” approximation of the mean OR estimated in the study (OR 0.66), of the RR.

The association between the use of diuretics and the occurrence of falls does not seem to be fully elucidated. Increased urinary frequency, especially when associated with urinary urgency and nocturia seem to justify this relationship for many authors and reference organizations. However, a large cross-sectional study carried out among the elderly population in Sweden found no association between the use of diuretics or other drugs that act on the cardiovascular system and the falls that occurred. Other studies suggest an association only between loop diuretics and the occurrence of falls - thiazide diuretics were not associated with the events in the populations studied.^{1,11-13,20-22}

In the present study, we understand that the fact that the chance of falling was lower in elderly patients taking diuretics alone (when compared to non-elderly patients) may be related to the fact that the use of diapers, urine collectors (“ducky” or “comadre” type), or condom-type devices to eliminate diuresis was chosen, without necessarily requiring these individuals to go to the bathroom.

Thus, the possible protection related to the use of diuretics and the occurrence of falls evidenced in this study cannot be

analyzed in isolation, much less be considered as something positive. For in the worst case scenario, considering the OR approximation with RR, the use of diuretics can increase by 140% the probability of falls among the elderly, when compared to the non-elderly. CNS depressant drugs, on the other hand, can increase this probability by up to 379%.

Therefore, both classes of drugs deserve attention when aiming to reduce the occurrence of falls, particularly among elderly patients, especially when these drugs are used concomitantly. In this case, the chance of falling may be 20 times higher in elderly patients (OR 2.16; 95% CI 0.23 - 20.67 P= 0.50).

Regarding the gender variable, the prevalence of falls was higher among male patients, a finding which is in line with studies developed in Brazilian hospitals, which indicate a higher prevalence of falls among male patients, ranging from 57.5% to 59.7%. The authors attribute this to the fact that male patients are more resistant to ask for help with activities of daily living, and considering that in nursing there is a predominance of female professionals, this reluctance can be accentuated.^{16,23}

Another fact that the study seems to reveal is that the inpatient unit was the sector of the hospital where falls were most prevalent, with a rate of 54.8% (34 events). This may be explained by the clinical condition of the patients in this unit: elderly patients, with the most varied types of diagnoses and comorbidities, and consequent use of multiple medications.

A study conducted in a Brazilian university hospital found similar results, with a predominance of falls in the clinical wards (26.2% of total falls). These results are confirmed by another study carried out in a university hospital in the south of the country, which showed a higher prevalence of the nursing diagnosis "risk of falling" in the clinical inpatient unit (63.2%).^{23,24}

Length of stay and occurrence of falls are variables that also deserve to be highlighted in this study, because their relationship may represent an extremely important clue for stratification of the risk of falls in the hospital environment. In the case of elderly patients, one must consider the institutional vulnerability to which this population is exposed, which associated to the biological/individual vulnerability (risk factors associated with aging), can contribute to the occurrence of the event in the hospital environment. The lack of information and the low interaction of healthcare professionals with the companions/caregivers and the elderly themselves can reinforce this vulnerability, favoring falls.²⁵

The findings of this survey show that in the population studied 67.74% of the falls occurred in the first 20 days of stay (n=42), which is in accordance with what is described in literature regarding the higher risk of falling in the first days of stay, since patients are in unfamiliar environments.^{1,2} Considering the specificities of Brazilian hospitals and ratifying the results of the present study, a survey carried out at a university hospital disclosed that 61.7% of the recorded falls occurred in the first 5 days; another study carried out at a public hospital specialized in cardiology, showed that falls of patients were predominant in the first 30 days of stay (58.2%).^{16,23}

The study data draw our attention to the 25% of falls that occurred just over 72 hours after admission, with a median of 10.50 days (IQR= 19.5). However, when it comes to the clinical inpatient unit, falls start happening, in 50% of the cases, around the 17th day of hospitalization, twice as long as in the surgical inpatient unit (7 days) and four times longer than in the EBU (4 days), which makes us reflect on the need to use different parameters to guide fall prevention actions in these units throughout the hospitalization period.

CONCLUSION

This research was an opportunity to understand a little more about the factors associated with falls among inpatients of the healthcare institution analyzed in this study.

The results reaffirm the need to consider the association of the variables age (≥ 60 years) and the use of CNS depressant and/or diuretic drugs as factors that may increase the chance of falls during hospitalization.

Even though it is not possible, at a P= 0.05 level, to state that there is an association between these variables and the outcome studied, it is noteworthy that, although in the best scenario (OR 0.55) these drugs can act as a protective factor, preventing falls, in the worst scenario (OR 4.79), they can increase more than 4 times the chance of falls. When used concomitantly (CNS depressant drugs and diuretics), the chance of falls can be up to 5 times higher than when used alone (OR 20.67).

Therefore, the results of this study suggest that the management of the use of these drugs must be one of the strategies to be adopted for the prevention of falls in the hospital environment, especially in the elderly, and the involvement of the multidisciplinary team becomes essential to achieve this goal.

As limitations of the study, we must highlight the impossibility of comparing patients who suffered falls with those who did not, making it impossible to estimate the relative risk of falling among patients exposed and not exposed to the risk factors analyzed in this study.

Another limitation refers to the impossibility of expanding the diversity of drugs screened within the therapeutic classes researched. We emphasize that extrapolation of these results must be carried out with caution, even if by other sectors of the study setting.

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