

Risk of falls in the elderly and the relationship with drug interactions

Risco de quedas na pessoa idosa e a relação com interações medicamentosas

Riesgo de caídas en personas mayores y su relación con las interacciones medicamentosas

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ABSTRACT

Objective: to evaluate the risk of falls in the elderly and the relationship with drug interactions. **Method:** a cross-sectional study with 117 elderly individuals conducted in an outpatient clinic in São Paulo between March and November 2019. Data collection was carried out through interviews using a sociodemographic and clinical questionnaire, along with the Fall Risk Score scale. Drug interactions were checked using the Drugs.com database. To compare the frequency of fall risk with drug interactions, the Likelihood Ratio and Fisher's Exact Test ($p \leq 0.05$) were applied. The Forward selection method was used to verify the simple and multiple regression models, with a 95% confidence interval. **Results:** elderly individuals had an 88% ($p=0.0488$) risk of falls in relation to mild drug interactions and a 90% ($p<0.0001$) risk of falls in relation to moderate drug interactions. Fall risk showed a stronger association with the moderate category of drug interactions ($p=0.0001$). **Conclusion:** the risk of falls was highly associated with moderate drug interactions. Therefore, it is essential to focus on adjusting drug therapy and organizing prescriptions to minimize adverse reactions.

Descriptors: *Accidental Falls; Drug Interactions; Drug Utilization; Aging; Health of the Elderly.*

RESUMO

Objetivo: avaliar o risco de quedas na pessoa idosa e a relação com interações medicamentosas.

Método: estudo transversal com 117 idosos conduzido em um ambulatório na cidade de São Paulo entre março e novembro de 2019. A obtenção dos dados ocorreu por meio de entrevista com aplicação de um formulário sociodemográfico e clínico, além da escala de risco de queda (Fall Risk Score). As interações medicamentosas foram verificadas pela base de dados *Drugs.com*. Para comparar as frequências do risco de quedas com as interações medicamentosas, aplicou-se teste da Razão de Verossimilhança e Exato de Fisher ($p \leq 0,05$). Para verificar o modelo de regressão simples e múltipla, utilizou-se método de seleção Forward, com intervalo de confiança de 95%. **Resultados:** a pessoa idosa possui 88% ($p=0,0488$) de risco de quedas em relação às interações medicamentosas na categoria leve, e 90% ($p<0,0001$) de risco de quedas em relação às interações medicamentosas moderadas. O risco de quedas apresentou melhor associação com a categoria moderada das interações medicamentosas ($p=0,0001$). **Conclusão:** o risco de quedas apresentou alta probabilidade em relação às interações medicamentosas na categoria moderada. É importante, pois, direcionar cuidados para adequar a terapêutica medicamentosa e organizar a prescrição dos fármacos de forma a reduzir as reações adversas.

Descritores: *Acidentes por Quedas; Interações Medicamentosas; Uso de Medicamentos; Envelhecimento; Saúde do Idoso.*

RESUMEN

Objetivo: evaluar el riesgo de caídas en las personas mayores y su relación con las interacciones medicamentosas. **Método:** estudio transversal con 117 personas mayores realizado en un ambulatorio en la ciudad de São Paulo entre marzo y noviembre de 2019. La obtención de datos se llevó a cabo mediante entrevistas con la aplicación de un formulario sociodemográfico y clínico, además de la escala de riesgo de caída (Fall Risk Score). Las interacciones medicamentosas se verificaron a través de la base de datos *Drugs.com*. Para comparar las frecuencias del riesgo de caídas con las interacciones medicamentosas, se aplicaron la prueba de Razón de Verosimilitud y la prueba Exacta de Fisher ($p \leq 0,05$). Para verificar el modelo de regresión simple y múltiple, se utilizó el método de selección Forward, con un intervalo de confianza del 95%. **Resultados:** las personas mayores tienen un 88% ($p=0,0488$) de riesgo de caídas en relación con las interacciones medicamentosas en la categoría leve y un 90% ($p<0,0001$) de riesgo de caídas en relación con las interacciones medicamentosas moderadas. El riesgo de caídas presentó una mejor asociación con la categoría moderada de las interacciones medicamentosas ($p=0,0001$). **Conclusión:** el riesgo de caídas mostró una alta probabilidad en relación con las interacciones medicamentosas en la categoría moderada. Por lo tanto, es importante dirigir los cuidados hacia la adecuación de la terapia medicamentosa y la organización de la prescripción de los fármacos para reducir las reacciones adversas.

Descriptores: *Accidentes por Caídas; Interacciones Farmacológicas; Utilización de Medicamentos; Envejecimiento; Salud del Anciano.*

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Introduction

The epidemiological transition associated with an aging population will be one of Brazil's main challenges, since Chronic Non-Communicable Diseases (NCDs) are often related to physical and cognitive disabilities. Circulatory diseases are responsible for 72% of deaths, especially Systemic Arterial Hypertension (SAH), cancer, Type 2 Diabetes Mellitus (DM2), and chronic respiratory diseases. NCDs can cause disability and increase dependence for carrying out daily activities.¹⁻³

The presence of chronic conditions associated with geriatric syndromes and the occurrence of falls among the elderly population can result in severe functional dependencies due to the physiological changes of aging. As a result, this population needs medication to control morbidities, maintain health and improve quality of life.⁴

Worldwide guidelines define falls as unexpected events in which an individual comes to rest on the ground, floor or lower level. Recurrent falls are characterized by occurring in the last 12 months when no apparent cause has been found; unexplained falls are those which, when carrying out a multifactorial falls risk assessment, cannot be explained by a failure to adapt to an environmental hazard or by any other gait or balance abnormality, with injuries serious enough to require a visit to a doctor.⁴

Severe falls result in the person lying on the ground unable to get up for at least one hour, requiring emergency room care, including hospitalization, associated with loss of consciousness or an injury incurred after a fall, such as fractures or sprains.⁴

The intrinsic factors associated with falls are physiological changes such as aging, frailty, gender, age, the effects of medication, and morbidities; the extrinsic factors are environmental lighting, sedentary behavior, the use of walking aids, furniture in the room or bathroom, and building structures.^{4,5}

The risk of falls in the elderly is associated with the daily use of medication and can result in Adverse Drug Reactions (ADRs), such as low adherence to proper treatment, inadequate dosages, or the identification of situations that impede the use of medication or the occurrence of Drug Interactions (DIs). The side effects of medication that are closely related to the risk of falling can be signs and symptoms of arrhythmias, postural hypotension, muscle weakness and dizziness, as well as reduced alertness and changes in the psychomotor function.⁵⁻⁷

The use of multiple medications is related to increased life expectancy, the control of morbidities such as SAH and DM2, and the management of health conditions. Therefore, the appropriate combination of various drugs based on the evidence found in the literature can reduce damage to health, control morbidities, increase life expectancy and improve

quality of life. However, some drug therapies are inappropriate and can cause ADRs, a harmful or undesirable and unintended effect when used in dosages for prevention, diagnosis and treatment.⁵⁻⁷

DIs are defined as a pharmacological or clinical reaction to the administration of a combination of drugs, which can occur between the use of one drug and another, and/or with food. These interactions interfere at the same or a similar receptor site and produce a greater effect (additive or synergistic) or a diminished effect (antagonistic), which makes it possible for unpredictable effects to occur in treatment. Thus, DIs can have favorable or unfavorable effects on the patient's health. Beneficial effects are generally those expected to help with pharmacological treatment, controlling morbidities; however, when harmful events occur, they can compromise the patient's health.⁸

Pharmacokinetic interactions can occur when one or more drugs affect the absorption, distribution, metabolism or excretion of other drugs. Regarding absorption, some drugs can alter the absorption of other drugs into the bloodstream; the distribution occurs through the interaction of proteins between two or more drugs that compete for a limited number of binding sites on plasma proteins; and the metabolism of drugs is often affected by metabolites of enzymes in the liver that dissolve the drugs to be eliminated from the body. However, enzyme levels can increase or decrease and influence the way drugs are broken down. The excretion of medicines can cause damage to kidney function or the elimination of certain drugs.⁸

DIs can be classified as severe when they present an imminent risk of death to the patient or require medical intervention to mitigate or prevent adverse reactions; moderate, when they result in a worsening of the patient's health condition or require changes in pharmacotherapy; and mild, when they result in limited clinical effects, which may include an increase in the frequency or severity of side effects, but generally do not require changes in pharmacotherapy.⁹

Therefore, research has identified a high frequency of drug prescriptions and drug interactions among elderly people in the community or at hospital discharge, making it clear that there is a need for an approach that guarantees safe drug therapy for those patients, especially in relation to drugs and drug interactions associated with the risk of falls and their aggravating factors.^{6,7}

Shared decision-making is the result of implementing strategies supported by health education for older people, their families and health professionals, taking into account particularities such as frailty, polypharmacy, DIs, morbidities, life expectancy, individual preferences, and other geriatric syndromes. It is highly recommended to review or reconcile

medications and indicate Fall Risk-Increasing Drugs (FRIDs) that help prevent falls.¹⁰

Thus, investigating the risk of falls in relation to DIs among elderly people attending an outpatient clinic in the city of São Paulo is relevant as it contributes to the definition and development of strategies focusing on fall prevention and the clinical management of drug interactions and their side effects.

From the above, the objective is to evaluate the risk of falls in the elderly person and the relationship with drug interactions.

Method

The study was approved by the Research Ethics Committee of the Federal University of São Paulo (UNIFESP) through opinion 3.165.580. It complied with the standards of Resolution 466/12 of the National Health Council (CNS).¹¹

This is a cross-sectional, descriptive study with a quantitative approach, following the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).¹² The non-probabilistic, convenience sample included 117 elderly individuals treated at the Elderly Medical Specialty Outpatient Clinic located in the Southeast region of São Paulo – SP, between March and November 2019.

Elderly individuals over 60 years of age who were able to understand and respond to the form and the scale applied in the research were included. The sociodemographic and clinical forms and the Fall Risk Score (FRS) scale were applied through an interview.

The FRS fall risk scale, created by Downton and made publicly available in 1993¹³, was translated in Brazil by Schiaveto (2008). It uses five criteria to assess the risk of falls in the elderly: history of previous falls, use of medication, presence of sensory deficits, mental status assessment, and gait assessment. The instrument's score ranges from 0 to 11, and an elderly person is classified as at risk of falling when they score 3 or more. In this study, elderly individuals who scored 0 to 2 were considered not at risk of falling, while those who scored 3 or more were considered at risk of falling.^{13,14}

To assess the elderly individual's mental status, the Mini-Mental State Examination (MMSE) developed by Folstein et al. (1975)¹⁵ was applied. It was translated and published by Bertolucci et al. (1994)¹⁶ and is commonly used alone or incorporated into broader instruments, allowing for cognitive function assessment and screening for neurodegenerative diseases.

The MMSE consists of several questions typically grouped into seven categories, each designed to assess specific cognitive "functions": temporal orientation (5 points), spatial orientation (5 points), registration of three words (3 points), attention and calculation

(5 points), recall of the three words (3 points), language (8 points), and visual constructive ability (1 point).

Due to the well-known influence of education level on total MMSE scores, this study used the cutoff scores proposed by Brucki et al. (2003): 20 points for illiterates, 25 points for individuals with one to four years of education, 26.5 points for five to eight years, 28 points for nine to eleven years, and 29 points for more than 11 years of schooling.

Drug interactions (DIs) were analyzed using the *Drugs.com* database by comparing medications and generating a list of DIs. These interactions were classified based on their potential impact as severe, moderate, mild, and no interaction.⁹ Severe DIs are classified as life-threatening and require medical intervention to minimize or prevent adverse reactions. Moderate DIs are considered significant due to the severity of the patient's condition and/or the need for treatment adjustments. Mild DIs result in limited clinical effects, such as increased frequency or severity of side effects, but generally do not require changes in pharmacotherapy.⁹

The variables analyzed included age (in years), sex (male and female), marital status (married, single, divorced, widowed), education level (years of schooling), household income (in minimum wage equivalents), number of medications used daily, drug classes, and DIs classified as mild, moderate, and severe. These were analyzed using descriptive statistics, presenting frequencies and percentages. Data were stored in an electronic spreadsheet using Microsoft Office 2016 Excel®. The software used for statistical analysis was the Statistical Package for the Social Sciences (SPSS), version 19.

To analyze the correlation between FRS scores and mild, moderate, or severe DIs, the Likelihood Ratio Test and Fisher's Exact Test were used, with a significance level of 5% ($p \leq 0.05$). Simple and multiple regression models between FRS and DIs were used to identify the set of independent variables that best explained the risk of falls. The Forward selection method was adopted, considering a 95% confidence interval.

Results

A total of 117 elderly individuals participated in the study, with a mean age of 71.5 years. Among them, 108 (92.3%) were female, and 44 (37.6%) were widows. The average years of education among the elderly was six years, corresponding to incomplete elementary school. A total of 94 (80.3%) were retired or pensioners, with a household income of 1.85 times the minimum wage. Regarding fall risk, 93 (79.5%) elderly individuals were considered at risk of falling.

The number of medications used by the participants ranged from 2 to 17, with a daily average of 6 drugs. The most commonly used drug classes were antihypertensives, with 85 (72.6%) using them, followed by 66 (56.4%) who used statins, 53 (45.3%) who used analgesics, and 42 (35.9%) who used oral antidiabetic medications and insulin. In terms of treatment adherence, 52 (44.4%) showed low to moderate adherence to pharmacotherapy in each category.

A total of 675 drugs (tablets, capsules, or pills) were included in the study, with antihypertensives being the most commonly used (130, 19.3%), followed by analgesics, anti-inflammatories, and muscle relaxants (86, 12.7%). Next were oral antidiabetic medications (79, 11.7%), statins (69, 10.2%), diuretics (48, 7.1%), proton pump inhibitors and gastroprokinetics (35, 5.1%), and antiplatelet agents (35, 5.1%). The total number of thyroid hormone tablets was 32 (4.7%), while antidepressants and benzodiazepines accounted for 27 (4%).

After analysis using the Drugs.com database, 491 drug interactions (DIs) were identified, of which 26 (5.3%) were classified as severe, 381 (77.6%) as moderate, 84 (17.1%) as mild, and 30 prescriptions showed no interactions (Table 1). Among the DIs, 7 (6%) patients had mild interactions, 58 (49.6%) had moderate interactions, 22 (18.8%) had severe interactions, and 30 (25.6%) had no interactions (Table 2).

Table - Distribution of the frequencies of drug interactions in the mild, moderate and severe categories of elderly people treated at a Specialty Medical Outpatient Clinic for the Elderly in the Southeastern region of the city of São Paulo (SP). São Paulo (SP), Brazil, 2019.

Drug Interactions	Total	
	N	%
Mild	84	17,1
Moderate	381	77,6
Severe	26	5,3
Total	491	100

Table 2 - Distribution of the frequencies of drug interactions in the mild, moderate and severe categories of elderly people treated at a Specialty Medical Outpatient Clinic for the Elderly in the Southeastern region of the city of São Paulo (SP). São Paulo (SP), Brazil, 2019.

Drug Interactions	Total	
	N	%
No DI*	30	25,6
Severe	22	18,8
Moderate	58	49,6
Mild	7	6,0
Total of patients	117	100

Mild DI*		
Yes	50	42,7
No	67	57,3
Total of patients	117	100
Moderate DI*		
Yes	80	68,4
No	37	31,6
Total of patients	117	100
Severe DI*		
Yes	20	17,1
No	97	82,9
Total of patients	117	100

*DI: Drug Interaction

Table 3 shows the correlation between the frequencies of risk of falls and DIs in the mild, moderate and severe categories. Elderly patients have a risk of falls in relation to total DIs ($p=0.0006$), with 88% ($p=0.0488$) having mild DIs and 90% ($p<0.0001$) having moderate DIs.

Table 3 - Correlation of the frequencies between the risk of falls and drug interactions in the mild, moderate and severe categories of elderly people treated at a Specialty Medical Outpatient Clinic for the Elderly in the Southeastern region of the city of São Paulo. São Paulo (SP), Brazil, 2019.

Variables	FRS [†]						p-value
	No risk of falling		High risk of falling		Total		
DI*	N	%	N	%	N	%	
No DI*	14	46,7	16	53,3	30	100	0,0006‡
Mild	2	28,6	5	71,4	7	100	
Moderate	5	8,6	53	91,4	58	100	
Severe	3	13,6	19	86,4	22	100	
Mild DI*							
Yes	6	12,0	44	88,0	50	100	0,0488§
No	18	26,9	49	73,1	67	100	
Moderate DI*							
Yes	8	10,0	72	90,0	80	100	<0,0001§
No	16	43,2	21	56,8	37	100	
Severe DI*							
Yes	2	10,0	18	90,0	20	100	0,3599§
No	22	22,7	75	77,3	97	100	

*DI: Drug Interaction; [†]FRS: Fall Risk Score; [‡] Likelihood Ratio Test; [§] Fisher's Exact Test

Elderly people at risk of falls were 6,86 times ($p=0.0001$) more likely to have moderate DIs. The risk of falls among the survey participants and the relationship with moderate DIs is the variable that best explains the risk of older people falling ($p=0,0001$). (Table 4)

Table 4 - Simple and multiple regression model of the risk of falls in relation to drug interactions in the mild, moderate and severe categories of elderly people treated at a Specialty Medical Outpatient Clinic for the Elderly in the Southeastern region of the city of São Paulo (SP). São Paulo (SP), Brazil, 2019.

Variables	Estimate	p-value	CI ^{II} by 95%
Mild DI* (Yes vs No)	0,99	0,0544	[0,98; 7,4]
Moderate DI* (Yes vs No)	1,93	0,0001	[2,6; 18,2]
Severe DI* (Yes vs No)	0,97	0,2155	[0,6; 12,3]
Constant	0,27	0,4125	
Moderate DI* (Yes vs No)	1,93	0,0001	[2,6; 18,2]

*DI: Drug Interaction; ^{II}CI: Confidence Interval

Discussion

Elderly individuals were at risk of falling when identified with drug interactions (DIs) in the mild or moderate categories. The risk of falls is associated with moderate DIs, which are characterized by the intensification of the patient's health condition, requiring changes in treatment.

Elderly individuals with multiple comorbidities consequently undergo pharmacological treatment with a tendency toward polypharmacy, exposing them to more adverse events such as fall risk, functional and cognitive impairment, frailty, and potential hospitalizations due to falls, which may increase their likelihood of being classified as vulnerable.¹⁹

The rational use of medications in this population, with a focus on fall prevention, is a major public health challenge. Educational and administrative measures are necessary to ensure the elderly population maintains functional capacity and quality of life, especially through periodic assessments of fall risk and pharmacotherapy, particularly concerning drug interactions.¹⁹

Supporting the findings of this study regarding the significant relationship between fall risk and drug interactions, a study conducted in Germany evaluated 2,120 patients with a mean age of 76 years, monitored over seven years, with 84.9% being followed up after hospitalization. The study found that 63.6% of these patients experienced frequent falls. Regarding the use of medications associated with increased fall risk, the research revealed that 20.8% of the elderly had at least one prescribed medication, 16.9% had a drug interaction, and 32.3% belonged to both the group of medications associated with fall risk and the drug interaction group.⁶

Medications with fall potential and drug interactions were statistically significant in association with increased hospitalizations ($p=0.003$) and frequent falls ($p=0.006$). Falls were more frequent in the group of elderly individuals who used fall-related medications and

had drug interactions (10.2%), whereas, in the group that did not use these drugs and had no interactions, falls occurred in 5.9% of the sample.⁶

A study conducted in southern Brazil identified 2.187 drug interactions, 9.1% of which increased the risk of falls. Drug interactions heightened the fall risk and were classified by severity, with 44.3% being severe, 39.2% moderate, and 1.5% mild. The study concluded that the increased risk of falls was due to the potential adverse effects of drug interactions.²⁰

Regarding fall risk associated with drug interactions, a study in Piauí identified 158 drug interactions among 286 research participants. The relationship between fall risk and drug interactions showed a 3,16 times greater chance of falls in patients using medications with interactions than in those without drug interactions. Therefore, a thorough evaluation of medication prescriptions is essential, along with proper guidance for users to verify potential drug interactions.²¹

A study conducted in Saudi Arabia with 387 patients identified gait instability in 48.8% of participants, while 32% were concerned about falling. More than 21% of patients had fallen in the past year, among whom 11 (2.84%) had fallen four or more times within that period, and 54.2% reported an injury due to the fall. The main results showed that more than half of the participants were at high risk of falling, with higher chances among patients using polypharmacy, indicating that the number of medications was one of the key factors contributing to falls.²²

A study conducted in Paraíba compared the fall risk between 30 polymedicated elderly individuals and 30 non-polymedicated elderly individuals, identifying a reduction in mild fall risk (26.7%) among those using multiple medications. However, there was an increase in moderate (63.3%) and high (10%) fall risks in the same group. The research concluded that medication use influences the increased fall risk among the elderly.²³

Another study conducted in Acre with 441 elderly individuals found that 42.5% reported fall episodes, among whom 80.7% used at least one medication daily, and 48.6% routinely used two or three medications. Over the past 12 months, the study identified that 47% of falls occurred among elderly individuals using medication. It was observed that fall risk may increase due to adverse events and effects from specific drug classes, such as postural hypotension, vertigo, dizziness, loss of balance, and vulnerability.²⁴

An educational intervention conducted with 140 elderly individuals on fall prevention and polypharmacy identified that some participants had experienced recurrent falls and had not yet implemented simple home modifications to prevent future episodes. Polypharmacy was not frequently mentioned, and few participants accurately defined it.²⁵

However, through discussions during the educational intervention, many reported medication side effects, including confusion about medication schedules and drug interactions. The research highlighted that the educational intervention was effective in promoting awareness of multiple medication use and fall prevention in the elderly, as well as identifying risk factors and avoidable behaviors, ultimately reducing morbidity and mortality while improving quality of life during aging.²⁵

In general, a high fall risk can increase hospitalizations, mortality, or injuries resulting from falls, as well as worsen quality of life. This is one of the potential consequences of adverse drug interactions in various aspects of health among elderly individuals with multiple comorbidities. Therefore, it is essential to regularly review medication, hypertension, and glycemic control goals, as well as consider deprescription strategies tailored to each patient holistically.^{26,27}

Furthermore, fall prevention should take into account the patient's social context, ability to self-manage therapy, mobility, and cognitive and functional capacities. Therapy may require dosage adjustments, medication substitutions, or adaptations based on different community realities.^{26,27}

Consequently, it is crucial to recognize medication-related adverse events and the impact of prescriptions on drug interactions, as well as to identify barriers to treatment adherence. This allows for the implementation of multidisciplinary interventions related to fall risk.¹⁰

The literature suggests several measures to improve drug interaction assessments, including information and communication technologies, feedback methods, visual medication identification, continuous medication reviews, and educational activities for patients, caregivers, and families.¹⁰ Proper monitoring of drug interactions can reduce inappropriate prescriptions, decrease prescription omissions, and ultimately ensure evidence-based pharmacotherapy recommendations for fall prevention.^{10,27}

Information and communication technologies can assist multidisciplinary teams in reviewing medications, identifying electronic alerts for administration and verification, and providing a database of interactions and adverse events according to specific criteria for elderly patients. These tools also support coordinated and organized transitions of pharmacotherapy management from hospital to home care.^{10,27}

Medication reconciliation is understood as a conscientious, patient-centered, and interprofessional process. This process supports medication management by creating an accurate drug list at all transition points between prescriptions, aiming to provide appropriate pharmacotherapy, identify potentially inappropriate medications, and propose

recommendations for moderate and severe drug interactions, particularly those associated with high fall risk.²⁷⁻²⁹

To enhance patient safety regarding fall risk, close collaboration and communication among multidisciplinary teams are necessary to identify drug interactions in prescriptions and allow for the substitution of medications that, when combined, could harm the patient.

To achieve this goal, this study demonstrates that fall risk is associated with drug interactions, highlighting the importance of identifying the risks elderly patients face during pharmacological therapy.

A limitation of the study is that it was conducted in a single center, exclusively assisting public health system patients, which may not represent other realities, limiting the generalizability of the results. Additionally, the cross-sectional design prevents the establishment of causal relationships, making it necessary to conduct longitudinal studies with larger samples to monitor the challenges faced by elderly individuals regarding drug interactions and fall risk. This would help propose future interventions for clinical practice.

Conclusion

The risk of falls showed a high probability in relation to drug interactions in the moderate category. It is therefore important to direct care towards adapting drug therapy and organizing drug prescriptions in order to reduce adverse reactions, advising the elderly person, their family members and caregivers on the importance of preventing the risk of falls, of adherence to prescribed drug therapy in order to control morbidities, of the risks of drugs and drug interactions.

Authors Contributions

Study Design: Cristiane Regina Soares, Meiry Fernanda Pinto Okuno. **Data analysis and interpretation:** Cristiane Regina Soares, Meiry Fernanda Pinto Okuno. **Manuscript Writing:** Cristiane Regina Soares, Meiry Fernanda Pinto Okuno. **Critical review of the manuscript:** Cristiane Regina Soares, Meiry Fernanda Pinto Okuno. **Approval of the final version of the text:** Cristiane Regina Soares, Meiry Fernanda Pinto Okuno.

Conflict of interest

There are no conflicts of interests.

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References

1. Romero D, Maia L. A epidemiologia do envelhecimento: novos paradigmas? Rio de Janeiro: Fundação Oswaldo Cruz. 2022;90:40. Available from: <https://biblioteca.unisced.edu.mz/handle/123456789/3431>
2. Brasil. Ministério da Saúde. Divisão de Biblioteca do Ministério da Saúde. Boletim temático da biblioteca do Ministério da Saúde. 2021;1(1). Available from: https://bvsms.saude.gov.br/bvs/boletim_tematico/saude_idoso_outubro_2022-1.pdf
3. Brasil. Ministério da Saúde. Departamento de Atenção Especializada e Temática. Guia de atenção à reabilitação da pessoa idosa. 2021:144. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/guia_atencao_reabilitacao_pessoa_idosa.pdf.
4. Montero-Odasso M, van der Velde N, Martin FC, Petrovic M, Tan MP, Ryg J, et al. World guidelines for falls prevention and management for older adults: a global initiative. *Age ageing*. 2022;51(9):afac205. DOI: <https://doi.org/10.1093/ageing/afac205>
5. World Health Organization. Falls. Available from: <https://www.who.int/news-room/fact-sheets/detail/falls>
6. Haerig TR, Krause D, Klaassen-Mielke R, Rudolf H, Trampisch HJ, Thuermann P. Potentially inappropriate medication including drug-drug interaction and the risk of frequent falling, hospital admission, and death in older adults – results of a large cohort study (getABI). *Front pharmacol*. 2023;14:1062290. DOI: <https://doi.org/10.3389/fphar.2023.1062290>
7. Dias BM, Santos FS, Reis AMM. Potential drug interactions in drug therapy prescribed for older adults at hospital discharge: cross-sectional study. *Sao Paulo med j*. 2019;137(4):369-78. DOI: <https://doi.org/10.1590/1516-3180.2019.013405072019>
8. Kozioloka M, Alcarob S, Augustijnsd P, Basite AW, Grimma M, Hensd B, et al. The mechanisms of pharmacokinetic food-drug interactions – A perspective from the UNGAP group. *Eur j pharm sci*. 2019;134:31–59. DOI: <https://doi.org/10.1016/j.ejps.2019.04.003>
9. Drug Interactions Checker. Drug Information Online. Available from: http://www.drugs.com/drug_interactions.html
10. Cole JA, Gonçalves-Bradley DC, Alqahtani M, Barry HE, Cadogan C, Rankin A, Patterson SM, Kerse N, Cardwell CR, Ryan C, Hughes C. Interventions to improve the appropriate use of polypharmacy for older people. *Cochrane database of sys rev*. 2023;(10)10: CD008165. DOI: <https://doi.org/10.1002/14651858.CD008165.pub5>
11. Brasil. Ministério da Saúde. Conselho Nacional de Saúde. Resolução nº 466 de 12 de dezembro de 2012. Regulamenta a pesquisa envolvendo seres humanos. *Diário Oficial da*

União: República Federativa do Brasil. 2012. Available from: http://bvsms.saude.gov.br/bvs/saudelegis/cns/2013/res0466_12_12_2012.html

12. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J clin epidemiol.* 2008;61(4):344-9. Available from: <https://www.jclinepi.com/action/showPdf?pii=S0895-4356%2807%2900436-2>

13. Downton JH. Falls in the Elderly. 1994;8(19):54. DOI: <https://doi.org/10.7748/ns.8.19.54.s62>

14. Schiaveto FV. Avaliação do risco de quedas em idosos. Ribeirão Preto (SP): Escola de Enfermagem de Ribeirão Preto da Universidade de São Paulo; 2008. Available from: <https://www.teses.usp.br/teses/disponiveis/22/22132/tde-19122008-153736/publico/FabioVeigaSchiaveto.pdf>.

15. Folstein MF, Folstein SE, McHugh PR. Mini-mental state: a practical method for grading the cognitive state of patients for the clinician. *J psychiatric res.* 1975;12:189-98. DOI: [https://doi.org/10.1016/0022-3956\(75\)90026-6](https://doi.org/10.1016/0022-3956(75)90026-6)

16. Bertolucci PH, Brucki SM, Campacci SR, Juliano Y. O mini-exame do estado mental em uma população geral: impacto da escolaridade. *Arq neuropsiquiatr.* 1994;52:1-7. DOI: <https://doi.org/10.1590/S0004-282X1994000100001>

17. Almeida OP. Mini Exame do Estado Mental e o diagnóstico de demência no Brasil. *Arq neuropsiquiatr.* 1998;56:605-12. DOI: <https://doi.org/10.1590/S0004-282X1998000400014>

18. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do mini-exame do estado mental no Brasil. *Arq neuropsiquiatr [Internet].* 2003[cited 2024 Dez 20];61(3B):777-81. DOI: <https://doi.org/10.1590/S0004-282X2003000500014>

19. Sousa CR, Coutinho JFV, Freire Neto JB, Barbosa RGB, Marques MB, Diniz JL. Factors associated with vulnerability and fragility in the elderly: a cross-sectional study. *Rev bras enferm.* 2022;75(2):e20200399. DOI: <https://doi.org/10.1590/0034-7167-2020-0399>

20. VLL Battisti ID, Petri AA, Colet CF, Stumm EMF, Loro MM, et al. Risk of falls associated with drug therapy in hospitalized patients. *Mundo da saúde.* 2020;44:115-125. DOI: <https://doi.org/10.15343/0104-7809.20194303732746>.

21. Gomes DM, Araújo PM, Sá MLF, Freitas AV, Carvalho MGFM, Silva HR. Risk of occurrence of falls related to the use of medication. *Research, society and development.* 2022;11(11):e313111133510. DOI: <https://doi.org/10.33448/rsd-v11i11.33510>

22. AlHarkan KS, Alsousi S, AlMishqab M, Alawami M, Almearaj J, Alhashim H, et al. Associations between polypharmacy and potentially inappropriate medications with risk of falls among the elderly in Saudi Arabia. *BMC geriatr.* 2023;23(1):222. DOI: <https://doi.org/10.1186/s12877-023-03852-y>

23. Santos RTA, Jatobá DCMO, Souza DT, Medeiros PHC, Mendes AB, Lucena ALR, et al. Assessment of the risk of falls in polymedicate elderly. *Brazilian journal of health review [Internet].* 2021;4(6):27784–27793. DOI: <https://doi.org/10.34119/bjhrv4n6-333>

24. Sussuarana CF, Rocha GS, Jucá FL, Araújo KS, Conceição VEM, Lago RR, et al. Polypharmacy and drug classes in fall risk among older adults. *Geriatr gerontol aging*. 2023;17:e0230017. DOI: <https://doi.org/10.53886/gga.e0230017>
25. Vaz AM, Gonçalves CLMD, Silva VM, Rocha MJS, Albuquerque IKS, Silva NFS, et al. Prevention of falls in elderly people using polypharmacy: an educational approach for elderly people and family health strategy teams. *Brazilian journal of health review*. 2020;3(3):5517–24. DOI: <https://doi.org/10.34119/bjhrv3n3-123>
26. Remelli F, Ceresini MG, Trevisan C, Noale M, Volpato S. Prevalence and impact of polypharmacy in older patients with type 2 diabetes. *Aging clin exp res*. 2022;34:1969–83. DOI: <https://doi.org/10.1007/s40520-022-02165-1>
27. Costa JM, Silva KL. Pharmaceutical counter-referencing in the transition care process: experiences of health professionals in a teaching hospital. *Rev enferm cent-oeste min*. 2021;11:e3942. DOI: <https://doi.org/10.19175/recom.v10i0.3942>
28. Santos CO, Lazaretto FZ, Lima LH, Azambuja MS, Millão LF. Medication reconciliation: implantation process in a hospital complex with the use of electronic system. *Saúde debate* [Internet]. 2019[cited 2023 Oct 12]; 43(121):368-77. DOI: <https://doi.org/10.1590/0103-1104201912106>
29. Redmond P, Grimes TC, McDonnell R, Boland F, Hughes C, Fahey T. Impact of medication reconciliation for improving transitions of care. *Cochrane database of sys rev* (on-line). 2018;8:CD010791. DOI: <https://doi.org/10.1002/14651858.CD010791.pub2>