

ASSOCIATION BETWEEN FALL RISKS AND MEDICATION USE IN THE ELDERLY

ASSOCIAÇÃO ENTRE RISCO DE QUEDAS E USO DE MEDICAMENTOS EM PESSOAS IDOSAS

ASOCIACIÓN ENTRE RIESGO DE CAÍDAS Y USO DE MEDICAMENTOS EN PERSONAS MAYORES

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How to cite this article: Rosa BM, Abreu DPG, Santos SSC, Silva BT, Ilha S, Martins NFF. Association between fall risks and medication use in the elderly Rev baiana enferm. 2017;31(4):e22410.

Objective: to verify the association between fall risks and medication use in the elderly. **Method:** cross-sectional study carried out in ambulatory care sector of a university hospital in southern Brazil, with 99 elderly people. Collection occurred in October, 2013, through an interview in which were used: one sociodemographic characterization instrument, the mini-mental state examination and the Downton Fall Risk Scale. Inferential and descriptive statistical analysis were made. **Results:** it was demonstrated that 55.6% of the elderly people present high fall risk. There was statistical association between the use of medication for cardiovascular and central nervous systems and the fall risk. There was significant difference between the number of medication taken by the elderly with high and low fall risk. **Conclusion:** fall risk is associated with the number of medicines and with the medicament classes taken by the elderly.

Descriptors: Elder. Fall accidents. Medication use. Nursing.

Objetivo: verificar a associação entre o risco de quedas e o uso de medicamentos em pessoas idosas. Método: estudo transversal realizado no setor de atendimento ambulatorial de um hospital universitário do sul do Brasil, com 99 pessoas idosas. A coleta ocorreu em outubro de 2013, por meio de entrevista na qual foram utilizados: um instrumento de caracterização sociodemográfica, o Miniexame do Estado Mental e a Escala de Risco de Quedas de Downton. Foram realizadas análise estatística descritiva e inferencial. Resultados: evidenciou-se que 55,6% das pessoas idosas apresentaram alto risco para quedas. Houve associação estatística entre o uso de medicamentos para o sistema cardiovascular e nervoso central e o risco de quedas. Houve diferença significativa entre o número

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de medicamentos utilizados por pessoas idosas com alto e com baixo risco de quedas. Conclusão: o risco de quedas apresenta associação com número de medicamentos e com as classes medicamentosas utilizadas pelas pessoas idosas.

Descritores: Idoso. Acidentes por quedas. Uso de medicamentos. Enfermagem.

Objetivo: verificar la asociación entre el riesgo de caídas y el uso de medicamentos en personas mayores. Método: estudio transversal realizado en el sector de atención ambulatoria de un hospital universitario del sur de Brasil, con 99 personas mayores. La recolección ocurrió en octubre de 2013, por medio de una entrevista en la que se utilizaron: un instrumento de caracterización socio demográfica, el Mini examen del Estado Mental y la Escala de Riesgo de Caídas de Downton. Se realizaron análisis estadísticos descriptivos e inferenciales. Resultados: se evidenció que 55,6% de las personas mayores presentaron alto riesgo para caídas. Hubo asociación estadística entre el uso de medicamentos para el sistema cardiovascular y nervioso central y el riesgo de caídas. Se observó una diferencia significativa entre el número de medicamentos utilizados por personas mayores con alto y con bajo riesgo de caídas. Conclusión: el riesgo de caídas presenta asociación con el número de medicamentos y con las clases medicamentosas utilizadas por las personas mayores.

Descriptores: Ancianos. Accidentes por caídas. Uso de medicamentos. Enfermería.

Introduction

Fall is the most common cause of accidents involving the elderly and present circa 30% of prevalence in Brazil^(1,2). Fall is defined as an unintentionally displacement of the body to a lower position in reference to the initial position, being incapable to correct the trajectory in timely manner⁽³⁾.

In the elderly, falls may be caused by multiple risk factors related to the socio-environmental context in which they live and interact. Such factors may relate themselves in a complex manner and if accumulated increase the probability of this event occurrence⁽⁴⁾.

With the aging process, elderly persons tend to present more non-communicable chronicle diseases (DCNT) and make use of multiple medications for treating them^(5,6). Studies indicate that the use of medication presents association with fall risk in older people as they may diminish alertness and psychomotor function, cause muscle weakness, dizziness, arrhythmia and postural hypotension^(7,8). Drug use and fall relation may occur due to inappropriate dosages, adverse effects and for medicament interactions⁽⁹⁾.

A fall may bring several consequences resulting in the reduction of autonomy and independence of the elderly. Among the physical related consequences are: skin injuries, dislocation, fractures, functional decline and activities restriction. Also, among psychological consequences: fear of falling syndrome and confidence loss^(4,10).

Falling risk increases significantly with ageing making falls be considered as geriatric syndrome and a public health problem, due to treatment increasing costs and long-term care required^(4,10,11). Thus, to identify the factors associated to fall risk in the elderly people may help in the planning of action of impact, in local demands, and in the implementation of public policy that aim to avoid the occurrence of this sort of event.

Therefore, the objective of this study was to verify the association between fall risks and medication use in the elderly.

Method

Exploratory, descriptive and cross-sectional study, with quantitative approach, carried out in the ambulatory care sector of a university hospital in southern Brazil.

The study's sample was constituted of elderly persons, in outpatient care which meet the inclusion criteria: make use of at least one medication for at least 15 days prior to the day of the interview. Elderly presenting fragmentary speeches with important memory losses that prevented from answering the research's instrument questions was an exclusion criterion.

The sample was not probabilistic for convenience, selected in a consecutive manner, according to the inclusion and exclusion criteria. Data collection was carried out in October, three times a week. An invitation was made to all the

elderly present in the waiting room in collection days, adding up to a total of 108 elderly approached. Nine individual refused to participate in the research, being the final sample composed of 99 elderly persons.

Data were collected through an interview. Interviews were conducted by members of a Study Group in Research Gerontology and Geriatrics Nursing, Nursing/Health and Education (GEP-Geron). Each elderly was approached in the ambulatory waiting room, of University Hospital Dr. Miguel Riet Côrrea Jr, bound to a federal university in the state of Rio Grande do Sul. Interviews were made previously or after the medical consultation and lasted for an average of 30 minutes. Permission was asked for the elderly, and they clarified regarding the research. Three instruments were used. The first had as objective to characterize the elderly and presented the following variables: age, sex, remunerated activity, companion, education, income, preexistent chronic diseases, comorbidity, medications used, polypharmacy (use of five or more medications per day).

Mini-mental state examination (MMSE), was the second instrument and was used to evaluate cognition. MMSE version accredited and available in Brazil was used, in which the reference score indicating decrease in cognition was of 18 points in illiterate elderly and 23 points for those schooled for more than one year⁽¹²⁾. Mini-mental state examination use was necessary in order to collaborate with one of the items in the Downton Fall Risk Scale. It was considered relevant the MMSE use as it allows the identification of interviewees with altered mental state, which would not be part of this research. Although mental state evaluation, specifically, is not part of the objectives, it is linked to the Downton Fall Risk Scale. This instrument allowed the mental state evaluation to be as reliable as possible, avoiding subjectivities from each interviewer.

Third instrument used was the Downton Fall Risk Scale, which have been accredited in Portuguese and had its specificity and sensibility assessed. It is composed by five items, Which are described as follows: According to the answers of each item, the score is credited; the affirmative

answer (yes) corresponds to one point and for each negative answer (no), no points are credited. In the first item, the scale includes the occurrence of previous falls: if the answer obtained is yes, scores one point, if the answer is no, there is no score. In the medication use item, none used equals to no score; if tranquilizers/sedatives, diuretics, anti-hypertensive, anti-Parkinson drugs and antidepressants are used, scores one point for each medicament class listed, used by the individual. In the presence of sensory deficits item (visual and hearing disorders), if there is absence of deficit, no score; impaired vision scores one point; impaired hearing scores one more point. In the mental state item, which according to the scale must be evaluated through the MMSE, present the following possibilities: if the individual presents himself/herself oriented, there is no score; if presents himself/herself confused according to the MMSE score < 24/30, scores 1 point. In the walking item, if the individual presents regular gait, there is no score; if he/she uses walking aid, for instance, walking cane, walker, however walks safely, there is no score; if walks without confidence, with or without aid equipment, it does score. Scale's score varies from zero and 11 points, and scores equal to or greater than three indicates a high fall risk⁽¹³⁾.

In order to organize data, an spreadsheet in the Microsoft® Excel 2007 program. Data analysis was made supported by Statistical Package for the Social Sciences (SPSS) software, version 20.0.

Descriptive statistical procedures were used, presenting simple frequencies and categorical variables percentage (age, sex, professional activity, marital status, schooling, income, pre-existent conditions, comorbidities, medicament classes, polypharmacy, cognitive state, fall risk) and central tendencies (mean and median) and dispersion measures (standard deviation, percentiles, minimum and maximum value) for the numeric variable, number of medications/day.

In order to verify the association between the fall risk variable (high-risk or low-risk) and the categorical variables, we used, for expected frequencies greater than 5, the Chi-Squared Test, and for expected frequencies lower than 5, Fisher's Exact Test.

Kolmogorov-Smirnov test was carried out in order to check the distribution normality of the fall risk and MMSE score. As data did not follow a regular distribution, median values of Fall Risk Scale score and the number of medication/day were used for the comparison of the categorical variables through the Mann-Whitney test. Correlation between Fall Risk Scale score and the number of medication/day was analyzed through Spearman's Rho correlation coefficient. In all the tests were considered as statistically significant the associations that presented value of $p < 0.05$.

Study development observed the national and international norms for ethics in research involving human beings, in accordance to the guidance of Resolution n. 466/2012, by National Health Council, and obtained a favorable opinion from the Ethics Committee in Health Research under the registration number 64/2013 and CAAE: 18859113.0.0000.5324. After the explanation of the objectives and with the voluntarily agreement of the elderly in participate in this research, the Free and Informed Consent Term (FICT) was read and they were asked to sign the

term. This measure guaranteed the participant's autonomy, among other issues.

Results

Among the elderly persons investigated, 55 (55.6%) scored equal to or greater than three in the Fall Risk Scale, presenting a high fall risk, and 44 (44.4%) scored lower than three points, presenting low fall risk. None of the sociodemographic variables demonstrated significant statistical association with fall risk in the chi-squared test, being $p > 0.05$ (Table 1).

Arterial hypertension was referred by 64 (64.6%) elderly, diabetes by 54 (54.5%), hypothyroidism by 24 (24.2%) and arthritis by 7 (7.1%) being these the diseases of prevalence in the sample. Others diseases mentioned, and all of them had a frequency lower than 3.0%: asthma, emphysema, cancer, osteoporosis, depression, hepatitis C, heart disease, cirrhosis, AIDS, glaucoma, herniated disc, sinusitis, bronchitis, labyrinthitis, rheumatism and cataract. Among the interviewees, 58 (58.6%) presented more than one disease associated. None

Table 1 – Sociodemographic variables in relation to fall risk. Rio Grande, RS, Brazil, 2013. N = 99

Sociodemographic variable	Fall risk		p-value*
	High-risk n = 55 n (%)	Low-risk n = 44 n (%)	
Sex			
Female	32 (53.3)	28 (46.7)	0.581
Male	23 (59.0)	16 (41.0)	
Age (years)			
60–69	37 (54.4)	31 (45.6)	0.113
70–79	13 (50.0)	13 (50.0)	
> = 80	5 (100)	0 (0)	
Marital status			
Have companion	34 (55.7)	27 (44.3)	0.836
Do not have companion	21 (55.3)	17 (44.7)	
Schooling			
Schooled	48 (55.2)	39 (44.8)	0.836
Without schooling	7 (58.3)	5 (41.7)	
Professional activity			
Performs paid activity	10 (47.2)	11 (52.8)	0.410
Does not perform paid activity	45 (57.7)	33 (42.3)	
Income**			
Up to 1 minimum salary***	16 (69.6)	7 (30.4)	0.109
Between 1 and 2 minimum salaries	18 (43.9)	23 (56.1)	

*Chi-squared test; **n yes = 54 and n no = 43; ***Minimum salary value at the time of data collection: R\$ 622,00, year 2013.

Source: Developed by the authors.

isolated disease and no comorbidity (associated diseases) presence demonstrated significant statistical association with fall risk in the chi-squared test, always resulting $p > 0.05$.

Elderly people used a mean of 2.4 ($DP \pm 1.4$) medication/day (minimum of 1 and maximum of 7). The number of medication used median was 2 ($P25 = 1$ and $P75 = 7$). Correlation between the Fall Risk Scale score and the number of medication/day through the Spearman's Rho correlation coefficient did not present statistical relevance ($p = 0.188$ and $p = 0.062$).

There was difference between the median of the number of medications used per day by the elderly with high fall risk (median = 3) and of those with low fall risk (median = 2) also, this result presented statistical significance in the Mann-Whitney

test ($U = 889.0$; $p = 0.020$). Although the median of the number of medications used per day by the elderly with high fall risk be superior than the median of those with low fall risk, it was lower than what is considered polypharmacy (use of five or more medications per day).

Nine (9,1%) elderly persons used more than five medications per day. Fall risk did not present significant statistical association with polypharmacy in the chi-squared test, being $p = 0.730$.

Among the researched elderly, 70 (70.7%) used medications for the cardiovascular system; 59 (59.5%) for the endocrine system, being these the most consumed medicament classes. Use of medication for the cardiovascular and central nervous systems presented significant statistical association with the fall risk in the chi-squared test (Table 2).

Table 2 – Medicament classes used according to fall risk. Rio Grande, RS, Brazil, 2013. N = 99

Medicament class	Fall risk		p-value*
	High-risk (n = 54) n (%)	Low-risk (n = 43) n (%)	
Cardiovascular system			
Yes	47 (67.1)	23 (32.9)	< 0.001*
No	7 (25.9)	20 (74.1)	
Endocrine system			
Yes	34 (57.6)	25 (42.4)	0.629*
No	20 (52.6)	18 (47.4)	
AINES			
Yes	15 (68.2)	7 (31.8)	0.179*
No	39 (52.0)	36 (48.0)	
Analgesics and muscle relaxant			
Yes	8 (53.3)	7 (46.7)	0.843*
No	46 (56.1)	36 (43.9)	
Herbal medicines			
Yes	8 (66.7)	4 (33.3)	0.413*
No	46 (54.1)	39 (45.9)	
Respiratory system			
Yes	6 (66.7)	3 (33.3)	0.501**
No	48 (54.5)	40 (45.5)	
Central nervous system			
Yes	7 (100)	0 (0)	0.016**
No	47 (52.2)	43 (47.8)	
Antiretroviral			
Yes	0 (0)	3 (100)	0.084**
No	52 (54.7)	43 (45.3)	
Topical use			
Yes	2 (100)	0 (0)	0.307**
No	52 (54.7)	43 (45.3)	
Digestive system			
Yes	0 (0)	0 (0)	

*Chi-squared test; **Fisher's exact test.

Source: Developed by the authors.

Fall risk presented significant statistical association with the cognitive state in the chi-squared test ($p = 0.014$). Among the 71 elderly persons with normal cognitive function 34 (47.8%) had high fall risk; and from the 28 elderly who presented cognitive decrease, 21 (75.0%) had high fall risk.

There was difference in the Fall Risk Scale score medians between the elderly with preserved cognitive function and those with cognitive decrease. Elderly with cognitive decrease score median was superior in 3.5 in relation to those with preserved cognitive function, which was 2, and this result presented statistical significance in the Mann-Whitney test ($U = 603.5$; $p = 0.002$). Elderly persons with cognitive decrease presented risk score median compatible with high fall risk, and those with preserved cognitive function presented a median that indicates low fall risk.

There was no significant statistical association between polypharmacy and cognitive state in the chi-squared test ($p = 0,217$) and the median of the number of medication used per day by the elderly with cognitive decrease was equal to those who did not present deficit (median = 2).

Discussion

Among the elderly in the study, 55.6% presented high fall risk according to the Downton Fall Risk Scale. In one basic health unity, in João Pessoa, state of Paraíba, 70% of the elderly presented high fall risk according the same scale⁽⁹⁾. High fall risk may be related to the presence of different risk factors, among them: physiological alterations related to the ageing, presence of diseases, effects caused by medicine use, ambient inadequate illumination, slippery surfaces, inadequate shoes and clothing, ground irregularities^(1,4,7).

Findings referring to sociodemographic profile of the elderly corroborate findings of other studies carried out in Brazil^(1,2). They reflect the feminization of ageing, the major presence of elderly in the initial age brackets of old age, living with a companion, retired and income lower than three minimum salaries^(1,2,6,7).

Among the investigated sociodemographic variables, none presented significant statistical association with fall risk, however it had been found in other studies relation between age, marital status, occupation, education, income and the occurrence of fall risk^(7,9,10).

Thus, as in other studies, arterial hypertension and diabetes were the most prevalent diseases in the elderly^(6,7). Such illnesses, if not treated properly, may cause symptoms as dizziness and vertigo that may contribute to the occurrence of falls⁽⁹⁾.

Presence of osteoporosis, cardiovascular and neurological diseases or comorbidities were associated to the occurrence of falls in studies carried out with elderly persons in Brazil^(1,14). In the present study, none of the mentioned diseases nor the presence of comorbidities presented any association with fall risk.

In the study, the elderly used a mean of 2.4 medications per day. This consumption was inferior than that found in a study carried out with elderly persons in an ambulatory in the city of Campinas-SP, where the mean consumption found was 4.5, and in the city of Rio Grande-RS community the mean consumption was 3.46^(1,7).

In this study there was no association between fall risk and polypharmacy ($p = 0.730$), although literature demonstrates this relation^(8,15). However, there was significant statistical difference in the median of the number of medications used per day by the elderly with high fall risk (median = 3) and with low fall risk (median = 2) ($p = 0.020$). Use of more medications by elderly persons with high fall risk may indicate that they have a more debilitated health, which as consequence may increase the fragility and predisposition to the occurrence of falls⁽¹⁶⁾.

Medications for cardiovascular system complications were the most used by the elderly (70.7%), a fact similar to that found in other studies^(6,7). Such medications use presented significant statistical association with fall risk ($p < 0.001$), result that was also found by a study carried out in Australia with elderly persons, which lived in the community⁽¹⁷⁾.

Corroborating the findings in this study, the association between the use of anti-hypertensives

and the occurrence of falls, was found in the elderly who suffered a traumatic injury in the city of Curitiba, state of Paraná⁽⁷⁾. Medications for the cardiovascular system may cause hypotension, bradycardia, drowsiness and fatigue, which may lead to the occurrence of fall in the elderly. Moreover, such medicines are considered responsible by a great number of interactions and adverse reactions that may present as clinical outcome the falls⁽¹⁸⁾.

Medications for the endocrine system were used by 59.5% of the elderly, being the second most used medicament class. These medications use are not free of risk, as well, because the hypoglycemic agents may predispose to hypoglycemia, which can be masked in the elderly, especially when cognitive problems are present, increasing the fall risk^(5,18).

Central nervous system medication use presented significant statistical association with fall risk ($p = 0.016$). An integrative revision, that identified factors associated to falls in institutionalized elderly, recognized that the use of medications which act in the central nervous system, such as benzodiazepines, is one main factors of risk that contributed to the occurrence of falls in the elderly⁽¹⁹⁾.

Use of medications which act in the central nervous system, as anxiolytics, antidepressant and antipsychotics, do alter cognitive and psychomotor aspects of the organism. Its main therapeutic effects are sedation, hypnosis and muscle relaxant, which may increase the fall risk^(18,20).

In the elderly, the identification of adverse reactions to these medications and of its interactions with others may become difficult, once it is possible that the manifestations simulate geriatrics syndromes such as falls, incontinence and cognitive disorders⁽¹¹⁾. For many professionals and family these symptoms may be interpreted as an evolution of the clinical condition and not as consequence of the therapeutic treatment⁽¹⁸⁾.

Fall risk presented significant statistical association with the cognitive state ($p = 0.014$). Elderly persons with cognitive decrease presented risk score median compatible with high fall risk and those with preserved cognitive function presented a median that indicates low fall risk.

In study carried out with 108 elderly people in a Health Center in the city of Belo Horizonte – MG, also found this association⁽²¹⁾. Cognitive deficit in the elderly may predispose to falls, as the perception of environmental threats may be absent. Moreover, the motor and concentration capacity are interconnected to the cognitive system, what brings difficulties in perform more than one task at the same time, predisposing to fall accidents⁽²¹⁾.

Cognitive decrease and medication use are risk factor for falls; however, there was no association between medication use and the cognitive state of the elderly, which may represent a bias to the study.

In the elderly, the drug interaction effects and adverse reactions can be accentuated due to alterations in absorption, metabolism and drugs elimination that results from the ageing of the organism⁽¹⁸⁾. Thus, identifying the association between fall risk and medication use becomes of fundamental importance to prevent the occurrence of falls and, consequently, to maintain the autonomy and independence of the elderly.

This study demonstrate that elderly persons with fall risks used a greater number of medications per day than those who are out of fall risk, also, that the use of medication for the cardiovascular system and the central nervous system, as well as the presence of cognitive deficit are associated to fall risk. One of the study's limitation refers to the sample, as it was selected consecutively for convenience, which does not allow to generalize the results.

Conclusion

This study allowed to identify the existence of an association between fall risk and medication use in the elderly, contemplating the proposed objective. Moreover, it was identified the presence of significant statistical association between medication use for the cardiovascular system and nervous system, and the fall risk, allowing to the study to overcome the described objective. Association between fall risk and use of polypharmacy in the studied elderly was not detected.

Concerning this situation, we stress the importance of the nurse to acquire knowledge regarding the aspects that predispose falls, among those, medication use, which are present in the elderly's daily life due to the DCNT they might have. Search the knowledge regarding the risk factors of fall accidents must be a nurse's concern, as in this sense he or she will be acting in the prevention of one more aggravation to the health of the elderly and its complications, preserving autonomy and functionality.

Colaborations

1. design, project, analysis and interpretation of the data: Silvana Sidney Costa Santos, Daiane Porto Gautério Abreu, Bárbara Tarouco da Silva, Bibiane Moura da Rosa.

2. article writing and critical review of the intellectual content: Silomar Ilha, Bibiane Moura da Rosa, Daiane Porto Gautério Abreu, Bárbara Tarouco da Silva e Nidia Farias Fernandes Martins.

3. final approval of the version to be published: Silvana Sidney Costa Santos, Daiane Porto Gautério Abreu, Bibiane Moura da Rosa, Bárbara Tarouco da Silva, Silomar Ilha e Nidia Farias Fernandes.

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Received: 29 de maio de 2017

Approved: 28 de novembro de 2017

Published on: January 25, 2018