Original Article

Cohort study of institutionalized elderly people: fall risk factors from the nursing diagnosis[1]

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Objective: to determine the incidence of falls in elderly residents of long-stay institutions of the Federal District, to identify the aspects involved in the falls, in terms of risk factors, from the application of scales and the Taxonomy II of NANDA-I, and to define the level of accuracy with its sensitivity and specificity for application in the clinical nursing practice. Method: this was a cohort study with the evaluation of 271 elderly people. Cognition, functionality, mobility and other intrinsic factors were evaluated. After six months, the elderly people who fell were identified, with significance analysis then performed to define the risk factors. Results: the results showed an incidence of 41%. Of the 271 patients included, 69 suffered 111 episodes of falls during the monitoring period. Risk factors were the presence of stroke with its sequelae (OR: 1.82, 95% CI 1.01 - 3.28, p=.045), presenting more than five chronic diseases (OR: 2.82, 95% CI 1.43 - 5.56, p=.0028), foot problem (OR: 2.45, 95% CI 1.35 - 4.44, p=.0033) and motion (OR: 2.04, 95% CI 1.15 - 3.61, p=.0145). Conclusion: the taxonomy has high validity regarding the detection of elderly people at risk of falling and should be applied consistently in the clinical nursing practice.

Descriptors: Accidental Fall; Aged; Institutionalization; Risk Factors; Nursing Diagnosis.

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Introduction

The demographic transition in which we live today is a reality. Unlike developed countries that present graduated aging of the population due to social improvements, Brazil and other developing countries present increased life expectancy due to improvements in healthcare technology, without social investments that provide quality of life for the elderly population[1].

This sudden process has caused a great economic and public health impact in Brazil. Recently, the Ministry of Health established care for elderly people as a priority, a decision guided by the health for life pact, with monitoring and evaluation of health indicators. The project includes the identification of elderly people in situations of fragility and risk to promote prevention and to improve the quality of life[1-2].

Falling is one of these indicators. In this context of identification of elderly people in vulnerable situations, the fall has a strong influence on the worsening of independence, quality of life and autonomy of elderly people[3-5]. Approximately 28 to 35% of people over 65 years of age suffer falls each year[6-7], this proportion rises to 32% to 50% in elderly people over 70 years of age[8-9]. When institutionalized, elderly people are three times more likely to fall than those who live in the community[8-10]. From this perspective, interventions of promotion and prevention of falls in elderly people, performed by nurses with the use of systematization of care and the Taxonomy II of NANDA-I, are important to provide better quality of life and autonomy, while avoiding increased disabilities that are the most common causes of institutionalization.

The choice is therefore explained of institutionalized elderly people, who, due to the loss of family relationships and development of levels of dependency, perpetuate and aggravate the cycle: aging, lower functional capacity and physical inactivity, due to inactivity and social isolation[1,8,10]. These associated factors add to greater likelihood of the elderly person falling and suffering hip fracture injuries.

In this context, assuming the hypothesis that the fall is multifactorial, with a negative influence on the quality of life for institutionalized elderly patients[8-11], the aim of this study was to determine the incidence of falls in elderly residents of long-term care facilities of the District Federal and to identify the aspects involved in the falls, with regard to risk factors, from the application of scales and the Taxonomy II of NANDA-I, and to define the level of accuracy with its sensitivity and specificity for application in the clinical nursing practice.

Method

This was a quantitative study, with a concurrent or prospective cohort design. The inclusion criteria were: elderly people aged 60 years and over, residents of long-term care institutions, for more than six months.

From contacts, conducted in March 2013, with the Council of Elderly People, the population of 455 institutionalized elderly people, of twelve philanthropic and private institutions, was identified in the Federal District. Considering a prevalence of falls in institutionalized elderly people of approximately 30%, from previous Brazilian studies[6-9], the sample size of 305 elderly people of five institutions was calculated.

To achieve this sample (n=305), five institutions were selected using a conglomerates type sampling design. They were enumerated and drawn according to the following criteria: coverage of the different areas of the Federal District, ease of access to the region and consent of the institution to participate in the study.

Due to not meeting the inclusion criteria, the initial sample was changed as a result of the exclusion of 32 people refusing to participate in the study or not fitting the inclusion criteria. Thus, 271 elderly people participated in the study, characterizing a loss of 10.4%. With this sample, it was possible to estimate the incidence of falls and its populational variance with maximum error of four percentage points (plus or minus), in the estimate of 50% prevalence of falls.

A fall was defined as "an unintentional event that results in changing the position of the individual to a lower level in relation to their initial position"[12].

The collection occurred from July to September 2013, after authorization from the institution and the elderly people. The questions were answered individually by the elderly people, when lucid, or by the caregiver, with evaluation of the medical record in the case of the elderly people with cognitive impairment. Due to lack of information, the education and marital status independent variables presented losses of five and one individual, respectively. After the overall evaluation, monitoring of the sample began, with the performance of monthly visits to the institutions and reading of the report book to identify the occurrence of falls. From the identification of the event, the control group was defined

(no falls) and the case group (with falls). Monitoring of the falls occurred for six months, from September 2013 to February 2014.

A structured script was used, with questions to characterize the elderly person regarding sociodemographic aspects and variables related to the risk for falls, defined by the Taxonomy II of NANDA-I.

In the study, 28 of the 55 risk factors of the nursing diagnosis Risk for Falls in the Taxonomy II of NANDA-I were evaluated, from previously validated instruments. The environmental factors subcategory was excluded due to unsuitability related to the institutionalized sample and the difficulty of constituting the control group. The inadequacy of some factors related to the risk of falling, however, had been expected since the individual is unique in nature and lives in permanent change.

In the evaluation of the balance and motion, reporting the risk factors present in the risk for falls diagnosis of NANDA-I, the Tinetti Balance Assessment Tool was used. The Tinetti Balance Assessment Tool, translated into Portuguese and validated in Brazil[12], was applied according to the model of Tinetti (1986). Indices below 19 points on the scale characterized impaired physical mobility, a risk factor present in the risk for falls diagnosis of the Taxonomy II of NANDA-I.

The cognitive evaluation was made using the Mini-Mental State Examination (MMSE), translated and validated in Brazil[13]. Cognitive decline was characterized by the cutoff of 20 points for illiterate people, 25 for those with four years of study, 26 for five to eight years of study and 28 for those with more than nine years of study.

The Index of Independence in Activities of Daily Living (Katz scale), developed by Katz and validated for the Brazilian context[14], was used to evaluate the functionality of the population. In this scale a score of six indicates that the elderly person is independent, a score between four and two indicates partial dependence, and a score of two or less implies significant dependency.

The study was approved by the Ethics Committee of the Health Sciences Faculty of the University of Brasilia (Process 64 No. 13). All the subjects or legal guardians signed the Informed Consent (IC) form.

To analyze the data, a spreadsheet was constructed in Microsoft Access and the SAS statistical package used. The collected data related to the elderly people were grouped according to risk factors of NANDA-I and sociodemographic information. These risk factors were associated with the likelihood of at least one accident in the following six months. The association was made through the odds ratio statistic, confidence interval and p-value of the statistic based on the chi-square distribution and logistic regression.

Results

First a descriptive analysis of the elderly people monitored for six months was made. Regarding the sociodemographic information, as can be observed in Table 1, of the 271 elderly people included the majority were female (57.5%), non-smokers (60.8%), illiterate (48.5%) and widowed (43.7%) or single (40%). Concerning the general physical and cognitive characteristics, it can be seen that the majority presented high dependency to perform daily activities (53.1%), could not walk (46.3%), presented impaired physical mobility (81.1 %) and had their mental status evaluated as compromised (87.2%).

According to Table 2, the mean age was 79 years, ranging between 60 and 111 years, the mean time in the institution was 4.7 years. The mean height of the patients was 1.60m, ranging between 1.22m and 1.86m, and the mean weight was 57kg, ranging between 31kg and 96kg. These measures gave a population of elderly patients with Body Mass Index (BMI) of 22.7 and Standard Deviation (SD) of 4.15, i.e., eutrophic, however, as shown in Table 1, the highest prevalence identified was of underweight elderly people (46.64%).

With regard to comorbidities, it was observed that the highest prevalence was for arterial hypertension (77.74%), followed by the occurrence of stroke (27.37%) and diabetes mellitus (27.37%). The majority of the elderly patients used medication (99%), with a mean of 5.76 medications used daily, with antihypertensive drugs being the most used (73%), followed by sleep inducers (61%) and diuretics (50%) .

The incidence of falls compared to the subsequent six months was 41%; among these, the majority were female (59.42%), aged 80 years or over (47.2%), had previous fall history (85.5%), illiterate (57.3%) and widowed (42.03%). In the overall assessment of the elderly people that fell, the majority of these were vulnerable, with a significant dependence for activities of daily living (55.07%), impaired cognition (91.1%) and impaired physical mobility (88.4 %), they presented multiple medication use (76.8%), however, had no more than five pathologies (27.54%).

After the description of the population affected by falls during the study period, the multivariate analysis was performed, as a measure of association between the risk characteristics of the dimensions studied and the fall, as represented in Table 3.

It was observed that the information of the category in the elderly people was significant, with the individuals that had foot problems, impaired mobility, lack of motion, stroke history and report of a fall in the previous six months having 5% greater likelihood of suffering a fall than the other people.

The estimated probabilities, sorted and plotted on a graph, provided the ROC (Receiver Operating Characteristic) curve, as shown in Figure 1. The area under the curve is able to predict the ability of the model to detect elderly people who had a chance to fall. The estimate of probability of each individual of the sample to fall, due to the significant variables, provided information on the individuals, and to establish the accuracy of NANDA Taxonomy, on their significant aspects.

From Table 4, it can be seen that the best cutoff score, maximizing sensitivity and specificity, was 0.337, with a sensitivity of 55% and specificity of 79%. Thus, an elderly people with history of falls in the preceding six months, impaired physical mobility, foot problems, more than five pathologies and stroke sequelae, presented a probability of 29% of falling in six months.

Table 1 - Distribution of the institutionalized elderly people regarding frequency and percentage, according to sociodemographic information, general physical characteristics and cognitive characteristics. Brasília, DF, Brazil, 2014

Type of information	Variable	Categoría	Frecuencia	Porcentaje %
Sociodemographic	Gender	Female	156	57.56
		Male	115	42.44
	Education	3 years of study	74	27.82
		4 to 7 years of study	34	12.78
		Illiterate	129	48.5
		More than 8 years	29	10.9
	Marital status	Married	21	7.78
		Divorced	23	8.52
		Single	108	40
		Widowed	118	43.7
	Smoker	No	165	60.89
		Yes	106	39.11
	Body mass index	Eutrophic	103	38.00
		Overweight	43	15.86
		Underweight	125	46.12
General physical and cognitive characteristics	Tinneti index	OK	51	18.82
		Impaired	220	81.18
	Activity of daily living	Significant dependence	144	53.14
		Partial dependence	66	24.35
		Independent	61	22.51
	Mini Mental State Examination	Compromised	235	87.45
		Uncompromised	36	12.91

Table 2 - Distribution of institutionalized elderly people regarding the descriptive analysis of the sociodemographic continuous variables. Brasília, DF, Brazil, 2014

Variable	Mean	Standard deviation	Minimum	Maximum
Age	79.14	9.71	60	111
Institutionalization (years)	4.72	4.71	1	30
Height	1.58	0.10	1	2
Weight	57.12	11.96	31	96
Body mass index	22.77	4.15	14	42
Number of medications	5.76	2.48	0	15

Table 3 - Association between risk factors present in the Taxonomy II of NANDA-I and occurrence of falls in institutionalized elderly people. Brasília, DF, Brazil, 2014

Risk factors	Fall (n=69) n (%)	No fall (n=202) n (%)	OR*	95% CI†	P-value
In elderly people					
Fall History	59 (85.51%)	145 (71.78%)	2.32	1.11-4.85	.0253
Aged 60-90 years	12 (17.56%)	38 (18.91%)	1.52	0.57-4.09	.4664
Aged 70-79 years	24 (35.29%)	73 (36.32%)	0.77	0.32-1.90	
Cognitive					
MMSE‡ compromised	62 (91.18%)	170 (85.6%)	1.70	0.67-4.31	.2616
Physiological					
Mobility & functionality					
ADL§ high dependence	38 (55.07%)	106 (52.48%)	1.46	0.70-3.04	.4696
ADL partial dependence	19 (27.54%)	47 (23.27%)	1.65	0.72-3.77	
ADL independence	12 (17.39%)	49 (24.26%)			
Foot problem	26 (37.68%)	40 (19.8%)	2.45	1.35-4.44	.0033
Ambulation	46 (66.67%)	100 (49.5%)	2.04	1.15-3.61	.0145
Tinneti impaired	61 (88.41%)	159 (78.7%)	2.06	0.92-4.63	.08
Comorbidities					
Incontinence	30 (43.48%)	80 (39.6%)	1.17	0.67-2.04	.5717
Sleep disturbance	14 (20.29%)	37 (18.32%)	1.14	0.57-2.26	.7175
Stroke	25 (36.23%)	48 (23.76%)	1.82	1.01-3.28	.0453
Higher multiple diseases	19 (25.54%)	24 (11.88%)	2.82	1.43-5.56	.0028
Medications					
Higher multiple medication use	53 (76.81%)	136 (67.33%)	1.61	0.86-3.02	.141
Antidepressants	17 (24.64%)	76 (37.62%)	0.54	0.29-1.01	.0518
Diuretics	33 (47.83%)	103 (50.99%)	0.88	0.51-1.52	.6501

*Odds Ratio
†Confidence interval
‡Mini Mental State Examination
§Activity of daily living

Table 4 - Regression of the significant variables from the Taxonomy II of NANDA-I, regarding the risk of falls in institutionalized elderly people. Brasília, DF, Brazil, 2014

Cutoff point	Sensitivity	1-Specificity	Specificity
0.828	0.014	0.000	0.990
0.711	0.058	0.010	0.985
0.655	0.101	0.015	0.980
0.632	0.145	0.020	0.975
0.587	0.174	0.025	0.951
0.492	0.290	0.050	0.936
0.468	0.333	0.064	0.926
0.433	0.333	0.074	0.926
0.420	0.362	0.074	0.896
0.404	0.435	0.104	0.856
0.358	0.478	0.144	0.822
0.337	0.551	0.178	0.797
0.301	0.580	0.203	0.787
0.281	0.580	0.213	0.574
0.257	0.783	0.426	0.569
0.231	0.783	0.431	0.505
0.222	0.797	0.495	0.480
0.206	0.797	0.520	0.470

Sensitivity
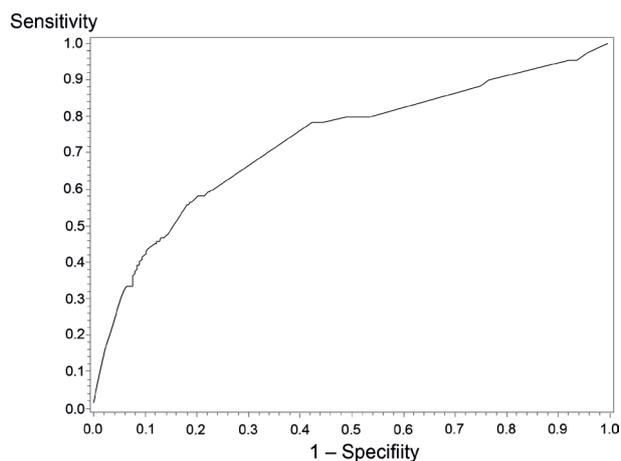
Figure 1 - ROC curve of the various cutoff points of the estimated probabilities of falling, from the significant variables found in the Taxonomy II of NANDA-I

Discussion

In this study, there was a predominance of females (58%) among the elderly people, a demographic prevalence corroborated by an integrative review[10], in which women were prevalent in the elderly population - 60%. Regarding the higher prevalence of widowed people, this was also corroborated in various studies[15-16]. It should be remembered that the long-lived population, after widowhood, associated with functional dependence and cognitive decline is often institutionalized. Analyzing the education of respondents, it was noted that they had obtained limited access to school. This data is in concordance with studies evaluating elderly people, which show a population with low levels of education, with this variable being a limiting and disabling factor in the life of the elderly person[17].

The study showed high vulnerability of this elderly population, with high dependence for activities of daily living (53%), impaired physical mobility (81.2%) and impaired cognition (87.2%). These conditions therefore, ratify several studies in which elderly people are characterized by functional dependency, family inadequacy, incontinence, multiple medication use, and cognitive, mood and nutritional decline, showing that these conditions are prevalent in long-stay institutions[7,8,15]. In addition, the data reveals the change of the profile of institutionalized elderly people that has occurred in recent years, from poor elderly people without family to a predominance of elderly people with disabilities and physical or cognitive and dependency, and chronic non-communicable morbidities[1].

The multiple disabilities associated with multiple pathologies and multiple medication use are common in institutionalized elderly people[18-20]. Among the morbidities investigated, in a study of 243 elderly of the Pelotas region, the most mentioned were spinal disease (40%), hypertension (37.2%) and arthritis or rheumatism (32.1%)[17], similar to the present study. In evaluating the sociodemographic and psychosocial profile of the institutionalized elderly people of the Federal District, the most prevalent chronic diseases were related to systemic arterial hypertension, reported by 51.6% of the elderly, and stroke (26.9%)[2]. Following the global trend, the current study demonstrated that the chronic disease with the highest prevalence was arterial hypertension, also following the trend presented in other studies[19-21]. Stroke, as a direct consequence of the worsening of the chronic condition of hypertension, presented a close association with falling (OR:1.82, 95% CI 1.01-3.28, p=.04). Stroke appears to be a possible risk factor for falls, due to hemiplegia or paresis of the affected side, as well as mobility, where an unstable position is assumed, incontinence and decrease in functional capacity, leading to a high degree of vulnerability in these elderly people.

The variety of medications the elderly respondents used and diseases they suffered, however, was discordant, as 69.7% of the elderly received more than five medications/day, however, only 15.8% had more than five pathologies. This can be explained by the frequent prescription for medications with the purpose of correcting side effects from other previously administered agents, which can lead to undesirable chain reactions, the so-called iatrogenic cascade.

Falls are multifactorial, difficult to prevent and require high complexity treatment. Regarding the causal relationships, intrinsic and extrinsic conditions of the elderly people have been identified[7,10,22]. In the evaluation of the history of falls, in the six months prior to the study, 75.2% of the elderly people said they had fallen previously (p=.025). This figure is ratified by studies on the incidence of falls, which showed high frequency and a high level of significance and causal relationships for the history of falls in the previous 12 months[7,21]. The fact of having experienced a previous fall with serious consequence such as fracture, appears to make the elderly person more vulnerable to new episodes, regardless of the frequency[7,22], confirming the fact that it is necessary not only to avoid the first fall event, substantially reducing the chance of new

episodes, but also to monitor the elderly people who have fallen and to establish which factors increase the risk of serious injury[7,22].

Regarding mobility and motion, a high prevalence was found of elderly people that presented motion in relation to the total population of walkers and non-walkers. There was, however, among the walkers, a higher prevalence of people with an impaired balance and motion. A total of 220 individuals, representing 81.1%, received scores lower than 19 points in the Tinetti Balance Assessment Tool, indicating that this population had an up to five times increased risk of falling[12,22]. In the study, however, there was no positive association between falling and motion quality, but rather the possibility of motion which gave the individual the OR: 1.85 chance of falling and significance with p less than .05 (p=.03).

Contrary to the present study, the evaluation of the occurrence of falls and its determinants in aging, in a population of 105 elderly residents of nursing homes, found that of the 40% of the elderly people who experienced falls, 61.9% presented scores lower than 19 points in the Tinneti Balance Assessment Tool, i.e., their physical mobility was impaired[7]. Aging is characterized by a decline in motor performance and the gradual reduction of movement, muscle weakness being a major contributor to the decline of the functionality of the elderly person[5,9].

The result of the significance of the absence of motion, as a protective factor for falling, observed in the present study was confirmed in a study of elderly residents in long-term care facilities in Germany, where there was a positive association between falls and partial dependence of elderly people, with the same association not being found among the independent and totally dependent subjects. The group of partially dependent elderly people had functional decline, however, not decisive for immobility, compared with the totally dependent or immobile groups, increasing the chance and risk of falling[23].

Foot problems also had a positive association with falling, doubling the risk (p=.003). Injury to the feet of the elderly population plays an important role in abnormal motion and altered postural stability. This detailed evidence of various ailments of the feet and the positive association with instability and falls has been studied. Foot problems cause elderly people some consequences such as decreased strength and coordination and increased postural instability and the risk of falling, resulting in functional incapacity[24].

The study evaluated 16 of the 28 existing categories as risk factors of the risk for falls Nursing Diagnosis, proposed by the Taxonomy II of NANDA-I. The Taxonomy II of NANDA-I, although consisting of multiple variables, presented good sensitivity and specificity (55% and 79%, respectively) for only five significant conditions, predicting the chance of the elderly person falling as 29% when presenting the characteristics studied.

In this study, there are some limitations that could influence the results, such as the possible memory bias, due to using the recall method regarding the fall history in the last previous months. Another limiting factor is the lack of evaluations regarding the extrinsic conditions, which have a great impact on the fall event. The reporting of the falls was also a limiting factor, since many institutions, despite mandatory health surveillance, do not record this event and have no protocol for this, even though their employees know the significance of its adverse reaction. Therefore, the chance of not reporting when a patient almost falls, as well as the omission by employees of the recording of the fall event, are possibilities, and could infer the possible reduction of the incidence of falls among the institutions.

Conclusion

Considering the aim of identifying the aspects that involve falls in institutionalized elderly people, in terms of risk factors, from the Taxonomy II of NANDA-I, it can be concluded that there is a high incidence of falls among institutionalized elderly people. The occurrence of this event is associated with the following aspects: presence of motion, stroke sequelae, multiple diseases, history of falls and foot problems.

This study showed that it is possible to identify elderly people who are likely to suffer falls by exploring and detecting the presence of factors associated with this event, from the nursing diagnosis instrument. The systematization of care, from the organization of nursing care to the elderly population, is a major challenge. Thus, it is necessary for the teams of the long-term care facilities to qualify the provision of care and maximize the detection and prevention of falls.

Among the variables related to the fall event, some are amenable to treatment or rehabilitation approaches; consequently, their identification can be the first promising step in developing fall prevention programs targeting elderly people. Considering the factors associates with the occurrence of falls found in this study,

some interventions can contribute to the reduction of the fall incidence and its consequences. Among the interventions the most promising is the evaluation of the motion of elderly people, particularly those with stroke sequel, providing better balance in their activities of daily life, through muscle strengthening exercises or mobility aids, as well as stimulating the use of closed and comfortable shoes adapted to foot problems.

The prevention of falls and their consequences is a major challenge, since the implementation of necessary measures for its control depends on the involvement of several agents. Due to its multifactorial character, the preventive intervention must be multidimensional and involve qualified professionals who understand that the country is undergoing an aging process and are prepared to deal with the old and new demands of this growing population. Therefore, health professionals should be trained and sensitized to the issue, experienced in the evaluation and performance of interventions, with special attention to health promotion and education of elderly people.

Acknowledgements

References

1. Bentes ACO, Pedroso JS, Maciel CAB. O idoso nas instituições de longa permanência: uma revisão bibliográfica. Aletheia. 2012,38(39):196-205.

2. Danilow MZ, Moreira ACS, Villela CG. Epidemiological, socialdemographic and psychosocial profile of institutionalized elders of the Federal District. Comun Ciênc Saúde. 2007,18(1):9-16.

3. Wahlin TBR, Winblad B, Emani A, Sandmark H. Falls and fall risk among nursing home residents. J Clin Nurs. 2008;112(35):126-34.

4. Bloch F, Thibaud M, Dugué B, Brèque C, Rigaud AS, Kemoun G. Epidoses of falling among elderly people: a systematic review and meta-analysis of social and demographic pre-disposing characteristics. Clinics. 2010;65(9):895-903.

5. Toba K, Kikuchi R, Iwata A, Kozaki K. Fall risk index helps clinicians identify high-risk individuals. JMAJ 2009, 52(4):237-42.

6. Finlayson LM, Peterson EW. Falls, aging and disability. Phys Med Rehabil Clin N Am. 2010;21(2):357–73.

7. Lojudice DC, Laprega MR, Rodrigues RAP. Falls of institutionalized elderly: occurrence and associated factors. Rev Bras Geriatr Gerontol. 2010;13(3):403-12.

8. Ferreira DCO, Yoshitome AY. Prevalência e caraterísticas das quedas de idosos institucionalizados. Rev Bras Enfermagem. 2010;63(6):991-7.

9. Menezes RL, Bachion MM. Study of intrinsic risk factors for falls in institutionalized elderly people. Ciênc Saúde Coletiva. 2008;13(4):1209-18.

10. Gomes ECC, Marques APO, Leal MCC, Barros BP. Factors associated with the danger of accidental falls among institutionalized elderly individuals: an integrative review. iênc Saúde Coletiva. 2014;19(8):3543-51.

11. Silva JMN, Barbosa MFS, Castro POCN, Noronha MM. Correlation between the risk of falling and functional autonomy in institutionalized elderly. Rev Bras Geriatr Gerontol. 2013;16(2):337-46.

12. Karuka AH, Silva JAMG, Navega MT. Analysis of agreement of assessment tools of body balance in the elderly. Rev Bras Fisioter. 2011;15(6):460-6.

13. Brucki SM, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do Mini-Exame do Estado Mental no Brasil. Arq Neuro-Psiquiatr. 2003;61(3B):777-81.

14. Lino VTS, Pereira SEM, Camacho LAB, Filho STR, Bucksman S. Adaptação transcultural da Escala de Independência em Atividades da Vida Diária (Escala de Katz). Cad Saúde Pública. 2008;24(1):103-12.

15. Gonçalves LG, Vieira ST, Siqueira FV, Hallal PC. Prevalência de quedas em idosos asilados do munícipio de Rio Grande, RS. Rev Saúde Pública. 2008;42(5):938-45.

16. Siqueira FV, Facchini LA, Silveira DS, Piccini RX, Tomas E, Thumé E, et al. Prevalence of falls and associated factors in the elderly. Rev Saúde Pública. 2007;41(5):749-56.

17. Carvalho MP, Luckow ELT, Siqueira FV. Falls and associated factors in institutionalized elderly people in Pelotas (RS, Brasil). Ciênc Saúde Coletiva. 2011;16(6): 2945-52.

18. Nurmi L, Luthie P. Incidence and costs of falls and fall injuries among elderly in institutional care. Scand J Primary Health Care. 2002;20(2):118-22.

19. Alvares LM, Lima RC, Silva RA. Falls by elderly people living in long-term care institutions in Pelotas, Rio Grande do Sul State, Brazil. Cad Saúde Pública. 2010;26(1):31-40.

20. Lawlor DA, Patel R. Association between falls in elderly women and chronic desease and drug use: cross sectional study. BMJ. 2003,27(7417):712-7.

21. Pinho TAM, Silva AO, Tura LFR, Moreira MSAP, Gurgel SN, Smith AAR, et al. Assessing the risk of falls for the elderly in Basic Health Units. Rev Esc Enfermagem USP. 2012;46(2):320-7.

22. Del Duca GF, Ante DL, Hallal PC. Falls and fractures among older adults living in long-term care. Rev Bras Epidemiol. 2013;16(1):68-76.

23. Kron M, Loy S, Sturm E. Risk indicators for falls in institutionalized frail elderly. Am J Epidemiol. 2003;158:645-53.

24. Prato SCF, Santos FC, Trevisani VFM. Pé doloroso do idoso associado à incapacidade funcional. Rev Dor. 2012;13(1):18-24.