

Association of frailty in hospitalized and institutionalized elderly in the community-dwelling

Associação da fragilidade em idosos internados e institucionalizados na comunidade
Asociación de la fragilidad en ancianos internados e institucionalizados en la comunidad

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ABSTRACT

Objective: to investigate the association between frailty with hospitalization and institutionalization in a follow-up study of elderly residents. **Method:** the follow-up study was performed in 2008 and 2013 with elderly of both genders, aged 65 years and older who were living in the community-dwelling. The sampling procedure performed was probabilistic, with dual-stage clustering. In 2008, 515 elderly people were interviewed and, in 2013, 262. We used the socioeconomic and demographic data, self-reported morbidity, specific data of hospitalization and institutionalization. Frailty was measured by the Edmonton Frail Scale (EFS), and functional capacity through the Functional Independence Measure. **Results:** we found the mean gross EFS score was higher among resident elderly who were hospitalized and institutionalized and was statistically significant in both investigated years. **Conclusion:** the confirmation of association between frailty and hospitalization and institutionalization reinforces the importance of the subject, and highlights frailty as an important tool for risk estimates for these adverse events. **Descriptors:** Frail Elderly; Aged; Hospitalization; Institutionalization; Geriatric Nursing.

RESUMO

Objetivo: investigar a associação entre a fragilidade e a internação e institucionalização em um estudo de acompanhamento de residentes idosos. **Método:** o estudo de acompanhamento foi realizado em 2008 e 2013 com idosos de ambos os sexos, com 65 anos ou mais de idade, que viviam na comunidade. O procedimento de amostragem realizado foi probabilístico, com agrupamento em dois estágios. Foram entrevistados 515 idosos em 2008, e 262 em 2013. Dados socioeconômicos e demográficos, morbidade relatada pelos mesmos, e dados específicos de internação e institucionalização foram utilizados. A fragilidade foi medida pela escala *Edmond Frail Scale* (EFS), e a capacidade funcional pela escala *Functional Independence Measure* (FIM). **Resultados:** A média da pontuação EFS foi maior entre os residentes idosos que foram internados e hospitalizados, e foi estatisticamente significativa nos dois anos investigados. **Conclusão:** A confirmação da associação entre a fragilidade e a internação e institucionalização reforça a importância do tema e enfatiza a fragilidade como um instrumento importante na avaliação dos riscos para esses eventos adversos. **Descritores:** Idoso Frágil; Idoso; Hospitalização; Institucionalização; Enfermagem Geriátrica.

RESUMEN

Objetivo: investigar la asociación entre la fragilidad y la internación e institucionalización, en un estudio de acompañamiento de residentes ancianos. **Método:** el estudio de acompañamiento fue realizado en 2008 y 2013, con ancianos de ambos sexos, de 65 años o más, los cuales vivían en la comunidad. El procedimiento de muestreo realizado fue probabilístico, con agrupamiento en dos etapas. Fueron entrevistados 512 ancianos en 2008 y 262 en 2013. Datos socioeconómicos y

demográficos, morbilidad relacionada por los mismos y datos específicos de internación e institucionalización han sido utilizados. La fragilidad fue medida por la escala *Edmond Frail Scale* (EFS) y la capacidad funcional por la escala *Functional Independence Measure* (FIM). **Resultados:** El promedio de la puntuación EFS fue mayor entre los residentes ancianos que fueron internados y hospitalizados, siendo estadísticamente significativa en los dos años investigados. **Conclusión:** La confirmación de la asociación entre la fragilidad y la internación e institucionalización refuerza la importancia del tema y enfatiza la fragilidad como un instrumento importante en la evaluación de los riesgos para estos eventos adversos.

Descriptores: Anciano Frágil; Anciano; Hospitalización; Institucionalización; Enfermería Geriátrica.

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INTRODUCTION

Conducting studies to investigate how frailty develops, how it can be safely detected, prevented, and what factors may be associated with it is essential to understanding this geriatric syndrome⁽¹⁾.

A group of experts from six international centers (North American and European), who study aging and frailty, released a consensus on the definition of frailty that suggests it is an important medical syndrome, caused by multiple factors, characterized by decreased strength, endurance and physiological function, which increases the vulnerability of a person for greater dependency and/or death⁽²⁾.

For some authors, this multifactorial cause may be linked to the interaction of biological, psychological, cognitive, social and environmental issues experienced over time, with the potential to prevent and treat symptoms, especially when it is identified early⁽³⁻⁴⁾. It is this approach that is used within the Edmonton Frail Scale⁽³⁾, validated in Brazil⁽⁵⁻⁶⁾, and which was used by this study.

Among experts in the area of aging, it is undisputed that this geriatric syndrome is associated with adverse health outcomes such as functional decline, dependence, recurrent falls, fractures, institutionalization, hospitalization and mortality⁽⁷⁻⁹⁾. Some studies show that frailty can be a predictive measure of immobility, the inability to develop basic and instrumental activities of daily living, institutionalization, hospitalization and death⁽¹⁰⁻¹⁵⁾. Frequent hospitalization has been an indicator for frailty. Some models proposed for frailty screening use hospitalization as an adverse outcome⁽³⁻¹⁷⁾.

A recent publication highlighted the existence of 13 longitudinal studies that identified the association between frailty and some adverse event, especially death and disability. There was a paucity of publications specifically on the association between frailty and hospitalization and institutionalization⁽¹⁸⁾. Thus, this relationship has not been clearly determined.

This study aims to analyze the association between frailty and hospitalization and institutionalization, in the tracking of elderly residents.

METHOD

Ethical aspects

The project was approved by the Ethics and Research Committee of Ribeirão Preto School of Nursing, University of São Paulo (EERP/USP). The Terms of Free and Informed Consent were read and signed in duplicate by the elder and/or the caregiver/family member of the elder, before interviews started.

Design and period

This is a follow-up study performed in 2008 and 2013, in Ribeirão Preto, São Paulo, Brazil, with elderly aged 65 years or older, living in the community.

Population and sample

The sampling procedure performed was probabilistic, using dual-stage clustering. At first, the census sector was considered as a Primary Sampling Unit. Then, a fixed number of households was visited to ensure self-weighting of the sample, with streets and blocks where this search process was started being drawn. At least 110 households in each sector were visited.

In 2008, 515 elderly were interviewed. In the first semester of 2013, these elderly were first contacted by telephone to schedule the second visit for interviews.

In 2013, the issue of sample loss was included in the study design, however it was higher than expected. The deaths totaled 24.7% and losses due to changes of address, refusal, institutionalization, and absence of the elderly at home (after three visits) totaled 24.4%. Thus, in 2013, for the analysis of the association between frailty and hospitalization, the sample consisted of 262 elderly and for analysis of the association between frailty and institutionalization, of 271 elderly was considered.

Study protocol

The cognitive assessment was performed through the Mini Mental State Examination (MMSE)⁽¹⁹⁻²⁰⁾. When the elderly had a score indicative of cognitive impairment, the presence of a family member/caregiver was requested to confirm the data during the interview.

For the dependent variables *institutionalization* and *hospitalization*, data were obtained from the elderly, family members and/or caregivers. For institutionalization, only the data from 2008 were considered. The date, place and reason for institutionalization were investigated. Regarding hospitalization, the date, number of hospitalizations, length of stay, and reason for each hospitalization in the previous five years were investigated.

Personal, socioeconomic and self-reported morbidity information was collected through an instrument developed by the Center for Research in Geriatric and Gerontology Nursing/USP (NUPEGG). For the analysis, the total number of self-reported illnesses (0-24) was considered.

The Edmonton Frail Scale (EFS)⁽³⁻⁶⁾, evaluates nine domains represented by 11 items, including cognitive, general health status, functional independence, social support, medication use, nutrition, mood, continence and functional performance.

The maximum score is 17, which represents the highest level of frailty. For the analysis, we used the raw EFS score (0-17).

The Functional Independence Measure (FIM) aims to measure the degree of care required by the patient with disabilities to perform motor and cognitive tasks⁽²¹⁾. Its total score ranges from 18 to 126 points, and lower values indicate a greater functional dependence. For the analysis, the FIM raw score was considered.

Analysis of results

For the descriptive analysis of numerical variables, measures of central tendency and dispersion were used, and proportions were used for categorical variables.

In order to determine the association between the variables with hospitalization and institutionalization, the Fisher’s exact test was used. For the income variables, the raw EFS score and raw FIM score, the Mann-Whitney test was used. Logistic regression models were adjusted for the hospitalization variables, and another for institutionalization. Adjustments were made considering all the independent variables and removing non-significant variables. Next, the individual adjustment was tested for each variable and the significant ones were investigated. The dependent variable in both cases is their occurrence. The selection of the best model, if there was more than one candidate model, was performed using the Akaike Information Criterion (AIC). According to this criterion, the lower the value, the better the fit of the model. In all analyses, a significance level of 5% (alpha = 0.05) was considered.

were not hospitalized, statistically significant only in 2008. The mean raw EFS score was higher among the elderly who were hospitalized, with statistical significance in both years. In the analysis of the raw FIM score, the mean values were higher among those not hospitalized, and were statistically significant in both years. The total mean of self-reported illnesses was higher among those not hospitalized, and it was statistically significant only in 2013.

In the logistic regression for hospitalization, considering all the independent variables, the raw EFS score and the number of self-reported illnesses in 2013 were statistically significant. In the individual analysis of the variables, the raw EFS score, raw MIF score, and the number of illnesses were statistically significant in both years. However, when testing them together, only the EFS score and the number of illnesses in 2013 remained significant.

Using the AIC criterion as a reference, the model with EFS scores and number of illnesses in 2013 had the best fit. Thus, according to the odds ratio, for each increase of one in the frailty scale of 2013, the chance of occurrence of hospitalization increases 1.24 times (given the same number of illnesses). For each extra illness that the elderly might have had in 2013, the chance of occurrence of hospitalization increased by 0.85, the total number of illnesses then being a protective factor (Table 1).

Table 1 - Logistic regression of hospitalization with raw EFS score in 2013 and total morbidity reported in 2013 by elderly residents

Parameters	Estimate	SE	z	p value	OR	CI 95%
(Intercept)	1.725	1.514	1.139	0.254	-	-
EFS Raw Score 2013	0.217	0.056	3.864	<0.001	1.243	(1.116- 1.393)
Illnesses 2013	-0.159	0.061	-2.601	0.009	0.852	(0.751-0.957)

Notes: EFS – Edmonton Frail Scale; SE = Standard Error; Z = Normal Curve; OR – Odds ratio; CI – Confidence interval

RESULTS

Regarding hospitalization

Among the 262 elderly respondents in both years, the majority were female (66.4%), with a mean age of 75 years (SD = 7.2) in 2008 and 79 years (SD = 6.3) in 2013. Of these, 56.1% had 1-5 years of education and there was a predominance of unmarried elderly (50.8%), with an income of up to R\$1,000.00 (2008, 72.5%; 2013, 60.7%). Among the self-reported illnesses, there was a predominance of hypertension (63.0%), among others. During this period, 98 (37.4%) participants reported having been hospitalized. The reasons were specific, such as surgery (50.0%), emergency care (28.6%), clinical treatment (21.4%), exam needs (6.1%). It is also noteworthy that there was more than one reason for hospitalization. However, 2.0% of the elderly were unable to provide information about these.

There was no statistical significance in the association of hospitalization with sociodemographic variables either in 2008 or in 2013.

For the analysis of the income variable, amounts in *reais* (Brazilian currency) according to mean tests were considered. In 2008, the mean income of the elderly who were not hospitalized was greater than the mean income of the elderly who

Regarding institutionalization

This analysis considered 271 elderly in 2013. Of these, nine (3.3%) were admitted to long-term care institutions for the elderly, of which the majority were female (8; 88.9%), mean age 80.4 years (=9.7), younger elderly (5; 55.6%), widowed (4; 44.4%), with 1-5 years of education (5; 55.5%), and an income between R\$0 - \$1,000 (7; 77.8%). The self-reported illnesses included: impaired vision (6; 66.7%), among others. Most of the elderly were considered dependent according to the FIM (5; 55.6%). The main reason for the institutionalization of the elderly, reported by family members, was the emergence of functional dependence and cognitive impairment. There was no statistically significant association between institutionalization with gender, age, marital status or education (Table 2).

Table 2 - Fisher’s exact test for long-term care institutionalization with the variables of sex, age, marital status and education in elderly residents interviewed in 2008

Variables	Institutionalization		p value
	No n (%)	Yes n (%)	
Sex			
Male	88 (98.9)	1 (1.1)	0.279
Female	174 (95.6)	8 (4.4)	
Age			
Younger elderly	208 (97.6)	5 (2.34)	0.101
Older elderly	54 (93.1)	4 (6.89)	
Marital status			
With partner	129 (98.5)	2 (1.5)	0.174
Without partner	133 (95.0)	7 (5.0)	
Education			
Illiterate	46 (97.87)	1(2.12)	0.705
1 to 5 years	146 (96.68)	5 (3.31)	
6 to 10 years	29(93.54)	2 (6.45)	
11 years or more	41(97.61)	1(2.38)	

Notes: Younger elderly (60 – 79 years old); Older elderly (80 years old or older); Fisher’s exact test $p < 0.05$.

According to the Mann-Whitney test, there was no association of the income variable with institutionalization ($p=0.904$), but it was associated with the raw EFS score ($p=0.015$) and FIM score ($p=0.046$) (Table 3).

In the logistic regression, considering all the variables described above in Tables 2 and 3, education (category 6 - 10 years) and the raw FIM score were statistically significant. However, when the variables were tested separately, age, raw score of frailty and the FIM showed statistical significance; when tested together, they were not statistically significant.

Thus, according to the AIC criterion, the individual models of age, raw score of EFS and FIM were compared. It was found that the FIM score had the lower AIC among the three models analyzed.

The Odds ratio analysis showed that for every point in the increase of the FIM scale in 2008, the elderly person’s chance of being institutionalized decreased 6.3%. Thus, the FIM is a protective factor.

DISCUSSION

In the analysis of the relationship between frailty and hospitalization and institutionalization, there was statistical significance, suggesting that frailty is a possible predictor of such events.

The absence of a universal criterion accepted by researchers to evaluate frailty prevents the comparison between different studies, because the publications use different instruments (Frailty Index, Cardiovascular Health Study, Armstrong Index, FI-CGA)⁽²²⁻²⁴⁾.

A systematic review, between 1990 and 2010⁽²³⁾, investigated the association between geriatric syndromes (including frailty) and hospitalization and admission to long term care facilities, with various definitions of frailty. It found an increased risk of hospitalization and institutionalization among the frail elderly. In another study, 31.3% of the frail elderly reported being hospitalized, compared with 20.3% of non-frail, and both showed statistical significance⁽¹⁵⁾.

Frailty in the elderly can be considered a specific phenotype, a condition often characterized by the presence of clinically unstable conditions, accompanied by advanced age, severe cognitive disorders, loss of autonomy and critical socioeconomic conditions⁽²⁵⁾. Multiple disorders, dementia and disabilities can both lead the elderly to frailty and cause worsening and aggravation of this state. Frail elderly may have multiple chronic diseases and/or significant physical or cognitive decline, requirements that select the candidate for multi-dimensional care⁽²⁶⁾ leading to hospitalizations and admission to long-term care facilities for the elderly.

Research findings are in agreement with those found in a study conducted in Canada, with 1,066 residents 65 years or older, which investigated the adjusted risk of mortality, hospitalization and institutionalization in those categorized as frail and non-frail, based upon three different instruments of frailty and the Changes in Health, End-Stage Illness and Signs and

Table 3 - Mann Whitney’s Test of long-term care institutionalization with the variables income and raw EFS score in elderly residents interviewed in 2008

Variables	Hospitalization	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum	SD	p value
Income	No	0.0	380.0	400.0	938.5	1100.0	10000.0	1.3	0.904
	Yes	380.0	380.0	380.0	773.3	760.0	2400.0	719.0	
Raw EFS Score ^a	No	0.0	2.0	4.0	4.2	6.0	12.0	2.6	0.015
	Yes	3.0	5.0	5.0	6.4	9.0	11.0	2.7	
Raw FIM Score ^b	No	51.0	119.0	123.0	120.3	125.0	126.0	8.7	0.046
	Yes	55.0	90.0	102.0	100.8	125.0	126.0	27.4	

Notes: Mann Whitney’s Test $p < 0.05$; EFS –Edmonton Frail Scale; High scores indicate frailty (0-17); FIM – Functional Independence Measure; a - High scores indicate independence (18-126); SD – Standard deviation

Symptoms (CHESS) Scale. Over one year, 15.9% of residents died, 39.8% were hospitalized at least once, and 19.1% moved into long-term care facilities. Despite the different stages of frailty, measured with different instruments, association between frailty, death, hospitalization and institutionalization were established. The authors report that residents with more severe levels of frailty are more likely to die, become hospitalized, and require institutionalization in long-term care facilities⁽²²⁾.

A prospective cohort study involving 752 elderly, aged 75 years or older, to investigate the predictive validity of the frailty index based on the geriatric assessment (CGA-FI) found that the increase of values in the index was associated with the growth of the risk of death, institutionalization, and length of hospital stay⁽²⁴⁾. With increased frailty, the risk rates for death and institutionalization also increase⁽¹²⁾. Three large prospective cohort studies have also shown this association, with worse outcomes among frail elderly^(8,16).

In a cross-sectional study with 331 institutionalized elderly of both sexes, 65 years or older, in two institutions in Spain, a prevalence of frailty attributes of 68.8% was determined. Frailty was also associated with age and female gender. Frail residents had a higher rate of dementia and increased the number of comorbidities⁽²⁷⁾.

Studies have shown that frailty is associated with institutionalization in Canadian populations in the community and in institutionalized homes⁽⁴⁻²⁸⁾. The elderly often have heterogeneous characteristics, with different rates of disability, comorbidities and multiple vulnerabilities.

Over a period of five years, both the raw EFS score and the FIM had statistical significance, which indicates the need for constant geriatric assessments throughout life.

Although there are a few studies on the subject, detection and treatment of frailty should be used to prevent disability, mobility decline, falls and death⁽²⁷⁻²⁸⁾, in addition to the reduction of hospitalization and institutionalization.

CONCLUSION

The analysis of hospitalization of the elderly showed an association between the EFS score and the number of morbidities in 2013. However, institutionalization had an association with the EFS and the FIM scores. At every FIM point that increased, the elderly person's chance of being institutionalized decreased 6.3%, which demonstrated that functional independence is a protective factor.

The confirmation of association between frailty and hospitalization and institutionalization reinforces the importance of the subject, and highlights frailty as an important tool for risk estimates for these adverse events.

The longitudinal method allowed to establish a cause and effect relationship, which broadened the knowledge on hospitalization and institutionalization of frail elderly people, however there was the risk of losing participants in the second assessment, which was confirmed in the study.

Thus, we suggest other studies on the subject, especially multi-centric studies, including other states of the country, to prove this association with a greater sample of elderly people.

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