

# Physical vulnerability of older adults in hospital discharge

*Vulnerabilidade física de idosos na alta hospitalar*

*Vulnerabilidad física de ancianos en el alta hospitalaria*

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**ABSTRACT** | Vulnerability is the individual's capacity to suffer damage in response to a stimulus. We identified physical vulnerability in older people in hospital discharge; the association of this condition with sociodemographic factors was verified, and we compared vulnerable with not-vulnerable individuals, as well as those referred or not to physical therapy during hospitalization. This was an exploratory study, and the sample consisted of 122 hospitalized older adults. Data were collected using a socio-clinical demographic questionnaire, the Mini-mental State Examination, the Geriatric Depression Scale and the Vulnerable Elders Survey-13. Spearman's correlation test was used to identify the correlation between vulnerability and socio-clinical demographic data, and the Mann-Whitney test was used to compare vulnerable and not-vulnerable older adults, and those accompanied or not by physical therapy. The significance level was 5%. Vulnerability has been identified in 75.4% of older people. A significant correlation was found between vulnerability and age ( $r=0.52$   $p=0.01$ ), length of hospital stay ( $r=0.25$   $p=0.01$ ) and number of comorbidities ( $r=0.25$   $p=0.01$ ), and a negative association between vulnerability and educational level ( $r=-0.20$   $p=0.02$ ). Statistical differences were found between vulnerable and not-vulnerable elders, for age ( $p=0.01$ ), comorbidities ( $p=0.01$ ), length of stay ( $p=0.01$ ), MMSE ( $p=0.01$ ) and GDS ( $p=0.01$ ); and among older adults accompanied or not by physical therapy, for vulnerability ( $p=0.04$ ) and length of hospital stay ( $p=0.01$ ). Most older adults were physically vulnerable in hospital discharge, being them older, presenting more comorbidities, longer hospitalization, cognitive decline and depressive

symptoms. Those treated by physical therapy showed greater vulnerability and longer hospital stay.

**Keywords** | Aged; Hospitalization; Vulnerability Study.; Health Vulnerability.

**RESUMO** | Vulnerabilidade é a capacidade de um indivíduo sofrer dano em resposta a um estímulo. Identificou-se a vulnerabilidade física de idosos na alta hospitalar e a associação dessa condição com fatores clínicos e sociodemográficos, e foram comparados idosos vulneráveis com os não vulneráveis e aqueles acompanhados ou não pela fisioterapia durante a internação. Este foi um estudo exploratório, com amostra de 122 idosos hospitalizados. Os dados foram obtidos por meio de questionário clínico e sociodemográfico, Mini Exame do Estado Mental, Escala de Depressão Geriátrica e Vulnerable Elders Survey-13. Utilizou-se para tanto o teste de correlação de Spearman para identificar a correlação entre vulnerabilidade e dados clínicos e sociodemográficos e o teste de Mann-Whitney. O nível de significância foi de 5%. A vulnerabilidade foi identificada em 75,4% dos idosos. Houve correlação significativa entre vulnerabilidade e idade ( $r=0,52$   $p=0,01$ ), tempo de internação ( $r=0,25$   $p=0,01$ ) e número de comorbidades ( $r=0,25$   $p=0,01$ ), e negativa entre vulnerabilidade e escolaridade ( $r=-0,20$   $p=0,02$ ). Houve diferença estatística entre idosos vulneráveis e não vulneráveis para idade ( $p=0,01$ ), comorbidades ( $p=0,01$ ), tempo de internação ( $p=0,01$ ), MEEM ( $p=0,01$ ) e GDS ( $p=0,01$ ), e entre idosos acompanhados ou não pela fisioterapia para vulnerabilidade ( $p=0,04$ ) e tempo de internação ( $p=0,01$ ). A maioria dos idosos era fisicamente vulnerável na alta hospitalar, sendo eles mais velhos, com mais comorbidades, maior tempo de internação, presença

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de declínio cognitivo e sintomas depressivos. Aqueles que receberam acompanhamento fisioterapêutico apresentaram maior vulnerabilidade e tempo de internação

**Descritores** | Idoso; Hospitalização; Estudo sobre Vulnerabilidade; Vulnerabilidade em Saúde.

**RESUMEN** | Vulnerabilidad es la capacidad de un individuo sufrir daño en respuesta a un estímulo. Se identificó la vulnerabilidad física de ancianos en el alta hospitalaria y la asociación de esa condición con factores clínicos y sociodemográficos, y fueron comparados ancianos vulnerables con los no vulnerables y aquellos acompañados o no por la fisioterapia durante el ingreso. Este fue un estudio exploratorio, con muestra de 122 ancianos hospitalizados. Los datos fueron obtenidos por medio de cuestionario clínico y sociodemográfico, Mini Prueba del Estado Mental, Escala de Depresión Geriátrica y Vulnerable Elders Survey-13. Se utilizó para tanto la prueba de correlación de Spearman para identificar la correlación entre la vulnerabilidad y los datos clínicos y los sociodemográficos y la prueba de Mann-Whitney. El

nivel de significancia fue de un 5%. La vulnerabilidad fue identificada en el 75,4% de los ancianos. Hubo correlación significativa entre la vulnerabilidad y la edad ( $r=0,52$   $p=0,01$ ), el tiempo de ingreso ( $r=0,25$   $p=0,01$ ) y el número de comorbidades ( $r=0,25$   $p=0,01$ ), y la negativa entre la vulnerabilidad y la escolaridad ( $r=-0,20$   $p=0,02$ ). Hubo diferencia estadística entre ancianos vulnerables y los no vulnerables para la edad ( $p=0,01$ ), las comorbidades ( $p=0,01$ ), el tiempo de ingreso ( $p=0,01$ ), el MEEM ( $p=0,01$ ) y el GDS ( $p=0,01$ ), y entre los ancianos acompañados o no por la fisioterapia para la vulnerabilidad ( $p=0,04$ ) y el tiempo de ingreso ( $p=0,01$ ). La gran parte de los ancianos era físicamente vulnerable en el alta hospitalaria, siendo ellos más mayores, con más comorbidades, el tiempo de ingreso más grande, la presencia de descenso cognitivo y los síntomas depresivos. Aquellos que recibieron acompañamiento fisioterapêutico presentaron la vulnerabilidad y el tiempo de ingreso más grandes.

**Palabras clave** | Anciano; Hospitalización; Estudio de Vulnerabilidad; Vulnerabilidad en Salud.

## INTRODUCTION

The Brazilian population aging is a progressive and accelerated scenario, implying a change in the epidemiological profile, which is marked by greater prevalence of chronic degenerative diseases that require continuous care and higher investment<sup>1</sup>. Thus, aging impacts the health service and imposes new demands and challenges<sup>2</sup>. Besides, the aging process is characterized by organic and physiological changes, which hinders the maintenance of homeostasis when the older adults are under stress<sup>3,4</sup>, making them more vulnerable.

The term “vulnerability” comes from the Latin *vulnerare* (to hurt) and *vulvabilis* (that injures). Vulnerability can be defined as the capacity of an individual to suffer damage in response to a stimulus. We use this term to characterize a person in vulnerable condition, not only from the biomedical viewpoint, but also from social and economic aspects, among others. In older adults, vulnerability varies according to the level of dependency for activities of daily living<sup>3,5,6</sup>.

In this context, hospitalized older adults present slower and more complicated recovery, higher rates of morbidity and prolonged hospital stay<sup>7</sup>. From 2002 to 2011, the older population was accountable for 27.9% of the hospitalizations in the Unified Health System (UHS), and 34.5% of the resources were spent on them<sup>7</sup>. Correspondingly, the

hospitalization can reduce the autonomy, independence and functionality of older adults<sup>3,7,8</sup>.

This way, it is important to identify the vulnerability of older people at the end of hospitalization. Public administrators and basic health professionals are believed to have a better knowledge of the older adults that will return to their care and, based on such information, they will be able to develop interventions that can prevent or postpone the functional incapacity.

Thus, the objectives of our study were (i) to identify the physical vulnerability of hospitalized older adults at the moment of hospital discharge, which was done through the *Vulnerable Elders Survey-13* (VES-13)<sup>6</sup>, (ii) to verify the correlations between length of hospital stay, age, income, educational level, comorbidities and vulnerability in hospital discharge; (iii) to compare clinical sociodemographic data of vulnerable older adults with the not-vulnerable ones; (iv) to compare the vulnerability index between individuals that received or not physical therapy treatment during hospitalization.

## METHODOLOGY

This was a cross-sectional, exploratory study, approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais. The research was conducted in

cardiology and clinical infirmaries in a university hospital from Belo Horizonte, Minas Gerais, from May to July 2015. We used a non-probabilistic sample, including people aged 65 years or older from both sexes, with programmed discharge in the medical records, who agreed to participate in the research and signed an informed consent form. The older adults who were transferred from sector before discharge were excluded, as well as those who had no companion in the moment of evaluation, or who died.

Physical vulnerability was identified through the *Vulnerable Elders Survey-13* (VES-13)<sup>6</sup>, which is composed of 13 questions, divided into four items that evaluate age, self-perceived health, and presence of physical limitations and inabilities<sup>5,6,9</sup>. This survey has a score range from 0 to 10, and a value equal or greater than 3 indicates the older adult presents a risk of functional decline and death in the next two years, which is a risk 4.2 times higher than for older adults that present a score of 2 or less<sup>6</sup>. The questionnaire was translated and adapted to the Brazilian population, with means of 79% and 94% in the cultural and conceptual idiomatic equivalence evaluation, respectively. For internal consistency analysis<sup>5</sup>, it presented  $\alpha=0.70$ , and the questionnaire could be responded by the patient or caregiver, showing an intraclass correlation coefficient of 0.88<sup>9</sup>.

The remaining variables were obtained with a socio-clinical demographic questionnaire (age, educational level, income, marital status, comorbidities, medications, length of hospital stay, referred or not to physical therapy during hospitalization), the Mini Mental State Examination (MMSE)<sup>10</sup> and the Geriatric Depression Scale (GDS)<sup>11,12</sup>.

MMSE is a cognitive tracking questionnaire, consisting of 30 points. The adapted version and the cut-off points were considered, according to educational level, as proposed by Bertolucci et al., 1994<sup>10</sup>.

GDS-15 is a scale of depressive symptoms that presents validity and reliability for the Brazilian population<sup>11,12</sup>.

First, MMSE was conducted. Older adults who have reached the cut-off points<sup>10</sup> answered the other questionnaires according to the level of education. In cases where the MMSE indicated possible cognitive deficit, the interview was held with the older adult responsible.

Descriptive analysis was obtained with frequency distribution and median. The normality of data distribution was checked by the Kolmogorov-Smirnov test, indicating the need to use non-parametric statistics. The correlation between vulnerability, age, income, educational level, length of hospital stay, and comorbidities was obtained through Spearman correlation test. Vulnerability comparison among individuals who had or had not received physical therapy, and among vulnerable or not-vulnerable groups, was assessed through the Mann-Whitney test. The significance level was of 5%.

## RESULTS

During the study period, 189 older adults were hospitalized. Of these, 122 were included. Sixty-seven individuals were excluded from the research, the reasons for it are outlined in Figure 1.

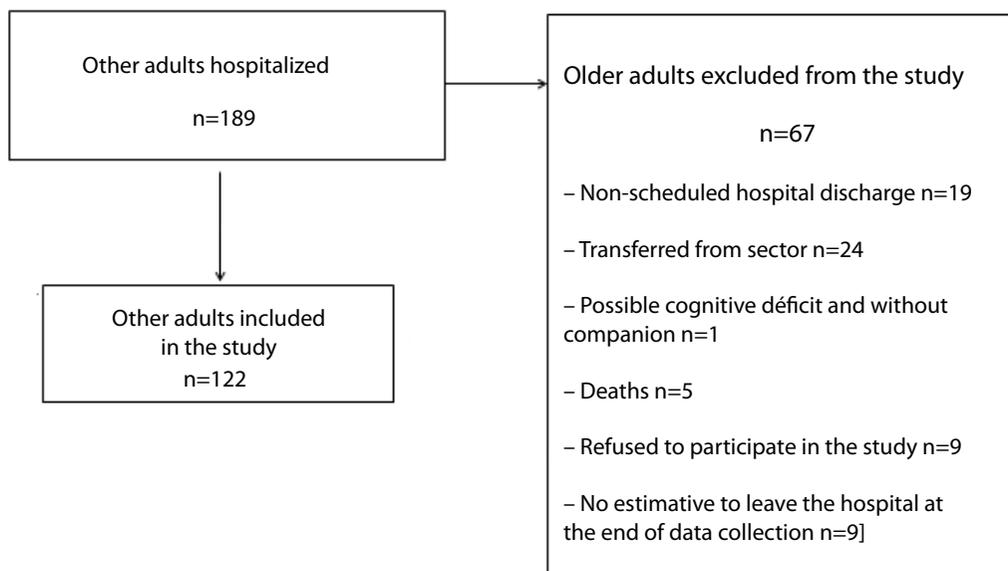


Figure 1. Flowchart of the sample included in study

Most older adults were men, married, with less than two minimum wages income, up to four years of education, and used five or more medicines (TABLE 1). In addition, the majority (56.6%) declared to be of mixed ethnicity; lived with spouse/children and grandchildren (80.3%) and were hospitalized for pulmonary heart diseases (54.1%).

Table 1: Clinical and sociodemographic characterization of older adults in hospital discharge (n=122)

Variables	N (%)
<b>Sex</b>	
Female	56 (49,6)
Male	66 (54,1)
<b>Marital status</b>	
Married	59 (48,4)
Widower	37 (30,3)
Divorced and single	26 (21,3)
<b>Income</b>	
Less than 2 minimum wages	97 (79,5)
More than 2 minimum wages	25 (20,5)
<b>Educational level</b>	
Up to 4 years.	74 (60,7)
5 years or more	48 (39,3)
<b>Number of medicines</b>	
≤4	31 (25,4)
≥5	91 (74,6)
<b>Physical therapy treatment</b>	
Yes	75 (61,47)
No	47 (38,53)
<b>Variable</b>	Median (interquartile range Q3-Q1)
Age (years)	71,0 (12,0)
Number of comorbidities	3,0 (2,0)
Hospitalization period (days)	17,0 (15,3)
Mini-mental State Examination (points)	22,0 (11,8)
Geriatric Depression Scale (points)	4,0 (4,3)

Concerning the physical vulnerability, 92 (75.4%) older adults were identified as vulnerable, the median of 6 points being found by means of VES-13. Regarding the correlation analyses, significant and moderate correlation was observed between vulnerability and age (RHO-0.52; P=0.01); and a weak and significant correlation was found between educational level (rho=0.20; p=0.02) and length of hospital stay (rho=0.25; p=0.01). Other correlations were not significant (p>0.05).

When comparing vulnerable older adults with the not-vulnerable ones, a statistically significant difference was observed for age (p=0.01), number of comorbidities (p=0.01), length of hospital stay (p=0.01), cognitive changes (p=0.01) and depressive symptoms (p=0.01). The results showed that those most vulnerable were

older, with greater number of comorbidities, prolonged periods of hospitalization, lower score in the MMSE, and greater number of depressive symptoms. Other comparisons were not significant (p>0.05).

When the older adults were compared regarding physical therapy treatment, a significant statistical difference was observed for duration of hospitalization (p=0.01) and vulnerability (p=0.04). Individuals who received physical therapy treatment were hospitalized for a longer period and were more vulnerable when compared with those who had not received treatment. No statistical difference was found for other variables (p>0.05)

## DISCUSSION

This research aimed to study the physical vulnerability of hospitalized older adults in hospital discharge. The results show that most individuals were physically vulnerable in hospital discharge, being them older, presenting more comorbidities, longer hospitalization, cognitive decline, and depressive symptoms. Older adults accompanied by physical therapy showed longer hospitalization period and physical vulnerability, suggesting that those who were referred to physical therapy could be in worse health conditions.

We could observe vulnerability in 75.4% of the older adults assessed. In cross-sectional studies with north-American people, vulnerability was identified in 54% and 52.6% of the individuals on the first week of hospitalization<sup>13,14</sup>. In a Brazilian longitudinal study, the vulnerability was identified in 38.1% of community older adults in 2000, and in 52.7% of those in 2006<sup>15</sup>. We demonstrated here a vulnerability percentage greater than the values found in the literature. This can be justified by the fact that the evaluation was conducted at the end of the hospitalization process, which can negatively impact older adults' functionality due to their need to rest. Functionality reduction is estimated to reach from 34% to 50% of older people during hospitalization<sup>3,16</sup>.

A literature review showed depression, *delirium*, cognitive and physical impairment, environmental factors, prior functional incapacity, and polypharmacy as risk factors for functional decline in hospitalized older people<sup>17</sup>. Such information reinforces our findings. One might think that hospitalization, despite being often the only alternative to control a medical condition, is a negative factor for older adults, since it tends to

be longer and offers greater risk of complications<sup>18</sup>. Hospitalization also affects older adults' autonomy and independence, considering that they are in an unfamiliar environment, exposed to different routines, limited in their daily activities, confined to bed, presenting sleep changes, iatrogenesis, malnutrition, and *delirium*<sup>14,19</sup>.

The weak correlations between vulnerability and educational level, comorbidities and length of hospital stay were statistically significant. Considering the association magnitude, these data should be interpreted cautiously, because they may not have clinical significance. However, it is worthwhile to remember that educational level is a determinant factor for health condition, particularly in older adults. The literature points out that a low educational level relates to a greater chance of individuals presenting health problems and negatively impacts their functionality<sup>15,20,21</sup>. In sequence, a greater functional impairment is related to multiple comorbidities, and both are risk factors for frailty<sup>20,21</sup>. On the other hand, still concerning the associations, age was mildly correlated, demonstrating that vulnerable individuals are older than the not-vulnerable ones, which confirms the fact that the older the age, the greater the difficulty in homeostasis maintenance, and the greater the susceptibility to harm<sup>15</sup>.

Regarding the older adults' characteristics, we point out that the majority was male, corroborating the UHS data<sup>3,22,23</sup>. This fact can be justified by the Brazilian culture, in which men only seek health services when the disease is at a very advanced stage and is more difficult to control with basic care<sup>22</sup>. Other sociodemographic data also resemble other Brazilian studies<sup>22,24</sup>.

On the other hand, the length of hospitalization for the older participants of this study (median of 17 days) contradicts the current literature<sup>22,24</sup>. Studies have shown a mean length of stay of 8.9 days for the Southwest region<sup>22</sup> and 6.2 days for the Central-West region<sup>24</sup>. Such a difference can be explained by the profile of the research institution, i.e., a reference hospital from moderate to high complexity health conditions that normally treats greater severity and risk patients. This may also be related to differences found in groups who received or not physical therapy care.

Furthermore, we should highlight that, when analyzed in general, the older people studied did not present signs of cognitive decline and depressive symptoms. However, when analyzed in groups, vulnerable individuals presented possible cognitive decline and depressive symptoms, indicating that the

vulnerability can influence cognition and depression, and vice versa. However, this assertion, for now, it is just speculation and should be examined in future studies.

Regarding physical therapy, 61.5% of the participants received treatment and presented longer hospitalization periods and vulnerability. Such fact can be justified by the hospital routine, which refers the patient to physical therapy after a request for medical referral and consultation. This is requested mainly for patients with pulmonary or cardiovascular involvement, in postoperative period, with mobility deficit, restricted to the bed and/or with some activities limitations, which means the worst clinical and functional conditions. In line with this result, a U.S. study has identified a greater likelihood of functional impairment, a month after hospital discharge, in physically vulnerable hospitalized older adults who received a "mobility plan"<sup>14</sup>. The authors justified it with the fact that the individuals indicated to "mobility plan" presented greater risk of functional impairment, greater number of associated geriatric symptoms (iatrogenesis, immobility, postural instability, dementia and incontinence), prior frailty and longer hospitalization<sup>14</sup>.

We observed a mean vulnerability of 4.5 ( $\pm 3.1$ ) points to older adults without physical therapy treatment. This value classifies the individuals as vulnerable, which means an increased risk of functional decline. It is not possible to say that, although they have not received physical therapy treatment, this would not be a necessary and beneficial resource to the individual. Thus, results concerning the comparison of groups that had or had not received physical therapy treatment must be interpreted with caution, because data about the beginning of physical therapy, monitoring goals, duration, frequency, pre- and post-intervention evaluation were not analyzed. This should be a goal for future studies, with an adequate methodological design.

Finally, one of the study limitations might be the lack of control on hospitalization motives, considering that those with very long hospital stay, and for acute reasons, could have over or underestimated their ability to perform some activities mentioned in the VES-13. Future studies, with longitudinal design, will help the understanding of the effect of hospitalization on older adults' physical vulnerability. Similarly, we suggest in future studies the qualitative analysis of medicines and comorbidities, naming the different drugs and their consequences, as well as the diverse types of comorbidities.

## CONCLUSION

Most older adults were physically vulnerable in hospital discharge, older, presenting more comorbidities, longer hospitalization, cognitive decline, and depressive symptoms. Yet, individuals who received physical therapy treatment presented longer hospitalization and greater vulnerability. These results may relate to the previous severity of the older adults referred to physical therapy.

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