Hospitalization of Older People in a Large Brazilian Urban Center and its Associated Factors

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Abstract

Objective: To evaluate the frequency of Hospital Admission (HA) in the last twelve months in older adults treated at Primary Health Care (PHC) and its associated factors, through a Comprehensive Geriatric Assessment (CGA). *Methods:* Cross-sectional study, with a random sampling of 400 older adults using PHC. The frequency of HA for at least 24 hours was self-reported (yes; no). A sociodemographic and health survey was used, tools to evaluate basic and instrumental daily life activities, cognition, depression, falling, and fear of falling. The association of factors to HA was analyzed using multiple logistic regression analysis. *Results:* Mean age was 75.23 (±8,53), 63.2% of participants were female 62.6% reported a poor/fair state of health and 38% reported HA in the previous twelve months. Older patients, with a poor perceived health, chronic illnesses, daily use of medications, dependent for basic and instrumental daily life activities, cognitive impairment, and having fallen in the previous year demonstrated associations with hospitalization. Knowing how to read and write was associated with protection from hospitalization. The frequency of hospitalization was high in this study. *Conclusion:* The frequency of HA of older people attended at basic health units was high and was associated with modifiable and non-modifiable factors, indicating that the multidimensional approach is an important tool in the care of the older adults in primary health care settings.

Keywords: Elderly. Hospitalization. Geriatrics. Geriatric Assessment.

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INTRODUCTION

Older adults access health services more frequently, involving a higher cost, prolonged treatment and impairment of the recovery stage[1]. Hospital Admission (HA) in this population is at high risk due to the presence of multiple comorbidities1. In the literature, there is relevant information on risk factors for HA in the older adults[1,2]. However, there is a need for a multidimensional approach, centered on the older adults, considering modifiable and non-modifiable factors[2].

Due to the increase in the older adults population, it will require a greater demand for health care at all levels, and an increase in the frequency of HA[3]. Older adults make greater use of health services than do other age groups[3]. Furthermore, the disease profile of older adults demands more health system resources, principally at the level of hospitalization, thus increasing costs[3,4]. Primary Health Care (PHC) has a fundamental role in reducing HA rates in the older population[3-6]. Most of the time, older adults can avoid HA by way of effective PHC measures[6]. There is no doubt that there is a great effort on the part of geriatricians, gerontologists, gerontologists and researchers to identify risk factors for HA in older adults[3]. Previous studies have shown that Non-Communicable Chronic Diseases (NCCDs), especially multimorbidities, functional incapacity, poor perceived health, polypharmacy, low educational levels, and advanced age were associated with the risk of HA among older Brazilians[5-8].

Understanding the factors associated with the HA of older adults is essential for developing policies to prevent the harm caused by this outcome[5]. For this reason, it is essential to carry out a multidimensional assessment focused on the older adults[2]. In this sense, the Comprehensive Geriatric Assessment (CGA) is the most appropriate way to assess the needs of the older adults[9].

To the best of our knowledge, few studies have used a multidimensional evaluation using validated scales of functional capacity, mental health, history of falls and HA among older Brazilians attended in PHC facilities. Therefore, preventing HA in this population is relevant for preserving quality of life and reducing health system costs[5-7]. Thus, the aim of this study was to assess the frequency of HA in the last twelve months in older adults assisted in PHC and its associated factors, through CGA.

METHODS

A cross-sectional study with probability sampling of adults 60 and older, treated at one of the PHC units in the city of São Paulo, SP, Brazil. This study followed the recommendations of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[10]. Research was conducted at the Marcus Belenzinho (Belenzinho) Primary Care Unit (PCU), located in the eastern zone of the municipality of São Paulo, SP, Brazil. The PCU has approximately 40,000 individuals registered, of whom 5,000 are older adults. Four hundred subjects were needed to do hierarchical logistic regression models with a dependent variable and fifteen independent variables, mean frequency of 14%[5,7]. HA of older adults, alpha value of 5% significance (α=0.05), and statistical power of 90%. Selection of older adults was done by way of simple random sampling, using those 5,000 registered of older adults' record numbers.

Inclusion criteria were being 60 and older and registered in the Belenzinho PCU. Exclusion criteria were having a severe physical limitation and medical diagnosis of cognitive deficits or dementia. Data collection was carried out between February and August 2018 by a nurse holding a doctoral degree with more than ten years' experience in PHC. After random selection of potential research participants, those chosen were contacted during nursing appointments at the PCU. Interviews (lasting approximately 40 minutes) were conducted individually in a private setting. The frequency of HA was obtained using a subjective, self-reported question: *Have you been hospitalized for more than 24 hours in the previous twelve months (yes, no)*? Sociodemographic variables: gender (male, female); age group (65 to 70 years of age; 70 to 79; 80 or more); marital status (with partner, no partner); knowing how to read/write (yes; no); level of studies (none; 1 to 4 years; >4 years); living alone (yes; no).

Variables related to state of health: satisfaction with life (yes; no), perceived health (poor; fair; good; excellent), chronic disease (yes; no), use of medications (yes; no), polypharmacy – daily use of ≥5 medications (yes; no); tobacco use (yes; no).

Basic activities of daily living: Katz Index – created by Sidney Katz in 1976 and validated for Portuguese in 2008[11]. This instrument is used to evaluate Basic Activities of Daily Living (BADL), according to the degree of independence in the outcomes of six BADL functions (bathing, dressing, going to the toilet, transferring, continence, and feeding). The Brazilian validation demonstrated excellent psychometric properties, with a Cronbach's alpha between 0.80 and 0.92[11]. The score varies from 0 to 6 points and classifies patients as independent (score of zero) and dependent (score greater than or equal to 1)[11].

Instrumental activities of daily living: Lawton Scale – elaborated by Lawton and Brody in 1969, validated for Portuguese in 2008[12]. This instrument is used to evaluate Instrumental Activities of Daily Life (ADL), in accordance with scores varying from 0 to 21. It classifies patients as dependent (score less than or equal to 20) and independent (score equal to 21)[12].

Cognition: Mini-Mental State Examination (MMSE) – elaborated by Folstein in 1976, used to evaluate cognitive function, transculturally adapted to Brazilian Portuguese in 1994[13]. The score varies between a minimum of 0 and maximum of 30 points. One of the cut-off points used in Brazil was based on level of education (in years of schooling): 13 points for illiterate; 18 for low to medium level of education (up to eight years of formal education), 26 for older adults with high levels of education (more than eight years of schooling)[13].

Depression: Geriatric Depression Scale, short form with 15 items (GDS-15); developed by Yesavage in 1983 and validated for Portuguese in 2005[14]. It is a fifteen-item scale, with two options for answers (yes; no). Scoring varies from 0 to 15, and classifies patients as not having depression (less than or equal to 5) and having depression (equal to or greater than 6)[14].

Fear of Falling: Falls Efficacy Scale – International (FES-I) was developed by Yardley in 2005[15]. This scale was validated for Portuguese in 2010, with a Cronbach's alpha equal to 0.96[15]. The FES-I evaluates fear of falling (FOF) in 16 distinct daily activities. The FES-I scoring scale, from 16 (not at all concerned) to 64 (extremely concerned), with each item measured on a four-point *Likert* scale. The cut-off points for the FOF were as follows: 16–22 = low concern and 23–64 = high concern[15]. Variables for presence of falls were a history of falls (yes; no) and last fall (<12 months ago; yes; no).

Presence of comorbidities with Prince et al.[16], cardiovascular (yes; no), neoplasm (yes; no), pulmonary (yes; no), musculoskeletal (yes; no), neurological (yes; no), metabolic (yes; no), obesity (yes; no)[16].

Descriptive analysis was presented in absolute and relative (categorized variables) values and measures of central tendency (continuous numeric variables). The proportion of categorized variables was compared using the Chi-Square test (or Fisher Test, according to the sample size). Multiple Logistic and Hierarchical Regression was used with dichotomous variable HA (yes, no). Five models were developed: Model 1: socio-demographic (age, gender, read/write, marital status, family arrangement), Model 2: Model 1 + state of health (perception of health (poor), chronic disease, use Daily Medication, polypharmacy - ≥5 medication per day, tobacco use. Model 3: Model 2 + functional capacity (Katz - dependent or independent, Lawton dependent or independent). Model 4: Model 3 + mental health (Depression- GDS15 yes; no, cognitive function - MMSE). Model 5: Model 4 + falls (falls in the last 12 months yes; no, FOF – FES-16 yes; no). Significance level of 5% was chosen for the test, with a 95% confidence interval and $p<0.05$*; $p<0.01$**; $p<0.001$***.

This project was approved by the Ethics and Research Committee of the São Paulo Municipal Health Secretariat, Protocol 2.468.315, January 17, 2018. All participants signed a Free and Informed Consent Form. The research is in accordance with Resolution No. 466/2012 and Resolution No. 510/2016.

RESULTS

From 488 older adults of this study, 400 (83.33%) completed all questionnaires. Of those who did not participate, 50 older adults did not meet the inclusion criteria and 38 refused to participate in the study. Sociodemographic and health variables are found in *Table 1*. Mean age was 75.23 (SD: 8.53) years. 63.20% were female, 67% had no partner, 39.5% did not know how to read and write, and 31.5% lived alone. More than half (54.2%) of the older adults were not satisfied with life. In regard to self-perception of state of health, 62.6% evaluated their health as poor or fair, and 92.3% had NCCDs.

In Table 2**,** we find the prevalence of the principle non-communicable chronic diseases.

The frequency of hospitalization in the previous twelve months was 38.0% (CI 95%= 33,30%-42,70%). Unadjusted multiple logistic regression gave evidence that older adults, with more advanced age, regular or poor health perception perceived health, having chronic diseases, using daily medication, dependent for BADL and IADL, and having fallen in the previous twelve months were associated with higher risk of hospitalization. The variables of knowing how to read and write and having better cognitive status were associated with less risk of hospitalization (Table 3).

In Table 4, Five models of Hierarchical Logistic Regression were conducted. In the first model, "Sociodemographic Variables", knowing how to read and write presented less risk of being hospitalized (OR=0.45; CI 95%:0.29–0.68, p<0.001). In the 2nd model "Sociodemographic Variables and State of Health", older adults with self-perception of a poor state of health (OR: 10.65; CI 95%: 1.19–95.23, p=0.034) and tobacco users showed greater chances of being hospitalized (OR=3.41; CI 95%=1.44–8.07, p=0.005). In the third model, "Sociodemographic Variables, State of Health, and Functional Capacity", older adults who are dependent for BADL – Katz showed more risk of HA (OR=2.93; CI 95%= 1.42–6.01, p=0.003). In the last model, older adults with a poor perceived health (OR=13.49; CI 95%= 1.26–144.38, p=0.031), or fair perceived health (OR=11.82; CI 95%=1.12–123.86, p=0.039), tobacco users (OR=3.36; CI 95%=1.36–8.29, p=0.008), dependent for BADL - Katz (OR=2.39; CI 95%=1.18–4.87, p=0.016) and falling in the previous twelve month (OR=2.37; CI 95%= 1.09–5.15, p=0.028) showed greater chances of HA.

Table 1. Sociodemographic and Health Characterization of the Older Adults (n=400). São Paulo,SP, 2018.

Variables	n (%)
Age	
60-69	104 (26.0)
70-79	159 (39.7)
≥80 years	137 (34.3)
Gender	
Male	147 (36.8)
Female	253 (63.2)
Marital Status	
With partner	132 (33.0)
No partner	262 (67.0)
Know how to Read/Write	
Yes	242 (60.5)
No	158 (39.5)
Schooling	
None	158 (39.5)
1 to 4 years	242 (60.5)
> 4 years	0 (0)
Lives Alone	
Yes	126 (31.5)
No	274 (68.5)
Satisfaction with Life	
Yes	183 (45.8)
No	217 (54.2)
Perceived health	
Poor	89 (22.3)
Fair	161 (40.3)
Good	120 (30.0)
Excellent	30 (7.4)
Chronic Disease	
Yes	369 (92.3)
No	31 (7.7)
Daily Medication	
Yes	363 (90.7)
No	37 (9.3)
Polypharmacy	
Yes	148 (37.0)
No	252 (63.0)
Tobacco	
Yes	110 (27.5)
No	290 (72.5)
FOF[b]	
Yes	251 (62.7)
No	149 (37.3)
Fall in past 12 months (yes)	
Yes	51 (20.3)
No	200 (79.70)

FOF: Fear of Falling; [b]The cut-off points for the FOF were as follows: 16–22 = no and 23–64 = yes.[15]

Table 2. Prevalence of Non-Communicable Chronic Diseases (n=400). São Paulo,SP, 2018.

Comorbidities*	n (%)
Cardiovascular	
Yes	295 (73.70)
No	105 (26.30)
Neoplasm	
Yes	19 (4.70)
No	381 (95.30)
Pulmonary	
Yes	26 (6.50)
No	374 (93.50)
Musculoskeletal	
Yes	118 (29.50)
No	282 (70.50)
Neurological	
Yes	199 (49.80)
No	201 (50.20)
Cardiometabolic	
Yes	206 (51.50)
No	194 (48.50)

*Chronic diseases were categorized according to Prince et al.[22]

Table 3. Associated factors with hospitalization of older adults (n=400). São Paulo,SP, 2018.

Sociodemographic and clinical variables	Hospital Admissiona OR, unadjusted (95%IC)	*p*-value
Age (mean)	1.09 (1.06 – 1.12)	<0.001***
Gender (female)	1.08 (0.71 – 1.65)	0.691
Read/Write (yes)	0.45 (0.29 – 0.68)	<0.001***
Marital status (yes)	1.41 (0.91 – 2.19)	0.117
Family Arrangement (yes)	0.91 (0.58 – 1.41)	0.677
Perceived health (poor)	5.62 (2.09 – 15.11)	<0.001***
Perceived health (fair)	2.92 (1.13 – 7.54)	0.026*
Perceived health (good)	1.10 (0.40 – 2.99)	0.842
Chronic Disease (yes)	3.44 (1.29 – 9.17)	0.013*
Daily Medication (yes)	2.38 (1.06 – 5.36)	0.036*
Polypharmacy (yes)	1.35 (0.89 – 2.05)	0.150
Tobacco (yes)	0.90 (0.57 – 1.43)	0.678
Katz (dependent)	6.31 (3.88 – 10.26)	<0.001***
Lawton (dependent)	4.29 (2.78 – 6.60)	<0.001***
Depression (yes)	0.77 (0.50 - 1.01)	0.222
MMSE (mean)	0.83 (0.76 – 0.90)	<0.001***
FES-I (With fear of falling)	1.74 (0.81 - 3.71)	0.150
Fall in past 12 months (yes)	2.93 (1.51 – 5.69)	0.001**

[a]Hospital admission at list 24 hours in the last 12 months. 0= no; 1=yes. * p<0.05; p<0.01**; p<0.001***. OR: Odds Ratio; CI: Confidence Interval; MMSE: Mini Mental State Examination; FES-I: Fall Effectiveness Scale – International.

Table 4. Hierarchical logistic regression among independent variables and hospitalization of older adults (n=400). São Paulo,SP, 2018.

Models	Hospitalization[a] OR, adjusted (95%IC)	*p*-value
1st Model		
Age (mean)	1.07 (0.99 – 1.15)	0.056
Gender (female)	0.72 (0.39 – 1.32)	0.295
Read / Write (yes)	0.45 (0.29 – 0.68)	<0.001***
Marital status (yes)	1.79 (0.91 – 3.49)	0.087
Family Arrangement	0.77 (0.41 – 1.42)	0.405
2nd Model		
Perceived health (poor)	10.65 (1.19 – 95.23)	0.034*
Chronic Disease (yes)	1.08 (0.12 – 9.37)	0.939
Daily Medication (yes)	2.75 (0.55 – 13.62)	0.214
Polypharmacy (yes)	1.21 (0.67 – 2.20)	0.511
Tobacco (yes)	3.41 (1.44 – 8.07)	0.005**
3rd Model		
Katz (dependent)	2.93 (1.42 – 6.01)	0.003**
Lawton (dependent)	1.91 (0.97 – 3.76)	0.061
4th Model		
Depression (yes)	1.06 (0.55 – 2.02)	0.852
MMSE (mean)	0.92 (0.80 – 1.06)	0.270
5th Model		
Age (mean)	1.04 (0.99 – 1.09)	0.087
Gender (female)	0.07 (0.41 – 1.84)	0.724
Read/Write (yes)	1.44 (0.70 – 2.94)	0.316
Marital status (yes)	1.25 (0.62 – 2.51)	0.526
Perceived Health (poor)	13.49 (1.26 – 144.38)	0.031*
Perceived health (fair)	11.82 (1.12 – 123.86)	0.039*
Perceived health (good)	5.54 (0.51 – 59.54)	0.157
Chronic Disease (yes)	1.07 (0.10 – 10.64)	0.952
Daily Medication (yes)	3.29 (0.61 – 17.64)	0.164
Polypharmacy (yes)	1.19 (0.64 – 2.21)	0.563
Tobacco (yes)	3.36 (1.36 – 8.29)	0.008**
KATZ (dependent)	2.39 (1.18 – 4.87)	0.016*
Lawton (dependent)	1.72 (0.89 – 3.34)	0.106
Depression (yes)	1.10 (0.58 – 2.08)	0.759
MMSE (mean)	0.92 (0.80 – 1.06)	0.286
FES-I (with fear of falling)	0.92 (0.20 – 4.16)	0.914
Fall in past 12 months (yes)	2.37 (1.09 – 5.15)	0.028*

[a] Hospitalization at list 24 hours in the last 12 months. 0= no; 1=yes. * $p<0.05$; $p<0.01$**; $p<0.001$***. Odds Ratio; CI: Confidence Interval, MMSE: Mini Mental State Examination, FES-I: Fall Effectiveness Scale – International.

DISCUSSION

This study researched the frequency of HA and factors associated with older patients treated in primary care. The frequency of HA in the sample studied was greater than that in other Brazilian publications[5-7]. Older adults of more advanced age, poor perceived health, having chronic diseases, using daily medication, being dependent for BADL, IADL, and having fallen in the previous twelve months showed greater chances of HA. Nevertheless, older adults who knew how to read/write and having better cognitive status demonstrated fewer chances of HA.

These findings are consistent with scientific literature and are important for health professionals who deal with older patients from primary to tertiary care[3-8]. In this context, identification of indicators associated with greater chances for hospitalization represents an essential tool in clinical practice, corroborating with preventive measures and resolvability[3-8]. The prevalence of hospitalization in the sample studied was greater when compared to other national publications that varied between 7.6% and 17.7%[5-7]. Possible explanations that illustrate the sample's greater fragility are that these older adults were treated at a PHC unit, almost one third were over 80 years of age, the vast majority of them have at least one NCCD and use medication daily, most have perceptions of poor health or lack of satisfaction with life, and a history of falling.

Older adults with perceptions of poor health show greater chances of HA. Negative self-perception of health is shared by various studies as an important indicator of health[5,17-19]. In a population based study of 23,815 older adults, it was shown that older adults with a perception of poor health had a 1.35 greater chance of being hospitalized[5]. The evaluation of self-perception of health is an important subjective tool in clinical practice, is easily applied, and is an excellent screen for health outcomes as a predictor of hospitalization and death in older populations[5,20].

Tobacco use was associated with HA in the sample studied. In a prospective populational study with 7.2 years follow up and 188,167 individuals with a mean age of 55, tobacco use was associated with HA and mortality due to various cardiovascular diseases[21]. Data from literature highlights tobacco use's deleterious effect, including reduced life expectancy[21,22]. In a national study, tobacco use by women subtracted 4.47 years of life compared to those who did not use it, and in the male population, the impact was 5.03 years for smokers[22]. Furthermore, the use of tobacco undermines the quality of life, due to the morbidities related to it, such as cardiovascular diseases, chronic obstructive pulmonary disease (COPD), and cancer[21]. In another international study, the fragility of older adults was greater in smokers, principally in the 60 though 79 year age range[23].

Older adults dependent for BADL presented a greater chance of HA. Diverse studies have shown that Functional Capacity (FC) is a dynamic composition that manifests itself as a central element of the older population's health[5-7,24]. Impairment of activities like bathing, and feeding and dressing oneself is related to increased fragility in older adults and, consequently, greater demands for medical care and the risk of HA[5,24].

Impairment of FC is more conspicuous and has implications for older adult's life, as it infringes on their autonomy, giving rise to a poorer evaluation of their quality of life and, consequently, greater need for medical intervention and hospitalization[5]. And, further, as literature has shown, increased hospitalizations potentially result from the deterioration of older adult's BADL[5-7,24].

A history of falls in the previous twelve months is related to greater rates of HA. Between 1996 and 2012, there were nearly 66,876 deaths in Brazil from falls and 941,923 hospitalizations in adults aged 60 or above[25]. According to the Center for Disease Control and Prevention (CDC), falls are the principal cause of morbidity and mortality in older adults in the United States of America (USA)[26]. In 2014, almost 28.7% of older adults in the USA reported a fall, resulting in 29 million falls, 37.5% of which necessitated HA[27]. In the older population there is a close relation with a history of falls as an indicator of fragility and serious morbidity[27,28].

Study participants who could read/write were less prone to HI. The higher level of literacy is a protective factor against worse health outcomes[29], especially among the older adults[30]. On the other

hand, there is strong evidence that low literacy is a risk factor for the development of CNCDs, low adherence to treatments and higher mortality[30]. Participants who had better cognitive status also had a lower risk of HI[31]. There is solid evidence that older adults with better cognitive status have better health outcomes[31,32].

The last model expresses modifiable and nonmodifiable risk factors relevant to hospitalization of older adults. The use of a multidimensional approach to the older adults can improve the permanence and link to PHC. There is solid evidence that the use of AGA by health professionals improves health outcomes, quality of life, accelerates rehabilitation and decreases the risk of HI in the older adults[33,34]. On the other hand, disease focused care provides outcomes with a risk of HA and, consequently, higher costs and indices of rehospitalization[3-8]. Professionals, especially those acting in PHC, must be aware of the factors illustrated in Figure 1.

This study has some limitations that must be addressed. The cross-sectional design limits the evaluation of cause and effect relationships. Greater proportion of female participants limits assessing exposure to older men. Furthermore, some independent variables suffer contextual influences, such as the emotional and physical state in which an individual finds him- or herself at the moment of going to the PCU. However, we must highlight the use of a multidimensional approach, contemplating sociodemographic variables, state of health, FC, mental health, and falls. Another important point is the participation of a specific population of older adults treated in a PCU. These results can be an important tool for health professionals who care for older adults in PHC. We recommend conducting longitudinal studies with larger samples in different locales in order to identify possible predictors of HA in older adults.

CONCLUSION

This study has identified factors associated with HA of older adults in PHC using a multidimensional approach. Older adults of a more advanced age, noncommunicable chronic diseases, the daily use of medication, a history of falls in the previous year, poor perception of health, tobacco use, and basic and instrumental incapacity in daily life present higher chances of having been hospitalized in the previous twelve months. Factors like knowing how to read and write and having better cognitive status presented lower chances of having been hospitalized. In conclusion, the knowledge of modifiable and nonmodifiable factors for hospital admission is a valuable instrument for the care of the older adults population.

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