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ARTIGO ORIGINAL / *ORIGINAL ARTICLE*

Elderly readmission and death after discharge from treatment of hip fracture, occurred in public hospitals from 2008 to 2010, Rio de Janeiro

Readmissão e óbito de idosos com alta após internação por fratura proximal de fêmur, ocorrida nos hospitais do Sistema Único de Saúde entre os anos de 2008 e 2010, Rio de Janeiro

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ABSTRACT: ***Objectives*:** To estimate the risk of death and readmission of a cohort of elderly patients discharged after hip fracture treatment from hospitals of the public health system; to describe the causes of these events; and to compare the rates of readmission and death observed with those of the elderly population hospitalized in public hospitals of Rio de Janeiro city. ***Methods*:** Data on deaths and readmissions were obtained through the linkage of these two data sources: the Hospital Information System of the Sistema Único de Saúde and the Mortality Information System from the city of Rio de Janeiro. The time frame for the study was 2008 to 2011. The population consisted of 2,612 individuals aged 60 years or older with nonelective hospitalization for hip fracture who were followed for a year after discharge. ***Results*:** The readmission rate in one year, excluding the deaths in this period, was 17.8%, and the death rate was 18.6%. The most common causes of death were circulatory system diseases (29.5%). Approximately 15% of the causes of readmissions were surgical complications. The state hospitals showed lower readmission risks and higher death risks compared with the federal and municipal hospitals. It was observed that there is an excess risk of readmission and hospitalization of the study population compared with the elderly population hospitalized in the public hospitals of the city. ***Conclusion*:** Hospitalization of elderly individuals for hip fracture causes adverse outcomes such as readmissions and deaths. Many of these outcomes can be prevented from actions recommended in the National Policy for the Elderly Health.

***Keywords*:** Patient readmission. Aged. Mortality. Femoral fractures. Aging. Public health.

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RESUMO: ***Objetivos*:** Estimar os riscos de óbito e readmissão de idosos com alta por fratura proximal do fêmur nos hospitais do sistema público de saúde; conhecer as causas desses desfechos e comparar as taxas de mortalidade e readmissão com aquelas observadas na população de idosos atendidos pelo sistema público de saúde no município do Rio de Janeiro. ***Métodos*:** Foram obtidos os óbitos e as readmissões por meio do *linkage* dos bancos de dados do Sistema de Informações Hospitalares do Sistema Único de Saúde (SIH-SUS) e do Sistema de Informações sobre Mortalidade (SIM) do município do Rio de Janeiro dos anos de 2008 a 2011. A população foi composta de 2.612 idosos com internação não eletiva por fratura proximal do fêmur, acompanhados por um ano após a alta. ***Resultados*:** A taxa de readmissão em um ano, com a exclusão dos óbitos nesse período, foi de 17,8% e a taxa de mortalidade independente de readmissão foi de 18,6%. As causas mais frequentes de óbitos foram as doenças do aparelho circulatório (29,5%). Quase 15% das causas das readmissões foram complicações cirúrgicas. Os hospitais estaduais apresentaram menores riscos de readmissão e maiores riscos de mortalidade comparados com os hospitais de outras esferas. Foi observado excesso de risco de mortalidade e de internação da população de estudo quando comparada com a população idosa atendida nos hospitais do Sistema Único de Saúde do município. ***Conclusão*:** A internação por fratura proximal do fêmur causa desfechos indesejados para o idoso, como readmissões e óbitos. Boa parte desses desfechos poderia ser prevenida a partir de ações previstas na Política Nacional da Saúde do Idoso.

***Palavras-chave*:** Readmissão do paciente. Idoso. Mortalidade. Fraturas do fêmur. Envelhecimento. Saúde Pública.

INTRODUCTION

The proximal femoral fracture (PFF) among the elderly is a relevant issue in public health, which may lead to the loss of autonomy and independence, reducing the quality of life of these individuals. In 2010, 356,000 elderly individuals were hospitalized due to femoral fractures, which is equivalent to 17.3 patients per 10,000 individuals[1]. This scenario tends to worsen in the next decades with the increase of life expectancy and consequent increase in the incidence of PFF[2]. According to the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE)[3], the proportion of elderly people in Brazil will increase from 10.0% to approximately 18.6% between 2010 and 2030.

Studies show an increased risk of mortality among elderly who had PFF when compared to the general population with mortality rates in a year varying between 12.9%[4] and 27.3%[5]. In Brazil, this rate was 21.5% in 1995[6]. Another unfavorable outcome among the elderly who had PFF is hospital readmission, which reflects the quality of the service and the effects on patient's health, and leads to an unnecessary increase in costs to the health system[7]. The hospital readmission rates for elderly patients who had PFF vary from 18.3% in 30 days[8]; 16.1[9] to 19.0%[10] in 3 months; 32.0% in 6 months[11] and in 1 year[12].

Male patients and patients in advanced age are the ones who have higher risk of death and readmission after discharge from hospital after PFF treatment[5,8,11,12]. There are diseases that increase the risk of readmission, such as pneumonia, heart attacks, thromboembolism, and health problems related to immobility after discharge from hospital after PFF treatment[10,11].

Circulatory diseases, cancers, dementia, falls, and infections are some of the causes of mortality described after discharge from hospital after PFF treatment[5,13]. Multiple comorbidities substantially aggravate the risk of death or readmission. The hospital care received by the patient and the planning of discharge are factors that may avoid further complications that could lead to readmission or to death[14].

The National Health Policy for Elderly People[15] assumes that the hospitalization of the elderly is a factor that indicates the deterioration of their functional independence and autonomy and considers the importance of change of the assistance model to the health of elderly. The Ministry of Health Ordinance No. 702 of 2002[16] determines the implementation of State Chains of Assistance to Elderly Health, which establishes differentiated service for elderly with the objective of meeting the needs of the hospitalized elderly. For that, the Reference Centers in Health Assistance were created, which are hospitals that must have infrastructure, physical facilities, equipment, and specific and appropriate human resources for the provision of health care to elderly in a comprehensive and integrated manner. Thus, studies on unwanted outcomes after hospitalization due to PFF, which is an important event that often leads to reduced functional capacity and death among the elderly, have become important.

The objectives of this study were to estimate the risks of death or hospital readmission of the patients discharged after PFF treatment, identifying associated factors, understanding the causes of mortality and readmission, and comparing mortality and hospital readmittance rates to those observed in elderly populations served by the public health system of the city of *Rio de Janeiro*.

METHODS

DATA SOURCE

The data on hospital admission and readmission were obtained from the Hospitalization Authorization (*Autorização de Internação Hospitalar* – AIH) of the Hospital Information System of the *Sistema Único de Saúde* (*Sistema de Informações Hospitalares do Sistema Único de Saúde* – SIH-SUS) of the city of *Rio de Janeiro*, and the death-related data were obtained from Mortality Information System (*Sistema de Informações sobre Mortalidade* – SIM) database, from 2008 to 2011.

Readmissions within a year after discharge were defined through linkage based on the probabilistic relation of records available in SIH-SUS, containing data related only to admissions due to PFF during 2008 – 2010. SIH-SUS contains records of all hospitalizations in the period 2008 – 2011, ensuring enough time for the observation of readmissions in the period of 1 year after discharge. Analogously, the data on deaths were obtained through linkage by PFF of SIH-SUS during the period 2008 – 2010, with deaths occurred in the period 2008 – 2011, available in the SIM database.

POPULATION

A total of 2,763 PFF patients aged 60 years old or older, who remained in the hospital for at least 24 hours and were discharged after non-elective admission, in SUS Hospitals, between January 2008 and December 2010, were included in the follow-up cohort. A total of 151 patients were excluded from the follow-up cohort, which corresponds to 5.5% of the population of participants included in the study. Of the excluded patients, 75 (49.7%) were transferred to another hospital in the absence of the possibility of follow-up; 49 (32.5%) of them showed incoherence in the records with regard to dates, with the admission date overlapping the period of another hospitalization; and 27 (17.9%) had polytrauma and/or had history of hospitalization due to multiple surgeries. At the end, 2,612 elderly discharged from hospitals after PFF treatment were monitored, retrospectively, for 1 year until the occurrence of one of the events, death or hospital readmission.

DATA ANALYSIS

The description of the studied population was based on a set of characteristics: age (categorized as aged 60 – 64, 65 – 69, 70 – 74, 75 – 79 years old and 80 or more); type of fracture (according to the International Classification of Diseases, 10th review, ICD-10, S720 – fracture of head and neck of femur; S721 – pertrochanteric fracture; S722 – subtrochanteric fracture of femur); length of stay at the first admission (1 – 10 days, 11 – 20, 21 – 30 and 31 days or more); administrative board of the hospital, according to the National Register of Health Facilities (the municipal, the state, and the federal ones); and type of surgery, according to the SUS codes of procedures (arthroplasties – partial or total, cemented or cementless; osteosynthesis – surgical treatments in which arthroplasties and conservative treatments were excluded, the nonsurgical ones). The causes for readmission and deaths were obtained from the main diagnosis of the hospitalization after discharge and the basic cause provided on the basis of SIH-SUS and SIM, respectively. They were grouped according to the chapters of ICD-10 and their proportions were verified in relation to the total of their respective outcomes. The causes whose chapters showed frequencies higher than 5% were used and, within the chapters, the ICD-10 categories with frequency higher than 10%. The surgical complications considered in the study were the following: complications related to internal orthopedic prosthetic devices, implants, and grafts (ICD-10, T84 and T85); complications related to procedures or medical and surgical care (ICD-10, T81); disorder of continuity of bone (ICD-10, M84); osteomyelitis (ICD-10, M86); and postprocedural musculoskeletal disorders (ICD-10, M96).

Gender differences among the characteristics of the patients who were discharged after treatment of PFF were compared using the χ^2-test and linear trend χ^2. We estimated the readmission and raw mortality rates adjusted by age and gender using the Poisson regression model, considering the time of contribution of the elderly in the study as an offset.

To assess the magnitude of additional risk by fracture and by age, the rates of mortality and of hospitalization of population in general from 2008 to 2010 were calculated, having expressed in the numerators the number of deaths of elderly living in the city of Rio de Janeiro, obtained from the SIM[17], and the number of hospitalization of elderly due to any cause in hospitals of the network related to SUS in the city of Rio de Janeiro in the same period of the study. Both rates considered, in the denominator, the elderly population living in the city in the year of 2009[18]. The confidence intervals of 95% (95%CI) for the rates were calculated following the method described in Szklo and Nieto[19]. All statistical analysis were performed using the R software (the R Project for Statistical Computing)[20], and the linkage of the data was carried out with the aid of the RecordLinkage package[21].

ETHICAL ASPECTS

This study was approved by the Research Ethics Committee of the National School of Public Health (CAAE-07040412.0.0000.5240, endorsement 119.827) and by that of the Municipal Secretariat of Health in (protocol 77/12 and endorsement 280A/2012).

RESULTS

Most patients were female (71.2%) and aged 80 years old or older (47.1%). The average age was 78.2 years, with standard deviation of 8.8 years. The most common type of fracture was the fracture of neck and head of femur (54.9%) and the procedure most commonly used was osteosynthesis (62.0%). One hundred percent of the arthroplasties were used in the treatment of fractures of neck and head of femur; 54.8% of the osteosynthesis were used for pertrochanteric fractures, 31.8% for the fractures of neck and head of femur, and 13.4% for the subtrochanteric fractures. The length of stay in the first hospitalization varied from 1 to 114 days, with an average of 19.37 days (± 14.27 days). In Table 1, characteristics of the 2,612 patients who were discharged after PFF treatment have been given according to gender.

Table 2 shows the readmission and mortality rates, both raw and adjusted by age and gender. No statistically significant differences in mortality and readmission rates between men and women were verified. The risk of readmission and death increased with age regardless of gender, when the baseline is 60 to 64 years of age. Hospitals in the federal scenario have higher readmission and lower mortality rates, whereas state hospitals have lower readmission and higher mortality rates.

The causes with frequency higher than 5% for death and readmission in 1 year after the first hospitalization are presented in Tables 3 and 4, respectively. The most frequent cause of death according to ICD-10 chapter were the diseases related to the cardiovascular system (29.53%), followed by external causes (17.5%). It is noteworthy that the increased proportion

Table 1. Characteristics of the elderly population who were discharged after proximal femoral fracture, according to gender, Rio de Janeiro, 2008 to 2010 (n = 2,612).

	Women n (%)	Men n (%)	p-value
Age			< 0.01*
60 – 64	106 (5.7)	104 (13.8)	
65 – 69	161 (8.7)	113 (15.0)	
70 – 74	256 (13.8)	112 (14.9)	
75 – 79	380 (20.4)	149 (19.8)	
80 +	956 (51.4)	275 (36.5)	
Procedure			0.13
Osteosynthesis	1154 (62.1)	492 (65.3)	
Arthroplasty	592 (31.8)	210 (27.9)	
Conservative treatment	113 (6.1)	51 (6.8)	
Type of fracture			0.24
Neck and head of femur (S720)	1021 (54.9)	412 (54.7)	
Pertrochanteric (S721)	687 (37.0)	265 (35.2)	
Subtrochanteric (S722)	151 (8.1)	76 (10.1)	
Time of permanence in the first hospitalization by proximal femoral fracture (days)			0.19*
≤ 10	471 (25.3)	222 (29.5)	
11 – 20	779 (41.9)	277 (36.8)	
21 – 30	327 (17.6)	152 (20.2)	
31 – 60	230 (12.4)	89 (11.8)	
60+	52 (2.8)	13 (1.7)	
Administrative level of the hospital			0.06
Municipal	1089 (58.6)	435 (57.8)	
State	568 (30.6)	256 (34.0)	
Federal	202 (10.9)	62 (8.2)	
Deaths in 1 year	342 (18.4)	145 (19.3)	0.65
Readmission in 1 year	284 (15.3)	127 (16.9)	0.34

Source: Ministry of Health. *Sistema de Informações Hospitalares do Sistema Único de Saúde* (SIH-SUS).
*Linear trend χ^2-test.

Table 2. Raw and adjusted risks: elderly with discharge after hospitalization by proximal femoral fracture, Rio de Janeiro, 2008 to 2010.

	Readmission							Death						
	Raw risk				Adjusted risk[a]			Raw risk				Adjusted risk		
	n	RR	95%CI	p-value	RR	95%CI	p-value	n	RR	95%CI	p-value	RR	95%CI	p-value
Gender[b]														
Female	284	1.00			1.00			214	1.00			1.00		
Male	127	1.11	0.90 – 1.37	0.33	1.19	0.97 – 1.48	0.10	84	0.98	0.75 – 1.25	0.84	1.18	0.92 – 1.53	0.20
Age[c]														
60 – 64	25	1.00			1.00			8	1.00			1.00		
65 – 69	38	1.20	0.73 – 2.01	0.48	1.22	0.73 – 2.01	0.45	13	1.27	0.53 – 3.25	0.58	1.30	0.54 – 3.13	0.56
70 – 74	52	1.25	0.78 – 2.05	0.35	1.30	0.81 – 2.10	0.28	25	1.86	0.87 – 4.44	0.11	1.95	0.88 – 4.33	0.10
75 – 79	83	1.43	0.93 – 2.28	0.11	1.49	0.95 – 2.34	0.08	48	2.55	1.27 – 5.86	0.01	2.69	1.27 – 5.69	0.01
80 +	213	1.73	1.17 – 2.68	0.01	1.83	1.20 – 2.78	0.01	204	5.11	2.70 – 11.35	< 0.01	5.45	2.68 – 11.09	<0.01
Type of fracture														
Neck and head of fêmur	232	1.00			1.00			166	1.00			1.00		
Pertrochanteric	140	0.89	0.72 – 1.09	0.26	0.86	0.70 – 1.06	0.17	106	0.94	0.73 – 1.20	0.61	0.88	0.69 – 1.12	0.30
Subtrochanteric	39	1.08	0.76 – 1.50	0.66	1.08	0.77 – 1.52	0.64	26	1.01	0.65 – 1.50	0.98	1.04	0.69 – 1.57	0.87
Administrative level of the hospital														
State	84	1.00			1.00			119	1.00			1.00		
Federal	55	2.19	1.55 – 3.08	< 0.01	2.16	1.54 – 3.04	< 0.01	22	0.62	0.38 – 0.96	0.04	0.58	0.37 – 0.91	0.02
Municipal	272	1.83	1.44 – 2.35	< 0.01	1.79	1.40 – 2.28	< 0.01	157	0.75	0.59 – 0.95	0.02	0.68	0.54 – 0.87	0.01
Procedure														
Arthroplasty	150	1.00			1.00			95	1.00			1.00		
Osteosynthesis	230	0.70	0.57 – 0.86	< 0.01	0.68	0.55 – 0.84	< 0.01	181	0.87	0.68 – 1.11	0.26	0.82	0.64 – 1.05	0.12
Conservative	31	1.00	0.67 – 1.45	0.98	1.00	0.68 – 1.47	1.00	22	1.12	0.69 – 1.75	0.65	1.14	0.72 – 1.81	0.59
Time of permanence (days)														
1 – 10	116	1.00			1.00			84	1.00			1.00		
11 – 20	159	0.87	0.69 – 1.11	0.25	0.88	0.69 – 1.12	0.28	100	0.76	0.57 – 1.01	0.06	0.77	0.57 – 1.03	0.07
21 – 30	80	0.99	0.74 – 1.31	0.93	0.99	0.74 – 1.31	0.93	55	0.94	0.66 – 1.32	0.71	0.94	0.67 – 1.33	0.74
31 +	56	0.88	0.64 – 1.21	0.43	0.90	0.65 – 1.23	0.50	59	1.28	0.91 – 1.78	0.14	1.33	0.95 – 1.85	0.10

Source: Ministry of Heath. *Sistema de Informações sobre Mortalidade* (SIM), *Sistema de Informações Hospitalares do Sistema Único de Saúde* (SIH-SUS).
[a]Adjusted by gender and age; [b]adjusted by age; [c]adjusted by gender; RR: relative risk; 95%: confidence interval of 95%.

of deaths among elders was classified according to Chapter XVIII; the proportion of poorly classified causes was 11.1%.

Regarding readmissions, the most frequent causes are injuries, poisoning, and some other consequences of external causes (28.2%). Among these injuries, fracture is the most prominent cause, with 11.7% of all causes (Table 4). Surgical complications account for 14.8% of readmissions.

Table 3. Main basic causes of death of elderly discharged after hospitalization by proximal femoral fracture in public hospitals, Rio de Janeiro, 2008 to 2010.

Causes (n = 214; 71.8%)	n	%
IX - Diseases of the circulatory system (n = 88; 29.5%)		
Ischemic heart diseases	18	20.5
Acute myocardial infarction	16	18.2
Stroke	10	11.4
Essential hypertension	10	11.4
Hypertensive cardiac disease	9	10.2
Cardiac insufficiency	9	10.2
XX - External causes of morbidity and mortality (n = 52; 17.5%)		
Non-specific facts or events and undetermined intention	39	75.0
Falls	9	17.3
XVIII - Symptoms, signs and abnormal findings (n = 33; 11.1%)		
Other poorly defined and non-specific mortality causes	24	72.7
Senility	5	15.2
IV - Endocrine, nutritional and metabolic diseases (n = 31; 10.4%)		
Diabetes	21	67.7
Nonspecified protein-calorie malnutrition	7	22.6
X - Diseases of the respiratory system (n = 30; 10.1%)		
Pneumonia	17	56.7
Chronic obstructive pulmonary disease	5	16.7
Respiratory failure	3	10.0
Other respiratory disorders	3	10.0

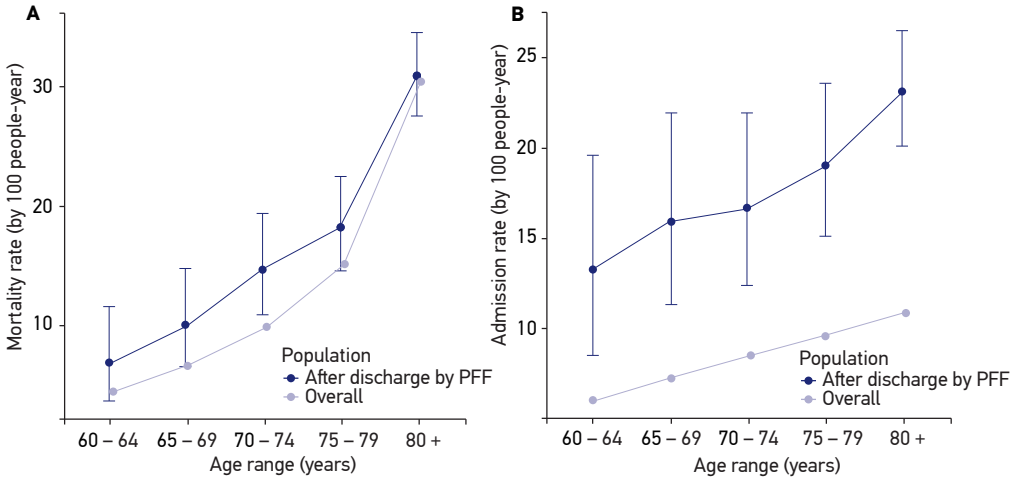
Source: Ministry of Health. *Sistema de Informações sobre Mortalidade* (SIM).

Figure 1 shows the mortality rates for all causes, in the overall elderly population, and the rates of hospitalization due to any cause among elderly patients treated in public hospitals, compared to the mortality and readmission rates for patients who had undergone a PFF treatment in the city of Rio de Janeiro from 2008 to 2010. With the exception of patients aged 80 years old or older, mortality rates in general were close to the lower limits of the intervals of the rates in the elderly population who had PFF. The hospitalization rates for

Table 4. Main causes of readmission of elderly discharged after hospitalization by proximal femoral fracture in public hospitals, Rio de Janeiro, 2008 to 2010.

Causes (n = 270; 65.7%)	n	%
XIX - Injury, poisoning and certain other consequences of external causes (n = 116; 28.2%)		
Fractures	48	41.4
Complications of prosthetics devices, orthopedic implants and grafts	27	23.2
Sequelae of lower limb trauma	20	17.2
IX - Diseases of the circulatory system (n = 58; 14.1%)		
Heart failure	16	27.6
Stroke	9	15.5
Phlebitis and thrombophlebitis	9	15.5
I - Certain infectious and parasitic diseases (n = 50; 12.2%)		
Sepses	29	58.0
Infections	9	18.0
X - Diseases of the respiratory system (n = 42; 10.22%)		
Pneumonia	35	83.3
XIII - Diseases of the musculoskeletal system and connective tissue (n = 35; 8.5%)		
Bone continuity disorders	13	37.1
Osteomyelitis	9	25.7
Post-operative musculoskeletal disorders	5	14.3
XIV - Diseases of the genitourinary system (n = 27; 6.5%)		
Urinary tract infection of non-specified location	17	63.0
XI - Diseases of the digestive system (n = 23; 5.6%)		
Other diseases of the digestive system	10	43.5

Source: Ministry of Health. *Sistema de Informações Hospitalares do Sistema Único de Saúde* (SIH-SUS).



PFF: proximal femoral fracture.

Figure 1. Mortality (A) and hospitalization (B) rates of the studies population (and their respective confidence intervals of 95%) and of the overall elderly population living in the city of Rio de Janeiro, 2008 to 2010.

patients who had PFF were always higher than the rates for the overall elderly population regardless of their age group.

The differences between mortality rates of the studied population and the general population were 1.5 for patients up to 74 years old and reduced to 1.2 among patients who were 75 to 80 years old, and approximately 1.0 for patients who were 80 years old or older. When the studied population was compared to the overall population, the differences between readmission and hospitalization rates were approximately 2.1 regardless of age, having an increase in the age group of individuals aged 80 years old or older.

DISCUSSION

In this study, 18.6% of patients died during the 1-year follow-up after discharge from hospital after PFF treatment. This result cannot be compared to other studies on mortality because those studies calculate the death percentage from hospitalization. Considering that the number of deaths during the first hospitalization is known, this percentage was calculated (27.0%), which was close to the average (24.5%) reported in a systematic review[22] for patients monitored after hospitalization for PFF, based on studies performed up to 2012. Another study performed in Brazil[6] found the percentage to be 21.5%.

The percentage of readmission of 17.8% after 1 years of follow-up was lower than the percentages reported in international studies (30.1[9] and 32.0%[12]), which may be partially explained by the fact that these studies consider populations aged 75 and 70 years or older, respectively. When considering elderly populations, it is expected that there is an increase in the incidence of chronic diseases and in functional incapacity, increasing the probability of complications that lead to readmission.

In this study, male patients did not have a higher risk of death as described by some international studies[23]. However, it is in accordance with other studies performed in elderly populations living in the city of Rio de Janeiro, which also did not observe this association[6,24]. As for readmission related to PFF, studies also pointed to the predominance of male patients[9,12,25]. The present study points toward this direction after adjusting rates by age.

It was observed that for all older ages the values of mortality in the overall population tend to approach those of populations with PFF. Abrahamsen et al.[23] observed in their systematic review that the rates of mortality related to PFF decreases with age. This result seems coherent as the risk of death with the age close to 80 may be explained more by the age factor rather than hospitalization due to PFF. Panula et al.[5] reported risk of mortality, standardized by gender and age range, three times higher among those who fractured their femur when comparing to the overall population, which is twice as high the risk of mortality found in this study.

In relation to hospitalization, when comparing the studied population to the elderly population hospitalized in SUS Hospitals of the city, the increase in risk of readmission for the individuals aged 80 years old or older seems justified by the fact that elderly are still alive at this age, after discharge from hospital after PFF treatment, are more vulnerable, and have higher probability of new hospitalizations. The higher risk of readmission found may be underestimated once all hospitalizations of this period were included in the overall population.

The most common type of fracture was fractures of the neck and head of femur, which occurred among a little more than half of the patients, differently from what was observed in other studies, in which there is a slight higher percentage for pertrochanteric fractures[9,11,26]. Similarly to other studies, the incidence of subtrochanteric fracture was the less. This kind of fracture is more common in osteopenic elderly patients after fall due to low energy and among younger patients involved in traumas of high energy[27]. This may justify the fact that the subtrochanteric fracture has a higher risk of readmission and death.

Arthroplasties represent higher risk of readmission, when compared to osteosynthesis, considering gender and age range of the patient. The decision on the type of surgery to be performed depends on several factors, among which are the type of fracture, health conditions, and age of the patient, which makes comparisons to other studies rather difficult[28].

This study did not show association between the length of hospitalization and readmission. According to a systematic review[29], the increase in time of stay in hospitals favors readmission, suggesting that a longer stay is related to a higher number of comorbidities among patients. As for mortality, hospitalization stay between 1 and 10 days and for longer than 30 days

were considered risk factors in relation to other periods. In relation to readmission, there is a hypothesis that shorter periods of stay suggest poor planning of discharge and higher period indicate complications[30]. This result points out the need for creating discharge criteria for patients treated for PFF.

The result referring to the spheres of hospitals brings show some reasons. Assuming that death is the most severe of the outcomes, patients treated at state hospitals may have presented higher postoperative complications and died before being readmitted. However, patients cared for in federal hospitals might have presented not so severe complications, allowing them to access health services in time, avoiding death.

Researchers and health professionals state that high readmission rates are associated to communication problems between health professionals and patients, inadequate adherence of patients to the recommendations made by the health professionals, insufficient support by family caretakers, and deterioration of clinical conditions of the patient or due to medical mistakes[31]. Regarding this point, it is believed that readmissions may be prevented through actions in Reference Centers on Elderly Health Care.

Although surgical complications may result from characteristics of the patient, such as diabetes or poor bone quality, some of them may be explained by the quality of execution of the surgical procedure, which makes these complications preventable. Even if the comparability between studies is hampered by the differences in classification of readmission causes, the results suggest that the percentage of readmissions by surgical complications is high.

The fracture was the most common complication leading to readmission, with a percentage within the average of other studies[11,25]. There was no possibility of verifying whether these fractures were new or not, as in the study of Bottle and Aylin[25]. Because falls are the most common factors responsible for PFF among elderly, the reduction of functional capacity after discharge and the poor quality of care may influence the increase in prevention of fall measures among elderly within the three levels of health attention of elderly.

Pneumonia and sepsis are often related as postoperative readmission causes due to PFF[9,11]. Although these infections are due to some preexisting disease, to vulnerability related to age and to impact of the trauma or surgical procedure that may reduce the functional reserve of the individual, they may also be associated to care during hospitalization and after discharge. Thus, a proportion of readmission due to these causes could be avoided through policies related to the care of the patient[13].

The most common causes of death in the study were cardiovascular, endocrine, nutritional, metabolic, and respiratory diseases. Because cardiovascular, respiratory, and neoplastic diseases are diseases that present higher percentage of death among elderly, one cannot attribute, necessarily, these deaths to PFF. In this study, the neoplasms were not among the first causes of death, though they were in second place among the causes of death among elderly in the city. One possible reason is that there are causes of death characteristics of PFF.

The proportion of poorly defined causes in the study was 11.1% (ICD-10, R00-R99) and that of nonspecific causes was 11.7%, which, according to a study by Kanso et al.[32], suggests

inadequate information quality. In the study of Jorge et al.[33], which was carried out in 2005, the proportion of poorly defined causes in elderly population (11.9%) was overcome by deaths whose basic causes were the diseases of the cardiovascular system, neoplasms, and respiratory diseases. In this study, this proportion was not overcome only by the ones from the cardiovascular system and by external causes.

The limitations of the study are the lack of information about the time between hospitalization and the surgery and on the level of severity or description of comorbidities of the patients. No information was available on the readmission of population in general and on the conducts and protocols of each hospital, such as discharge planning, presence of interdisciplinary staff, prophylactic use of anticoagulants, and monitoring by a physical therapist. Variables such as race, school education level, and patients' income were also unknown. The results of the present study are not suitable for Brazil as a whole, because there are regions with differences regarding access to public health. However, one must take into account that the data analyzed belonged to a national system of information on health.

CONCLUSION

The results reveal that patients ages equal or higher than 80 years old have higher risk of readmission and death. Compared to the administrative core, patients in federal and municipal hospitals have higher risk of death and higher risk of readmission when compared to state hospitals. When comparing the rates of readmission and death of the studied population with those of the overall population, it was observed that there is a higher risk of both outcomes for the studied population. It is believed that when public policies on elderly health care are implemented in accordance to the provisions of the National Health Policy for Elderly, there will be a reduction in the risk of readmission and death of the elderly population hospitalized due to PFF.

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