

# PROFILE OF PATIENTS UNDERGOING SURGERY FOR PROXIMAL FEMORAL FRACTURES AND ITS ECONOMIC IMPACT ON PUBLIC HEALTH IN THE STATE OF SÃO PAULO

*Perfil dos pacientes submetidos ao tratamento cirúrgico para fraturas do fêmur proximal e seu impacto econômico na saúde pública do estado de São Paulo*

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## ABSTRACT

**Objectives:** To identify and evaluate the epidemiological profile of patients that underwent surgery for proximal femoral fractures and to analyze data regarding their hospitalization, such as length of hospital stay and costs, in public hospitals in the State of São Paulo, Brazil. **Methods:** This is a retrospective and descriptive population study, which included patients hospitalized with proximal femoral fractures that underwent surgery from April 2018 to March 2019, in hospitals belonging to the Brazilian Public Health System (SUS), in the State of São Paulo, Brazil. We analyzed the Prior Authorization Letters registered in the Hospital Information System of the Brazilian Public Health System (SIHSUS). The DATASUS tabwin32.exe software, developed by the Brazilian Ministry of Health, was employed for data gathering. **Results:** We found a total of 10,118 surgical procedures for proximal femoral fractures, with a predominance of the trochanteric region, with 63.69%; female sex, with 58.69% and white race, with 68.65%. Regarding the age groups, 38.8% of patients were older than 80 years. Most patients (18.33%) came from the state of São Paulo capital, where most of the surgical procedures were performed (4.95%), followed by the city of Ribeirão Preto (2.12%). Most patients (41.76%) stayed in the hospital for four to seven days and the majority did not need to be transferred to an Intensive Care Unit. Among the outcomes at hospital discharge, 65.96% showed clinical improvement, while 4.17% died. The mean cost of each surgical procedure was BRL 2,355.63, while the total amount spent on surgeries for intertrochanteric fractures corresponded to 68.3% of the total expense on surgeries for femoral fractures, which reached BRL 23,834,300.58. **Conclusion:** Proximal femoral fractures should be monitored by health authorities given their great impact on the health of the elderly, in addition to the costs involved. The implementation of interventions aimed at preventing these injuries can result in the reduction of their negative impact. Orthopedic care services should optimize the care for these patients, who present long hospital stays, which can increase their morbidity and mortality.

**Keywords:** Proximal femoral fractures. Elderly. Epidemiology. Brazilian Unified Health System.

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## INTRODUCTION

The incidence of proximal femoral fractures significantly increased in the last decades and is an important external cause of death and morbidity, especially in the elderly<sup>1,2,3</sup>. These fractures are associated with low-energy trauma, such as fall of own height<sup>1,4,5,6</sup>, and increase in incidence as age progresses<sup>7</sup>.

This type of fracture represents 84% of the acute bone lesions observed in people older than 60 and is considered a public health issue, involving excessive medical and hospital expenses. Moreover, it results in family and social problems in this population<sup>3,4</sup>, causing impacts on quality of life and functional status. 41.8% of these patients die in up to two years<sup>8</sup>. In the study carried out by Guerra *et al.*<sup>9</sup>, the mortality rate of patients undergoing surgical procedures for proximal femoral fractures was 23.6% and the main comorbidities associated with this outcome were anemia and dementia.

Proximal femoral fractures are divided according to the local anatomy. The most important types are: femoral transcervical fracture, intertrochanteric fracture and subtrochanteric fracture<sup>8</sup>. Surgery is indicated in most cases, whereas non-surgical treatment is reserved for patients who have incomplete fractures with no deviation, on a case-by-case basis, or when there are no clinical conditions for the procedure<sup>10,11</sup>. A period between 24 and 48 hours after the fracture is ideal for the surgical procedure, considering the patient's general health condition<sup>12,13,14,15,16,17</sup>.

Several studies point out advanced age, male gender, physical condition, and treatment delay as risk factors for increased mortality in these patients<sup>14,18,19</sup>.

Presence of ambulatory disability before the fracture, cognitive impairments, a second fracture, poor functional status at hospital discharge, lack of vitamin D replacement, bisphosphonates use are associated with poor outcomes and increased risk of fractures<sup>18,20,21</sup>.

Studies on the economic impact of hip fractures in elderly patients in Brazil are still scant. Oliveira *et al.*<sup>22</sup> carried out a study on the epidemiology and costs of hip fractures in the elderly population in the State of Paraná, Brazil, identifying 11,226 fractures in the year 2012, 66.8% of which were seen in women. The rate of mortality during hospitalization reached 5.9% in this study and was higher in males, in patients older than 80 years and in black Asians ethnicities. The authors also reported a total expenditure of BRL 29,393,442.78 with surgeries for proximal femoral fractures, with an average cost per hospitalization of BRL 2,618.34.

Hence, in this study, we aim to identify and evaluate the epidemiological profile of patients with proximal femoral fractures. We also report the data regarding their hospitalization, such as length of hospital stay and costs, in public hospitals in the State of São Paulo, Brazil.

## METHODS

This is a retrospective and descriptive population study, which included patients hospitalized with proximal femoral fractures that underwent surgery from April 2018 to March 2019, in hospitals belonging to the Brazilian Public Health System (SUS) in the State of São Paulo, Brazil.

The variables included were: type of fracture, gender, ethnicity, age, place of

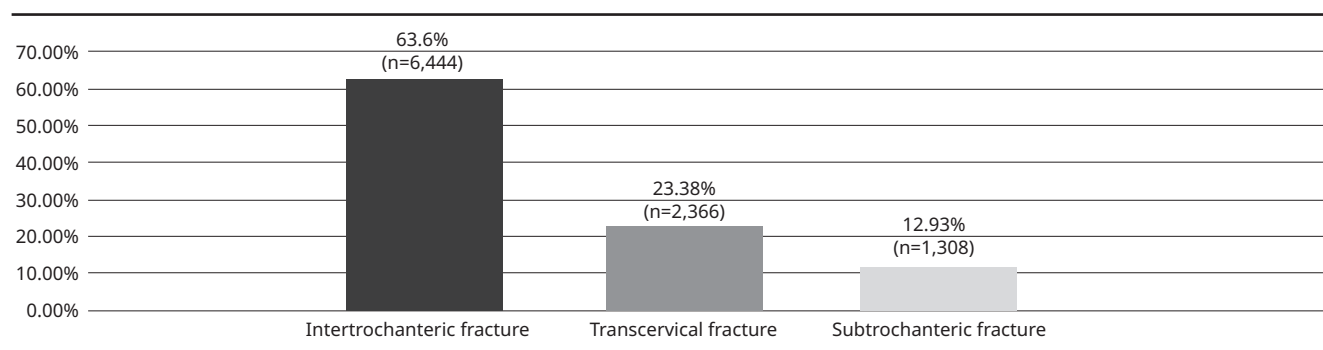
origin and of hospitalization, length of hospital stay, need for Intensive Care Unit (ICU) admission, reasons for hospital discharge, and costs per surgical procedure. Cases of pathological fractures of the femur were removed from the study. Prior Authorization Letters (AIH) registered at the Hospital Information System of the Brazilian Public Health System (SIHSUS) were analyzed. The DATASUS (SUS database) tabwin32.exe software, developed by the Brazilian Ministry of Health, was employed for data gathering. The DATASUS provides relevant data for the implementation of public health policies, such as access to health services, quality of care, morbidities, information about public health care, the register of hospital and outpatient services, demographic and socio-economic data as well as information about healthcare funding and costs.

## RESULTS

A total of 10,118 surgical procedures were performed for the treatment of proximal femoral fractures, the majority of which (63.6%) were located in the intertrochanteric region (Figure 1).

The incidence was higher in female patients, who corresponded to 58.69% (n = 5,938) of the sample. Regarding ethnicity, there was a predominance of white patients, who represented 68.65% (n = 6,946) of the sample, followed by *pardos* (Brazilian terminology for a person of mixed ethnic ancestry), with 17.32% (n = 1,727). Regarding the age group, 38.8% of the patients were over 80 years old (n = 3,934), while 23.29% were between 70 and 79 years old (n = 2,421) and 15.36%, between 60 and 69 years old (n = 1,555).

**FIGURE 1** - Distribution of surgical procedures performed for the treatment of proximal femoral fractures, according to their type, between April 2018 and March 2019



Most patients (1,855 or 18.33%) came from the state of São Paulo's capital, where most of the surgical procedures were performed (501 or 4.95%), followed by the city of Ribeirão Preto (214 or 2.12%) and by the city of Presidente Prudente (210 or 2.08%).

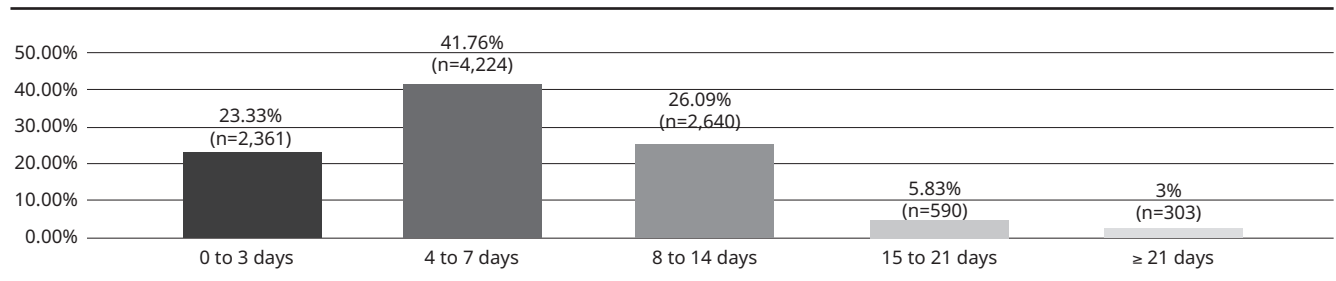
As for the length of hospital stay, most patients (4,244 or 41.76%) stayed in the hospital for four to seven days, whereas 2,640 patients (26.09%) stayed for eight to 14 days (Figure 2).

Most patients (6,583 or 65.06%) did not require admission in the ICU (Figure 3). Regarding the reasons for hospital discharge, 6,674 (65.96%) of the patients were discharged after clinical improvement, 1,793 (17.72%) were discharged with scheduled appointments for follow-up and 422 (4.17%) died.

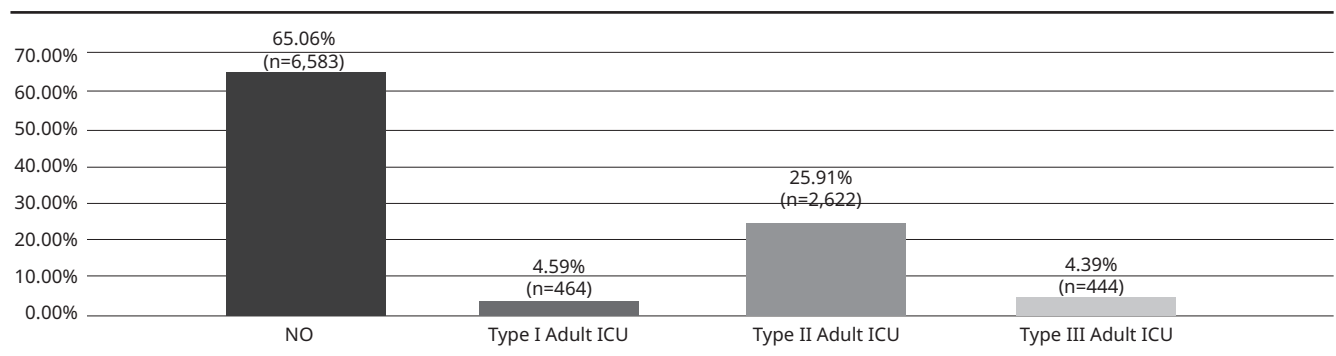
The average total cost per procedure during the period of reference was BRL 2,355.63. Among the types of fractures,

the surgery of the intertrochanteric fractures presented the highest total value of hospital fees (hospital and professional services fees), according to the SUS fee schedule, reproduced in Table 1. Thereby, the surgeries for intertrochanteric fractures corresponded to 68.3% (BRL 16,279,415.02) of the total expenditure on surgeries for proximal femoral fractures, which reached BRL 23,834,300.58 during the reference period. The expenditure on

**FIGURE 2** - Distribution of the length of hospital stay, from April 2018 to March 2019.



**FIGURE 3** - Need for ICU admission in the postoperative period of patients undergoing surgical treatment for proximal femoral fractures, from April 2018 to March 2019.



**TABLE 1** - Fees per surgical procedure for proximal femoral fractures according to the SUS fee schedule - Exercise from April/2018 to March/2019. SUS Table.

PROCEDURE CODE - SUS FEE SCHEDULE	PROCEDURE TYPE	HOSPITAL SERVICE FEE	PROFESSIONAL SERVICE FEE	HOSPITAL TOTAL FEE
04.08.05.063-2	Surgical treatment of intertrochanteric fracture	BRL 725.17	BRL 247.80	BRL 972.97
04.08.05.048-9	Surgical treatment of proximal femoral transcervical fracture/physeal lesion	BRL 715.22	BRL 246.63	BRL 961.85
04.08.05.061-6	Surgical treatment of subtrochanteric fracture	BRL 534.15	BRL 225.27	BRL 759.42



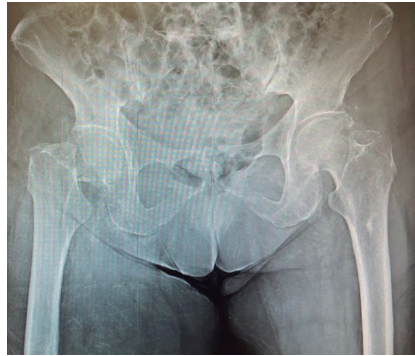
surgeries of femoral transcervical fractures, on the other hand, corresponded to BRL 4,673,704.04 (19.6% of the total), followed by the expenditure on surgeries for subtrochanteric fractures, which totaled BRL 2,881,181.52 (12% of the total).

## DISCUSSION

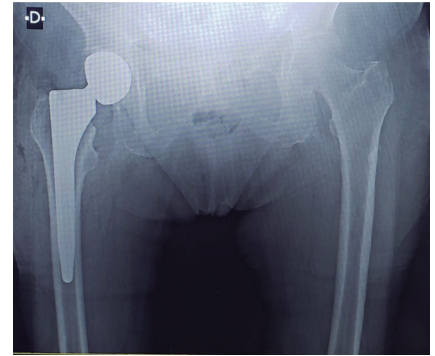
In this study, important clinical and epidemiological characteristics of proximal femoral fractures could be observed. Regarding the classification according to the anatomical location, intertrochanteric fractures corresponded to more than 60% of all fractures in this study, a value slightly higher than those observed in some studies in the literature<sup>3,21</sup>, which varied between 45% and 50.4%. The predominance of patients older than 80 years found in this study is in accordance with the literature<sup>13,24</sup>, as reported by authors who observed mean ages ranging from 78.2 to 79 years<sup>6,23</sup>. Since these fractures are caused by low-energy traumas and are associated with the longevity of the population, an increase in their incidence is expected<sup>7</sup>, especially in Brazil, as the Brazilian population is aging rapidly.

Regarding gender and ethnicity, female and white patients predominated in our sample, a finding also in line with those reported in the literature, which describes an incidence of two to eight times higher in women<sup>18,19,20,24</sup>. Factors such as greater exposure to domestic activities, higher prevalence of osteoarthritis, deficits in anthropometric indices, genetic factors and the diagnosis of osteoporosis were pointed out as contributing to the greater vulnerability of women to proximal femoral fractures<sup>21,22,23</sup>.

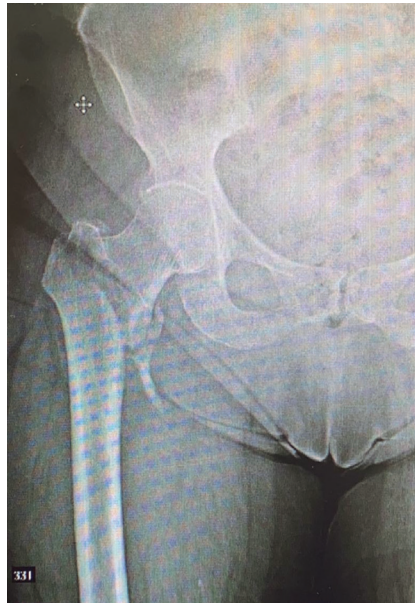
As for the length of hospital stay, the majority of patients of our sample remained hospitalized for four to seven days. Astur *et al.*<sup>2</sup>, in turn, reported hospital stays ranging from one to 101 days, in a hospital in São Paulo, whereas 53.2% of patients remained hospitalized for a period longer than seven days. In this study, the average length of hospital stay was 10.7 days, while other studies reported averages of up to 13.5 days<sup>20,24</sup>. This prolonged length of hospital stay can be attributed to factors such as the delay in performing surgery, social issues, poor public health management, as well as low resource availability due to public health underfunding.



**93-year-old patient. Preoperative X-ray: fracture of the right femoral neck**



**93-year-old patient. Postoperative X-ray: partial right hip arthroplasty**



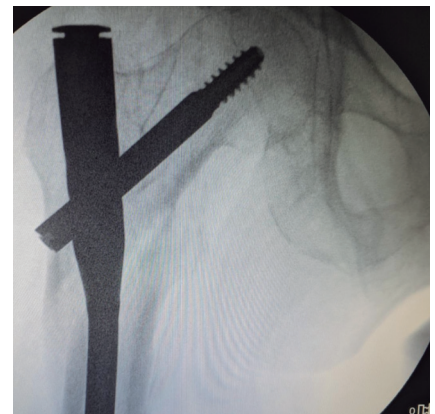
**Preoperative X-ray: intertrochanteric fracture of the right femur**



**Postoperative X-ray: osteosynthesis of proximal femur using Proximal Femoral Nail (PFN)**



**Preoperative 90-year-old patient: subtrochanteric fracture of the right femur**



**90-year-old patient, postoperative X-ray: osteosynthesis of proximal femur using long proximal femoral nail**

Regarding the need for intensive care, most patients did not need an ICU referral, probably because there were no complications during the intraoperative period or because the majority were not critically ill before surgery. However, in the postoperative period, 30.5% of patients needed a referral to a type I or II ICU (according to the Brazilian classification system). In its Ordinance N°. 3,432, of August, 12, 1998, the Brazilian Ministry of Health established minimum requirements for the accreditation of ICU beds and criteria for their classification. Thus, the ICUs accredited after the publication of this ordinance, having fulfilled the required criteria for the care of critically ill patients, were classified as type II or III, according to their complexity. In turn, the ICUs previously accredited, that is, without going through the requirements established by the Ministerial ordinance, were classified as type I<sup>25</sup>. Consequently, of the patients who required ICU in our sample, about 87% were referred to ICU beds that presented the complexity required by the Ministry of Health for the delivery of proper intensive care, that is, types II and III ICUs.

At hospital discharge, most patients presented favorable clinical outcomes after surgical correction and less than 5% of patients died. Although in-hospital mortality rates present great variability in the literature, Brazilian studies in the states of Rio Grande do Sul and Rio de Janeiro reported rates of 5.55% and 8.9%, respectively<sup>8,18</sup>. In the state of São Paulo, in a high complexity service, in-hospital mortality rate reached 7.1%<sup>20</sup>. International studies, on the other hand, reported rates of 4.5% in Denmark<sup>3</sup> and 2.7% to 4.5% in the United States<sup>3,26</sup>, values that are closer to the rate we report in this study. Risk factors for in-hospital mortality reported in the literature were: shock, presence of heart disease and diabetes mellitus<sup>26</sup>. Moreover, the delay in performing surgery represents an important risk factor for mortality and complications, which is potentially modifiable<sup>26</sup>. This fact represents a warning about the excessive delay in performing surgery in the Brazilian public health system, which may explain the higher mortality rates observed in Brazil. While the literature indicates 12, 24 or 48 hours as an ideal waiting time,

depending on the clinical condition of the patient, in general, patients from the Brazilian public health system waited for an average of 7 days for surgery<sup>20</sup>.

As for the expenditure of the Brazilian public health system, a survey carried out between 2008 and 2016, pointed out that the total cost of hospitalizations for hip fractures totaled BRL 810,774,576, or an yearly average of BRL 90,000,000. In the same period, these expenditures increased by 120%, with an expected additional increase of 74% between 2016 and 2026. Furthermore, it is estimated that the total expenditure of SUS with hip fractures will reach an accumulated total of BRL 2.5 billion between 2008 and 2026<sup>27</sup>. The same authors reported an average cost per procedure of BRL 2,207<sup>26</sup>. for the entire Brazilian territory, while a value of BRL 2,198.50 was observed in the Federal District, in the same period<sup>27</sup>. A study carried out in the state of Paraná, on the other hand, reported, in a similar period (2010-2014), an average cost of BRL 2,618.34 per hospital stay<sup>28</sup>. Thus, the value of BRL 2,355.63 observed in our sample, in the state of São Paulo, is at an intermediate level between the national average and the highest values reported in the state of Paraná. The findings demonstrate that, despite the variability costs present across the country, hospital care for proximal femoral fractures has a major economic impact on the system. Due to the epidemiological characteristics of the disease, with the increase in life expectancy of the Brazilian population, an increase in the number of hospitalizations for proximal femoral fractures is expected, contributing to the increase of the financial burden of the Brazilian public health system.

Despite providing an overview of proximal femoral fractures in the state of São Paulo, Brazil, this study has important limitations. First, it is a descriptive study and, therefore, possible variables that could be associated with the data presented, such as risk factors for in-hospital mortality and longer hospital stay were not analyzed. However, it is worth noting that the necessary data for this type of analysis should be retrospectively obtained from individual medical records, as it is not available in the database we used, SIHSUS. If performed, this type of analy-

sis would hardly encompass the sample size we analyzed in this study, that is, all surgical procedures for proximal femoral fractures performed in the State of São Paulo. In addition, we also point out as limitations of this study the lack of technical details regarding the surgeries performed, as well as details about the follow-up of these patients. These observations highlight the importance of improving and unifying the repositories of clinical data of SUS, as it happens in other foreign public health systems, especially in Scandinavian countries.

Nevertheless, the results we report in this study represent an alert for health authorities, due to the great impact of proximal femoral fractures on the health of the elderly and because of their important economic impact, resulting both from health care costs and from the disability caused by these fractures. Thus, it is essential to outline the demographic profile and statistics of hospitalizations of patients with proximal femoral fractures, so that the planning of novel public policies aimed at promoting health and preventing these injuries may be improved.

## CONCLUSION

Most of the patients in this study were over 80 years old and female, which is a finding consistent with the epidemiological characteristics of proximal femoral fractures. The surgeries were concentrated in the capital of the State of São Paulo, which has a greater number of institutions with specialized services, necessary for this type of medical assistance, in addition to greater population demand. The hospital mortality rate observed in the sample was lower than that reported in other studies conducted in Brazil, but higher than that observed in developed countries. This finding must be analyzed in light of other factors, such as the time required to perform surgery, which is high in the Brazilian public health system, resulting in an important negative impact in terms of public health. Regarding the economic impact, the costs of proximal femoral fractures are high for the system and their tendency is to increase with the aging of the Brazilian population. In this scenario, it is essential that authorities institute public policies that improve the clinical outcomes and mitigate the financial impact of this disease.



## DISCLOSURES

There is no conflict of interests to declare.

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