Cogitare Enfermagem

ORIGINAL ARTICLE

CHARACTERIZATION OF THE OCCURRENCE OF FRACTURES IN THE ELDERLY: AN EPIDEMIOLOGICAL STUDY IN A PUBLIC HOSPITAL*

HIGHLIGHTS

1. Main causes of fractures in the elderly.
2. Most common postoperative complications after surgery.
3. Variables statistically related to the number of complications and type of fracture.

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ABSTRACT

Objective: To find out about the main postoperative complications and the clinical outcome of elderly people after corrective fracture surgery. **Method:** a descriptive, cross-sectional study carried out in a public hospital in Minas Gerais, Brazil, between August and October 2021. Data was obtained through interviews and medical records and analyzed using the Chi-square and Fisher's exact tests. **Results:** The main postoperative complications were pain, bleeding, and mental confusion. The variables correlated with the number of complications were outcome (p=0.016), ASA classification (p=0.047) and postoperative time (p=0.002). As for the type of fracture, it was the destination sector (p=0.002) and length of stay (p>0.0001). **Conclusion:** This study provides the team with greater knowledge about the profile of the elderly, to improve surgical planning and reduce the factors correlated with the presence of postoperative complications.

DESCRIPTORS: Elderly; Bone fractures; Postoperative Complications; Nursing; Surgical Procedures, Operative.

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INTRODUCTION

Aging is considered one of the most significant changes of the 21st century, with repercussions on health systems and the structure of families; its pace has increased significantly in the world population. The prevalence of multiple comorbidities, combined with the high average age, may show a greater risk of loss of autonomy and independence for these people[1].

The World Health Organization (WHO) estimates that between 2015 and 2050, the proportion of the world's population aged over 60 will rise from 12% to 22%. This corresponds to a total of 2 billion in 2050, compared to 900 million in 2015[2]. According to the National Household Sample Survey (PNAD), in 2017 the elderly population in Brazil reached the 30.2 million mark[3].

As life expectancy has increased, people over 60 have become more active. However, a decrease in functional capacity, such as changes in walking speed associated with the presence of comorbidities and polymedication, make this population more susceptible to the risks of accidents and falls that can lead to fractures [4].

Falls are the second-leading cause of death from unintentional injuries5. A study on the prevalence and determinants of falls among the elderly in southern Brazil showed that falls affected almost a third of the elderly. In addition, around 12% of elderly people who fell fractured a bone[6].

Fractures have been identified as an important cause of hospitalization for the elderly and have a direct impact on the length of hospital stay. Orthopedic trauma is defined as musculoskeletal injuries resulting from accidents ranging from low-energy trauma, such as falls, to high-energy trauma, such as traffic accidents[7].

Hospitalizations resulting from falls in the elderly generate significant costs for health systems, in the order of two billion reais[8]. Considering that there is a gap in the literature regarding the correlation between postoperative complications and the different types and main causes of fractures, this study was proposed.

The general objective of this study is to find out about the main post-operative complications and the clinical outcome of elderly people after corrective fracture surgery.

METHOD

This is a descriptive, cross-sectional, documentary study with a quantitative approach, carried out in a public hospital in the city of Uberlândia, Minas Gerais (MG), Brazil. Data collection took place between August and October 2021.

The population was made up of elderly people aged 60 or over, of both sexes, who had undergone a surgical procedure to repair a fracture in any segment of the body. The inclusion criteria were patients over 60 years of age, of both sexes, hospitalized for surgical treatment of a fracture in any segment of the body between August and October 2021. Patients with pathological fractures, death before surgery and a change of management to conservative treatment were excluded from the study. The universe of participants was obtained through intentional non-probabilistic sampling, for convenience, of patients who met the inclusion and exclusion criteria for the study.

Eligible patients were assessed using a structured questionnaire adapted from a similar study9. Items that were not relevant to the study in question were excluded, and items pertinent to the study were added. The questionnaire was divided into sociodemographic

data, clinical data, postoperative complications, and outcomes. Eligible patients were recruited on admission to the operating room, where the patient or their guardian was approached, depending on their clinical condition, or within 24 hours of the surgery.

Data were obtained in two ways: I) interviews using a structured questionnaire adapted for the study, and II) documentary analysis of the information contained in the electronic medical records. The interview was carried out when the patient or accompanying person authorized it by signing the Informed Consent Form (ICF). Documentary analysis of the electronic medical records took place throughout the patient's follow-up until the clinical outcome, either discharge or death.

After collection, the data was entered into Microsoft Excel® spreadsheets using the double-entry technique, with subsequent validation. A coded dictionary was created. Categorical and nominal data were analyzed as absolute and relative frequencies.

Independence between groups and qualitative variables was tested using the Chi-Square test of Independence (when the expected frequencies were greater than five) or Fisher's Exact test (when at least one of the expected frequencies was less than five). The SPSS-Statistical Package for the Social Science software (version 19.0) or the R environment (R CORE TEAM 2019) was used for all the analyses. A significance level of 5% was adopted for all analyzes, except where described.

The project was submitted to the Research Ethics Committee under substantiated opinion number 5.426.340, approved by the CEP. As such, no information that could identify the individuals in the study was disclosed, guaranteeing the privacy and anonymity of the subjects.

RESULTS

All elderly patients over the age of 60 admitted for surgical treatment of a fracture in any segment between August and October 2021 were enrolled. The sample obtained, the exclusion criteria and the patients eligible for the study are shown in Figure 1.

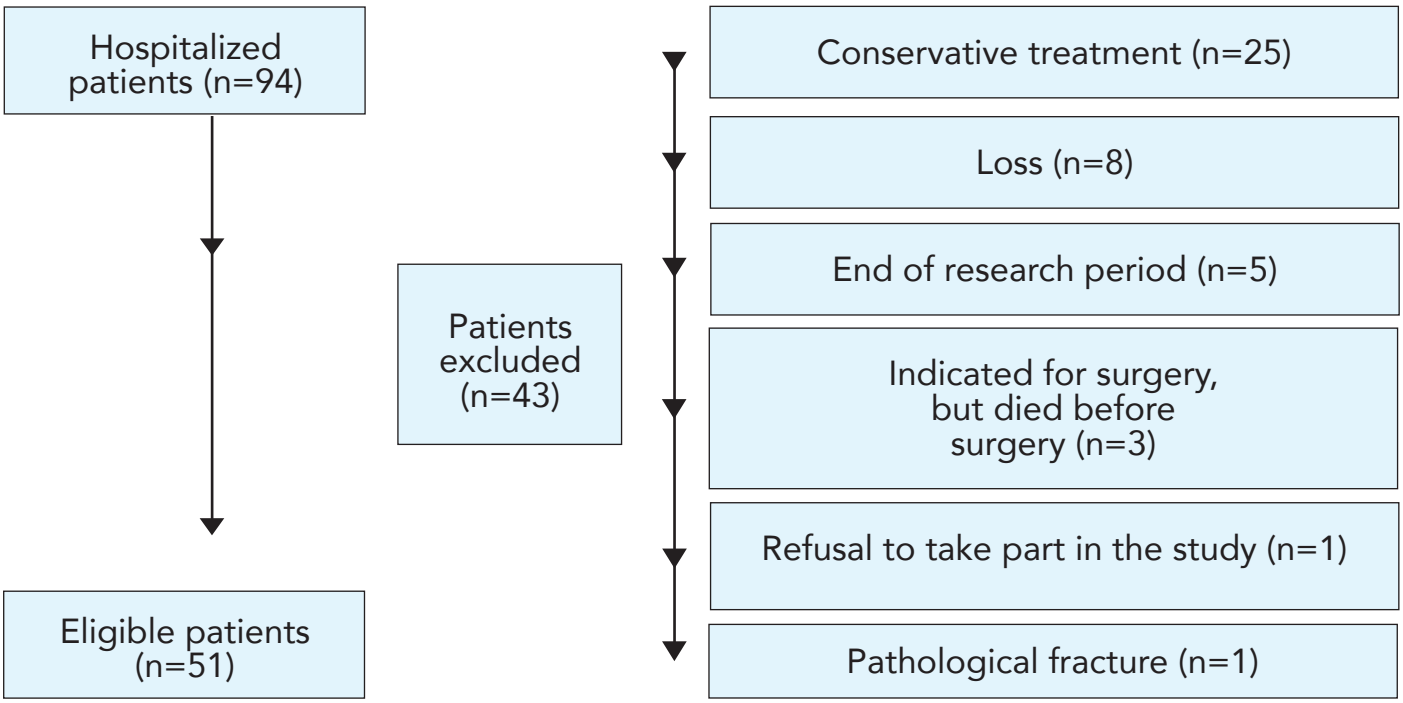

Figure 1 - Diagram of patients selected for the study. Uberlândia, MG, Brazil, 2021
Source: The authors (2021).

The results presented refer to the data collected through the questionnaire and the information contained in the electronic medical records of the 51 patients included in the study, data shown in Table 1.

Table 1 - Sociodemographic and clinical profile of elderly patients undergoing surgical treatment for fracture repair (n=51). Uberlândia, MG, Brazil, 2021

Variable	Level	n* (%)
Age	60 to 69	26(51)
	70 to 79	16(31.4)
	over 80	9(17.6)
Gender	Male	28(54.9)
	Female	23(45.1)
Color	White	35(68.6)
	Brown	11(21.6)
	Black	5(9.8)
Education	Illiterate	7(14.3)
	Elementary School	33(67.3)
	Ensino High School	7(14.3)
	Higher Education	2(4.1)
Profession	Retired	27(52.9)
	Household	7(13.8)
	General Services	3(5.9)
	Pensioner	2(3.9)
	Others	12(23.5)
Hypertension	Yes	32(62.7)
	No	19(37.3)
Diabetes	Yes	13(25.5)
	No	38(74.5)
Smoking	Yes	8(15.7)
	No	43(84.3)
Number of comorbidities	None	13(25.5)
	1 to 2	27(52.9)
	3 or more	11(21.6)
Risk of falling	Yes	28(54.9)

	No	23(45.1)
Visual, hearing or motor impairment	Yes	13(25.5)
	No	38(74.5)
Previous surgery	Yes	9(17.6)
	No	42(82.4)
Skin integrity	Intact	31(60.8)
	Excoriation	10(19.6)
	Lesion	10(19.6)

n* - number of patients

Source: The authors (2021).

Among the 51 participants, 33 (66%) had suffered a fall and 12 (24%) had traffic accidents involving motorcycles, cars, trucks and being run over as the main cause of the fracture. One of the patients had an unknown trauma mechanism. As for the type of fracture, 28 (54.9%) were of the lower limbs, including the femur, acetabulum, tibia, ankle and metatarsal. Femur fractures were the most significant, accounting for 19 (37.2%) patients. Around 43 (84.3%) had only one fracture.

We analyzed the time intervals between the fracture (incident) and hospitalization, pre- and postoperative care, length of hospital stay, whether the surgery was scheduled or not, and whether the patient underwent more than one surgical intervention during the same hospital stay. The time between the fracture and hospitalization was up to five days for 34 (66.7%) patients. Scheduled surgeries were those not performed on the day of hospitalization, which were predominant in 34 (66.7%) cases.

Pre-operative time was measured from hospitalization to surgery; the time between the fracture and hospitalization was not considered. It was found that 19 (37.3%) patients underwent surgery within 24 hours of hospitalization, and 16 (31.4%) had a preoperative time of more than ten days. The average preoperative time was 7.69 ± 8.12 days. Post-operative time was stratified between 0 and 2, 3 to 6 and more than seven days, with 18 (35.3%) patients staying between three and six days, with little difference between the groups, the first 17 (33.3%) and the third 16 (31.4%), respectively. The average postoperative time was 6.43 ± 6.8 days.

As for the length of hospital stay, 39 (76.5%) stayed longer than six days and the average length of stay was 14.1 ± 9.63 days. When only femur fractures were analyzed, this average increased to 18.8 ± 9.35 days. Definitive treatment was carried out in the first surgery in 42 (82.4%) patients, without the need for a new surgical approach. In cases where patients had to undergo more than one surgery in the same hospitalization, the average interval between them was 15.4 ± 6.46 days.

Factors relating to the surgery and the patient were also analyzed. As for the ASA classification, 41 (80.4%) patients were classified as ASA II, followed by 10 (19.6%) patients classified as ASA III. No patients were found with an ASA I, IV or V classification. The most used type of anesthesia was regional with sedation in 34 (66.7%) patients, followed by general and regional in nine (17.6%) cases.

Regarding the degree of contamination, clean surgery was present in 42 (82.4%) of the elderly. As for the most used surgical positioning, the dorsal type, and its variations (with the use of cushions or a beach chair) were found in 42 (82.4%) patients.

Regarding blood transfusion, 48 (94.1%) did not require intraoperative transfusion. In the immediate postoperative period, 33 (64.7%) patients returned to the emergency department as their destination sector, 13 (25.5%) returned to the ward, and five (9.8%) went to the Intensive Care Unit (ICU).

The most common postoperative complications were pain in 33 (64.7%), bleeding in 16 (31.4%) and mental confusion in eight (15.7%) patients. Regarding mental confusion, when only patients with femur fractures were analyzed, four (21.05%) had this type of complication.

As for the number of complications, 32 (62.7%) patients had one to two complications. The predominant clinical outcome was hospital discharge, in 49 (96.1%) cases. The other postoperative complications are described in Table 2.

Table 2 - Postoperative complications and clinical outcome of elderly patients undergoing surgical treatment for fracture repair (n=51). Uberlândia, MG, Brazil, 2021

Variable	Level	n* (%)
Pain	Yes	33(64.7)
	No	18(35.3)
Bleeding	Yes	16(31.4)
	No	35(68.6)
Infection	Yes	2(3.9)
	No	49(96.1)
Fever	Yes	4(7.8)
	No	47(92.2)
Nausea	Yes	2(3.9)
	No	49(96.1)
Vomiting	Yes	3(5.9)
	No	48(94.1)
Mental confusion	Yes	8(15.7)
	No	43(84.3)
Dyspnea	Yes	4(7.8)
	No	47(92.2)
Hypotension	Yes	1(2)
	No	50(98)
Agitation	Yes	2(3.9)
	No	49(96.1)
Number of complications	0	12(23.5)
	1 to 2	32(62.7)
	3 or more	7(13.8)
High	Yes	49(96.1)
	No	2(3.9)

Death	Yes	2(3.9)
	No	49(96.1)

n* - number of patients
Source: The authors (2021).

The independence between the groups and the qualitative variables (number of complications) were analyzed and tested using the Chi-Square test of Independence (when the expected frequencies were greater than five) or Fisher's Exact test (when at least one of the expected frequencies was less than five). The Chi-Square test was corrected for continuity in the 2x2 contingency tables (2 rows by 2 columns). These data are described in Table 3.

Table 3 - Descriptive analysis of the stratified database of patients with several complications (qualitative variables) (n=51). Uberlândia, MG, Brazil, 2021

Variable	Modality	0	1 to 2	3 or more	Statistics	p value*
Duration of hospitalization	Less than or equal to 6 days	4(33.3)	7(21.9)	1(14.3)	1.012	0.627
	Over 6	8(66.7)	25(78.1)	6(85.7)		
Age	60 to 69 years	6(50)	17(53.1)	3(42.9)	3.756	0.434
	70 to 79 years	5(41.7)	10(31.2)	1(14.3)		
	Over 80	1(8.3)	5(15.6)	3(42.9)		
Outcome	Discharge	12(100)	32(100)	5(71.4)	7.129	0.016
	Death	0(0)	0(0)	2(28.6)		
Type of fracture	Upper limb	6(54.5)	15(46.9)	1(14.3)	2.992	0.223
	Lower limb	5(45.5)	17(53.1)	6(85.7)		
More than one surgery in the same hospitalization	Yes	0(0)	7(21.9)	2(28.6)	3.741	0.113
	No	12(100)	25(78.1)	5(71.4)		
ASA	II	8(66.7)	29(90.6)	4(57.1)	6.058	0.047
	III	4(33.3)	3(9.4)	3(42.9)		
Time between fracture and hospitalization	0 to 5 days	10(83.3)	21(65.6)	3(42.9)	3.965	0.373
	6 to 10 days	0(0)	4(12.5)	1(14.3)		
	More than 10	2(16.7)	7(21.9)	3(42.9)		
Pre-operative time	1 day	3(25)	13(40.6)	3(42.9)	4.37	0.647
	2 to 5 days	3(25)	3(9.4)	1(14.3)		
	6 to 10 days	3(25)	6(18.8)	0(0)		
	More than 10	3(25)	10(31.2)	3(42.9)		
Postoperative time	0 to 2 days	7(58.3)	10(31.2)	0(0)	15.027	0.002
	3 to 6 days	5(41.7)	12(37.5)	1(14.3)		
	More than or equal to 7 days	0(0)	10(31.2)	6(85.7)		

n(%)- number of patients
p-value*- Chi-squared (p<0.05)
Source: The authors (2021).

For the purposes of statistical analysis, fractures were grouped into upper and lower limbs, with lower limb fractures being the most prevalent, especially femur fractures in 19 (37.2%) patients. A correlation was tested between the type of fracture (upper and lower limb) and the variables of more than one surgery in the same hospitalization, destination sector, length of hospitalization, gender, and ASA classification. These data are described in Table 4.

Table 4 - Descriptive analysis of the stratified database of patients with type of fracture (qualitative variables) (n=51). Uberlândia, MG, Brazil, 2021

Variable	Modality	Upper Limb	Lower Limb	p value*
More than one surgery in the same hospitalization	Yes	2(9.1)	7(25)	0.109
	No	20(90.9)	21(75)	
Destination sector	Emergency room	19(86.4)	13(46.4)	0.002
	Ward	3(13.6)	10(35.7)	
	ICU	0(0)	5(17.9)	
Duration of hospitalization	Less than or equal to 6 days	11(50)	1(3.6)	p>0.0001
	Longer than 6 days	11(50)	27(96.4)	
Gender	Male	13(59.1)	14(50)	0.19
	Female	9(40.9)	14(50)	
ASA	II	19(86.4)	21(75)	0.178
	III	3(13.6)	7(25)	

n(%)- number of patients
p-value*- Chi-squared (p<0.05)
Source: The authors (2021).

DISCUSSION

The average age in this study was 71.1 ± 8.96 years. Several authors have found similar results, but the fractures they investigated were femoral or hip fractures separately. In this study, when only femoral fractures were stratified, we found a mean age of 78.31 ± 8.94 years. Similarly, patients with femur fractures had a mean age of 76 years(10) and 78.7 ± 9.1 years[11].

Regarding gender, there was a predominance of males. However, when only femur fractures were analyzed in isolation, women were the majority. This finding is in line with the literature, which points to a predominance of females among patients with femur fractures, with 76.9% being women[11].

In terms of color and education profile, the majority were white and had attended elementary school. A study on the association between diagnosis, clinical outcome, and length of stay among the elderly in a university hospital found similar results to those in this study[12].

The most prevalent comorbidities in this study were hypertension and diabetes. The literature indicates that these comorbidities are the most common in patients with hip fractures[13,14]. In addition to those mentioned in this study, heart disease, stroke, anemia, and dementia were also found[15].

As for the causes of fractures in the elderly, similarly, falls and traffic accidents were cited as the main mechanisms. In a study evaluating the risk factors that contribute to falls in the elderly, the incidence of falls was 36.41%[16].

Low-energy trauma was identified as the most common cause of distal femur fractures in both genders (97%), with falls from one's own height being found in 61% of cases[17]. This was evidenced in our study, when only patients with femur fractures were analyzed, around 17 (89.5%) had falls as the main mechanism.

Regarding the average preoperative hospitalization time, when only patients with femoral fractures were analyzed, the average preoperative time was even longer, at around 14.5 days. This figure is higher than that found in the literature, in which the average wait between hospitalization and the day of surgery was 5.9 days in patients with femoral fractures[11].

The average hospital stay is a potentially modifiable component of healthcare spending. By addressing factors such as early fixation and treatment of medical complications, the overall length of stay and the economic burden associated with femur fractures can be reduced[18].

One of the factors that increases the length of hospital stays is the failure to carry out definitive treatment immediately. In the present study, although 42 (82.4%) patients underwent only one surgery, among those who had to undergo further surgery, the time between surgeries was 15.4 ± 6.46 days. In patients with hip fractures, the time between the fracture and hospital discharge was significant. Patients who remained in the hospital for more than 30 days showed an increase in mortality[15].

In some cases, the patient undergoes surgery to control the damage and then definitive treatment. This is due to the trauma mechanism, the patient's clinical conditions, the lack of suitable consigned material or the absence of a specialist doctor. In addition, as this is a referral hospital for trauma care, it may be necessary to suspend the scheduled procedure for harming emergencies, increasing the length of the hospital stay.

Some authors have linked delays in surgery and long hospital stays with mortality. Surgical treatment more than two days after the trauma was associated with increased mortality in patients with distal femur fractures[10], and mortality in patients hospitalized with hip fractures was related to the time between hospitalization and surgery exceeding seven days ($p=0.005$)[14].

Early surgery is highlighted in the literature as a strategy to reduce complications for patients. Although most of the risk factors do not influence it, early surgery and mobilization are seen as important in trying to reduce the number of complications and mortality in patients with hip fractures[19].

Regarding data on surgery, the ASA classification system is used to predict perioperative risks. The ASA II classification was predominant in this study. This score is associated with a higher risk of complications compared to the lower ASA classification in hip fracture patients[20].

Regarding the type of anesthesia, there was a predominance of regional anesthesia

associated with sedation. Similarly, to our study, in which 16 (84.2%) patients with femoral fractures underwent regional anesthesia, neuroaxis anesthesia was also the most used in patients with femoral fractures[11].

As for the profile of patients transferred to the ICU, all had femur fractures. This proportion, equivalent to five (26.31%) patients, is higher than that found in other studies, where the preoperative transfer rate was 1.6% and the postoperative rate was 3.3% in patients with femoral fractures[11].

As for post-operative complications, mental confusion was among the most common, especially among patients with femoral fractures. In a similar study of hip fracture patients, the main clinical complication was cognitive-behavioral disorders, the main one being mental confusion, with a prevalence of 23.8%[14].

Delirium has been cited by several authors as a recurrent postoperative complication. In patients with hip fractures, the incidence of delirium was 20%19. Among patients with femoral fractures, delirium and other complications occurred in 57% of patients[11].

As for the clinical outcome, the results indicated that there were more discharges than deaths. The literature shows equivalent figures in a study in which the mortality rate among patients with hip fractures who underwent surgery was 1.7%[13].

When analyzing the number of complications, patients with three or more had a length of stay of more than six days. Corroborating these findings, in patients with femoral fractures, age was cited as one of the independent predictors associated with an increased length of stay of more than six days[18].

In this study, age was not related to an increase in in-hospital complications. However, in some studies, age has been correlated with postoperative complications, longer hospital stays and mortality in patients with femoral fractures (21), as well as being considered an independent predictor of mortality and, when associated with other factors such as functional dependence, contributing directly to the occurrence of adverse events [11].

The literature shows that after adjusting for the ASA classification, age showed no difference in surgical complication rates, although these patients had higher rates of surgical revision, need for transfusion, ICU stay, and hospital stay[22].

When correlated with the number of complications, the outcome was statistically significant (p=0.016). Two (28.6%) patients who died had three or more complications. In a study investigating factors associated with mortality in elderly patients hospitalized for femoral fractures, the degree of leukocytosis associated with advanced age was associated with mortality[23].

Another statistically significant result was the ASA classification (p=0.047). Many patients were ASA II and had 1 to 2 complications. However, it was expected that patients with ASA III would have more complications, as indicated in the literature[20].

Postoperative time was also statistically significant (p=0.002). In the group with three or more complications, six (85.7%) patients had a hospital stay of seven days or more. As for the group with zero complications, no patient was hospitalized for more than seven days.

When the type of fracture was correlated with other variables, two were statistically significant. The first was the destination sector (p = 0.002). All the patients referred to the ICU in the immediate postoperative period had a fracture of the lower limb (femur).

The second variable that showed a statistical correlation when correlated with the type of fracture was the length of hospitalization (p > 0.0001). Around 27 (96.4%) patients with lower limb fractures were hospitalized for longer than the group with upper limb

fractures. The risk of death among patients with femur fractures was found to be 2.5 times higher in those who were hospitalized for more than seven days[22].

This study had some limitations. The first was sample loss due to exclusion criteria. The number of patients undergoing conservative treatment was high. Next was the sample size, which, although relevant, is still considered small.

FINAL CONSIDERATIONS

The study made it possible to find out about the main postoperative complications and the clinical outcome of elderly people undergoing surgical treatment for fracture repair. It was also possible to characterize the profile of this population and describe the main causes and types of fracture.

The importance of this study for the field is that it contributes to the health team's knowledge of the profile of elderly people who have had a fracture and required surgery, to inform discussions about the best surgical planning. To reduce the length of post-operative hospitalization, the factor was correlated with the presence of postoperative complications. In addition, the healthcare team will be able to better plan care considering the difference in length of stay between patients with lower and upper limb fractures.

The strengths of this study include the prospective nature and the daily monitoring of these patients, even if only through their medical records, allowing for the detection of possible postoperative complications. Another important aspect of this research is the need to assess and manage clinical conditions to plan care, ensuring that the needs of this population are met in the shortest possible time. Further studies involving the importance of education for the public on the prevention of falls and external causes in the elderly should be developed.

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Toneto MA dos S, Mendes PC, Araújo SA de.** Drafting the work or revising it critically for important intellectual content - **Toneto MA dos S, Mendes PC, Araújo SA de.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Toneto MA dos S, Mendes PC, Araújo SA de**. All authors approved the final version of the text.

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