



## Original Article

# Comorbidities, clinical intercurrents, and factors associated with mortality in elderly patients admitted for a hip fracture<sup>☆</sup>



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## ABSTRACT

**Objective:** To analyze comorbidities and clinical complications, and to determine the factors associated with mortality rates of elderly patients admitted with a hip fracture in a tertiary public hospital.

**Methods:** Sixty-seven medical records were reviewed in a retrospective cohort study, including patients equal to or older than 65 years admitted to this institution for hip fracture between January 2014 and December 2014. The evaluated items constituted were the following: interval of time between fracture and hospital admission, time between admission and surgical procedure, comorbidities, clinical complications, type of orthopedic procedure, surgical risk, cardiac risk, and patient outcome.

**Results:** The average patients' age in the sample was 77.6 years, with a predominance of the female gender. Most patients (50.7%) had two or more comorbidities. The main clinical complications during hospitalization included cognitive behavioral disorders, respiratory infection and of the urinary tract. The times between fracture and admission and between admission and surgery were more than seven days in most of cases. The mortality rate during hospitalization was 11.9%, and was directly connected to the presence of infections during hospital stay ( $p=0.006$ ), to time between admission and surgery longer than seven days ( $p=0.005$ ), to the Goldman Cardiac Risk Index class III ( $p=0.008$ ), and to age equal to or greater than 85 years ( $p=0.031$ ).

**Conclusion:** Patients with hip fractures generally present comorbidities, are susceptible to clinical complications, and have an 11.9% mortality rate.

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## Comorbidades, intercorrências clínicas e fatores associados à mortalidade em pacientes idosos internados por fratura de quadril

### R E S U M O

#### Palavras-chave:

Idosos

Fraturas do quadril

Cirurgia ortopédica

**Objetivo:** Analisar as comorbidades e as intercorrências clínicas e determinar os fatores associados à mortalidade de pacientes idosos internados por fratura de quadril em um hospital público de atenção terciária.

**Métodos:** Neste estudo coorte retrospectivo, foram revisados 67 prontuários médicos de pacientes com idade igual ou maior que 65 anos, admitidos em nossa instituição por fratura de quadril, no período entre janeiro a dezembro de 2014. Foram avaliados os intervalos de tempo entre a fratura e admissão hospitalar e entre essa e o procedimento cirúrgico, o tempo total de internação, a presença de comorbidades, as intercorrências clínicas, o tipo de procedimento ortopédico adotado, o risco cirúrgico, o risco cardíaco e o desfecho de alta. **Resultados:** A média de idade foi de 77,6 anos, com predominância do sexo feminino (64,1%). A maioria dos pacientes (50,7%) tinha duas ou mais comorbidades. As principais intercorrências clínicas durante a internação foram distúrbios cognitivo-comportamentais e infecções respiratórias e do trato urinário. Os intervalos de tempo entre fratura e internação e entre essa e a cirurgia foram superiores a sete dias na maioria dos casos. A taxa de mortalidade durante a internação foi de 11,9% e esteve diretamente vinculada à presença de infecções no período hospitalar ( $p=0,006$ ), ao intervalo de tempo entre a internação e a cirurgia superior a sete dias ( $p=0,005$ ), ao escore de Goldman igual a III ( $p=0,008$ ) e à idade igual ou superior a 85 anos ( $p=0,031$ ).

**Conclusão:** Pacientes com fraturas do quadril geralmente apresentam comorbidades, estão predispostos a intercorrências clínicas e têm uma taxa de mortalidade de 11,9%.

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## Introduction

A significant increase in the life expectancy of the population has been observed both in Brazil and worldwide; this has triggered a higher prevalence of chronic and degenerative diseases. According to the Brazilian Institute of Geography and Statistics (IBGE), the current elderly population in the country reaches approximately 15 million; estimates for the next 20 years indicate that it could exceed 30 million when it will represent almost 13% of the population.<sup>1</sup>

Balance and gait depend on a complex interaction between nerve, musculoskeletal, cardiovascular, and sensory functions, as well as the ability to quickly adapt to environmental and postural changes. Balance control changes with age and causes gait instability, which, together with the interaction of various environmental and individual factors, may result in falls.<sup>2</sup>

The 2008 guidelines of the Brazilian Society of Geriatrics and Gerontology indicate that approximately 5% of fall episodes trigger fractures, the most common of which are vertebral fractures and those of the femur, humerus, distal radius, and rib cage. Femoral fractures can be observed in the proximal, distal, or femoral diaphysis; in most cases, these fractures have serious consequences on the physical capacity and longevity of the patients. Since bone is able to transmit a load during motion, fractures cause a loss of bone structural integrity, which hinders the effectiveness of movement.<sup>2</sup>

It is estimated that one in three women and one in 12 men will experience this type of fracture (whether intertrochanteric or of the femoral neck), and 86% of the cases occur in people aged 65 years or older. A 15–20% reduction in the life expectancy of individuals with fractures can be expected, as the relative risk of mortality in these patients increases by 4% per year.<sup>3,4</sup>

Osteoporosis, sensory deficits caused by a stroke, dementia, muscular hypotrophy, decreased visual acuity, altered balance and reflexes, muscle weakness, neurological disorders, cardiovascular disorders, and osteomyoarticular deformities are predisposing conditions to falls and, consequently, fractures. Regarding mortality due to hip fracture, other preoperative factors, identified at the patient's admission, are associated with an increase in this index, namely: being non-white, age, the presence of dementia, male gender, clinical comorbidities, and delirium.<sup>5</sup>

Clinical comorbidities, apart from being an important risk factor for higher mortality, are also associated with the onset of immediate or late postoperative complications. Immediate complications include shock, fatty embolism, compartment syndrome, venous thromboembolism, pulmonary embolism, disseminated intravascular coagulation, and infections. Late complications include delayed consolidation, malunion, pseudoarthrosis, avascular necrosis of the bone, reaction to internal fixation devices, and reflex sympathetic dystrophy.<sup>6</sup>

In addition to complications in the postoperative period, the motor disability triggered by falls and fractures in the elderly can lead to immobility, with several consequences

for the patient's health. Among the detrimental effects to the musculoskeletal system, muscular atrophy, osteoporosis worsening, and joint degeneration are noteworthy. It is estimated that a four to six-week bedrest may lead to a 6–40% decrease in bone density, especially in trabecular bone. Other organic systems are affected by rest, especially the cardiovascular system; an increase in heart rate and a decrease in ejection volume may be observed.<sup>7</sup>

Together with comorbidities and the complexity of orthopedic operations, functional impairment highlights the importance of the clinical follow-up of these patients, as well as an adequate evaluation of their surgical risk. The primary scores for this analysis are the American Society of Anesthesiology (ASA) Surgical Risk Score and Goldman's Cardiac Risk Index.<sup>8</sup>

The ASA score, described in the 1960s, is universally used for its ability to predict the overall risk of mortality according to the patient's age and functional status, regardless of the type of procedure to be performed.<sup>9</sup> Goldman's Index was the first multifactorial model specifically designed for perioperative cardiac complications to be widely adopted. Those authors identified nine statistically significant and clinically relevant cardiac risk factors, assigning values to each of them. In the preoperative evaluation, each factor is added; the higher the sum, the greater the risk of death due to a cardiac reason and of life-threatening cardiac events, such as myocardial infarction, pulmonary edema, and ventricular tachycardia.<sup>10</sup>

Due to the relevance of falls and fractures in the elderly population, the authors aimed at analyzing the comorbidities and clinical complications of patients aged 65 years or older hospitalized for hip fractures at this institution, as well as to identify the risk factors associated with mortality in these patients.

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## Material and methods

This study was approved by the Research Ethics Committee of the institution. This was a retrospective cohort study of data retrieved from the medical records of patients aged 65 years or older, admitted for proximal femoral fracture between January and December 2014, who were longitudinally followed-up during hospitalization.

The mean age was 77.6 years (range: 65–91 years), and 64.4% were females. All patients attended an initial preoperative evaluation consultation; case history, physical examination, and subsidiary examination were transcribed in the hospital's Preoperative Record Form; the back of this form features the Goldman's cardiac risk index and the ASA score (Appendix A).

In the global clinical evaluation, the following variables were analyzed: gender; age; comorbidities, defined as conditions that preceded the fracture; cardiac risk stratification according to the modified Goldman's index, since arterial blood gas analysis was only measured when pulse oximetry, at the time of the clinical evaluation, was lower than 90% in ambient air; clinical complications, defined as health problems that occurred during hospitalization; ASA score; time between fracture and hospitalization; time between hospitalization and orthopedic procedure, whether surgical or

conservative; time between surgery and hospital discharge; total time of hospitalization; type of surgery, when performed; need for intensive care unit (ICU) during hospital stay; and discharge outcome.

Regarding the time between surgery and hospital discharge, patients who did not undergo surgery and those who died during hospitalization were excluded.

## Statistical analysis

Univariate analysis was performed. The frequencies of the studied variables were obtained and the tables were assembled by relating the dependent variable with the independent variables. The chi-squared test was used to compare the factors considered; in all tests, the level of significance was set at 0.05 or 5%.

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## Results

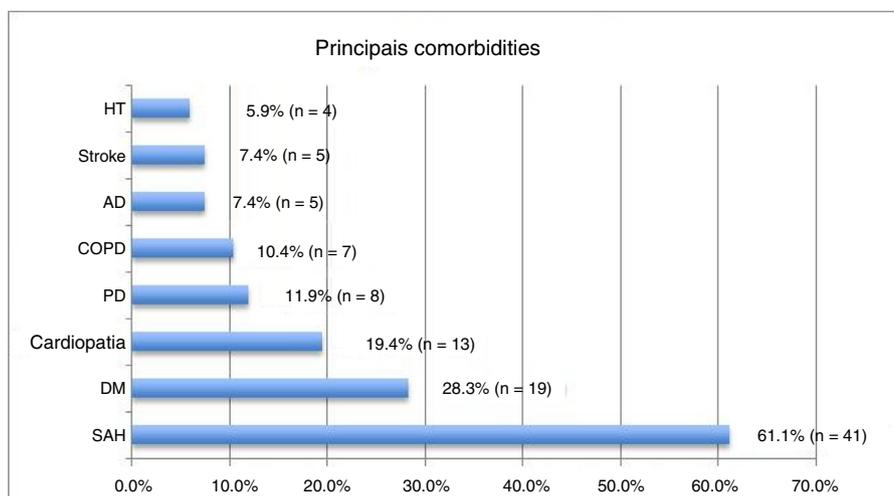
Regarding comorbidities, 11.9% of the patients had no associated disease, 37.3% had one comorbidity, 17.9% had two comorbidities, and 22.3% had three. In 10.4% of the study population, more than four comorbidities were observed.

The main comorbidities found in this population were systemic arterial hypertension (SAH), with a prevalence of 61.1%; diabetes mellitus, present in 28.3% of the cases; and heart diseases, observed in 19.4% of the patients. Among the latter, the most frequent was coronary insufficiency, which accounted for half of the cases. Other heart conditions included arrhythmias (4.6%), aortic stenosis, heart failure, and atrial fibrillation; the latter three had the same prevalence (1.5%). Chronic obstructive pulmonary disease was detected in 10.4% of the population studied and hypothyroidism, in 5.9%.

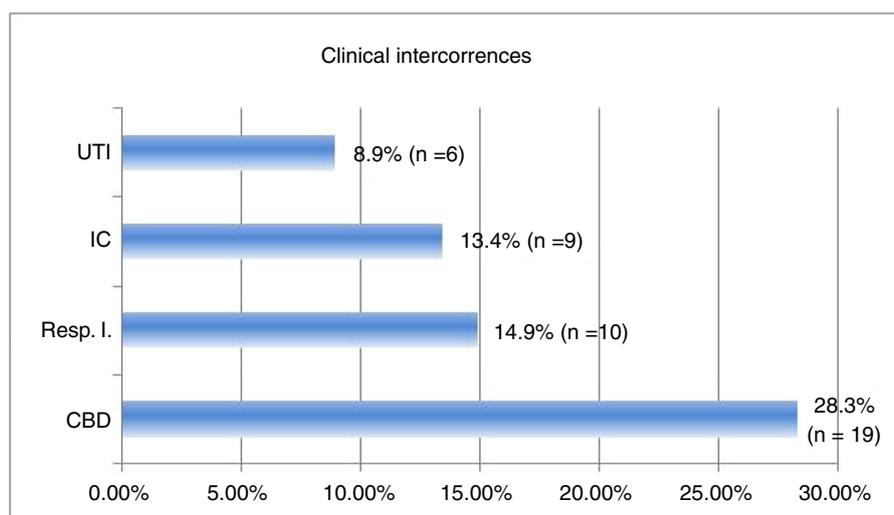
In addition to these diseases, psychiatric disorders were observed in 11.9% of cases, half of whom had depression. Alzheimer's disease and stroke had an individual prevalence of 7.4% (Fig. 1).

The most commonly reported clinical complications were cognitive-behavioral disorders, in 28.3% of the patients. The most frequent was mental confusion, with a prevalence of 23.8%. Other behavioral and cognitive disorders were psychomotor agitation (8.9%) and lowering of the level of consciousness (2.9%). Intestinal constipation was observed in 13.4% of the patients. Respiratory insufficiency or infection occurred in 14.9% of the cases. Furthermore, a considerable part of the patients (8.9%) had a urinary tract infection (UTI) during their hospital stay (Fig. 2).

When the Goldman score was used for cardiac risk assessment, 50.7% ( $n=34$ ) of the patients were classified as class I, 25.3% ( $n=17$ ) as class II, and 13.4% ( $n=9$ ) as class III. In turn, the surgical risk assessment indicated that 56% ( $n=38$ ) of the patients were classified as ASA II, 26.8% ( $n=18$ ) as ASA III, and 4.4% ( $n=3$ ) as ASA IV. The remaining individuals not included in these categories of cardiac and surgical risk were not stratified: seven patients were not classified by the Goldman score and eight patients were not assessed by the ASA score.



**Fig. 1 – Main comorbidities observed in the analyzed population. HT, hypothyroidism; AD, Alzheimer’s disease; COPD, chronic obstructive pulmonary disease; PD, psychiatric disorders; DM, diabetes mellitus; SAH, systemic arterial hypertension.**



**Fig. 2 – Most common complications observed in the postoperative period of patients with femoral fractures. UTI, urinary tract infection; Resp. I., respiratory insufficiency or infection; IC, intestinal constipation; CBD, cognitive-behavioral disorders.**

The time between fracture and hospitalization was up to seven days in 25.3% of the cases, seven to 15 in 13.4%, 15–30 in 19.4%, and over 30 days in 7.4%. In 34.3% of the patients, this period was unknown, as the medical chart did not feature the exact date of the fracture. The time between hospitalization and surgery was up to seven days for 23.3% of the patients, from seven to 15 for 43.3%, from 15 to 30 for 30%, and more than 30 for 3.3%. Regarding the total hospitalization duration, 11.9% of the patients remained hospitalized for up to seven days; in 31.3%, the time was from seven to 15; in 41.7%, from 15 to 30; and in 14.9%, over 30 days (Table 1).

The time between surgery and hospital discharge was up to two days in 57.1% of the cases, three to seven in 33.9%, and over seven days in 7.1%.

Surgical treatment predominated in most cases, with proximal femoral osteosynthesis in 58.2% of patients ( $n=39$ ) and total hip prosthesis in 31.3% of the analyzed population ( $n=21$ ). In the other 10.4% of cases ( $n=7$ ), a conservative treatment was chosen, as these patients presented high surgical risk according to the scores applied. Postoperative ICU admission was necessary for 26.8% of the patients. In these patients, the length of ICU stay ranged from one to 30 days, with a mean of five days.

**Table 1 – Description of the time intervals analyzed in the present study.**

Time between fracture and hospitalization	n = 67 (100%)
0-7 days	17 (25.3%)
7-15 days	9 (13.4%)
15-30 days	13 (19.4%)
Over 30 days	5 (7.4%)
Unknown	23 (34.3%)
Time between hospital admission and surgery	n = 60 (100%)
0-7 days	14 (23.3%)
7-15 days	26 (43.3%)
15-30 days	18 (30%)
Over 30 days	2 (3.3%)
Length of hospital stay	n = 67 (100%)
0-7 days	8 (11.9%)
7-15 days	21 (31.3%)
15-30 days	28 (41.7%)
Over 30 days	10 (14.9%)

**Table 2 – Characterization of the eight patients whose outcome was death.**

Gender	Female 50% (n=4)
No. of comorbidities	1 comorbidity 50% (n=4) 3 comorbidities 37.5% (n=3) More than 3 comorbidities 12.5% (n=1)
Age ≥85 years	50% (n=4)
Infections during hospitalization	67.5% (n=5)
Goldman score	Class I: 12.5% (n=1) Class II: 37.5% (n=3) Class III: 50% (n=4)
Time between hospitalization and surgery >7 days	37.5% (n=3)
Treatment	Conservative 50% (n=4) Femoral osteosynthesis 37.5% (n=3) Hip prosthesis 12.5% (n=1)

Finally, during the hospitalization period, a mortality rate of 11.9% (n=8) was observed. [Table 2](#) shows the main characteristics of patients who died, including variables with statistical significance.

The univariate statistical analysis indicated that the presence of infections in the hospitalization period ( $p=0.006$ ), the time between hospitalization and surgery for more than seven days ( $p=0.005$ ), a Goldman score equal to III ( $p=0.008$ ), or age equal to or greater than 85 years ( $p=0.031$ ) were associated with death during hospitalization. Other factors, without statistical significance, are described in [Table 3](#).

## Discussion

The main finding of the present study was that the mortality of hospitalized patients with hip fracture was related to the time between hospitalization and surgery of more than seven days,

**Table 3 – Univariate analysis with the chi-squared test to determine the p-value between the independent variables and death outcome.**

Independent variable (in relation to the dependent variable "death")	p-Value
Gender	0.373
Age ≥ 85 years	0.031
No. of comorbidities	0.397
Diabetes mellitus	0.541
Systemic arterial hypertension	0.991
Heart conditions	0.670
Psychiatric disorders	0.959
Cardiac risk (Goldman)	0.008
Surgical risk (ASA)	0.653
Infection during hospital stay	0.006
Cognitive-behavioral disorders during hospitalization	0.148
Time between fracture and admission	0.980
Time between admission and surgery	0.005
Postoperative ICU admission	0.401

the occurrence of infections, Goldman's score equal to III, and age equal to or greater than 85 years. Post-hip fracture mortality is elevated not only in the months following the event, but for years after the trauma. The multiple cohort data analysis performed by Haentjens et al.<sup>11</sup> showed the persistence of excessive mortality ten years after the fracture, which highlights the impact of this pathology on public health. Although Belmont Jr. et al.<sup>12</sup> have mentioned several risk situations for death and complications in elderly fractured patients, such as obesity, dialysis, shock, and comorbidities, in the present study the authors attempted to address the most relevant factors.

In the present study, the mortality rate during hospitalization was 11.9%, higher than that observed in the literature. A review of mortality in cases of femoral fractures in the elderly gathered data from 25 studies and concluded that the mean mortality during hospital stay was 5.5%.<sup>13</sup>

In turn, the study by Roche et al., which included 2448 patients assessed over a period four years, presented a 30-day postoperative mortality of 9.6%, lower than that observed in the present population.<sup>14</sup> The patients in that study were older than 60 years and presented cardiovascular and respiratory disorders as their main comorbidities, while infections and heart failure were the most prevalent complications.<sup>14</sup>

Time until surgery was a factor statistically associated with the mortality rate. In the present study, the waiting time between hospital admission and the procedure ranged from seven to 15 days in 43.3% of the patients; in 30% of the cases, from 15 to 30 days; and in 3.3%, over 30 days. A systematic review and meta-analysis of 35 studies retrieved from the MEDLINE, Embase, and Cochrane databases demonstrated a significant increase in the risk of death in patients who underwent surgery over 48 h after hospital admission ( $p<0.0001$ ). This association remained true after adjusting for age, gender, location, and year. In conclusion, those authors suggest that orthopedic services should advocate that femoral fracture patients ought to undergo surgery within the first 48 h after admission.<sup>15</sup>

Mesquita et al.,<sup>16</sup> in a survey extracted from the MEDLINE, LILACS, and SciELO databases from January 2003 to December 2007, reported that the mean waiting time between fracture and surgery was 6.8 days, and that the increase of one day waiting increased the possibility of death by approximately 4%.<sup>16</sup> Considering that in the present study the vast majority of patients had a waiting time between hospitalization and surgery longer than seven days, and that the time between fracture and hospitalization was also longer than seven days, the strong negative impact on the mortality rate can be well understood.

The presence of infections during hospitalization was another variable associated with the death outcome. Respiratory and urinary tract infections were the most commonly observed in the present sample; together, they were present in 23.8% of the patients. A literature research in the LILACS, SciELO, and BDNF databases between January 2003 and June 2008 retrieved 38 articles on hospitalized elderly patients. In these cases, the presence of infectious diseases was a factor associated with mortality rates, and the most prevalent sites were the respiratory system and urinary tract.<sup>17</sup> That finding is similar to those observed in a study by Cunha et al., in which a frequency of 28.5% was observed; the most prevalent infections were pneumonia, urinary tract, and surgical site.<sup>18</sup> It is known that elderly individuals who are submitted to long hospitalizations are more susceptible to infections due to physiological alterations caused by the aging process, a decline in the immune response, and the presence of comorbidities, with a consequent increase in morbidity and mortality.<sup>19</sup>

Barba et al.,<sup>20</sup> in a study that included elderly patients admitted to an internal medicine unit in Spain between 2005 and 2007, observed that pneumonia was the most frequent fatal infection in this population, which reinforces the importance and severity of this infectious process in hospitalized elderly patients, not only in the orthopedic area. Regarding UTIs, Nyman et al. observed a prevalence rate of 52.3% of this infection in elderly patients hospitalized for a hip fracture at a university hospital in Switzerland.<sup>21</sup> These authors emphasized the need to prevent such a prevalent complication in the hospitalized population in order to avoid the unnecessary clinical picture of urinary symptoms and fever.<sup>21</sup>

Although cardiac diseases, as an isolated variable, were not significantly associated with the risk of death, Goldman's cardiac risk index showed a positive correlation in those patients classified as class III. This score includes variables related to the clinical evaluation, electrocardiogram, and type of surgery, stratifying patients into classes I to IV as to the risk of presenting cardiovascular complications or evolving to death.<sup>22</sup> In fact, cardiac conditions have been described as a factor in the prognosis of patients with femoral fractures; they are essential in the evaluation of the anesthetic risk of these individuals. The severity of heart disease is associated with an increased anesthetic risk and, consequently, with an unfavorable outcome.<sup>13</sup>

Age equal to or higher than 85 years was also statistically associated with the mortality rate in the present study. Patients from this age group accounted for 50% of the deaths.

In the study by Garcia et al.,<sup>23</sup> 71% of the deaths occurred in individuals over 80 years of age; in their sample, the variable of age over 80 years was associated with mortality. Turrentine et al.<sup>24</sup> stated that the elderly present unique health challenges; they have a special physiological, pharmacological, and psychological state, as well as social attributes not observed in younger patients. These peculiarities require special attention and understanding by surgeons and their teams. In their study, age was significantly associated with morbidity.<sup>24</sup>

In stress situations, such as surgery, elderly patients may not meet the increased functional demand. This reserve loss is an important factor in the reduced tolerance of elderly patients to invasive procedures.<sup>25</sup> According to Souza et al.,<sup>26</sup> each year of a patient's life represents an increase in the chance of death of approximately 6%. A longitudinal study in a large hospital in Australia followed-up 410 men and 1094 women with femoral fractures and observed an 8.7-fold increase in the risk of death in patients aged 90 years or over.<sup>27</sup> Guerra et al.<sup>28</sup> found a significant association between age greater than 86 years and the mortality rate (38.3%). These authors associated the fact that femoral fractures predominantly occur in very old patients with relevant previous diseases and high surgical risk, which increases mortality when compared with other types of fractures.

Females accounted for 64.1% of the studied population, a finding similar to that observed by Ariyoshi<sup>29</sup> and Arndt et al.,<sup>30</sup> who reported females as 62.6% and 76.2% of patients hospitalized due to femoral fractures and/or falls, respectively. One of the hypotheses to justify this predominance is the decline in bone mineral density, which is observed earlier among females, as the two components responsible for bone strength, density and bone quality, begin to decrease in females after menopause due to the decrease in estrogen production. Some women lose bone mass at a rate above 1% per year; some may lose up to 5% and, at the end of five years, the total loss is above 25%, characterizing postmenopausal osteoporosis.<sup>30</sup> Moreover, women achieve peak muscular strength earlier than men and suffer the decline earlier.<sup>31</sup>

The high percentage (61.1%) of patients with SAH found in the present study can be understood as a consequence of the increased prevalence of this condition observed with increased age. A study conducted at the State University of Campinas estimated that 50.4% of the patients aged between 60 and 69 years suffered from hypertension; this percentage reached 54.1% in the age range between 70 and 79 years.<sup>32</sup> Presence of SAH has also been considered a risk factor for the occurrence of falls and fractures in the elderly. A possible explanation would be the type of antihypertensive medication used by these patients. A case series in Ontario, Canada indicated that elderly patients on antihypertensive therapy had a 43% increase in the risk of hip fractures within the first 45 days of treatment onset, which was significant for beta-blockers and angiotensin-converting enzyme inhibitors.<sup>33</sup> In contrast, the use of calcium-channel blockers would cause urinary loss of this mineral, thus also contributing to bone fragility and consequent fractures.<sup>34</sup>

Diabetes mellitus was the second most prevalent disease in the studied population, observed in 28.3% of the cases, similarly to the study by Ariyoshi,<sup>29</sup> in which the most prevalent chronic diseases in the population with femur fracture treated in a hospital in Ribeirão Preto (São Paulo State, Brazil) were, respectively, SAH and diabetes. This pathology can also be understood as an amplifying factor of fracture risk. It has been observed that patients older than 65 years with type II diabetes have, on average, glycosylated hemoglobin greater than 9%, which would increase the chance of fracture by up to 31%.<sup>35</sup> A meta-analysis that included 21 studies from the PubMed and Embase databases also demonstrated a strong association of this event with type I diabetes. Possible explanations for this excessive risk increase are diabetic complications, such as polyneuropathy and retinopathy, vestibular dysfunction, cognitive deficit, and episodes of hypoglycemia due to the use of insulin.<sup>36</sup>

Psychiatric disorders – especially depression – were also reported by patients, with a prevalence of 11.9%. Jahana and Diogo<sup>37</sup> believe that psychiatric disorders can act both as a cause and a consequence of fractures in the elderly. A high risk of falls among depressed elderly patients can be explained by the use of antidepressant and sedative medications, poor health, physical decline, decreased self-confidence, indifference to the environment, seclusion, and inactivity, which may contribute to the occurrence of trauma.<sup>38</sup> In turn, fractures, the fear of falling again, and the loss of post-fall independence may favor the onset of depression in the affected population.<sup>26</sup> Furthermore, previous diagnosis of depression has been associated with difficulties in the rehabilitation process, greater susceptibility to infectious diseases, and a reduced survival of patients with femoral fractures.<sup>39</sup>

In the present study, another prevalent clinical complication was cognitive behavioral disorders, present in 28.3% of the patients analyzed. Of these, the most commonly observed alteration was mental confusion, in 23.8%. Often, mental confusion may be part of a delirium state, a common complication in the hospitalization of elderly patients after hip surgery, especially in those with cognitive impairment, advanced age, multiple comorbidities, and low body mass index.<sup>40</sup> In the study by Cunha et al.,<sup>18</sup> a waiting time for surgery greater than 48 h was associated with a greater number of delirium cases. This finding could explain the high prevalence of disorders such as mental confusion observed in the postoperative period in the present study, as the time between surgery and hospitalization was over seven days in most cases.

Intestinal constipation was observed in 14% of inpatients. Based on data that indicates a prevalence of constipation between 62.3% and 71.7% in post-fractured geriatric patients,<sup>41,42</sup> the authors believe that this condition may have been underreported in medical records. Immobilization is known to cause alterations, such as lack of appetite and constipation. The latter may be the result of adrenergic inhibition, mobility impairment, low fluid and fiber intake, and the adverse effects of anticholinergic and opioid medications.<sup>42,43</sup>

The present study has limitations, such as the fact that it did not include patients with proximal femoral fractures younger than 65 years, as this institution's protocol requires clinical follow-up only for patients older than 65 years. The inclusion of patients younger than 65 years could reduce the

mortality rate, as they theoretically present a lower risk of death. Moreover, in some cases, the data obtained in the medical charts did not allow Goldman and ASA scoring, nor the inclusion of smoking as a risk factor for complications and death.

The present findings revealed an important post-fracture mortality rate in the population evaluated in comparison with other studies, which indicates the need to intervene in the factors associated with this unfavorable outcome. Surgical treatment of patients with femoral fractures in the first 48 h after admission may be due to the lack of sufficient operating rooms and the high demand of patients in the Brazilian Unified Health System, but efforts must be made to change this reality.

The prevention and appropriate treatment of comorbidities and clinical complications are important measures to improve the short-term prognosis of these individuals, especially as they are patients with advanced age and high cardiovascular risk. In turn, in those who remain hospitalized, clinical attention to the emergence of pneumonia, urinary tract infection, and other infections that may destabilize the elderly patient is paramount.

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## Conclusions

Patients with hip fractures usually present comorbidities, are predisposed to clinical complications, and have a mortality rate of 11.9%, mainly related to infections during hospitalization, the time between hospitalization and surgery longer than seven days, Goldman score equal to III, and age equal to or greater than 85 years.

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## Conflicts of interest

The authors declare no conflicts of interest.

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## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.rboe.2018.07.014](https://doi.org/10.1016/j.rboe.2018.07.014).

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