

● Original article

## MAIN COMPLICATIONS AND CLINICAL OUTCOMES OF ELDERLY TRAUMA VICTIMS ADMITTED TO INTENSIVE THERAPY UNIT\*

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**Objective:** To identify the main complications and the clinical outcome of elderly trauma victims admitted to the Intensive Care Unit of a referral hospital of Distrito Federal between July 2012 and July 2014. **Method:** Retrospective analytical study that uses medical records. Data were analyzed using Chi-Square and Mann-Whitney tests, and a significance value of  $p < 0.05$  was considered. **Results:** Most of the 91 elderly were men, whose mechanism of injury was falls from standing height. The main complications were pulmonary infection, tracheostomy due to prolonged intubation and septic shock. There was a high mortality rate: 38 (41.7%), associated with male gender ( $p = 0.029$ ), other external causes ( $p = 0.03$ ), septic shock ( $p = 0.039$ ) and dialysis ( $p = 0.015$ ). **Conclusion:** The severe condition of the patients favored the occurrence of multiple complications during hospitalization in intensive care. However, despite the worst prognosis, the elderly may survive the trauma and its associated complications.

**KEYWORDS:** Elderly; External causes; Wounds and injuries; Mortality; Intensive care unit

### PRINCIPAIS INTERCORRÊNCIAS E DESFECHOS CLÍNICOS DE IDOSOS VÍTIMAS DE TRAUMA NA UNIDADE DE TERAPIA INTENSIVA

**Objetivo:** Identificar as principais intercorrências e o desfecho clínico de idosos internados por causas traumáticas na Unidade de Terapia Intensiva de um hospital de referência do Distrito Federal admitidos entre julho de 2012 e julho de 2014. **Método:** Estudo retrospectivo analítico, com coleta de dados em prontuário. Os dados foram analisados com os testes Qui-Quadrado e Mann-Whitney, considerando como significativo um valor de  $p < 0,05$ . **Resultados:** Dentre 91 idosos, houve prevalência do sexo masculino e da queda da própria estatura, como mecanismo de lesão. As principais intercorrências foram: infecção pulmonar, traqueostomia decorrente de intubação prolongada e choque séptico. Observou-se alta mortalidade, 38 (41,7%), associada ao sexo masculino ( $p=0,029$ ), às outras causas externas ( $p=0,03$ ), ao choque séptico ( $p=0,039$ ) e à diálise ( $p=0,015$ ). **Conclusão:** A maior gravidade apresentada favoreceu a ocorrência de múltiplas intercorrências durante a internação na terapia intensiva; entretanto, apesar do pior prognóstico, os idosos podem sobreviver ao trauma e suas complicações associadas.

**DESCRIPTORES:** Idoso; Causas externas; Ferimentos e lesões; Mortalidade; Unidade de terapia intensiva.

### PRINCIPALES COMPLICACIONES Y SUS RESULTADOS CLÍNICOS DE ANCIANOS VÍCTIMAS DE TRAUMA EN LA UNIDAD DE TERAPIA INTENSIVA

**Objetivo:** Identificar las principales complicaciones y su resultado clínico asociadas a ancianos ingresados a causa de traumas en la Unidad de Terapia Intensiva de un hospital de referencia de Distrito Federal entre julio de 2012 y julio de 2014. **Método:** Estudio retrospectivo analítico, con obtención de datos en prontuario. Se analizaron los datos por medios de los test Chi cuadrado y Mann-Whitney, considerando como significativo un valor de  $p < 0,05$ . **Resultados:** De 91 ancianos, hubo prevalencia del sexo masculino y de la caída de la propia estatura, como mecanismo de lesión. Las principales complicaciones fueron infección pulmonar, traqueostomía proveniente de intubación prolongada y choque séptico. Se observó gran mortalidad, 38 (41,7%), asociada al sexo masculino ( $p=0,029$ ), a otras causas externas ( $p=0,03$ ), al choque séptico ( $p=0,039$ ) y a la diálisis ( $p=0,015$ ). **Conclusión:** La mayor gravedad presentada favoreció la ocurrencia de múltiples complicaciones durante el ingreso en la terapia intensiva; sin embargo, a pesar del peor pronóstico, los ancianos pueden sobrevivir al trauma y sus complicaciones asociadas.

**DESCRIPTORES:** Anciano; Causas externas; Herimientos y lesiones; Mortalidad; Unidad de terapia intensiva.

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## ● INTRODUCTION

Population aging is characterized by a decline in the proportion of the population of children and young people and a rise in the proportion of the population composed of adults, and particularly, of elderly in a society. In Brazil, the elderly population composed of individuals aged 60 years or over accounts for approximately 10.8% of the country's population, corresponding to more than twenty million individuals, predominantly women (55.5%). There has been an increase in life expectancy at all ages, including among the elderly.<sup>(1)</sup>

In parallel with the significant increase in the number of elderly, due to the increase in life expectancy, decrease in mortality and birth rates, and the search for a more active way of life, there has been a greater incidence of traumas in this population. The trauma can be described as an injury that can be unintentional, self-inflicted or result from an act of violence, and that affects one or more systems and requires immediate care.<sup>(2)</sup>

The causes of trauma are important determinants of morbidity and mortality in the elderly, and are mostly represented by falls and traffic accidents.<sup>(1)</sup> Trauma in elderly individuals has some particularities and factors such as disorders related to the aging process, association with preexisting diseases and the concomitant use of medications, which can have a negative impact on morbidity and mortality.<sup>(3)</sup>

Traumatic events are one of the main causes of injuries, disabilities and hospitalizations in nursing homes and other institutions, and are the fifth cause of mortality among individuals over 75 years of age. Elderly trauma victims are more likely to die, need hospitalization more frequently and account for a large percentage of the patients admitted to the Intensive Care Unit (ICU), and also consume more resources than younger patients.<sup>(3)</sup>

Despite the fact that the significant increase in the elderly population, the associated costs and the high mortality rates of this population due to trauma have great impact on the Unified Health System (SUS), as these patients are admitted to high-complexity hospitals that count on specialized teams and use advanced technologies, few studies were conducted on this issue.

Thus, this topic is of great relevance in public health, since alternatives that minimize complications and morbimortality associated with trauma can be identified and validated for use in the care delivered to these patients, improving work processes, optimizing the existing resources, adding quality to the care provided and reducing costs associated with hospitalization under the SUS.

The present study aimed to identify the main complications and the clinical outcome of elderly trauma victims admitted to the Intensive Care Unit of a referral hospital.

## ● METHOD

Retrospective, analytical study with a quantitative approach, whose data was collected at the ICU of a referral center for trauma patients of the State Department of Health of Distrito Federal (SES-DF), located in Brasília (DF).

The study sample consisted of trauma patients aged 60 years or older admitted to ICU between July 2012 and July 2014. Convenience sampling (non-probability sampling method) was used. Elderly patients admitted to ICU because of non-traumatic clinical or surgical causes and those whose medical records contained incomplete information about the mechanisms of injury and the causes of trauma were excluded.

The electronic database of SES-DF - the TRACKCARE® EMR system- was used in the study, and the following data was collected: sociodemographic information (gender, race, age, weight, height, education), information related to the mechanism of injury, associated comorbidities and ICU stay (length of hospital stay, use of invasive devices, vasoactive drugs and sedatives, complications and outcomes).

Due to the recognized importance of falls in the epidemiology of trauma in the elderly population, and although it is considered an external cause by the International Code of Diseases (ICD-10), data on elderly patients with trauma caused by falls and other external causes (accidents and violence) were separately analyzed. This allowed a more accurate assessment of the impact of each causal mechanism on the health status of elderly trauma victims admitted to the ICU.

For statistical data analysis, descriptive statistics and tables of absolute and relative frequencies were used. The data was recorded in a spreadsheet of Microsoft Excel software (version 14.0), and Chi-Square test and non-parametric Mann-Whitney test were used for analysis of the associations between the variables, through the SPSS software, version 18.0. For the assessment of data normality, Shapiro-Wilk test was used. A p value <0.05 was considered statistically significant.

The present study was approved by the Research Ethics Committee of the Teaching and Research Foundation of Secretaria de Estado de Saúde do Distrito Federal (CEP/FEPECS/SES-DF), under protocol numbers 453.470 and 882.249.

● RESULTS

Between July 2012 and July 2014, 2,652 patients were admitted to the ICU of the hospital where the study was conducted. Of these, 960 (36.2%) were elderly. Of the total study population, 103 patients (10.7%) admitted to the ICU for traumatic causes were selected. Of these, 12 (11.6%) were excluded from the sample because their medical records contained incomplete information about the mechanism of injury and the cause of trauma. Thus, the final sample was composed of 91 elderly trauma victims, which corresponded to 9.5% of the admitted elderly or 3.4% of the total admissions in that period.

Regarding gender, there was a predominance of men, with a men-women ratio of 2.6:1. As for the age group, the mean age was 72±7.8 years (60 to 92 years), higher in women (76±7.1 years) than in men (70.4±7.6 years). However, there was no significant difference between the genders (p=0.19). There was a predominance of elderly in the age group of 60 to 69 years (42.8%), followed by 70 to 79 years (38.5%). (Table 1).

**Table 1** - Distribution of the elderly trauma victims hospitalized in the Intensive Care Unit, by age group and gender Brasília, DF, Brazil, 2015

Age	60-69 years n (%)	70-79 years n (%)	80-89 years n (%)	>90 years n (%)	Total n (%)
Female	4 (4.3)	14 (15.4)	5 (5.5)	2 (2.2)	25 (27.5)
Male	35 (38.5)	21 (23.1)	9 (9.9)	1 (1.1)	66 (72.5)
Total	39 (42.8)	35 (38.5)	14 (15.4)	3 (3.3)	91 (100)

Analysis of preexisting diseases showed that 60 (65.9%) elderly had at least one comorbidity; and the most prevalent were hypertension (n=36, 60%), alcoholism (n=13, 21.7%), type 2 diabetes mellitus (n = 11, 18.3%) and ischemic stroke (n=10, 16.7%). The average number of preexisting diseases per elderly was 2.4, and 31 medical records (34.1%) informed the absence of previous diseases or lack of record of such diseases.

There was an association between gender and the comorbidities of the patients; (p=0.017). Hypertension (p=0.017) and diabetes (p=0.041) were more frequent among the women, while ischemic stroke (p=0.026) and alcoholism (p=0.001) were more frequent among the men.

Records on ethnicity (color), education and marital status were not found because they were absent in 80 (87.9%) medical records Regarding pre-hospital care, 51 (56%) elderly people received such care, which was provided by the Mobile Emergency Care Service (SAMU) to 42 (82.4%) individuals, especially those who were victims of trauma produced by external causes (n=26, 61.9%).

Regarding the mechanism of injury, there was a predominance of falls (n=52, 57.1%), especially falls from standing height (n=38, 41.7%), compared to other external causes (accidents and violence) present in 39 cases (42.9%), particularly, running over (n=15, 16.5%). Regarding the main traumatic causes of admission, there was a predominance of cranioencephalic trauma (n=51, 56%), followed by polytrauma (n=21, 23.1%) and fractures (n=16, 17.6%). (Table 2).

**Table 2** -Traumatic causes of admission and mechanisms of injury of elderly trauma victims admitted to an intensive care unit in Brasilia, DF, Brazil, 2015

Traumatic Causes	Fall n (%)	Other External Causes n (%)	Total
Cranioencephalic trauma			
Mild	3 (3.3)	1 (1.1)	51 (56)
Moderate	4 (4.4)	2 (2.2)	
Severe	28 (30.8)	13 (14.3)	
Polytrauma	1 (1.1)	20 (22)	21 (23.1)
Spinal cord injuries			
Cervical	0	1 (1.1)	3 (3.3)
Thoracic	0	1 (1.1)	
Lumbar	1 (1.1)	0	
Fractures			
Hip	2 (2.2)	0	16 (17.6)
Femur	13 (14.3)	1 (1.1)	
Total	52 (57.1)	39 (42.9)	91(100)

The average waiting time for an ICU bed of the elderly in the sample was 55.8 hours (1h-312h) or 2.35 days. Meanwhile, the mean length of hospital stay in intensive care was 346.9 hours (12h-2544h), or 14.45 days.

Regarding the invasive devices, the average number of devices used was five (1-9). Regarding the use of vasoactive and sedative drugs, 67 (73.6%) elderly patients used vasoactive drugs during hospitalization, especially norepinephrine (n=63, 69.2%) and sodium nitroprusside (n=11, 12.1%); in particular norepinephrine (n=63, 69.2%) and sodium nitroprusside (n=11, 12.1%); 65 patients (71.4%) used sedatives, especially fentanyl (n=58, 63.7%), midazolam (n=53, 58.2%) and propofol (n=36, 39.6%).

Regarding the complications observed during ICU admission, the following were prevalent: focal pulmonary infection (n=41, 45%), tracheostomy after prolonged tracheal intubation or failed extubation (n=38, 41.7%), (n=31, 34.1%), the use of blood products (n=30, 33%) and acute renal failure (n=26, 28.6%), and 19.8% (n=18) required renal replacement therapy (hemodialysis). It is noteworthy that 67 (73.6%) had more than one complication during hospitalization and that only nine (9.9%) elderly had no complications.

Regarding the clinical outcome of the elderly patients in the ICU, 38 (41.8%) died, 47 (51.6%) were discharged to the ward and six (6.6%) were transferred to intensive care units that provide less complex care because their traumatic injury was healed, but they still required mechanical ventilation. As for the patients who died, most were male individuals (n=29, 76.3%) and victims of other external causes (n=20, 52.6%).

● DISCUSSION

More than 30% of all the patients admitted to the ICU were elderly individuals, and elderly trauma victims accounted for about 10% of this population. This is consistent with the findings of several

studies that reported a higher prevalence of trauma among young individuals. The elderly population has a higher prevalence of clinical emergencies. However, the number of elderly trauma victims is increasing, which is a matter of concern, since injuries that could be easily tolerated by younger patients may result in higher mortality rates in the elderly.<sup>(4-6)</sup>

Regarding gender, the findings of this study are consistent with those contained in the publications investigated, i.e., most of the elderly population is composed of women. The age-related findings are also consistent with the literature<sup>(4-5,7-8)</sup>

The predominance of males (n=66, 72.5%) is assumed to be related to the lower mean age of the elderly population of this study. Elderly aged 60-69 years, the most prevalent age range in this study, are in the so-called younger old group, characterized by independence and autonomy. So, these individuals may maintain an active lifestyle, participating in social, work and leisure activities, which may expose them to situations of trauma.<sup>(3)</sup>

Elderly in the younger age groups are more likely to be exposed to trauma because of their external activities; while older women generally move to places closer to their homes. Moreover, men are more likely to engage in riskier activities than women, and hence are more often victims of violence, which is aggravated by social inequality and other adverse conditions.<sup>(2)</sup>

In this study, there was a prevalence of elderly patients (n=60, 65.9%) with pre-existing chronic diseases, especially systemic arterial hypertension. More than 50% of the elderly population who suffered trauma has non-diagnosed hypertension, and more than 30% have heart disease. Diabetes, previous cerebrovascular events, chronic obstructive pulmonary disease (COPD), dementia, arrhythmias and endocrine disorders are present in approximately 10% of this population. Other common diseases among the elderly, such as respiratory infections, neoplasias and chronic renal failure, also increase the risk of post-trauma complications.<sup>(9)</sup>

It should be stressed that alcoholism ranked second among the comorbidities reported by the elderly in this study, observed in 14.3% of the cases. A study conducted in the northeastern region of Brazil found similar data and inferred that the use of alcoholic beverages is one of the main factors that contribute to the rise of mortality rates due to external causes. There are many explanations for alcohol drinking, such as easy access, low cost and stimulus to consumption by advertising.<sup>(2)</sup>

The main traumatic causes of hospitalization are consistent with the findings of other studies, with a predominance of falls (n=52, 57.1%), especially from standing height (41.7%). According to the 10<sup>th</sup> revision of the International Classification of Diseases (ICD-10), fall is considered an external cause. It is defined as "an unintentional event resulting from a change in position, which places the individual at a lower level than before", and can be classified as falling at the same or a higher level.<sup>(10)</sup>

Same-level fall, more prevalent in the present study, is defined as an unintentional event that causes a person to inadvertently fall to the ground at the same or at a lower level. It is considered a public health problem and is associated with intrinsic and extrinsic factors. Complications due to falls in the elderly can be characterized by prolonged immobilization, rhabdomyolysis, dehydration and infection. In addition, injuries resulting from falls in elderly patients tend to be more severe than those of young patients with similar falls. Studies showed that 30% of the individuals over 65 years old fall at least once a year and that half of them experience other falls after the first event.<sup>(11-13)</sup>

Falls, especially those from standing height, were the main mechanisms of injury among the elderly in several studies, followed by traffic accidents and interpersonal violence.<sup>(11-13)</sup> In the present study, other external causes (accidents and violence) accounted for 42.9% of the cases, most of which were road accidents (16.5%). Although it not the most prevalent traumatic cause, other external causes were present in 52.6% of the deaths, having a significant impact on this age group. Such data is consistent with the literature that reports running over as the main cause of death of elderly who are victims of traffic accidents.<sup>(1)</sup>

The aging process leads to gradual loss of reflexes, agility and strength, associated with a higher prevalence of chronic diseases in the elderly and the use of several drugs (polypharmacy) to treat comorbidities, increasing the risk for traumatic events in this age group.<sup>(14)</sup>



Regarding the presence of prehospital care, 51 patients (56%) received this type of support. However, in this study, there was a significant association between the absence of prehospital care and mortality ( $p=0.037$ ), especially in the case of the elderly victims of other external causes who had more (and more severe) injuries, than patients of other age groups. The contribution of mobile prehospital care to reduce mortality and sequelae in trauma victims is undeniable, as it avoids late or inadequate care.<sup>(3)</sup>

In the present study, there was a predominance of cranioencephalic trauma, mainly of the severe type, followed by polytrauma and fractures. There is evidence that injuries of the extremities are more frequent. However, injuries in the cephalic segment are more serious, leading to intracranial bleeding and brain contusions, increasing the probability of death. According to the literature, polytrauma are not common among elderly. Nonetheless, 21 patients in this study had this type of injury, which aggravated their condition.<sup>(14-16)</sup>

The use of a large number of invasive devices in severe ICU patients predisposes them to a greater risk of infection. The use of vasoactive drugs and sedatives in more than 70% of the patients demonstrates the severity of the clinical picture of these patients, which requires neuroprotective measures and hemodynamic support.

Elderly critically ill trauma patients may have cardiac and/or renal disorders, requiring special attention in the control of diuresis and frequent examination of the cardiovascular and respiratory systems, in order to prevent complications. It is suggested that the most aggressive initial approach in this type of patient is related to higher survival rates. The proposed procedures include invasive hemodynamic monitoring, hemodialysis and early nutritional support.<sup>(3, 9)</sup>

The mean time between the indication for admission to intensive care and admission to the ICU, found in the present study, was 55.8 hours, that is, slightly longer than two days. A Brazilian study<sup>(17)</sup> recommends admission to intensive care unit within 72 hours. However, a North American study<sup>(18)</sup> recommends admission in less than six (6) hours. According to these articles<sup>(17-18)</sup>, the prolonged waiting time for an ICU bed can worsen the clinical picture, prolong hospital stay and increase the risk of mortality by approximately 1.5% every waiting hour.

Many studies address only the length of hospital stay in the emergency room or the total length of hospital stay of elderly trauma, victims, which is in average six days of hospitalization, and up to ten days for high energy trauma.<sup>(14)</sup> In the present study, the average length of hospital stay in the ICU alone was 14 days, which again corroborates the severity of the hospitalized patients and the high cost associated with trauma in this population. Prolonged hospitalization time is a worrying factor when it comes to elderly patients, considering the possibility of complications and especially the functional decline to which they are vulnerable.<sup>(7)</sup>

The post-trauma period is considered critical, as the elderly become even more susceptible to cardiorespiratory impairment, deep venous thrombosis, muscle atrophy, joint disorders and pressure injuries. It is assumed that the elderly trauma victims are more likely to have complications during ICU admission.<sup>(11)</sup> The main complications experienced by the elderly patients in this study were pulmonary infection; septic shock; tracheostomy due to prolonged intubation or failed extubation; use of blood products; and acute renal failure, especially with need of dialysis support.

Studies have shown that age is an independent predictor of mortality in trauma patients admitted to ICU. In addition, pre-existing renal disease and need for renal replacement therapy during hospitalization are also predictors of mortality. Patients with severe trauma who had organic dysfunction and used inotropic drugs, as well as with cardiac impairment, in dialysis and mechanical ventilation had higher mortality rates and worse survival after discharge from the ICU.<sup>(15, 19-20)</sup>

The mortality rate of the patients was 41.8% ( $n=38$ ), with a higher prevalence among males and victims of other external causes. This was an alarming finding that is consistent with the literature, where mortality ranged from 7.4% to 12.2%, although some studies report that patients who needed dialysis had a mortality rate of 33%<sup>(14,19,21)</sup>. In the present study, there was no significant association between age and mortality ( $p=0.42$ ). However, there was a significant association between mortality and male gender ( $p=0.029$ ), other external causes ( $p=0.03$ ), focal pulmonary lesion ( $p=0.039$ ) and dialysis ( $p=0.015$ ).

Given the high mortality rates obtained, some studies suggest that the coefficients of mortality due to external causes in the elderly are very close to that of the age group of adolescents and young adults, which have high coefficients and are more likely to face traumatic events (accidents and violence ).<sup>(4-5)</sup>

Although the data collection system used EMR technology, there is a lack of standardization in the record of clinical evolution in the various specialties, generating underreporting of valuable information, which made it difficult to collect some data and establish possible causal and prognosis association with the traumatic events.

Some considerations should be made regarding the type of hospital where the study was conducted, that is, a high complexity hospital and a referral center in trauma in the region that receives the most critically ill patients. Therefore, it is expected that trauma patients are admitted to the ICU. This may have impacted the associations with the outcome mortality.

## ● CONCLUSION

Fall was the main mechanism of injury of elderly trauma victims admitted to the ICU, particularly falls from standing height, followed by other external causes, especially running over. The fact that most patients were critically ill, especially those with severe traumatic brain injury and polytrauma, favored the occurrence of multiple complications during hospitalization, with a higher prevalence of pulmonary infection, tracheostomy due to prolonged intubation or failed extubation, septic shock, use of blood products and acute renal failure.

Despite the diminished ability to cope with trauma-induced stress, which worsens the prognosis of elderly individuals, many patients survived the traumatic event. However, high mortality rates associated to male gender, the occurrence of other external causes, the severity of the trauma and the complications, especially septic shock resulting from focal pulmonary lesion and the need for dialysis support were observed.

There has been an increase in the number of publications on trauma in elderly individuals, especially trauma caused by falls and admission to emergency services. However, the hospitalization of elderly critically ill trauma patients in intensive care and its associated complications has been little explored. Thus, further studies on hospitalization in high-complexity centers are needed, with focus on elderly trauma victims and their particularities, to improve the care to this population, with better prognosis and longer survival.

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