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# Epidemiological Profile and Predictors of Outcome in Trauma Victims: Electronic Data Analysis of a Teaching Hospital in São Paulo

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## Abstract

**Introduction:** Overall, trauma is the third leading cause of mortality in Brazil accounting for 13.3% of all causes of death and it is the main cause of mortality in the first half of life.

Besides the preventive measures necessary to try to change this scenario, the creation of integrated trauma centers and a systematization of care, with or without the help of technology, are promising in the treatment of victims of polytrauma.

**Objective:** Demonstrate a survey of trauma cases treated at a teaching hospital in the city of São Paulo and correlate factors with predictors of hospitalization and mortality.

**Methodology:** Analysis of trauma patients admitted to Santa Marcelina Hospital in Itaquera, São Paulo, from March to October 2018. Data on the occurrence of trauma by age and sex, affected body part, origin of patients, means to reach the university hospital, accommodation, mortality and length of hospitalization were collected.

**Results:** A total of 1,315 patients, victims of trauma, were admitted to Santa Marcelina Hospital in Itaquera, São Paulo, 69.2% male and 13.2% over 65-years old. Most had access to such hospital due to primary health care.

The analysis of the predictors of mortality in this survey were -age over 65-years ($p<0.001$), need for ICU accommodation ($p<0.001$), admission to the hospital through rescue units (SAMU or COBOM) ($p<0.001$) and traumatic brain injury ($p<0.001$).

**Conclusion:** Elderly people with traumatic brain injury and need for ICU accommodation correlate with higher mortality rates and length of hospitalization.

**Keywords: Polytrauma; Treatment in specialized care center; Telemedicine; Predictors of outcome**

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## Introduction

Trauma can be defined as the manifestation of an external cause, whether accidental or violent, suffered by the individual in the form of physical injury and corresponds to the third leading cause of mortality in Brazil, accounting for 13.3% of all causes of death and it is the main cause in the first half of life [1-4]. Furthermore, for every million trauma patients who die, a greater number of people have an event-related disabilities, corresponding to an unfortunately neglected public health problem [5-8].

In the last decades, epidemiological studies indicate increased mortality, morbidity and incapacity rates caused by trauma. Such situation makes it a serious social problem in the country, with significant impact associated with economic issues, whether due to non-production resulting from lethal success or related to the costs involved as a result of temporary or permanent incapacities arising from such trauma [3,4]. On road accidents alone, the impact of the high mortality rate is more than one million potential life years lost, especially among working-age adults [9]. Additionally, the possibilities of damage caused by trauma include significant physical, mental and cognitive deficits, which compromise the quality of life of victims and their families [10-13].

However, even with information and knowledge of the possibility of death from external causes in the world, especially in developing countries, and annual global cost of more than $500 billion related to trauma, for every dollar spent on the United States federal government research, only 4 cents are intended for this topic [14]. In Brazil, 2014 data reveal a cost of one billion Brazilian reals for the trauma-related Unified Health System (SUS) [15].

Besides the preventive measures necessary to try to change this scenario, the creation of integrated trauma centers and a systematization of care are promising in the treatment of victims of polytrauma and, based on data from the World Health Organization (WHO), a 40% increase in world trauma mortality rates is estimated between 2002 and 2030 [16-18]. In this aspect, the existence of the national ordinance 1366/2013 that establishes the organization of trauma centers within the scope of the Unified Health System (SUS) should be highlighted.

Thus, a more integrated care, with or without technology, allowing properly screened patients prompt access to appropriate centers, required for their treatment, can reduce the length of hospitalization, potentially preventable sequelae and trauma-related deaths and also corresponds to one of the 5 action plans stipulated by the United Nations (UN) with the objective of reducing deaths from traffic accidents [19-21].

## Objectives

The objective of this study is to demonstrate a survey of trauma cases treated at a reference teaching hospital in the city of São Paulo and to correlate factors with predictors of hospitalization and mortality.

## Methodology

Analysis of all trauma patients admitted to Santa Marcelina Hospital in Itaquera, São Paulo, through an electronic medical record and International Disease Code (ICD) from March to October 2018.

Data on the occurrence of trauma by age and sex, affected body part, origin of patients, means to reach the university hospital, accommodation, mortality and length of hospitalization were collected.

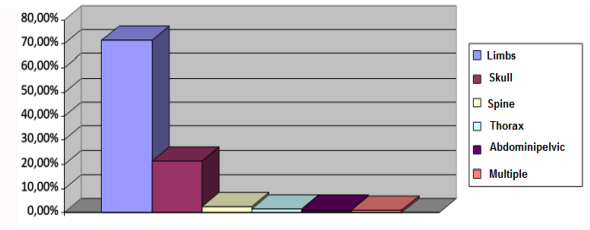
Age was stratified into patients under 20-years-old, 20-35 years old, 35-65 years old and over 65-years-old. The analysis of the body part affected by the trauma was subdivided into skull, spine, limbs, thorax, abdomen and multiple parts. As for origin of patients, it was considered whether the patient was from São Paulo capital city or not. The investigations of the means to reach the hospital, patients were grouped into primary health care, secondary health care, own means and rescue/prehospital services, i.e. SAMU and COBOM.

Finally, for the analysis of accommodations, admitted patients were subdivided into Emergency Room (ER), ward and Intensive Care Unit (ICU).

## Statistical Analysis

The characteristics evaluated using absolute and relative frequencies were described for all patients, except for the length of hospitalization, which was analyzed using summary measures (mean, standard deviation, median, minimum and maximum).

Patient mortality was described according to the characteristics evaluated using absolute and relative frequencies and the association




**Graph 1:** Patients treated had multiple injuries.

was verified using chi-square or exact tests (Fisher's exact test or likelihood ratio test). Odds ratios of each variable of interest were estimated with mortality and 95% confidence intervals using simple logistic regression. For variables with $p<0.20$, the multiple logistic regression model was used.

Length of hospitalization was described according to each characteristic evaluated using summary measures and compared between the categories using Mann-Whitney or Kruskal-Wallis tests respectively for variables with two or more categories with model adjustment in bivariate tests with significance lower than 0.2.

IBM-SPSS for Windows version 20.0 software was used to perform the analysis and Microsoft Excel 2003 software was used to tabulate the data. The tests were performed with a significance level of 5%.

## Results

From March to October 2018, 1,315 trauma patients were admitted to the Santa Marcelina Hospital in Itaquera, São Paulo, being 69.2% male and 94.3% from the capital city. Most (40.1%) had access to the referred hospital through primary health care, 10.8% through secondary care, 27.2% by their own means and 21.9% of patients entered the hospital through rescue systems. COBOM (11.9%) or SAMU (10.0%) - as shown in Table 1.

Regarding stratification by age, 32.6% of patients were younger than 20-years-old, 22.6% between 20 and 35-years-old, 31.6% between 35 and 65-years-old and 13.2% of patients were older than 65 years. Most patients had a favorable outcome and 4.8% died. As for hospitalization, the average number of hospitalized days was 7.24 ± 17.22 days with a median of 4 days (0-372), as shown in Table 1.

As for affected body parts, 21.4% were the skull, 2.8% the spine, 71.3% limbs, 1.8% the thorax, 1.4% the abdominopelvic region and 1.2% of patients treated had multiple injuries, as shown in Graph 1.

The analysis of the predictors of mortality within this survey was age over 65-years-old ($p<0.001$), need for ICU accommodation ($p<0.001$), admission to the hospital through rescue units (SAMU or COBOM) ($p<0.001$) and traumatic brain injury ($p<0.001$).

Furthermore, when adjusting mortality to the characteristics evaluated, it was observed that the relative risk of a patient over 65-years-old to die was 3.55 times that of a patient under 20-years-old ($p=0.013$). Likewise, the chance of a patient requiring hospitalization in ER was 2.83 times higher than that of an individual admitted to the ward ($p=0.007$) and a patient in the ICU was 226.93 times when compared to this ($p<0.001$). Additionally, the chance of death in patients with traumatic brain injury was 2.99 times higher than those with upper limb trauma ($p=0.006$).

When analyzing predictors of longer hospitalization, it was observed that the age group above 20-years-old, ICU admission, traumatic brain injury and abdominopelvic trauma and multiple

**Table 1:** Characteristics of treated traumas.

| | |
|---|---|
| **Sex** | |
| Male | 69.20% |
| Female | 30.80% |
| **Place of Origin** | |
| Capital City | 94.30% |
| Outside capital city | 5.70% |
| **Admission Form** | |
| Primary care | 40.10% |
| Secondary care | 10.80% |
| Own means | 27.20% |
| COBOM/SAMU | 21.90% |
| **Age** | |
| <20 years old | 32.60% |
| 20-35 years old | 22.60% |
| 35-65 years old | 31.60% |
| >65 years old | 12.20% |
| **Outcome** | |
| Discharge | 95.20% |
| Death | 4.80% |
| **Length of hospitalization** | |
| Mean | 7.24 ± 17.22 days |
| Median | 4 (0-372 days) |

trauma are factors that lead to longer hospitalization, all with statistical significance with p<0.001. Furthermore, patients with TBI had a 79% longer hospitalization than those with limb trauma (p=0.001).

Comparing the means of hospital admission to the length of hospitalization of patients arriving through primary or secondary health care to the university hospital, it was demonstrated that secondary health care services (p=0.004), admission by their own means (p<0.001) and through COBOM (p<0.001) had a longer hospitalization time. On the other hand, those from SAMU did not show this correlation (p=0.084).

On the other hand, the gender and origin of the patients showed no relation with the length of hospitalization (p=0.808 and p=0.243, respectively).

## Discussion

In underdeveloped or developing countries, 11% of the causes of disability are due to trauma with an increase in event-related causes of death from 1.87% in 2007 to 2.71% in 2011 in Korea, therefore, knowledge of epidemiology and attention to risk factors with improvements in transportation and trauma centers should be topics of increasing need for debate [22-24].

Specifically, in 2013, around 151,000 deaths were recorded as a result of accident violence. Of these individuals, more than 50% were between 10 and 49-years-old [15]. However, despite the predominance of young individuals involved in car accidents, there is a significant percentage of elderly people linked to these events. Degenerative pathologies and peculiarities of this age group worsen the prognosis of these patients, providing longer hospitalization, higher mortality rate and incidence of existence in survivors [25,26].

Thus, knowledge of the profile and statistics of trauma care is an extremely important tool as it allows the collection of data on trauma mechanisms seen in a given hospital, assisted population, average age, and prognostic factors involved in hospitalization and lethality, means of access to health facilities. Moreover, such data assists authorities to analyze preventive initiatives on traffic, special care for the elderly, public safety and local police reinforcement.

In a survey conducted by the Ministry of Health, analyzing 47,455 trauma patients, the results show that 64.8% of the patients are male, 59.6% aged between 20 and 59-years-old, mainly using their own means of transportation (52.2%) and prehospital care (24.5%) [27]. Similarly, the present survey also found a higher prevalence of male patients (69.2%) and in the age group mentioned (54.4%). On the other hand, there was a higher percentage of patients coming from primary health care units, probably due to the performance of this sector in the trauma area studied, but even so, 49.1% of the cases were admitted by their own means and through prehospital care.

Araújo et al. [25] also showed a higher prevalence of trauma between the ages of 20 and 60, accounting for 82.8% and a 22 times greater chance of male involvement in accidents than females (OR: 22.6; CI 13.4 to 38.2) (p<0.0001). In the present study, on the other hand, although a higher incidence of male trauma was demonstrated, there was no statistical significance in relation to gender (p=0.695).

These same authors found that 62.5% of the trauma involved the limbs and 22.7% the skull-brain region. Similarly, the present survey also showed a greater preference for these regions, with 71.3% of limb involvement and 21.4% of the skull-brain portion, and, like us, other studies in the literature show a higher mortality rate in patients with TBI [24,28,29].

When analyzing the age of trauma patients, in a US survey [30], 7.8% of accidents involved elderly people over 65-years-old and 29% of deaths due to trauma. Alberti et al. [31] demonstrated that 23% of hospital admissions for severe trauma occur in elderly people over 65-years-old.

In Brazil, Souza et al. [26] found that the mortality rate of people over 60-years-old who suffered traffic accidents was 11.8%, about three times higher than in other age groups. Similarly, in the present study, it was shown that patients aged 65-years-old and older had a chance of mortality 3.55 times the chance of patients younger than 20-years-old (p=0.013).

Still regarding trauma in elderly patients, Katz et al. [32] found that 78.5% of patients over 65-years-old were hospitalized more than 10 days victim of orthopedic trauma, similar to our study in which the average number of hospitalized days in this age group was 7.94 ± 9.45 days.

These negative mortality factors and length of hospitalization in the elderly can be explained by several variables, such as demographic factors, age, gender, and social status, use of chronic medications, comorbidities, injury characteristics and psychological factors [33-36].

Thus, the Technical Regulation of the State Urgency and Emergency Systems establishes measures that ensure reception in first care, aiming at adequate and, above all, resolute attention to the urgencies with referral to more specialized centers when necessary [37].

Finally, the establishment of trauma centers, especially with the use of technology assistance, may consistent with article 3 of the national ordinance 1366 from the Ministry of Health, culminate in

improved care for trauma patients with consequent reduction in morbidity and mortality, as well as universalization and standardization of care [38]. Moreover, this service for trauma centers corroborates the transportation time and the constant training of these centers.

## Conclusion

In the present study, it was found that elderly people with traumatic brain injury and need for ICU accommodation correlate with higher mortality rates and length of hospitalization, making the care for polytrauma patients, especially in this age group which has an increasing incidence worldwide, be performed more and more quickly in specialized centers.

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