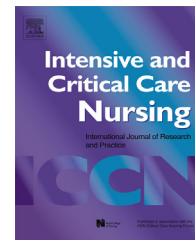




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# Risk factors for the mortality of trauma victims in the intensive care unit



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## KEYWORDS

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## Summary

**Objective:** To identify the risk factors associated with mortality of trauma victims during hospitalisation in the intensive care unit (ICU).

**Design:** Prospective cohort.

**Setting:** Brazilian ICU specialising in the care of trauma victims.

**Methods:** The subjects were divided into two groups: survivors and non-survivors. The variables used to compare the groups included demographic and clinical characteristics and illness/injury severity (Acute Physiology and Chronic Health Evaluation [APACHE II], Simplified Acute Physiology Score [SAPS II], Logistic Organ Dysfunction System [LODS], Injury Severity Score [ISS] and New Injury Severity Score [NISS]). The data were analysed using descriptive and inferential statistics and multiple logistic regression analysis.

**Results:** The sample consisted of 200 patients (164 males) with a mean age of 40.7 years. The predominant causes of injury were traffic accidents (57.5%) followed by falls (31.0%). The ICU mortality was 19.0%. Logistic regression analysis revealed that one point on the NISS and SAPS II scores increased the risk of death by 6% and 7%, respectively. In contrast, the risk of dying decreased 4% for each day of ICU hospitalisation.

**Conclusion:** Professionals must use the SAPS II and NISS for the early identification of trauma victims at high risk for death especially during the first days of ICU hospitalisation.

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### Implications for Clinical Practice

- The identification of risk factors for ICU mortality of trauma victims offers subsidies to improve the quality of care, reducing the risks of morbidity and mortality in this group of patients.
- The early identification of trauma patients at risk of death in the ICU is relevant to developing treatment strategies to improve the outcome.
- The findings may contribute to risk adjustment of this subset of trauma patients when treatment results from different centres are compared.
- Moreover, these findings may contribute to the choice of illness and trauma severity score used to estimate the risk of death of trauma patients admitted in ICU.

## Introduction

Currently traumatic injuries are the primary cause of death and permanent disabilities among youth and are a consistent worldwide public health problem. Improvements in pre-hospital care and the efficacy of hospital treatment have contributed to the reduction of these mortalities and morbidities over the last decades (Probst et al., 2009).

Severe trauma is characterised as an emergency, and victims frequently require surgical intervention, intensive care unit (ICU) admission or both (Duane et al., 2008). The ICU is a complex unit in which advanced technology and the continuous assistance of qualified professionals are essential for optimising and improving the outcome of critically unstable trauma victims. Thus, this setting is necessary in the treatment of trauma victims who are critically unstable.

Results from an American study revealed that treating trauma victims in a specialised ICU reduces mortality (Nathens et al., 2006); however, despite continuous advances in ICU technology and interventions, major trauma patients continue to die in the ICU. The identification of factors responsible for this mortality is of paramount importance for improving the quality of care that is offered to these patients (Chalya et al., 2011). Moreover, the early identification of trauma victims who have higher risk of death is fundamental to ICU clinical practice as such identification allows for the adoption of therapeutic and preventive interventions that can reduce undesirable outcomes.

The Acute Physiology and Chronic Health Evaluation II (APACHE II) (Knaus et al., 1985), the Simplified Acute Physiology Score II (SAPS II) (Le Gall et al., 1993) and the Logistic Organ Dysfunction System (LODS) (Le Gall et al., 1996) are indicators that are used with patients hospitalised in the ICU to identify the severity of their situation. These indicators use logistic regression equations to calculate the risks of death of patients in the critical unit. Physiological and laboratory variables are utilised for these calculations and are scored according to the level of deviation from normality (higher alteration values indicate higher final scores). In addition to these variables, the APACHE II and SAPS II use information about chronic diseases and age. The LODS also allow for the identification of failures in six organ systems: neurologic, cardiac, pulmonary, renal, haematologic and hepatic.

In the estimation of trauma severity, the literature highlights the Injury Severity Score (ISS) (Baker et al., 1974) and the New Injury Severity Score (NISS) (Osler et al., 1997); these indicators are calculated based on the Abbreviated

Injury Scale (AIS) (AAAM, 2008). To identify AIS values, a manual of anatomical injury descriptors is used to determine a score from one (minor injury) to six (major injury, normally fatal) for the severity of each traumatic injury according to body regions. In mortality studies of trauma victims, injuries with AIS scores  $\geq 3$  represent a potential threat to life (AAAM, 2008).

The ISS is defined as the sum of the squares of the single highest AIS score for each of the three most severely injured body regions (Baker et al., 1974). In 1997, the authors of the ISS changed this indicator due to an identified failure in the calculation that resulted in the consideration of only single injuries to each body region and thus underestimated the severity of the injuries to the patient. To correct this limitation, the NISS was created and includes the three most serious injuries according to the AIS in the calculation regardless of body region (Osler et al., 1997).

Some of these indicators of severity, together with other clinical and/or demographic variables, have been tested analyses of the mortality of trauma patients in the ICU (Brattström et al., 2010; Ulvik et al., 2007). However, some clinical characteristics of trauma patients have not yet been explored in the literature; these characteristics included body regions with significant injuries, the type of organic failure and the variables that are typically assessed in critical unit patients. Considering the importance of analysing these variables to clinical outcomes, the objective of this study was to identify the risk factors associated with mortality of trauma victims during ICU hospitalisation.

## Methods

### Setting

The study used a prospective cohort design and was conducted within an ICU of a trauma referral hospital in São Paulo, Brazil. The ICU specialises in the care of trauma victims and has 22 beds with an occupation rate of approximately 100%.

The ICU is located in a large teaching hospital that specialises in the care of a wide range of clinical conditions and is a referral hospital for the treatment of acute and emergency care patients in the metropolitan region of São Paulo, which is composed of 39 municipalities. This region has a population of 19,956,590 inhabitants, an area of approximately 7943 km<sup>2</sup> and an average of 2512.47 inhabitants/km<sup>2</sup> (IBGE, 2013).

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