



## Original article

# Predicting Survival in Geriatric Trauma Patients: A Comparison Between the TRISS Methodology and the Geriatric Trauma Outcome Score<sup>☆</sup>



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## A B S T R A C T

**Introduction:** We compared the Geriatric Trauma Outcome Score (GTOS) with the probability of survival using the TRISS methodology (PS-TRISS) in geriatric severe trauma patients admitted to Intensive Care Units (ICU) participating in the Spanish trauma ICU registry (RETRAUCI).

**Methods:** Retrospective analysis from the RETRAUCI. Quantitative data were reported as median (Interquartile Range (IQR)), and categorical data as number (percentage). We analyzed the validity of the GTOS and PS-TRISS to predict survival. Discrimination was analyzed using receiver operating characteristics curves. Calibration was analyzed using the Hosmer-Lemeshow goodness-of-fit test. A P value < .05 was considered statistically significant.

**Results:** The cohort included 1417 patients aged  $\geq 65$  years. Median age was 75.5 (70.5–80.5), 1003 patients were male (68.2%) and median Injury Severity Score was 18 (13–25). Mechanical ventilation was required in 61%. Falls were the mechanism of injury in 659 patients (44.8%). In-hospital mortality rate was 18.2%. The areas under the curve were: PS-TRISS 0.69 (95% CI 0.66–0.73), and GTOS 0.66 (95% CI 0.62–0.70); P < .05. Both scores overestimated mortality in the upper range of predicted mortality.

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*Conclusions:* In our sample of geriatric severe trauma patients, the accuracy of GTOS was lower than the accuracy of the PS-TRISS to predict in-hospital survival. The calibration of both scores for the geriatric population was deficient.

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## Predicción de la supervivencia en pacientes traumáticos ancianos: comparación entre la metodología TRISS y el Geriatric Trauma Outcome Score

### R E S U M E N

#### Palabras clave:

Traumatismo grave  
Traumatismo anciano  
Supervivencia  
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Escalas

*Introducción:* Comparamos el Geriatric Trauma Outcome score (GTOS) con la probabilidad de supervivencia empleando la metodología TRISS (PS-TRISS) en pacientes traumáticos ancianos ingresados en las Unidades de Cuidados Intensivos (UCI) participantes en el registro de traumatismo en UCI (RETRAUCI).

*Métodos:* Análisis retrospectivo del RETRAUCI. Los datos cuantitativos se expresan como mediana (rango intercuartil), los datos categóricos como número (porcentaje). Analizamos la validez del GTOS y la PS-TRISS para la predicción de supervivencia. La discriminación se evaluó mediante curvas *receiver operating characteristics*. La calibración de los modelos se analizó mediante el test de bondad de ajuste de Hosmer-Lemeshow. Un valor de  $p < 0,05$  se consideró estadísticamente significativo.

*Resultados:* La cohorte incluyó a 1.417 pacientes  $\geq 65$  años. Mediana edad 75,5 (70,5-80,5) años, varones 1.003 (68,2%), mediana Injury Severity Score 18 (13-25). Ventilación mecánica, 61%. Las caídas fueron el mecanismo de lesión en 659 pacientes (44,8%). Mortalidad hospitalaria: 18,2%. El área bajo la curva para PS-TRISS fue 0,69 (IC del 95% 0,66-0,73) y para GTOS 0,66 (IC del 95% 0,62-0,70);  $p < 0,05$ . Ambos scores sobrestimaron la mortalidad en el rango alto de mortalidad predicha.

*Conclusiones:* En nuestra muestra de pacientes traumáticos ancianos la precisión de GTOS fue inferior a la de la metodología TRISS en la predicción de la supervivencia hospitalaria. Ambos scores tuvieron una mala calibración en la población anciana.

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## Introduction

The progressive aging of the populations of developed countries has led to a significant increase in the number of elderly patients who are treated after severe trauma. This number is expected to continue increasing in the coming decades.<sup>1,2</sup> According to results from the pilot phase of the ICU trauma registry (RETRAUCI), more than 20% of trauma patients admitted to the Intensive Care Units (ICU) in Spain are over 65 years of age.<sup>3</sup> These patients present different baseline characteristics. These are patients with a lower physiological reserve against trauma aggression, in whom the predominant mechanisms of injury is accidental low-energy falls, complicated by the habitual use of antiplatelet agents and anticoagulants.<sup>4</sup> The prediction of the final outcome of these patients is extremely important, since mortality increases progressively with age.<sup>4</sup> Knowing the probability of survival at admission to the ICU can help make complex decisions in this population, including the limitation of life support (LLS). This calculation has usually been determined with the complex Trauma and Injury Severity Score (TRISS) method, but in recent years a new useful score has been developed in the elderly population, the Geriatric Trauma

Outcome Score (GTOS), which is simpler and easier to use 24 h after admission.

The aim of our study was to compare the probability of survival using the TRISS methodology (PS-TRISS) with the GTOS in elderly traumatic patients admitted to the Spanish ICU participating in the RETRAUCI.

## Methods

The RETRAUCI included its first patient on November 23, 2012, and was approved by the ethics committees of the participating hospitals. It is a multi-center registry with voluntary participation and implementation in 49 centers throughout the country promoted by the Neurointensive and Trauma Workgroup of the Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC).

*Inclusion and exclusion criteria:* there is controversy regarding what age should be used as a cut-off point to define senior patients. A recent consensus document has reported the age of 65 as the most commonly used among its participants,<sup>5</sup> and this has been the cut-off point used in our study. Thus, we retrospectively analyzed patients aged 65 or older included between November 2012 and May 2017, with complete data,

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