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Prediction Scores of Mortality and Factors Affecting Morbidity in Trauma Patients in the Intensive Care Unit

Cansu Kılınç Berktaş[1], Müslüm Akkılıç[2], Kadir Yeşildal[3], Tarkan Mıngır[4], Namigar Turgut[4]

[1]*University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Turkey*
[2]*Yeni Yüzyıl University Gaziosmanpaşa Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Turkey*
[3]*Üsküdar State Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Turkey*
[4]*University of Health Sciences Turkey, Prof. Dr. Cemil Taşcıoğlu City Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Turkey*

Abstract

Objective: Trauma is a significant public health issue with sociocultural and economic consequences that affect mortality and morbidity, resulting from both primary damage caused by direct impact and secondary damage. The aim of this study was to identify factors affecting mortality and morbidity in trauma patients admitted to the intensive care unit (ICU).

Methods: Demographic data on patients admitted to the ICU due to trauma between 2019 and 2021 were collected for the present study. Variables such as the acute physiology and chronic health evaluation II (APACHE II), sequential organ failure assessment (SOFA), and Glasgow Coma scale (GCS) scores, as well as the trauma score-injury severity score (TRISS), injury severity score (ISS), and revised trauma score (RTS), scores were recorded. Additionally, the use of vasopressors, development of renal failure, need for dialysis, and requirement for mechanical ventilation (MV) were documented for statistical analysis.

Results: The study included 194 trauma patients. The mean age ± standard deviation of the patients was 37.20±16.32 years. The most common cause of injury was traffic accidents (34.5%), with the head-neck region being the most frequently injured area (39.2%). The median length of stay in the ICU was 3 days (0-73), and the median number of days on MV was 0.25 days (0-73). Vasopressor medication was used in 34.5% of the patients, MV was required in 53.1%, septic shock was present in 4.1%, renal failure in 3.1%, hemodialysis was needed in 1.5%, and 51.5% required blood product replacement. Decreased GCS and TRISS scores and increased APACHE II, SOFA, and ISS scores were associated with increased mortality and prolonged ICU and MV days.

Conclusion: The results of our study showed that APACHE II and ISS scores were more sensitive than TRISS, SOFA, GCS, and RTS in predicting mortality in trauma patients, but the TRISS score was more reliable in predicting mortality.

Keywords: Trauma, intensive care, trauma scores, mortality, morbidity

INTRODUCTION

Trauma is a significant public health issue affecting mortality and morbidity. Trauma-induced functional impairment leads to disability and deteriorates health, delaying the achievement of functional independence (1). Many affected patients are severely or multiplely injured individuals, contributing to a higher rate of loss within the young population compared with other illnesses. Trauma cases require prompt diagnosis of anatomical and physiological damage, and prognosis should be determined during early intervention. It is critical to standardize these instances using objective criteria from both trauma scoring systems and scoring systems frequently utilized in intensive care units (ICUs) to accomplish this. The predictive scores for trauma mortality are inherently complex (2). Among these

Address for Correspondence: Cansu Kılınç Berktaş, University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Turkey
Phone: +90 554 244 80 87 **E-mail:** cansukilinc87@gmail.com **ORCID ID:** orcid.org/0000-0002-5387-0734

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scoring systems, physiological scoring systems [Glasgow Coma scale (GCS), revised trauma score (RTS), pediatric trauma score (PTS), prehospital index, trauma triage rule, committee on risk assessment methodology] and anatomical scoring systems based on the type and severity of injury [abbreviated injury scale (AIS), injury severity score, trauma score-ISS (TRISS), new ISS, anatomic profile] stand out. Previous studies have reported that anatomical trauma scores better predict admission to ICU and physiological trauma scores better predict mortality (3).

It was suggested that the score should be very sensitive in predicting mortality risk and should be simple and rapid to apply in clinical settings. This approach makes it possible to gauge the severity of a condition, comprehend the variables influencing morbidity and mortality, take appropriate safety measures, avert unfavorable consequences, and enhance patients' quality of life all of which may lower healthcare expenses. The aim of the present study was to investigate the factors affecting mortality and morbidity using scoring systems developed for trauma patients and those used in intensive care.

METHODS

Study Approval and Ethical Considerations

This study complied with the Declaration of Helsinki's ethical criteria and was approved by the Clinical Research Ethics Committee of the University of Health Sciences Turkey, Okmeydanı Training and Research Hospital (decision number: 928, date: 05.06.2018). Prospective observation and descriptive analysis were conducted on the medical records of patients diagnosed with trauma treated at the department of anesthesiology and reanimation's ICU between November 2019 and November 2021. Informed consent forms were obtained from all patients.

Participant Selection and Data Collection

The inclusion criteria for this study were as follows: patients aged 18 years and above who have experienced non-vehicular traffic accidents, in-car traffic accidents, penetrating or cutting instrument injuries, falls from a height, firearm injuries, or assault. In addition, patients requiring intensive care due to trauma are included. Conversely, the exclusion criteria are as follows: patients under the age of 18, patients with vascular injuries who are being treated in the cardiovascular surgery ICU, and trauma patients with high American Society of Anesthesiologists (ASA) scores and advanced age who are being treated in the ICU for reasons unrelated to trauma.

Demographic data, type and severity of trauma, predominant injury site, hemodynamic parameters, and laboratory values at the time of initial ICU admission were recorded. The ISS, RTS, TRISS, acute physiology and chronic health evaluation II (APACHE II), sequential organ failure assessment (SOFA) score, and GCS were calculated.

The ISS calculation involved reducing the original nine body areas to a total of six: head (including neck), face, chest, abdomen, extremities (including pelvis), and soft tissue. The severity classification was then assigned to each of these bodily regions. The trauma score most commonly employed for research and statistical purposes is (4). The RTS is a numerical assessment derived from three variables: respiratory rate, systolic blood pressure, and GCS (5). The TRISS score is a comprehensive scoring method that incorporates anatomical and physiological data, including the RTS (physiological component), ISS (anatomical component), age, and injury mechanism, to assess and evaluate the data (6).

The following events were noted during ICU follow-up: the need for vasopressors; the presence of septic shock; renal failure; the need for dialysis; the quantity and type of blood replaced; the length of the ICU stay; the duration of mechanical ventilation (MV); the existence and severity of pressure ulcers; the existence of pneumonia associated with the ventilator; the ICU and 28-day mortality records; and the occurrence of re-admission to the ICU within 24 hours of discharge.

Statistical Analysis

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) (Chicago, IL, USA) version 24.0 software. The Mann-Whitney U test was used to compare continuous variables between two groups when parametric criteria were not met, and the chi-square test or Fisher's exact test was used to analyze categorical data. Utilizing receiver operating characteristic (ROC) analysis, the predictive powers of scoring systems in mortality prediction were assessed. In all analyses, a p-value of less than 0.005 was considered statistically significant.

RESULTS

A total of 235 patients were included in the study. Among the patients in the study, 12 were excluded because of their advanced age and high ASA score, whereas 10 patients were under the age of 18, and 19 suffered vascular injuries, and they were monitored in the cardiovascular surgery ICU. Consequently, 194 participants participated in the study. The demographic data about the patients are presented in Table 1. The mortality rate of the patients was 19.6%. The TRISS-blunt (TRISS-B) score was mean ± standard deviation (SD) 79.57±32.43, the TRISS-penetrating (TRISS-P) score was mean ± SD 79.98±34.10, and the RTS score was mean ± SD of 6.27±2.05. The diagnostic values of the scoring systems for predicting mortality based on cut-off values are presented in Table 2, and the ROC curves are presented in Figure 1.

Table 1. Demographic data of the patients

Demographic data	Mean ± SD, n (%)
Age (years)	37.20±16.32
Gender, n (%)	
Female Male	15 (7.7%) 179 (92.3%)
Body mass index (kg/m²)	24.00±4.81
Chronic disease history, n (%)	
Yes No	32 (16.5%) 162 (83.5%)
Antithrombotic usage, n (%)	
Yes No	6 (3.1%) 188 (96.9%)
Mortality rate	38 (19.6%)

SD: Standard deviation

The median GCS, ASA, APACHE II, SOFA, and ISS scores of the patients were 13 [minimum (min)-maximum (max): 8-14], 1 (min-max: 1-1), 15 (min-max: 10-24), 3 (min-max: 1-6), and 18 (min-max: 13-29) respectively. The patients' RTS, TRISS-P, and TRISS-B scores were 6.27±2.05, 79.98±34.10, and 79.57±32.43, respectively, in terms of mean and SD.

In patients with an ISS score of 23 and above, the rates of MV requirement, development of renal failure, vasopressor requirement, and need for blood replacement were significantly higher ($p<0.001$, $p=0.040$, $p<0.001$, and $p<0.001$, respectively).

In patients with TRISS-B score below 84 and TRISS-P score below 73, the rates of MV requirement, vasopressor requirement, development of renal failure, and need for blood replacement were significantly higher ($p<0.001$).

In patients with a GCS score of 10 or below and an APACHE II score above 19, the rates of MV requirement, vasopressor requirement, development of renal failure, and need for blood replacement were significantly higher ($p<0.001$) (Table 3).

The median length of stay in the ICU was 3 (min-max: 0-73) days, with a mean ± SD of 9.28±14.2 days. The median duration of MV was 0.25 (min-max: 0-73) days, with a mean ± SD of 5.5±11.9 days. The distribution of MV days, ICU length of stay, and mortality rates according to scoring systems are presented in Table 4.

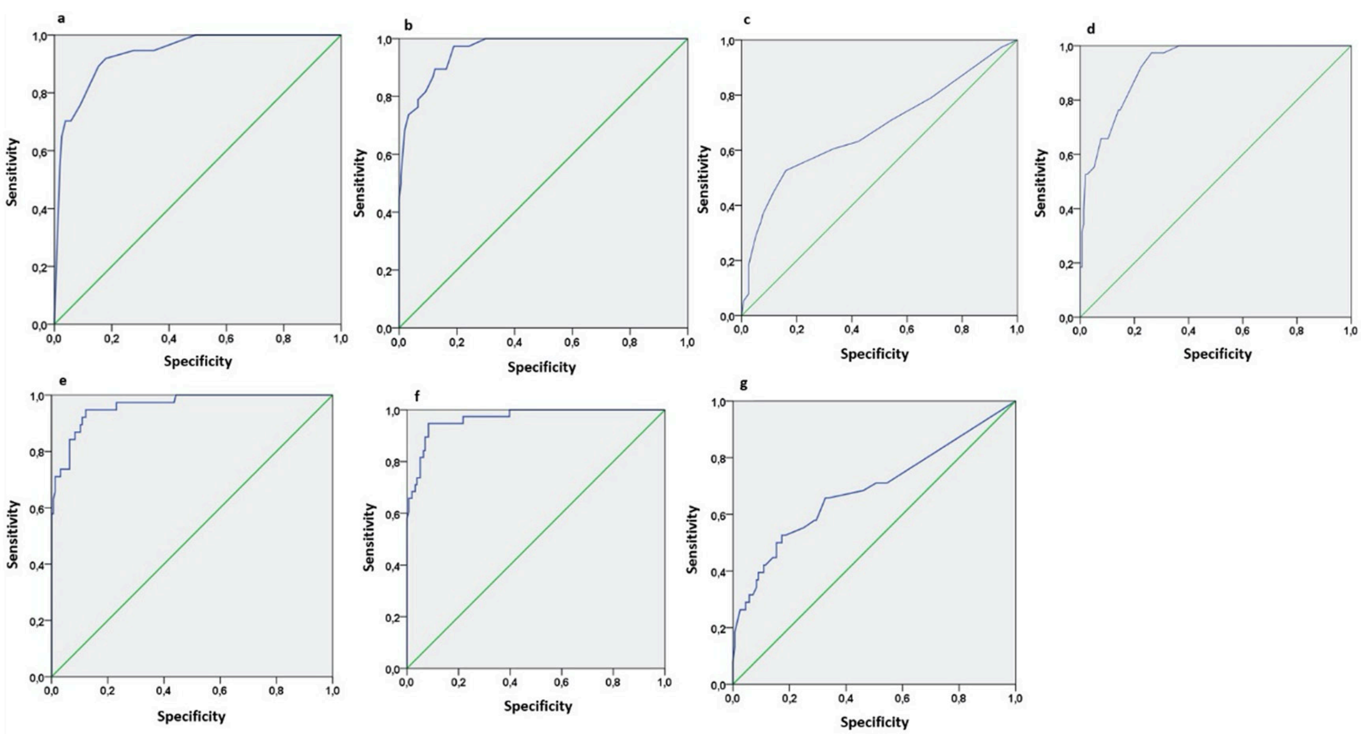

Figure 1. The ROC curves for mortality prediction of GCS (a), APACHE II (b), SOFA score (c), ISS (d), TRISS-B (e), TRISS-P (f), and RTS (g) are shown

ROC: Receiver operating characteristic, GCS: Glasgow Coma scale, APACHE II: Acute physiology and chronic health evaluation II, SOFA: Sequential organ failure assessment score, ISS: Injury severity score, TRISS-B: Trauma score-injury severity score-blunt, TRISS-P: Trauma score-injury severity score-penetrating, RTS: Revised trauma score

Table 2. Analysis of the diagnostic values of scoring systems in predicting mortality

Cut-off value	AUC	S.E.	OR (95% CI)		Sensitivity	Specificity	*p
GCS ≤10	0.93	0.02	0.89	0.97	0.91	0.82	<0.001
APACHE II >19	0.96	0.01	0.93	0.98	0.97	0.81	<0.001
SOFA ≥7	0.67	0.05	0.56	0.78	0.52	0.84	0.001
ISS ≥23	0.92	0.01	0.88	0.96	0.97	0.73	<0.001
TRISS-B <84	0.96	0.01	0.93	0.99	0.94	0.87	<0.001
TRISS-P <73	0.96	0.01	0.94	0.99	0.94	0.91	<0.001
RTS <5.63	0.68	0.05	0.57	0.79	0.52	0.82	<0.001

*Receiver operating characteristic analysis

OR: Odds ratio, CI: Confidence interval, AUC: Area under the curve, S.E.: Standard error, GCS: Glasgow Coma scale, APACHE II: Acute physiology and chronic health evaluation II, SOFA: Sequential organ failure assessment score, ISS: Injury severity score, TRISS-P: Trauma score-injury severity score-penetrating, TRISS-B: Trauma score-injury severity score-blunt, RTS: Revised trauma score

Table 3. Distribution of morbidity rates according to scoring systems

	MV need	Vasopressor need	Renal failure	Blood replacement
GCS				
≤10	96.2%	60.3%	5.1%	75.6%
>10	24.1%	17.2%	1.7%	35.3%
APACHE II				
≤19	31.2%	13.6%	0.0%	37.6%
>19	92.8%	72.5%	8.7%	76.8%
ISS				
<23	28.4%	12.9%	0.9%	31.9%
≥23	89.7%	66.7%	6.4%	80.9%
TRISS-B				
<84	98.2%	74.5%	7.3%	89.1%
≥84	35.4%	18.7%	1.4%	36.7%
TRISS-P				
<73	98.0%	81.6%	8.2%	87.8%
≥73	37.9%	18.6%	1.4%	39.3%

*p-values are derived from chi-square test or Fisher's exact test. Data is presented as percentages

GCS: Glasgow Coma scale, APACHE II: Acute physiology and chronic health evaluation II, ISS: Injury severity score, TRISS-P: Trauma score-injury severity score-penetrating, TRISS-B: Trauma score-injury severity score-blunt, MV: Mechanical ventilation

The most common type of injury was traffic accident, accounting for a total of 34.5%, with non-vehicular traffic accident and in-car traffic accident being the most frequent subtypes. The head-neck region was the most commonly injured area, accounting for 39.1% of all injuries. Patients with head-neck injuries had the highest mortality rate at 31.6%. The highest mortality rate was observed in patients with in-car traffic accident at 34.5%. The distribution of mortality rates according to the type of injury and predominant injury regions is shown in Table 5.

34.5% of patients required vasopressor medication, 53.1% required MV, 4.1% developed septic shock, 3.1% developed renal failure, and 1.5% required hemodialysis. Blood product replacement was performed in 51.5% of the patients. Among the included patients, 9.8% required reoperation, 8.2% developed a need for ICU readmission after transfer to the ward, and pressure ulcers were observed in 17.5% of the patients.

Patients who required vasopressors had a significantly longer length of stay in the ICU and longer duration of MV compared with those who did not require vasopressors ($p<0.001$). The mortality rate among patients requiring vasopressors was 52.2%, which was significantly higher than that among those not using vasopressors ($p<0.001$).

Patients who developed septic shock, required blood replacement, required reoperation, or developed pressure ulcers had significantly longer lengths of stay in the ICU and longer durations of MV ($p<0.005$). Among the 8 patients who developed septic shock, mortality occurred in 5 (62.5%). The mortality rate of patients with septic shock was significantly higher than that of patients without septic shock ($p=0.002$) (Table 6).

The mortality rate was significantly higher in patients without a history of chronic illness than in those with such a history ($p=0.021$). Among patients who developed renal failure, those who required blood transfusion, and those who required dialysis, mortality was significantly higher compared with those who did not develop these conditions ($p<0.001$, $p<0.001$, and $p=0.007$, respectively).

DISCUSSION

Early diagnosis and intervention for trauma patients at high risk of death can lead to positive outcomes. Determining the extent of damage and gathering preliminary prognostic information are critical steps in triage for trauma patients. Various physiological

Table 4. Distribution of mechanical ventilation days, days of ICU stay, and mortality rates according to scoring systems

	Mechanical ventilation days median (min-max)	Days of ICU stay median (min-max)	Mortality rate median (min-max)
GCS			
≤10	2.5 (0-73)	13.5 (1-73)	44.9%
>10	0 (0-43)	2 (0-48)	2.6%
APACHE II			
≤19	0 (0-43)	2 (0-50)	0.8%
>19	2.5 (0-73)	14 (1-73)	53.6%
ISS			
<23	0 (0-43)	2 (0-50)	0.9%
≥23	2 (0-73)	9 (1-73)	47.4%
TRISS-B			
<84	3 (0-73)	17.5 (1-73)	65.5%
≥84	0 (0-45)	2 (0-60)	1.4%
TRISS-P			
<73	3 (0-73)	17.5 (1-73)	73.5%
≥73	0 (0-45)	2 (0-60)	1.4%

*p-values are derived from Mann-Whitney U test for continuous variables and the chi-square test or Fisher's exact test for categorical variables
Data is presented as median (minimum-maximum) for continuous variables and percentage for categorical variables
Min-max: Minimum-maximum, ICU: Intensive care unit, GCS: Glasgow Coma scale, APACHE II: Acute physiology and chronic health evaluation II, ISS: Injury severity score, TRISS-P: Trauma score-injury severity score-penetrating, TRISS-B: Trauma score-injury severity score-blunt

Table 5. Distribution of mortality rates by mechanism of injury and weighted injury regions

Mechanism of injury	n	Mortality (%)
Stabbing/cutting injury	43	14.0
Falling from height	39	20.5
Non-traffic accident	38	15.8
Gunshot injury	36	19.4
Traffic accident	29	34.5
Assault	9	11.1
Injury region		
Head-neck	76	31.6
Vascular injury	26	7.7
Thorax	25	12.0
Abdomen	25	20.0
Extremity	17	5.9
Vertebral injury	10	0.0
Pelvic injury	10	20.0
Cardiac	5	20.0

Data is presented as number (n) and percentage (%)

and anatomical scoring systems have been devised to provide clinicians with a suitable quantitative framework for decision-making (3).

Scoring systems should be simple, objective, and reliable and capable of accurately differentiating the severity of a patient's injury. The purpose of scoring systems is to ensure precise and prompt diagnosis and treatment of patients. A total of 194 patients were included in the study (mean ± SD age, 37.20±16.32 years). In a study conducted by Unlü et al. (7) on trauma patients, the mortality rate was determined to be 35.8%. Similarly, Kara et al. (8) found a mortality rate to be 19.4% in their study. In the present study, the mortality rate was 19.6%.

The GCS is commonly used as the gold standard to assess patient consciousness. A significant relationship between low GCS and mortality has been reported in previous studies (9-14). In the present study, the median GCS score was 13 (min-max: 8-14), and mortality was 44.9% in patients with a GCS ≤10. Additionally, in patients with GCS ≤10, the need for MV, duration of MV, duration of ICU stay, vasopressor requirement, need for blood replacement, and incidence of renal failure were statistically higher and longer than those with GCS >10.

The AIS and ISS are anatomical scoring systems, which indicates that they may be insufficient in distinguishing between patients with the same score but different hemodynamic status. Therefore, in 1987, Boyd et al. (6) proposed the TRISS system by combining the ISS and RTS while also taking into account the age factor. Studies have reported that the effectiveness of ISS in predicting mortality (%94.4 sensitivity, %60 specificity) is lower than that of TRISS and RTS, with TRISS demonstrating the highest effectiveness in predicting mortality and trauma outcomes. The

Table 6. Distribution of MV and ICU stay days by comorbidities				
Comorbidity	**MV days Median (min-max)**	**p**	**Days of ICU stay Median (min-max)**	**p**
Chronic illness				
Yes	0.8 (0-73)	0.142	3 (0-73)	0.395
No	0.5 (0-45)		3.5 (1-60)	
Antithrombotic use				
Yes	0.25 (0-73)	0.746	3 (0-73)	0.617
No	0.56 (0-20)		3 (1-20)	
Inotrope use				
Yes	0 (0-38)	<0.001	2 (0-50)	<0.001
No	2 (0-73)		9 (1-73)	
Septic shock				
Yes	0.25 (0-73)	<0.001	3 (0-73)	<0.001
No	43 (3-60)		45 (3-60)	
Kidney failure				
Yes	0.25 (0-73)	0.084	3 (0-73)	0.306
No	2.25 (0.25-9)		9 (3-9)	
Blood transfusion				
Yes	0 (0-18)	<0.001	2 (0-20)	<0.001
No	1.75 (0-73)		7 (1-73)	
Reoperation need				
Yes	0.25 (0-73)	0.034	3 (0-73)	0.032
No	2 (0-60)		6 (1-60)	
ICU re-admission				
Yes	0.18 (0-73)	0.004	3 (0-73)	0.012
No	3 (0-60)		7 (1-60)	

MV: Mechanical ventilation, ICU: Intensive care unit, min-max: Minimum-maximum
*P-values were calculated using the Mann-Whitney U test. Data is presented as median (minimum-maximum)

ROC value for TRISS was 0.963, whereas that for ISS was 0.854 (15,16).

Unlü et al. (7) reported a median TRISS value of 61, while Eryılmaz et al. (17) determined TRISS values for patients with fatal outcomes as 87.9±11.4. In our study, the mean ± SD TRISS-B was 79.57±32.43, and the mean ± SD TRISS-P was 79.98±34.10. TRISS-B [hazard ratio (HR): 0.967] and TRISS-P values were statistically associated with increased mortality (HR: 0.968). For TRISS-B, a cut-off value <84 had a sensitivity of 94% and specificity of 87% in predicting mortality. When the cut-off value for TRISS-P was determined as <73, the sensitivity for predicting mortality was 94% and specificity was 91%. The area under the ROC curve (AUC) results showed that compared with other trauma scores, TRISS-P provided the best prediction of mortality.

The median ISS value was 18 (min-max: 13-29), and a statistically significant relationship was found between an increase in ISS and an increase in mortality. When the cut-off value for ISS was determined as ≥23, the sensitivity for predicting mortality was 97%, with a specificity of 73%. Patients with TRISS-B cut-off value <84 and TRISS-P cut-off value <73 had statistically longer lengths of stay in the ICU and longer durations of MV.

An increase in the APACHE II score is significantly associated with mortality (7,8,18). Having an APACHE II score >19 has been found to be associated with mortality in trauma patients (19). In our study, the median APACHE II score was 15, and an APACHE II score >19 had a sensitivity of 97% and specificity of 81% for predicting mortality. Similarly, patients with an APACHE II score >19 had longer lengths of stay in the ICU and longer durations of MV.

A significant increase in the SOFA score (HR: 1.155) was found to be statistically associated with mortality. Although the mean SOFA admission score in the European trauma cohort was reported as 5.1 (20), Brattström et al. (21) reported a median SOFA score of 5 in a study involving trauma patients. However, in our study, for a cut-off value of SOFA ≥7, the sensitivity for predicting mortality was 52%, with a specificity of 84%.

In a study involving 706 trauma patients, the SOFA score had discriminative power similar to APACHE II and TRISS in predicting outcomes of trauma patients in the ICU. The sensitivity of SOFA was found to be higher than that of APACHE II and TRISS, while its specificity was higher than that of TRISS but lower than that of APACHE II. The accuracy of SOFA was higher than that of TRISS but was not significantly different from that of APACHE II. In our study, however, the SOFA was found to have lower sensitivity compared with APACHE II (97%) and TRISS (94%), lower specificity compared with TRISS (TRISS-B: 87%, TRISS-P: 91%) but higher than APACHE II (81%).

It has been observed that the combination of anatomical and physiological scoring systems in the TRISS score provides better results in predicting the probable survival of trauma patients (22,23). The ability of TRISS to provide different survival predictions based on whether the trauma is blunt or penetrating also expands its utility in multiple traumas, thereby aiding clinicians. By encompassing physiological scoring like RTS and consequently GCS, as well as anatomical scoring like ISS, TRISS scoring becomes stronger compared to other scoring systems.

GCS, a physiological score incorporating systolic blood pressure and respiratory rate, has been reported to have a significant association with decreased RTS values and increased mortality rates, with mortality observed when the RTS cut-off value was <6.2 (7,17,18). In our study, however, the mean ± SD RTS was found to be 6.27±2.05, and no statistically significant relationship was observed between RTS and mortality. The sensitivity of predicting mortality for an RTS cut-off value <5.63 was 52%, with a specificity of 82% (AUC: 0.68). It was found that 42.6% of our patients with an RTS <5.63 had a fatal outcome. Given that most trauma patients are young and have potentially better compensatory mechanisms, initial RTS scores may be higher, making RTS alone insufficient for predicting mortality. Based on all these findings, we believe that in trauma patients, APACHE II and ISS scores are more sensitive for predicting mortality than TRISS, SOFA, GCS, and RTS.

In international studies conducted on trauma patients, it is stated that young people (15-45 years old) and males have a higher rate, and the majority of them do not have any comorbidities (7-9,18,24-27). In our study, 92.3% of patients were male, 7.7% were female, and 74.8% were aged 45 years or younger. The mortality rate was 16%, whereas 83.5% of the patients had no history of chronic illness, and the mortality rate among those without a history of chronic illness (34.4%) was higher. We believe that the high mortality rate among patients without a history of chronic illness in our study may be attributable to the exclusion of patients admitted to the ICU due to advanced age and high ASA scores. When the etiologies of the patients were examined, traffic accidents were found to be the most common. Trauma-related to traffic accidents was associated with mortality rates ranging from 49% to 52.4%, with head and neck injuries being predominant (8,10,21,28-30).

In our study, traffic accidents were found to be the most common cause of trauma, and a mortality rate of 50.3% was associated with these accidents. However, when examining the predominant injury sites of the patients, it was determined that head and neck injuries accounted for 39.2% of cases, with the highest mortality rate (31.6%) observed in this group. The lowest mortality rate (5.9%) was observed in patients with extremity injuries. Mortality was not observed in patients with vertebral injuries.

It is not surprising that trauma patients, particularly those with a high rate of erythrocytes (88%), require blood product transfusion (27). Kara et al. (8) reported that mortality was statistically higher in patients who received transfusions. In our study, 51.5% of patients received blood product replacement, and the mortality rate was higher among those requiring blood transfusion, with longer ICU and MV durations. Additionally, 3.1% of patients developed kidney failure, and 1.5% required hemodialysis; all of whom had fatal outcomes.

The high incidence of MV requirement in trauma patients has been significantly associated with mortality (8,18,27,31). In our study, MV was required in 53.1% of patients, and the mortality rate of 36.9% among these patients. In a study involving 9,721 trauma patients, the incidence of ventilator-associated pneumonia (VAP) was reported to be 5.6% (32), whereas another study with 4,111 trauma patients reported it to be 8% (33). In our study, VAP developed in 4.1% of our patients, and the differences in the incidence of VAP may be related to the number of patients and number of days under MV care. Brattström et al. (21) reported severe sepsis in 31.1% of trauma patients, whereas Dur et al. (31) reported sepsis in 20.3% of patients. In our study, 3.1% of patients developed septic shock, and 62.5% of those with septic shock had fatal outcomes. The mortality rate was higher in patients developing septic shock, and these patients had significantly longer ICU stays and MV durations. Patients requiring vasopressors tend to experience increased duration of ICU stay, prolonged MV duration, and increased mortality

(7,8,18,21,31). Dur et al. (31) reported that 14.5% of trauma patients required inotrope, and 77.7% of these patients had fatal outcomes. Brattström et al. (21) reported an average ICU stay of 3.1 days for trauma patients, Adıyaman et al. (18) reported a mean ± SD ICU stay of 14±16.2 days, Dur et al. (31) reported a mean ± SD ICU stay of 5±11 days, Kara et al. (8) reported a median of 3 days, and Unlü et al. (7) reported an ICU stay of 5 (1-139) days.

CONCLUSION

In conclusion, identifying factors contributing to mortality and morbidity in trauma patients admitted to the ICU is crucial for improving patient management. Factors such as GCS <10, TRISS-P <73, APACHE II >19, and ISS ≥23, the need for blood transfusion, vasopressor use, development of kidney failure, need for dialysis, prolonged invasive MV, and increased ICU stay duration are associated with increased mortality. The APACHE II and ISS scores are more sensitive in predicting mortality than the TRISS, SOFA, GCS, and RTS; however, the TRISS score is considered more reliable in predicting mortality.

Ethics

Ethics Committee Approval: This study complied with the Declaration of Helsinki's ethical criteria and was approved by the Clinical Research Ethics Committee of the University of Health Sciences Turkey, Okmeydanı Training and Research Hospital (decision number: 928, date: 05.06.2018).

Informed Consent: Informed consent forms were obtained from all patients.

Authorship Contributions

Surgical and Medical Practices: C.K.B., Concept: C.K.B., Design: C.K.B., Data Collection or Processing: C.K.B., M.A., K.Y., Analysis or Interpretation: C.K.B., M.A., K.Y., T.M., N.T., Literature Search: C.K.B., M.A., K.Y., T.M., N.T., Writing: C.K.B., M.A., K.Y., T.M., N.T.

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