

The impact of Pediatric Trauma Score on burden of trauma in emergency room care

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Traumatic injuries are the leading cause of mortality and morbidity during childhood. A retrospective study was performed to evaluate the impact of Pediatric Trauma Score (PTS) on burden of trauma in emergency care.

Children admitted to the emergency room were retrospectively evaluated for age, sex, mechanism of injury, physical examination findings, and PTS. The cost of trauma was obtained by medical records.

A total of 146 patients (male/female: 93/53) were enrolled. The median age was 6 (interquartile range: 3-9.25). Mechanism of injury was falls (74%), motor vehicle crashes (9.6%), non-vehicular accidents (7.5%), struck by/against (6.2%), and cuts and gunshots (2.1%). The median PTS was 10. In the evaluation of trauma burden, radiologic investigations accounted for 41%, consultations for 23.5%, laboratory investigations for 15.6%, emergency surgical interventions for 12.1%, and medical interventions for 6.8% of total trauma cost in emergency care. PTS showed no impact on burden of trauma in emergency care ($p>0.05$). Total trauma cost was increased 2.1-fold in male patients, 2.6-fold in head injuries and 4.4-fold in abdominal injuries ($p<0.05$).

Pediatric Trauma Score had no effect on the burden of pediatric trauma in emergency care. The total cost of trauma was primarily affected by head injury and abdominal trauma. Higher costs may be related with routine radiological investigations in head and abdominal injuries.

Key words: Pediatric Trauma Score, children, cost of trauma.

Trauma is a significant cause of mortality and morbidity in all age groups. Every year, numbers of children around the world die or become disabled as a result of preventable injuries¹. The burden of trauma is estimated in developed countries and compared with other preventable health problems to determine the national investment for specific injury-prevention activities². However, the estimated burden of trauma in developing countries is still lacking.

Pediatric trauma in emergency care consists of a great range of injuries with high trauma costs. Although injuries that receive medical attention in emergency care without hospitalization can have costs equivalent to those of severe injuries, the burden of pediatric trauma in emergency care has not been evaluated previously.

Pediatric Trauma Score (PTS) is a trauma scoring system for children to evaluate the initial critical assessment and subsequent care³. Studies focused on the use of PTS in emergency care and its correlation with costs of trauma are limited. A retrospective study was performed to evaluate the impact of PTS on burden of pediatric trauma in emergency care.

Material and Methods

Children who were admitted to the emergency room (Kırıkkale University, Medical Faculty, and Department of Emergency Medicine) with the diagnosis of major trauma (more than 1 organ system involved) between March 2006 and March 2007 were enrolled in the study. Initial assessment of patients was done and

PTS was evaluated by practitioners in the emergency room. No specific protocol was followed for diagnosis and management of pediatric trauma. The data obtained from the medical reports were evaluated retrospectively for age, sex, mechanism of injury, physical examination findings, and PTS.

Pediatric Trauma Score parameters are listed in Table I.

The cost of trauma in the emergency room was obtained from the medical reports of patients. Costs were evaluated as total sum of:

- Medical interventions
- Surgical interventions
- Laboratory investigations
- Radiological investigations
- Consultations

The costs used in the study were determined by the Ministry of Health, and are applied in all governmental and university hospitals in Turkey. The cost of trauma is given in Turkish lira (1 US dollar = 1.35 Turkish lira).

Data obtained from medical records were analyzed with Mann-Whitney U test (SPSS 12.0), and multivariate logistic regression analysis was performed to determine the factors affecting the total trauma cost. A probability value of <0.05 was considered significant.

Results

The medical records of 146 patients were evaluated in the study. The male to female ratio was 93/53 (M: 63%, F: 37%) and the mean age was 6 (range: 3-9.25). The median PTS was 10 (interquartile range: 6-12). The mechanisms of injury are listed in Table II.

On admission, some patients presented with traumatic injury involving multiple sites. Injuries according to body site were head in 78.1%, abdominal in 61.6%, extremity in 41.8%, thoracic in 8.6%, and genitourinary in 1.4% of all cases.

Determinants of trauma cost are summarized in Figure 1. Mean total cost in emergency care was 217.35 TL (range: 43.6 – 260.2 TL). Mean costs of interventions are listed in Table III.

No significant correlation was detected between PTS and age, sex, mechanism of trauma or total trauma cost ($p > 0.05$). It was found that

Table II. Injury Mechanisms in Patients

Mechanisms of Injury	Number of Patients (% of Total)
Falls	108 (74%)
Motor-vehicle crashes	14 (9.6%)
Non-vehicular accidents	11 (7.5%)
Struck by/against	9 (6.2%)
Cuts and gunshots	3 (2.1%)

Table I. Parameters of Pediatric Trauma Score

	+2	+1	-1
Weight	>20 kg	10-20 kg	<10 kg
Airway	Normal	Maintainable	Not maintainable
Systolic blood pressure	>90 mmHg	50-90 mmHg	<50 mmHg
Central nervous system	Awake	Obtunded	Comatose
Skeletal	None	Closed fracture	Open or multiple fracture
Open wound	None	Minor	Major

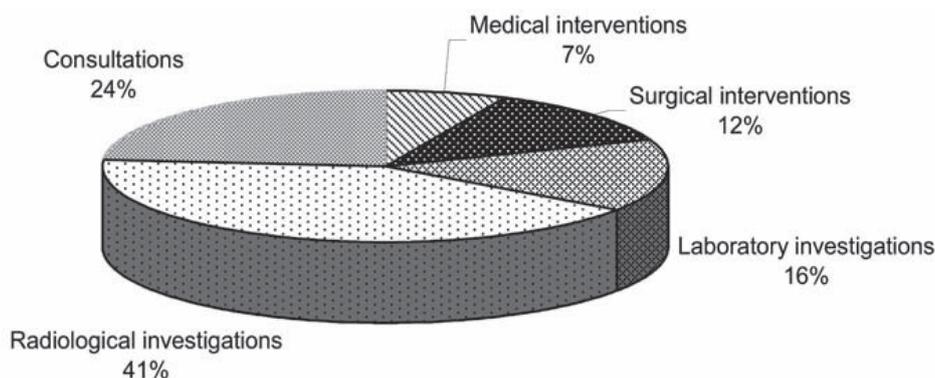


Fig. 1. Determinants of trauma cost.

Table III. Mean Cost of Interventions in Emergency Room

Interventions	Mean (TL)*	Range
Medical	53.8	2.22-55.5
Surgical	67.4	0-94.1
Laboratory	45.4	4.45-48.8
Radiological	167.60	7.76-181.8
Consultations	24.9	16-41.4
Total	217.35	43.6-260.2

*1 US Dollar = 1.35 TL.

PTS had no impact on burden of trauma in emergency care ($p > 0.05$).

Since probability distribution in trauma cost was non-normal, we could not analyze the data with linear regression. We performed logistic regression analysis after determining the median trauma cost as the cut-off value. Costs lower than median values were considered as 0, whereas higher values were considered as 1.

When we investigated the parameters affecting total trauma cost, we found that total trauma cost was increased 2.1-fold in male patients, 2.6-fold in head injuries and 4.4-fold in abdominal injuries ($p < 0.05$).

Discussion

Traumatic injuries are one of the most important causes of mortality and morbidity during childhood³. In addition to devastating medical and emotional effects, traumatic injuries are accompanied by significant consumption of health care resources⁴. In low-income countries, millions of children die or become disabled annually due to unintentional injuries¹. Since other diseases continue to rank higher as causes of mortality in developing countries, traumatic injury receives relatively little attention¹.

In the literature, pediatric trauma shows a considerable variation in demographic features. In our study, 63% of patients were male, which is similar to other reports suggesting a slight male predominance, ranging from 58.8% to 78.4%^{5,6}. The mean age of our patients was 6, also consistent with other series⁶. Most injuries in our series were due to falls, accounting for 74% of all cases. Although this overwhelming presentation is supported by the literature⁷, motor-vehicle crashes were reported as the most common injury mechanism in developed countries (range: 45%-69.8%)^{3,5}. The most common injury site in the pediatric

population remains the head⁵, and in our series as well, 74% of patients were evaluated with presumptive diagnosis of head injury. This high incidence of head injury may relate to the high rate of falls in our series.

Several trauma score systems are proposed to help practitioners in decision-making on initial assessment of patients in emergency care³. PTS is a popular scoring system designed for children. PTS can be determined by a basic physical examination with a checklist of weight, age, consciousness, systolic blood pressure, fractures and skin findings⁸. PTSs of 9 to 12 are assessed as minor trauma while lower scores are assessed as life-threatening situations. Trauma scoring systems are not only defined for the initial critical care assessment but also evaluated for possible correlation with trauma cost. An inverse correlation between PTS and total trauma cost was reported by Dueck et al.⁵ In contrast to that former report, our study did not reveal such a correlation between PTS and cost of trauma in emergency care. This discrepancy may be related with the better PTS in our patients and because only emergency costs were evaluated in our study. There was also no correlation between PTS and age, sex or mechanism of injury.

The total cost of trauma in the United States has been reported as US\$1900 to US\$5800 per hospital stay⁹. When compared to developed countries, our trauma costs in emergency care are significantly lower. This striking difference may be related with the lower health care cost in Turkey. According to our results, radiological investigations were the most important, accounting for 41% of total trauma cost in emergency care. The routine radiological evaluation of patients, without considering PTS, causes higher trauma costs, especially in head and abdominal injuries.

When we evaluated the cost factors in pediatric trauma, we found that male gender increases trauma cost 2.1-fold, head injuries 2.6-fold and abdominal injuries 4.4-fold. Although PTS showed no significant difference between males and females in our study, it has been previously reported that boys are predisposed to having severe injuries¹. This may explain why boys are more likely to generate higher costs. We suggest that in patients with head and abdominal injuries, legal requirements

and uncertainty in diagnosis in pediatric trauma force practitioners to perform routine radiological and laboratory evaluations, thus generating higher trauma costs.

In conclusion, PTS has no impact on the burden of pediatric trauma in emergency care. The total cost of trauma was primarily affected by head injury and abdominal trauma. Higher costs may be related with the performance of routine radiological investigations in head and abdominal injuries.

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