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INTRODUCTION: *Posttraumatic injuries are among the most frequent reasons of admission to emergency room services (ERs). In the first assessment of the cases, ATLS protocols recommends use of triage decision scheme consisting of parametres of abnormal physiologic findings, anatomic injury site, pathogenic mechanism of injury, concomitant diseases and conditions, and activation of trauma teams in line with these criteria. The aim of this study is to evaluate TEWS(Triage Early Warning Score) as a marker for predicting mortality in trauma patients who presented to Emergency Services.*
MATERIALS AND METHODS: *381 trauma patients aged ≥ 18 years who admitted to the Emergency Service and met criteria of ATLS protocol were included in the study.TEWS values of the patients were calculated using patients'data included in the study forms. Impact level was scrutinized using multivariant logistic regression test. Level of statistical significance was accepted as p<0.05.*
RESULTS: *In the prediction of survival and ex patient rates; significant effectiveness of TEWS was observed [0.973 (0.944-1)] (p<0.05). In the ROC analysis maximum TEWS AUC value was [0.930 (0.895-0.966)] with a cut-off value of 5 points. TEWS scores of 17.2% (66/381) of the patients who were discharged were above 5 points. These patients had undergone intubation (n= 21; 35%), tube thoracostomy (n= 16; 26.6%), transfusion of blood products (n= 29; 48.3%), and emergency surgery (n=16; 26.6%).*
CONCLUSIONS: *Triage Early Warning Score is effective in the prediction of emergency treatment, and prognosis in trauma patients hospitalized in the emergency services, and it may identify patients under risk. We think that Triage Early Warning Score together with ATLS protocol can be used as an easily applicable triage warning trauma score in trauma patients.*

KEY WORDS: Mortality, Scoring systems, Trauma

Introduction

Posttraumatic injuries are among the most frequent reasons of admission to emergency room services (ERs). In The USA, nearly 40% of all consultations in ERs consist of trauma patients [1]. In studies performed in our country (Turkey) 3-20% of all patients who presented to ER were trauma patients [2-4]. According to ATLS (Advanced Trauma Life Support) protocol prepared by American College of Surgeons early diagnosis, and activation of treatment algorithm carry importance for survival. In the first assessment of the cases, ATLS recommends use of triage decision scheme consisting of parametres of abnormal physiologic findings, anatomic injury site, pathogenic mechanism of injury, concomitant diseases and conditions, and activation of trauma teams in line with these criteria [5].

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TABLE I - *Triage Early Warning Score table*

Score	3	2	1	0	1	2	3
Sistolic tension	<71	71-80	81-100	101-199	-	>199	-
Hearth rate	-	<41	41-50	51-100	101-110	111-129	>129
Respiratory rate	-	<9	-	9-14	15-20	21-29	>29
Fever	-	<35,0	-	35-38,4	-	>38,4	-
AVPU	-	-	-	A	V	P	U
trauma				no	yes		
mobility				mobile	mobile with help	immobile	

AVPU; A: alert, V: verbal, P: painful, U: unresposive

Early warning scores consist of physiologic parametres developed to gain time to perform necessary interventions at an early stage for the patient whose health state worsened based on simple bedside observations [6]. As a simple triage tool MEWS (Modified Early Warning Score) with a rapid yield has been used for the identification of patients with a higher mortality risk who need hospitalization [7].

Adapted form of MEWS was modified for the hospital load to meet the need for hospitalization in the South African population, and renamed as Triage Early Warning Score (TEWS). Triage Early Warning Score parameters are seen in Table I.

The aim of this study is to evaluate TEWS both as a risk marker for predicting mortality, and emergency treatment for trauma patients who presented to Emergency Services and met criteria of ATLS.

Materials and Methods

The study was conducted after obtaining approval of the Ethics Committee for Clinical Investigations and written informed consent from the study participants. 381 trauma patients aged ≥ 18 years who presented to the Emergency Service were included whereas patients younger than 18 years and individuals who didn't meet criteria of ATLS protocol, and patients who were lost to follow-up within 4 weeks after admission were not included in the study.

Demographic data (age, gender) GCS, AVPU scores, vital signs (blood pressure, body temperature, pulse and respiratory rates per minute), mobility status, mechanism of injury, injury site, treatment(s) received, outcomes (hospitalization/referral/discharge/rejection of treatment/exitus), unit of hospitalization (clinic/intensive care unit-ICU) of the cases enrolled in the study were recorded. Afterwards, the cases were tracked using their phone, and address contact information both during their stay in the emergency service, and for 4 weeks thereafter to calculate their mortality rates TEWS values of the patients were calculated using patients'data contained in the study forms.

For statistical analyses, all data were entered into IBM SPSS for Windows® 22. 0 (SPSS Inc. Chicago, USA.) program, and analyzed.Distribution of variables was estimated using Kolmogorov- Smirnov test. In the analysis of quantitative data Mann-Whitney U test was employed. For the analysis of qualitative data chi-square test was utilized. Impact level, and cut- off value were investigated using Receiver Operating Characteric (ROC) curve. Level of statistical significance was accepted as $p<0.05$.

Results

According to Advanced Trauma Life Support protocol, 381 patients who met study criteria were included in the study.Their demographic characteristics, and vital signs at admission are summarized in Table II.

The most frequent cause of referrals was high-speed collision in 32.7% (n= 125) of the patients. Concomitant diseases, and conditions were detected in 17.5% (n= 67) of the patients who were older than 55 years of age.

During 4 weeks of follow-up period of the patients, gender, and age distribution of the survived, and exited patients did not demonstrate any significant difference. However when physiologic variables of these patients were compared GCS, SBP and SPO_2 values of the exited group were significantly lower than those of the survived patients ($p<0,05$).

Monitorization of mortality during 4 weeks of follow-up period, significantly higher TEWS scores were calculated among exited patients when compared with those of the survived ($p<0,05$) (Table III).

TEWS scores of the patients evaluated based on ATLS parametres, and the correlation of these scores with the survival was evaluated. All 381 patients met ATLS criteria. TEWS scores were over 7 points in 26 (6.8%) patients, and 6 (1.5%) of them exited. In 40 (10.4%) patients TEWS scores were 6 or 7 points, and 2 (0,5%) of them died. TEWS scores were less than 6 points in 82.8% (n= 315) of the patients without any mortality. In the prediction of survived, and exited patients significant effectiveness of TEWS was observed. [0.973

TABLE II - *Demographic characteristics of the patients*

		Min	Max	Median	Mean. ± SD. n %
Gender	Female				68 17.8 %
	Male				313 82.2%
Age (years)		18.0	93.0	36.0	39.9 ± 17.3
SBP mm Hg		40.0	180.0	120.0	118.5 ± 15.0
HR, n/min		50.0	149.0	88.0	88.7 ± 15.2
RR, n/min		8.0	30.0	13.0	14.1 ± 3.6
Body temperature °C		36.0	37.4	36.5	36.5 ± 0.3
SPO_2, %		40.0	100.0	99.0	97.0 ± 6.5
GCS		3.0	15.0	15.0	14.5 ± 2.0
Mobility	Mobile				192 50.5%
	Mobile with help				33 8.6%
	Immobile				156 40.8%
AVPU	A				346 90.8%
	V				10 2.6%
	P				21 5.5%
	U				4 1.0%
TEWS		1,0	15.0	2.0	2.9 ± 2.6

SD; standard deviation, SBP; systolic blood pressure, HR; heart rate, RR; respiratory rate, SPO_2; oxygen saturation, GCS; Glasgow coma scale, AVPU; A: alert, V: verbal, P: painful, U: unresponsive, TEWS; Triage Early Warning Score

TABLE III - *Comparison of TEWS scores of survived, and exited patients*

	Survived		Exited		
	Mean±s.s.	Median(Min-Max)	Mean±s.s.	Median(Min-Max)	P
TEWS	2.7±2.3	2 (1-14)	10.6 ±3.1	11 (6-15)	**<0.001**

TABLE IV - *Predictive mortality rates within four weeks of follow-up according to TEWS*

	AUC	95% CI	P
TEWS	0.973	0.944 – 1.000	**<0.001**
Cut -Off 5	0.930	0.895 – 0.966	**<0.001**

TEWS; Triage Early Warning Score, AUC; area under curve, CI: confidence interval

(0.944-1)] ($p<0.05$). In the ROC analysis maximum TEWS AUC value was [0.930 (0.895-0.966)] with a cut-off value of 5 points (Table IV).

Discussion

Triage Early Warning Score is a scoring system which uses simple clinical parametres, and will be applicable at all levels of emergency service units under conditions of developing countries. [8-12]. Contrary to other scoring systems, TEWS can be more easily used in developing countries. Therefore it is a potential score which aids in the measurement of the success of emergency care system or emergency intervention [13]. The aim of this study is to evaluate TEWS as a risk predictor with the intention to predicting prognosis in trauma patients included in the triage protocol of ATLS, and assess TEWS in emergency treatments envisaged for these patients.

The reason of our application of ATLS protocol for the triage of trauma patients was that although discriminators as one of the components of South African Triage Scale are used as a tool for the safety of the patients with potentially severe pathology but normal vital signs, utilization of mechanism of injury demonstrates high sensitivity in the identification of the cases with severe trauma. However this scale mistakenly perceives minor traumas as more severe injuries, and so demonstrates higher overtriage rates [8-14].

A total of 381 trauma patients were included in the study. The study population consisted of 313 (82.2%) male, and 68 (17.8%) female patients. Male/female ratio of trauma patients was comparable to those reported in other studies [15-17].

Hundred and twenty-five (32.7%) study patients were

injured as a result of high-speed collision in a traffic accident. This phenomenon complies with the World Health Organization statistics which indicate that traffic accidents rank on top of injurous accidents [18].
Severe trauma can be sometimes a complicated condition. Rapid, and accurate evaluation of the severity of trauma, predetermination of rules for examination, diagnosis, and treatment have become successful life-saving key issues. A scoring system which may foresee emergency treatment for trauma patients in the emergency service is available, then it may help medical staff to spare their time, and energy for critical patients in case of need, and may save the life of the patient in notime at all.

Conclusions

Our study had some limitations. Firstly, data were collected within nearly three months. So the study had a small sampling size. In addition it was based on the data retrieved from only one hospital. Therefore its clinical validity, and reliability needs to be confirmed with its applications in other fields, and hospitals of our country. Triage Early Warning Score is appropriate in the prediction of emergency treatment, and prognosis in trauma patients hospitalized in the emergency services, and it may identify patients under risk. We think that Triage Early Warning Score together with ATLS protocol can be used as an easily applicable triage warning trauma score in trauma patients.

Riassunto

Gli infortuni post-traumatici sono tra i motivi più frequenti di ricorso ai servizi di pronto soccorso (ER). Nella prima valutazione dei casi, i protocolli ATLS raccomandano l'uso di uno schema decisionale di triage costituito da parametri fisiologici anormali, dal sito delle lesioni anatomiche, dal meccanismo patogenetico della lesione, da eventuali comorbilità e attivazione di trauma teams in linea con questi criteri.
Lo scopo di questo studio è valutare il TEWS (Triage Early Warning Score) quale indicatore di previsione della mortalità in questo tipo di pazienti vittime di trauma. Sono stati studiati 381 pazienti traumatizzati di età ≥ 18 anni, accettati al servizio di emergenza con criteri corrispondenti al protocollo ATLS. I valori del TEFS di questi pazienti sono stati calcolati utilizzando i dati compresi nelle schede dello studio. Il livello di impatto è stato esaminato utilizzando il test di regressione logistica multivariante, accettando come statisticamente significativo il $p < 0,05$.
Per la previsione della sopravvivenza è stata rilevata una significativa efficacia di TEWS [0.973 (0.944-1)] ($p<0.05$). Nell'analisi ROC il valore AUC massimo di TEWS era [0,930 (0,895-0,966)] con un valore soglia di 5 punti. I punteggi di TEWS del 17,2% (66/381) dei pazienti che sono stati dimessi erano superiori a 5 punti. Questi pazienti sono stati sottoposti a intubazione (n= 21; 35%), drenaggio toracotomico (n= 16; 26,6%), trasfusione di emodrerivati (n= 29; 48,3%) e chirurgia d'urgenza (n= 16; 26,6%).
In conclusione il punteggio di preallarme del triage è efficace nella previsione del trattamento di emergenza e nella prognosi nei pazienti traumatizzati ospedalizzati nei servizi di emergenza e può identificare i pazienti a rischio. Riteniamo che il punteggio di preallarme di Triage insieme al protocollo ATLS possa essere usato come un punteggio traumatico di triage facilmente applicabile nei pazienti traumatizzati.

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