Research Article

Archives of Anesthesiology and Critical Care (Summer 2022); 8(3): 193-200.

Available online at http://aacc.tums.ac.ir

Comparison of Emergency Trauma Score (EMTRAS) with Rapid Emergency Medicine Score (REMS) for Prediction of Early Mortality in Adult Trauma Patients

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ARTICLE INFO

Article history:
Received 14 January 2022
Revised 08 February 2022
Accepted 25 February 2022

Keywords:
Trauma;
Survivors;
Mortality;
Hospitals

ABSTRACT

Background: Trauma is an injury to living tissue from an external source. The severity of traumatic injuries plays a crucial role in the determination of mortality in patients with trauma, thus a proper understanding of the severity of trauma is very important for improving trauma care. Several scoring systems are available for the objective, initial assessment of the severity of injury to help treatment strategy. Aim of the study was to compare Emergency Trauma Score (EMTRAS) with Rapid Emergency Medicine Score (REMS) for prediction of early mortality in adult trauma patients.

Methods: Study was conducted with 100 patients of either sex, age 18 years or above with history of trauma due to road accident, fall and assault. REMS and EMTRAS score was calculated from the laboratory and patient characteristics mentioned in the Trauma scoring datasheet, within 30 minutes of arrival of the patient in the hospital and 24 hours after hospitalization.

Results: Comparison of the REMS score within 30 mins of patient arrival and at 24 hrs was statistically significant (p=0.0099). Comparison of EMTRAS SCORE Within 30 mins of patient arrival and at 24 hrs was not statistically significant (p=0.0505). Comparison of REMS vs Outcome at 24 hrs (Non-Survivors and Survivors) was statistically significant (p=<0.0001). Comparison of EMTRAS vs Outcome at 24 hrs (Non-Survivors and Survivors) was statistically significant (p=<0.0001). Comparison of AUROC (Area Under the Receiver Operating Characteristics) of REMS and EMTRAS were 0.689 and 0.789 respectively, which was statistically significant.

Conclusion: We conclude that both REMS and EMTRAS are easy, accurate predictors of in-hospital early mortality in Adult Trauma Patients. But in our study, EMTRAS AUROC was greater than AUROC of REMS. Hence EMTRAS should have good prognostic power for predicting in-hospital early mortality in Adults Trauma patients.

Trauma is an injury to living tissue from an external origin. Despite improvements in trauma systems and the consequent reduction in preventable deaths, trauma and unintentional injury are the major cause of death which results in a major cost burden for the health system in the world [1]. Current literature supports that early diagnosis and proper treatment both enhance outcomes and economical. Hence, during the first hour of trauma management, assessment, resuscitation, and definitive care are play crucial role [2]. The severity of traumatic injuries plays a crucial role in the determination of mortality in patients with trauma, thus a proper understanding of the severity of trauma is very important for improving trauma care. Several

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scoring systems are available for the objective, initial assessment of the severity of injury to help treatment strategy. Scoring systems are based on Anatomical description of injuries, physiological parameters and combined data. The ideal trauma scoring system should provide quick accurate, authentic and reproducible details of injuries and it should predict mortality and morbidity outcomes in any setting [3].

The Injury Severity Score (ISS), formulated in 1971 is anatomical scoring system use for patients with multiple injuries. It is calculated by using the Abbreviated Injury Scale (AIS) grades. These scores correlate with length of hospital stay, morbidity, and mortality [4]. A complete evaluation of patient's injuries may take significant time following admission to the emergency room. This limits its usefulness in initial injury assessment [3,5-6].

The Revised Trauma Score (RTS), formulated in 1989 is physiological scoring systems in use which can be applied early in treatment, even in the prehospital phase. Although RTS Correlates with trauma mortality, its calculation is complex [7-8].

The Acute Physiology and Chronic Health Evaluation (APACHE) II, formulated in 1985, is a scale that assesses illness severity among critical care patients, nonsurgical, and surgical. The score has 12 variables such as body temperature, respiratory rate (RR), heart rate, mean arterial pressure (MAP), oxygenation of arterial blood, arterial pH, serum sodium and potassium levels, white cell count, haematocrit, serum creatinine, and Glasgow Coma Scale (GCS) [9]. However, its base on laboratory tests, such as blood chemistry analysis, the use of APACHE II remains not useful for the rapid assessment of injury severity required in the emergency department [8,10].

Emergency Trauma Score (EMTRAS) has been developed by Raum et al [3] for early estimation of mortality risk in adult trauma patients. The score is calculated using 4 variables – Age (yrs.), GCS, Base Excess (BE){mmol/l}, prothrombin time (PT) {%}. For each predictor, a sub-score of 0,1,2,3 points is assigned, based on the actual value of predictor The EMTRAS uses parameters that are available within 30 minutes of a patient presenting to the Emergency Department (ED), without need a knowledge of anatomic injuries and accurately predicts mortality. The lowest (best) is 0 and highest (worst) is 12. The strength of this score is probably related to the fact that each component is independently strongly related to mortality in trauma patients [3,11].

Rapid Emergency Medicine Score (REMS) is a simple version of APACHE II. REMS is a composite score consisting of the Glasgow coma scale (GCS), Respiratory Rate (RR), Oxygen Saturation, Mean Arterial Pressure (MAP), Heart Rate (HR) and Age. REMS was found to be a powerful predictor of in-hospital mortality for the trauma population. Age is assigned a value from 0 to 6 and remaining five variables assigned values from 0 to 4. The maximum value is 26; higher scores are associated with worse prognosis. In the trauma population, REMS appears to be a quick and reliable predictor of in-hospital mortality.

A study by HO Park et al [12] in compared the Emergency Trauma Score with Rapid Emergency Medicine Score in patients with trauma. Which showed that Emergency Trauma Score and Rapid Emergency Medicine Score tools are quick, accurate, authentic predictors of in-hospital mortality in patients with trauma. However, this study had limitations in being a retrospective analysis and had patient selection bias. Hence, they plan to conduct a cross-sectional observational study to Compare Emergency Trauma Score with Rapid Emergency Medicine Score for prediction of early mortality in adult trauma patients.

There is no single accepted standard scoring system for evaluating trauma severity. There has been only one study in 2017, comparing the EMTRAS and REMS for prediction of mortality among trauma population. Limited data is available. So, we planned a study to compare Emergency Trauma Score (EMTRAS) and Rapid Emergency Medicine Score (REMS) for prediction of early mortality in Adults trauma patients.

We hypothesise that rapid Emergency Medicine Score (REMS) is as accurate as Emergency Trauma Score (EMTRAS) in prediction of early mortality in emergency trauma patient. Aim of the study was to compare Emergency Trauma Score (EMTRAS) with Rapid Emergency Medicine Score (REMS) for prediction of early mortality in adult trauma patients.

Methods

This prospective cross-sectional observational study was conducted after approval from institutional ethics committee (IEC/2018/PGIMER/RMLH-1850) between 1st November 2018 to 31st March, 2020. Inclusion criteria were patients of either sex, age between 18 years or above with history of trauma due to road accident, fall and assault. Patients died on arrival, minor superficial soft tissue injuries, requiring hospitalization less than 24 hours and patients transfer from another hospital were excluded from the study.

Sample size was calculated based on a previous study by Hyun Oh Park, et al [11] The study observed AUC of Emergency Trauma Score for predicting mortality was 0.957 and AUC of Rapid Emergency Medicine Score was 0.9. Taking this value as reference, δ as 0.045, and 5% level of significance, calculated sample size is 95 patients. So the total sample size taken is 100. The formula used is:

$$\frac{1 - AUC}{2}\left(\frac{Z_{\alpha/2}}{\delta}\right)^2$$

Where Zα is the value of Z at the two-sided alpha error of 5% and δ is 0.045. Calculations 1. N=((1-.957)/2)*(1.96/0.045)2=40.79=41(approx.) 2. N=((1-.9)/2)*(1.96/0.045)2=94.85=95(approx.)

A written informed consent taken from all patients or their relatives. REMS and EMTRAS score was calculated from the laboratory and patient characteristics mentioned in the Trauma scoring datasheet, within 30 minutes of arrival of the patient in the hospital and 24 hours after hospitalization. The Glasgow Coma Score was used to evaluate the neurological status of patients.

The outcome based on the score used within 30 minutes of the arrival of the patient in the hospital and 24 hours after hospitalization would be calculated and correlated with the actual outcome, as survivors or non-survivors.

The REMS and EMTRAS for each patient were calculated using the following tables:

Table 1 - EMTRAS Scoring System

Variable	Category	Score
Age (years)	<40	0
	41-60	1
	61-75	2
	>75	3
Glasgow Coma Scale (GCS)	13-15	0
	10-12	1
	6-9	2
	3-5	3
Base Excess (mile/L)	>-1	0
	-1 to -5	1
	-5.1 to -10	2
	<-10	3
Prothrombin Time (%)	>80	0
	50-80	1
	20-49	2
	<20	3

Table 2- REMS Scoring System

Variable	0	+1	+2	+3	+4	+5	+6
Age (years)	<45		45-54	55-64		65-74	>74
Mean Arterial Pressure (mm Hg)	70-109		110-129 50-69	130-159	>159 <50		
Heart Rate (bom)	70-109		110-139 55-69	140-179 40-54	>179 <40		
Respiratory Rate(breaths/min)	12-24	25-34 10-11	6-9	35-49	>49 <6		
Oxygen Saturation (%)	>89	86-89		75-85	<75		
Glasgow Coma Scale	14 or 15	11-13	8-10	5-7	3 or 4		

Calculating the REMS requires the patient's Respiratory Rate, Heart Rate, Mean Arterial Pressure, Glasgow Coma Scale, age, and oxygen saturation; age is assigned a value from 0 to 6, and the remaining 5 variables are each assigned values from 0 to 4. The maximum REMS value is 26; higher scores are associated with a worse prognosis. The total score is a simple arithmetic sum of the integer sub scores.

The EMTRAS is calculated using 4 variables: age, Glasgow Coma Scale, Base Excess, and Prothrombin Time. These 4 factors are weighted equally to arrive at a final score. The final score is a simple arithmetic sum of the integer sub scores and ranges from 0 to 12.

In statistical analysis Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. The normality of data was tested by the Kolmogorov-Smirnov test. If the normality is rejected, then a non-parametric test was used. Quantitative variables were compared using the Unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups of patients (died and survived). Qualitative variables were compared using the Chi-Square test /Fisher's exact test. Receiver operating characteristic curve was used to find out area under the curve of Emergency Trauma Score (EMTRAS) and Rapid Emergency Medicine Score (REMS) for predicting mortality and comparison of AUC was performed to find out whether one is significantly better predictor than the other. Univariate and multivariate logistic regression will be performed to assess the significant risk factors of mortality. A p-value of <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS).

Results

In our study, 37(37.0%) patients were female and 63(63.0%) patients were male. In our study, 13(13.0%) patients were ≤20 years old, 30(30.0%) patients were 21-30 years old, 19(19.0%) patients were 31-40 years old, 17(17.0%) patients were 41-50 years old, 11(11.0%) patients were 51-60 years old, 7(7.0%) patients were 61-

70 years old and 3(3.0%) patient was >70 years old. In our study, 6(6.0%) patients were Non-survivors and 94(94.0%) patients were Survivors.

Our study showed that, Comparison of Age REMS within 30 min of patient arrival and at 24 hrs was not statistically significant (p=0.9969). Comparison of Heart rate, Respiratory rate, MAP REMS within 30 min of patient arrival and at 24 hrs was statistically significant (p<0.0001). Comparison of 'oxygen saturation' REMS within 30 minutes of patient arrival and at 24 hrs was not statistically significant (p= 0.3485). Comparison of 'GCS' REMS within 30 minutes of patient arrival and at 24 hrs was statistically significant (p= 0.0044). Comparison of Age EMTRAS within 30 minutes of patient arrival and at 24 hrs was not statistically significant (p= 0.9587). Comparison of GCS EMTRAS within 30mins of patient arrival and at 24 hrs was statistically significant (p= 0.0033). Comparison of base excess EMTRAS within 30mins of patient arrival and at 24 hrs was statistically significant (p= 0.0462). Comparison of base Prothrombin time EMTRAS within 30mins of patient arrival at 24 hrs was statistically significant (p= 0.0283).

Comparison of the REMS score within 30mins of patient arrival and at 24 hrs was statistically significant (p=0.0099) (Figure 1). Comparison of EMTRAS SCORE Within 30mins of patient arrival and at 24 hrs was not statistically significant (p=0.0505) (Figure 2).

Comparison of 'Heart rate' REMS vs Outcome at 24hrs was statistically significant (p=0.0032). Comparison of 'Respiratory rate', 'MAP', 'oxygen saturation', 'GCS' REMS vs Outcome at 24 hrs was statistically significant (p=<0.0001).

Comparison of 'Age' EMTRAS vs Outcome at 24 hrs was statistically significant (p=0.0480). Comparison of 'GCS', 'base excess', 'Prothrombin time' EMTRAS vs Outcome at 24 hrs was statistically significant (p=<0.0001).

Comparison of REMS vs Outcome at 24 hrs (Non-Survivors and Survivors) was statistically significant (p=<0.0001) (Figure 3). Comparison of EMTRAS vs Outcome at 24 hrs (Non-Survivors and Survivors) was statistically significant (p=<0.0001) (Figure 4).

Figure 1- Comparison of REMS within 30 min of Patient Arrival and at 24 hrs

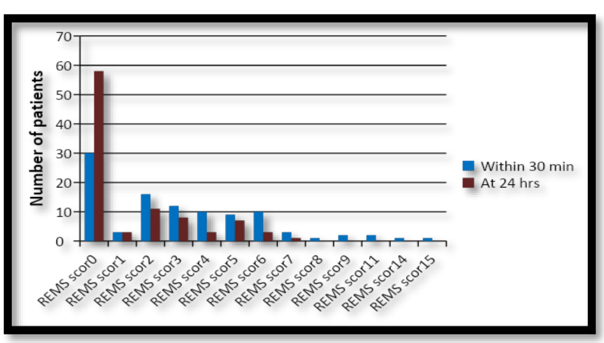


Figure 2- Comparison of EMTRAS within 30 min of Patient Arrival and at 24 hrs

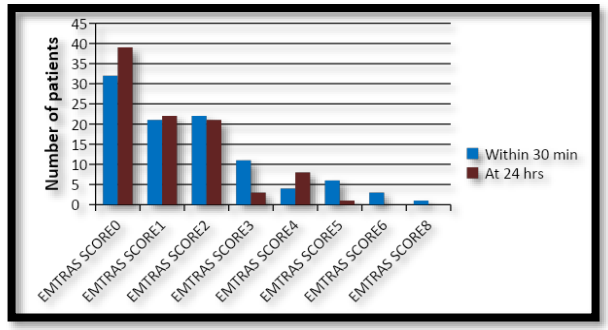


Figure 3- Comparison of REMS: Outcome at 24 hrs (Non-Survivors Vs Survivors)

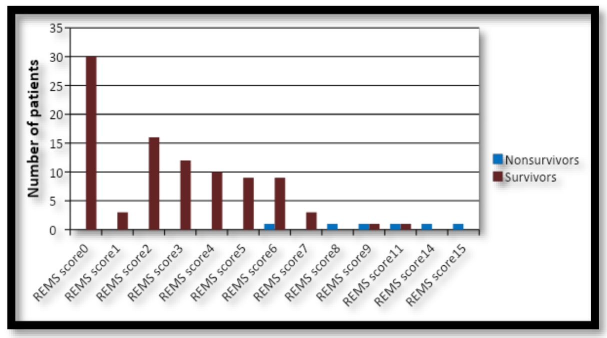
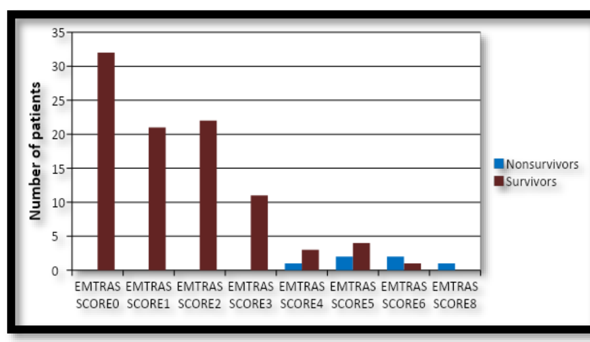


Figure 4- Comparison of EMTRAS: Outcome at 24 hrs (Non-Survivors Vs Survivors)



Difference of mean' Age', 'Oxygen Saturation' REMS within 30 min of patient arrival and at 24 hrs was not statistically significant. Difference of mean 'Heart rate', 'Respiratory rate' 'MAP' REMS within 30 min of patient arrival and at 24 hrs was statistically significant (p=<0.0001). Difference of mean 'GCS' REMS within 30 min of patient arrival and at 24 hrs was statistically significant (p=0.0071) (Table 3).

Difference of mean 'Age' EMTRAS within 30 min of patient arrival and at 24 hrs was not statistically significant (p=0.7542), Difference of mean 'GCS' EMTRAS within 30 min of patient arrival and at 24 hrs was statistically significant (p=0.0110), Difference of mean 'base excess' (mmol/L) EMTRAS within 30 min of patient arrival and at 24 hrs was not statistically significant (p=0.0916), Difference of mean

'Prothrombin' time (%) EMTRAS within 30 min of patient arrival and at 24 hrs was statistically significant (p=0.0284),

Difference of mean REMS within 30 min of patient arrival and at 24 hrs was statistically significant (p<0.0001), Difference of mean EMTRAS within 30 min of patient arrival and at 24 hrs was statistically significant (p=0.0185) (Table 4).

Difference of mean' Age' REMS within 30 min of patient arrival and at 24 hrs was not statistically significant (p=0.1736). Difference of mean 'Heart rate' REMS within 30 min of patient arrival and at 24 hrs was statistically significant (p=0.0030). Difference of mean 'Respiratory rate', 'MAP', 'oxygen saturation', 'GCS' REMS within 30 min of patient arrival and at 24 hrs was statistically significant (p=<0.0001) (Table 5).

Difference of mean 'Age' EMTRAS within 30 min of patient arrival and at 24 hrs was not statistically significant (p=0.0843), Difference of mean 'GCS', 'base excess', 'Prothrombin time' EMTRAS within 30 min of patient arrival and at 24 hrs was statistically significant (p=<0.0001).

Difference of mean REMS within 30 min of patient arrival and at 24 hrs was statistically significant (p=<0.0001), Difference of mean EMTRAS within 30 min of patient arrival and at 24 hrs was statistically significant (p=<0.0001) (Table 6).

Comparison of AUROC of REMS and EMTRAS were 0.689 and 0.789 respectively, which was statistically significant (Table 7, Figure 5-6).

Table 3- Distribution of Mean 'Age' REMS, 'Heart rate' REMS, 'Respiratory Rate' REMS, 'MAP' REMS, 'Oxygen Saturation' REMS, 'GCS' REMS Within 30mins and at 24 hrs

		Number	Mean	SD	P value
'Age' REMS	Within 30 min	100	0.9700	1.5983	0.8070
	At 24 hrs	94	0.9149	1.5357	
'Heart Rate' REMS	Within 30 min	100	0.6000	0.9211	<0.0001
	At 24 hrs	94	0.1064	0.4512	
'Respiratory Rate' REMS	Within 30 min	100	0.2000	0.4020	<0.0001
	At 24 hrs	94	0.0213	0.1451	
'MAP' REMS	Within 30 min	100	0.7300	1.0235	<0.0001
	At 24 hrs	94	0.0000	0.0000	
'Oxygen Saturation' REMS	Within 30 min	100	0.1800	0.5752	0.0721
	At 24 hrs	94	0.0638	0.2458	
'GCS' REMS	Within 30 min	100	0.4600	0.8810	0.0071
	At 24 hrs	94	0.1596	0.6274	

Table 4- Distribution of mean 'Age' EMTRAS, 'GCS' EMTRAS, 'Base Excess' (mmol/L) EMTRAS, 'Prothrombin' Time (%) EMTRAS, REMS, EMTRAS within 30 mins and at 24hrs

		Number	Mean	SD	P value
'Age' EMTRAS	Within 30 min	100	0.5000	0.7317	0.7542
	At 24 hrs	94	0.4681	0.6832	
'GCS' EMTRAS	Within 30 min	100	0.3400	0.6849	0.0110
	At 24 hrs	94	0.1170	0.5050	
'Base Excess' (mmol/L) EMTRAS	Within 30 min	100	0.6700	0.6675	0.0916
	At 24 hrs	94	0.5213	0.5434	
'Prothrombin' Time (%) EMTRAS	Within 30 min	100	0.1800	0.3861	0.0284
	At 24 hrs	94	.0745	.2639	
REMS	Within 30 min	100	3.1400	3.1302	<0.0001
	At 24 hrs	94	1.2872	1.9211	
EMTRAS	Within 30 min	100	1.7000	1.7552	0.0185
	At 24 hrs	94	1.1702	1.3004	

Table 5- Distribution of Mean 'Age' REMS, 'Heart Rate' REMS, 'Respiratory Rate' REMS, 'MAP' REMS, 'Oxygen Saturation' REMS, 'GCS' REMS among Non-survivors and Survivors

	Outcome	Number	Mean	SD	P value
'Age' REMS	Nonsurvivors	6	1.8333	2.4014	0.1736
	Survivors	94	0.9149	1.5357	
'Heart rate' REMS	Nonsurvivors	6	1.6667	.8165	0.0030
	Survivors	94	0.5319	0.8884	
'Respiratory rate' REMS	Nonsurvivors	6	1.0000	0.0000	<0.0001
	Survivors	94	0.1489	0.3579	
'MAP' REMS	Nonsurvivors	6	2.3333	0.8165	<0.0001

	Survivors	94	0.6277	0.9502	
'oxygen saturation' REMS	Nonsurvivors	6	1.3333	1.3663	<0.0001
	Survivors	94	0.1064	0.4008	
'GCS' REMS	Nonsurvivors	6	2.3333	0.8165	<0.0001
	Survivors	94	0.3404	0.7413	

Table 6- Distribution of Mean of 'Age' EMTRAS, 'GCS' EMTRAS, 'Base Excess' (mmol/L) EMTRAS, 'Prothrombin Time (%)' EMTRAS, REMS and EMTRAS among Non-survivors and Survivors

		Number	Mean	SD	P value
'Age' EMTRAS	Nonsurvivors	6	1.0000	1.2649	0.0843
	Survivors	94	0.4681	0.6832	
'GCS' EMTRAS	Nonsurvivors	6	1.6667	0.8165	<0.0001
	Survivors	94	0.2553	0.5854	
'Base Excess' (mmol/L) EMTRAS	Nonsurvivors	6	2.0000	0.0000	<0.0001
	Survivors	94	0.5851	0.5940	
'Prothrombin' Time (%) EMTRAS	Nonsurvivors	6	1.0000	0.0000	<0.0001
	Survivors	94	0.1277	0.3355	
REMS	Nonsurvivors	6	10.5000	3.5071	<0.0001
	Survivors	94	2.6702	2.4600	
EMTRAS	Nonsurvivors	6	5.6667	1.3663	<0.0001
	Survivors	94	1.4468	1.4489	

Table 7- ROC of REMS and EMTRAS

Trauma Score	Area Under the Curve	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval Lower Bound	Upper Bound
REMS	0.689	0.088	0.155	0.517	0.862
EMTRAS	0.789	0.064	0.030	0.664	0.915

[a]Under the nonparametric assumption, [b]Null hypothesis: true area = 0.5

Figure 5- ROC of REMS

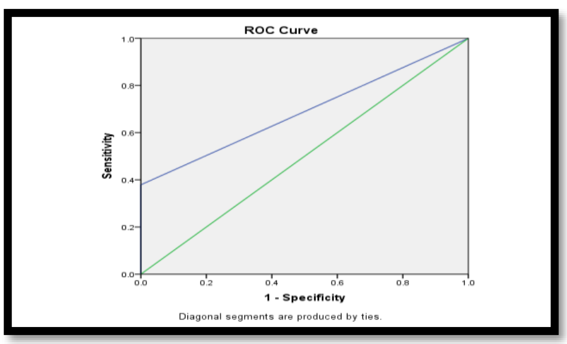
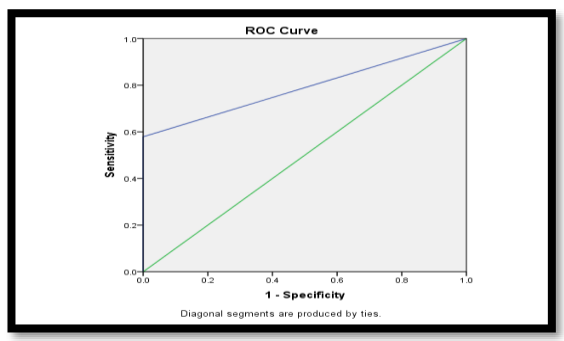


Figure 6- ROC of EMTRAS



Discussion

In our study, the indications for admission to the resuscitation room were age greater than 18yrs, RTA (37%), history of fall (53%), history of assault (10%). In contrast to our study, Park et al [12] reported age >15 years, RTA (>23.3%), history of fall (>19%) were the most common indication for admission to the resuscitation room.

We found that Mean age of patients with trauma admitted to the trauma resuscitation room was 41.039 ± 16.102 years. The mean age of trauma patients were admitted as reported by Raum et al4 was (40 ± 18 yrs), Imhoff et al [5] (36.5 ± 17.0 yrs), Park et al [12] (57.42 ± 18.51yrs), Joosse et al [11] (42.3 ± 19.2yrs). Hence, our patients were of similar age at the time of admission to the Trauma resuscitation room as compared to the above-mentioned studies.

In our study, male patients (63%) outnumbered female patients (37%). This finding are in correspondence with other studies conducted by Raum MR et al [3] (males 73.4%; females 26.6%), Imhoff et al [5] (males 62.5%, females 37.5%) and Park et al [12] (males 62.2%; females 31.8%) in which there was male preponderance.

Evaluation of REMS within 30 min of patient arrival vs at 24hours was statistically significant (p=0.0099). Imhoff et al [5] showed that REMS appears to be a simple, accurate predictor of in-hospital mortality in the Trauma population.

Evaluation of EMTRAS within 30 min of patient arrival vs at 24hours was not statistically significant (p=0.0505). Raum MR et al [3] found that in the EMTRAS the strongest predictors of mortality. Among 100 patients, 6(6%) patients were nonsurvivors and 94(94%) patients were survivors at first 24 hrs after hospitalization (6% mortality). This was comparable to what was observed by Imhoff et al [5] (5.2% mortality) and Park et al [11] (3.1% mortality). Evaluation of REMS score vs outcome at 24 hrs was statistically significant (p<0.0001). Seak CJ et al [13] found that REMS is superior in predicting the mortality of these patients compared to Rapid acute physiology score (RAPS) and Modified Early Warning Score (MEWS). They recommend that REMS be used for outcome prediction and risk stratification of adult patients presenting with Hepatic venous pressure gradient (HVPG) in the emergency department. Nakhjavan-Shahraki B et al [14] found that REMS could be used for predicting mortality and poor outcome of trauma patients in emergency settings.

Evaluation of EMTRAS score vs outcome at 24 hrs was statistically significant (p<0.0001). In the present study survivors were younger (mean age 37.2447± 15.2673 yrs) as compared to non-survivors (mean age 44.8333 ± 29.7820 yrs). This finding was consistent with the reported by Imhoff et al [5] (mean age 36.5±17.0 yrs in survivors vs 43.7±21.0 yrs among nonsurvivors), Park et al [11] (mean age 57.17±18.52 yrs in survivors v/s 65.55±16.34 yrs among non survivors), and Raum et al [3] (mean age 40±18 yrs in survivors vs 50±22 yrs among non survivors).

In our study mean REMS showed 3.14 ± 3.13 and 1.2872 ± 1.9211 within 30 min of admission and at 24 hrs after hospitalization respectively, whereas among survivors the mean REMS showed 2.6702 ± 2.46 and among nonsurvivors the mean showed 10.5 ± 3.5071 at 24 hrs after hospitalization. The score was significantly less among survivors than nonsurvivors (p=<0.0001). Therefore, according to our study higher REMS were associated with higher mortality in trauma patients. Similar to our study, Imhoff BF et al [5] found that the predictive ability of REMS was evaluated hospital mortality in trauma patients with mean s of 3.4 ± 3.2 in survivors and 11.8 in nonsurvivors (p=<0.0001). Olsson et al [15] found that the REMS was a strong predictor of in-hospital mortality in patients seen in the Emergency Departments (ED) and their research showed that all six parameters were predictive of mortality with a mean of 5.5 ± 3.4 in survivors and 10.5 ± 4.9 in nonsurvivors (p=<0.0001) but the association between mean arterial pressure and mortality was not significant on multivariate analysis.

Similar to our study Goodcare et al [16] study found that the REMS components correlated with mortality were Age, GCS, Oxygen saturation and MAP but HR and RR were associated with mortality on univariate analysis. Nolan B et al [17] found that the REMS has the necessary measurement properties to be both a predictive and evaluative clinical index to measure the prehospital severity of illness; however, no studies have adequately addressed the intra or inter reliability of the score. There is evidence to support the use of the REMS as a predictive or evaluative instrument. Ha DT et al [18] found that Both REMS and Worthing Physiological Scoring (WPS) system have good prognostic value in the prediction of death in ED patients. The WPS appeared to have a better prognostic performance than the REMS system.

In our study mean EMTRAS showed 1.7000 ± 1.7552 and 1.1702 ± 1.3004 within 30 min of admission and at 24 hrs after hospitalization respectively (p<0.0185), whereas among survivors the mean EMTRAS showed 1.4468 ± 1.4489 and among nonsurvivors, the mean showed 5.6667 ± 1.3663 at 24 hrs after hospitalization. This was significantly less among survivors than nonsurvivors (p=<0.0001). Similar to our study, Raum et al [3] also found that EMTRAS accurately predicts mortality based on 4 parameters assessed early in the emergency room (p=<0.0001). Joosse P et al [11] found that the Emergency Trauma has been developed for early estimation of mortality risk in adult trauma patients with an Injury Severity of 16 or higher. The Emergency Trauma model performs well in discriminating between trauma patients who will survive and who will not. If applied to all trauma patients, predicted mortality risks are too high in the low-risk category.

Similar to our study Raum et al [3] found that the strongest predictors of mortality were age, prehospital Glasgow Coma Scale, base excess (mmol/L), and prothrombin time (% of reference). EMTRAS combines four early parameters from the emergency room and accurately predicts mortality. Mangini M et al [19] found that the Predictive value of the EMTRAS was compared with the Injury Severity (ISS), Revised Trauma (RTS), Trauma Injury Severity (TRISS), and Simplified Acute Physiology (SAPS) II. In particular, patients with EMTRAS of 5, 6 and 7 had a more major risk of death (odds ratio) of 2.3, 4, and 16, respectively, than patients with EMTRAS below 5. Their preliminary results confirm that EMTRAS has a good correlation with mortality risk. Difference of mean REMS score within 30 min of patient arrival and at 24 hrs was statistically significant (p<0.0001), Difference of mean EMTRAS SCORE within 30 min of patient arrival and at 24 hrs was statistically significant (p<0.0001).

In our study area under the Receiver operating characteristics(ROC) curve for REMS was 0.689 ± 0.088 and EMTRAS was 0.789 ± 0.064. We found that the area under the ROC curve of the REMS was lesser than that of the EMTRAS. The EMTRAS showed good prognostic power for predicting hospital mortality in severely injured patients. Similar to our study Raum et al [3] found the area under the receiver operating characteristic curve for EMTRAS was 0.828. Park HO et al [12] found that higher EMTRAS and REMS scores were associated with hospital mortality (P<.001). The ROC curve demonstrated adequate discrimination (AUC = 0.957 for EMTRAS and 0.9 for REMS). The EMTRAS and the REMS are simple, accurate predictors of in-hospital mortality in patients with trauma. Our study has certain limitations; first the sample size was small. The study has been done in a single center. The study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out.

Conclusion

We conclude that both REMS and EMTRAS are easy, accurate predictors of in-hospital early mortality in Adult Trauma Patients. But in our study, EMTRAS Area Under the Receiver Operating Characteristics (AUROC) was greater than AUROC of REMS. Hence EMTRAS should have good prognostic power for predicting in-hospital early mortality in Adults Trauma patients.

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