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Investigation of the Efficacy of Risk Scoring Systems on Prognosis in Patients with STEMI Presenting to the Emergency Department

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Abstract

Aim: ST-elevation myocardial infarction (STEMI), is a common cause of morbidity and mortality. Emergency departments (ED) have a very important role in the management of these patients. Prediction of mortality in STEMI is decisive in establishing therapeutic management to improve outcomes. This study aims to investigate whether triage in emergency departments early warning score (TREWS), modified early warning scoring, national early warning score2 (NEWS-2), and rapid emergency medicine score (REMS) scoring systems are as effective as thrombolysis in myocardial infarction (TIMI), Portuguese registry of acute coronary syndromes (ProACS), and Canadian acute coronary syndrome (C-ACS) in predicting the prognosis in patients diagnosed with STEMI.

Materials and Methods: Patients presenting to a tertiary emergency service in a single center between 01.07.2021 and 30.06.2022 and diagnosed with STEMI were prospectively analyzed. The mortality prediction performances of the patients' measured scores in the first 24 hours and 30 days were evaluated.

Results: A total of 213 patients who met the criteria were included in the study. When the area under the curve values for the first 28-day mortality diagnosis were examined, the NEWS-2 [0.713 (0.574-0.852), $p<0.05$], REMS [0.768 (0.642-0.894), $p<0.05$], TREWS [0.823 (0.736-0.911), $p<0.001$], TIMI [0.761 (0.646-0.876), $p<0.05$], ProACS [0.769 (0.670-0.868), $p<0.05$], and C-ACS [0.743 (0.601-0.885), $p<0.05$] were found to be significant.

Conclusion: The TREWS, NEWS-2 and REMS scores measured at admission were seen to be as effective as the TIMI, ProACS, and C-ACS scores commonly used by cardiologists in predicting the prognosis of STEMI patients presenting to the ED. Among all these scorings, we found that the TREWS showed the best performance. We think that the TREWS score can be used to predict the prognosis of STEMI patients.

Keywords: Emergency medicine, ST-elevation myocardial infarction, mortality, TIMI risk score

Introduction

ST-elevation myocardial infarction (STEMI) is defined as a complete thrombotic occlusion of the coronary vessels caused by rupture of an atherosclerotic plaque (1). STEMI remains one of the leading causes of death worldwide. There are many factors affecting the mortality rate of STEMI patients. Factors such as old age, diabetes mellitus, killip classification, treatment delay, renal failure, emergency medical-oriented STEMI networks existence, myocardial infarction history, left ventricular ejection fraction, problematic coronary arteries existence, and improper treatment strategy. In-hospital mortality of STEMI patients ranges from 4-12%. The 1-year mortality rate of this condition is approximately 10% (2-4). The response and tendency toward unfavorable situations differ among patients with acute coronary syndrome acute coronary syndrome (ACS) receiving treatment methods administered at presentation. For this reason, individualized treatment methods should be developed by predicting the risk of

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mortality in ACS patients (5). Within this scope, several risk-scoring tools have been developed (6). Some of these commonly used risk scores are the thrombolysis in myocardial infarction (TIMI) risk score, the Portuguese registry of acute coronary syndromes (ProACS) risk score, and the Canadian acute coronary syndrome risk score (C-ACS) (6-8). The management of patients with severe conditions requires great care, and emergency departments (ED) play a crucial role in managing such patients. Evaluation methods may be helpful in some conditions, such as sepsis, acute stroke, and STEMI. Additionally, some physiological scoring systems have been proven effective in predicting mortality in patients with ED (9-12). Among these scoring systems, the modified early warning score (MEWS) (13), national early warning score-2 (NEWS-2) (14), rapid emergency medicine score (REMS) (15), and triage in emergency departments early warning score (TREWS) (16) are most commonly used for ED patients. Some risk scores, such as MEWS, NEWS-2, REMS, and TREWS, have been designed to predict critically ill outcomes, prognosis, and mortality in EDs using a variety of signs and symptoms (14-17). These scores are widely used to predict the prognosis of many critical clinical conditions, such as sepsis, COVID-19, pneumonia, and trauma. These scores are widely used to predict the prognosis of many critical clinical conditions, such as sepsis, COVID-19, pneumonia, and trauma (18-20).

In our literature search, we did not find any studies evaluating the effectiveness of the TREWS, NEWS, NEWS-2, and REMS scoring systems in predicting 24-h and 28-day mortality in patients with STEMI. The aim of this study was to investigate the effectiveness of the TREWS, MEWS, NEWS-2, and REMS scoring systems, which are commonly used by emergency physicians, and the TIMI, proACS, and C-ACS scores, which are commonly used by cardiologists, in predicting short-term mortality in patients with STEMI.

Materials and Methods

This study was conducted at the Bursa Yüksek İhtisas Training and Research Hospital Ethics Committee Department of Emergency Medicine, with approval obtained from the clinical research ethics committee of the same hospital (decision no: 2011-KAEK-25 2021/06-02, date: 23.11.2011). In the statistical analysis performed using G power 3.1 software, a sample size of 210 cases was required to conduct the study with a medium effect level (d=0.5), 5% type 1 error level, and 95% power. Patients over the age of 18 who presented to the emergency service between 01.07.2021 and 30.06.2022, diagnosed with STEMI, whose data were fully accessible, and who gave consent to participate in the study were included in this prospective study. On the other hand, patients under the age of 18, those whose data could not be reached, pregnant women, those who did not give consent for the study, and those without STEMI findings on electrocardiogram were not included in the study.

By creating a standard data entry form, patients' demographic information (age, gender), date of admission to the ED, vital signs (fever, respiratory rate per minute, oxygen saturation in room air and oxygen-assisted fingertips, saturation of peripheral oxygen, glasgow coma scale, systolic blood pressure (SBP), diastolic blood pressure, presence/absence of newly developed confusion, STEMI type, admission complaints and onset time of complaints, chronic diseases, medication use, and patient's outcome in the ED (service admission, intensive care unit admission, death, referral) were recorded. TREWS, MEWS, NEWS-2, REMS, TIMI, ProACS, and C-ACS of the patients were calculated.

Statistical Analysis

In addition, the patients were followed up for the development of mortality within 24 hours and 28 days. After the study was completed, the data in the study forms were recorded in an electronic format for statistical analysis. IBM SPSS statistics for Windows, version 21.0 (IBM Corp., Armonk, NY: USA. The released 2012) package program and MedCalc ver 20.014 (MedCalc Software Ltd., Ostend, Belgium) were used for statistical analysis. In descriptive statistics, numerical variables were expressed as mean ± standard deviation (minimum-maximum), median to range, and/or interquartile range, whereas categorical variables were expressed as number of cases and (%). The Kolmogorov-Smirnov test was used to determine the normality of data distribution. Whether the assumption of homogeneity of variances was met was investigated using Levene's test. The significance of the difference between the groups in terms of continuous numerical variables in which parametric test statistics assumptions were met was evaluated using Student's t-test, while the significance of the difference in terms of continuous numerical variables in which parametric test statistics assumptions were not met was evaluated using the Mann-Whitney U test. One-Way ANOVA or Kruskal-Wallis test was used for comparisons of groups of three or more. Receiver operating characteristic analysis was performed for predicting mortality within the first 24 hours and 28 days. In addition, a C-statistics model was administered for the first 24 hours and first 28 days of mortality prediction using the scoring systems. Logistic regression analysis was performed to determine the factors affecting mortality. Chi-square and Fisher's exact tests were used to analyze whether there was a relationship between categorical variables. $P<0.05$ was considered statistically significant. Results are presented as 95% confidence intervals (CI).

Results

A total of 213 patients were included in the study. The median age of the patients was 57 (51-67) years, and 177 (83.1%) were males. Additionally, 111 (52.1%) patients had a history of additional diseases. The most common additional disease was hypertension (n=90, 42.3%). The most common STEMI was anterior STEMI (n=114, 53.5%). Mortality was observed in 4 (1.9%) patients in the ED; it occurred within the first 24 hours in 8 (3.8%) and 28 days in 15 (7.3%) patients (Table 1).

The median SBP was 131 (110-152) mm/Hg, and the median pulse rate was 80 (67-92.5) minutes. The median REMS score of the patients was 5 (3-7), the median TREWS score was 3 (3-4), the median TIMI score was 3 (2-5) and the median ProACS score was 2 (1-3) (Table 2).

In the analysis performed to investigate whether there was a difference between the MEWS, NEWS-2, REMS, TREWS, TIMI, ProACS, and C-ACS with the first 24-hour and first 28-day mortality, the NEWS-2, REMS, TREWS, TIMI, ProACS, and C-ACS of patients who developed mortality within the first 24 hours were found to be significantly different [($p<0.05$), ($p<0.05$), ($p<0.05$), ($p<0.05$), ($p<0.05$), ($p<0.05$)]. In addition, the NEWS-2, REMS, TREWS, TIMI, ProACS, and C-ACS of patients who developed mortality within 28 days were found to be significantly different [($p<0.05$), ($p<0.001$), ($p<0.001$), ($p<0.05$), ($p<0.001$), ($p<0.05$)] (Table 3).

ROC analysis was performed for MEWS, NEWS-2, REMS, TREWS, TIMI, ProACS, and C-ACS, and the diagnostic value of the first 24 hours and first 28 days of mortality. In the analysis, the area under the curve (AUC) of TREWS 0.847 [(95% CI: 0.751-0.943),

Table 1. Clinical and demographic data

Variables		p value
Age[&]		57 (51-67)
Gender[#]	Male	177 (83.1)
	Female	36 (16.9)
Additional disease[#]		111 (52.1)
Additional diseases[#]	Hypertension	90 (42.3)
	Diabetes mellitus	58 (27.2)
	Chronic renal failure	14 (6.6)
	Hyperlipidemia	11 (5.2)
	Congestive heart failure	21 (9.9)
	Previous myocardial infarction	43 (20.2)
	Past cardiac event	57 (27.7)
Family history of cardiac event[#]		44 (20.7)
Smoking[#]		120 (53.3)
Alcohol use[#]		64 (30.3)
STEMI electrocardiography findings[#]	Anterior STEMI	60 (28.2)
	Inferior STEMI	114 (53.5)
	Inferoposterior STEMI	11 (5.2)
	Anteroseptal STEMI	6 (2.8)
	Anterolateral STEMI	11 (5.2)
	Lateral STEMI	6 (2.8)
	Posterior STEMI	4 (1.9)
	Posteriolateral STEMI	1 (0.5)
Emergency department outcome[#]	Mortality in the emergency department	4 (1.9)
	Coronary intensive care hospitalization	209 (98.1)
Mortality[#]	First 24 hours	8 (3.8)
	28 days	15 (7.3)
Total		213

[#]n (%), [&]Median (IQR 25-75), STEMI: ST-elevation myocardial infarction, IQR: Interquartile range

(p<0.05)], AUC of ProACS: 0.769 [(95% CI: 0.634-0.903), (p<0.05)], and AUC of C-ACS: 0.734 [(95% CI: 0.549-0.919), (p<0.05)]. On the other hand, the AUCs of TREWS of 0.823 [(95% CI: 0.736-0.911), (p<0.001)], AUC of ProACS: 0.769 [(95% CI: 0.670-0.868), (p<0.05)] and AUC of C-ACS: 0.743 [(95% CI: 0.601-0.885), (p<0.05)] (Figure 1).

When the TREWS had a cut off value of ≥6 in the first 24-hour mortality, the sensitivity and specificity were 62.5% and specificity was 87.3%. When the ProACS had a cutoff value of ≥3 in the first 24-hour mortality, the sensitivity and specificity were 75.0% and 70.2%, respectively. When the C-ACS had a cutoff value of ≥3 in the first 24-hour mortality, its sensitivity and specificity were 62.5% and specificity was 73%. On the other hand, when the ProACS had a cutoff value of ≥3 in the first 24-hour mortality, the sensitivity and specificity were 73.3% and specificity was 1.7%, and finally, when the cutoff value of the C-ACS in the first 24-hour mortality was ≥3, its sensitivity and specificity were 60.0% and specificity was 74.2% (Table 4).

Logistic regression analysis was performed using variables that may affect mortality within the first 24 hours. As a result of this analysis, the effective factors for the diagnosis of 24-h mortality were male sex [odds ratio (OR): 5.406 (95% CI: 1.285-22.734), p=0.021], age ≥65 years [OR: 8.181 (95% CI: 1.603-41.754), p=0.011]. On the other hand, in the logistic regression analysis performed with variables that may affect mortality in the first 28 days, the effective factors for the diagnosis of 28-day mortality were age ≥65 years [OR: 12.163 (95% CI: 3.296-44.885), p<0.001], (Table 5).

Discussion

STEMI is one of the most common emergency and critical conditions in cardiovascular patients presenting to the ED. It is important to classify the factors that affect the early risk and short-term prognosis of STEMI. Therefore, in addition to the current diagnosis, treatment modalities, and procedures, it is critical to identify clinical indicators that can assist in the early identification of high-risk patients with potential risks or poor prognosis by analyzing the risk factors of STEMI that affect prognosis to improve the quality of care and reduce the risks (21). The TIMI risk score for early mortality prediction is widely used in all cardiology guidelines, and prognostic factors are used to predict early risk in patients with STEMI (7). In the study of Wei et al. (22), when the TIMI risk score was >7.5, the sensitivity and specificity were 64.3% and the specificity was 85.3% (AUC: 0.803, p<0.001). In another study, the AUC value for in-hospital mortality among patients with STEMI was 0.832 (95% CI: 0.786-0.878) (23). In our study, it was statistically significant in predicting mortality within the first 24 hours and 28 days after STEMI. These results are consistent with the literature.

Table 2. Clinical and laboratory data

Variables	p value
GCS median IQR (25-75)	15 (15-15)
SBP mm/Hg median IQR (25-75)	131 (110-152)
DBP mm/Hg median IQR (25-75)	80 (70-94)
MBP mm/Hg median IQR (25-75)	98 (84-113)
Fever °C mean ± SD	37.35±0.36
SpO_2 % median IQR (25-75)	98 (96-99)
Heart rate/min median IQR (25-75)	80 (67-92.5)
Respiratory rate/min median IQR (25-75)	17 (15-20)
MEWS median IQR (25-75)	1 (1-2)
NEWS-2 median IQR (25-75)	1 (0-4)
REMS median IQR (25-75)	5 (3-7)
TREWS median IQR (25-75)	3 (3-4)
Killip score median IQR (25-75)	2 (1-3)
TIMI median IQR (25-75)	3 (2-5)
ProACS median IQR (25-75)	2 (1-3)
C-ACS median IQR (25-75)	1 (0-2)

GCS: Glasgow coma scale, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MEWS: Modified early warning score, NEWS-2: National early warning score-2, REMS: Rapid emergency medicine score, TREWS: Triage in emergency departments early warning score, TIMI: Thrombolysis in myocardial infarction score, ProACS: Portuguese registry on acute coronary syndromes, C-ACS: Canada acute coronary syndrome score, IQR: Interquartile range, MBP: Mean blood pressure, SpO_2: Saturation of peripheral oxygen

Table 3. First 24-hour and 28-day mortality analysis of variables

	24-hour mortality	n	Median (IQR: 25-75)	p value*	First 28-day mortality	n	Median (IQR: 25-75)	p value*
MEWS	No	205	1 (1-2)	>0.05	No	198	1 (1-2)	>0.05
	Yes	8	3.5 (0.25-9.75)		Yes	15	2 (1-4)	
	Total	213	1 (1-2)		Total	213	1 (1-2)	
NEWS-2	No	205	1 (0-3)	<0.05	No	198	1 (0-3)	<0.05
	Yes	8	7.5 (1-16)		Yes	15	4 (1-9)	
	Total	213	1 (0-4)		Total	213	1 (0-4)	
REMS	No	205	5 (3-7)	<0.05	No	198	5 (3-7)	<0.001
	Yes	8	8 (6-16.75)		Yes	15	8 (6-13)	
	Total	213	5 (3-7)		Total	213	5 (3-7)	
TREWS	No	205	3 (3-4)	<0.05	No	198	3 (3-4)	<0.001
	Yes	8	6 (4-11.5)		Yes	15	6 (4-8)	
	Total	213	3 (3-4)		Total	213	3 (3-4)	
TIMI	No	205	3 (2-5)	<0.05	No	198	3 (1.75-5)	<0.05
	Yes	8	5 (4-6.75)		Yes	15	5 (4-7)	
	Total	213	3 (2-5)		Total	213	3 (2-5)	
ProACS	No	205	2 (1-3)	<0.05	No	198	2 (1-3)	<0.001
	Yes	8	3.5 (2.25-6.25)		Yes	15	4 (2-5)	
	Total	213	2 (1-3)		Total	213	2 (1-3)	
C-ACS	No	205	1 (0-2)	<0.05	No	198	1 (0-2)	<0.05
	Yes	8	2 (1-2.75)		Yes	15	2 (1-3)	
	Total	213	1 (0-2)		Total	213	1 (0-2)	

*Mann-Whitney U test, MEWS: Modified early warning score, NEWS-2; National early warning score-2, REMS: Rapid emergency medicine score, TREWS: Triage in emergency departments early warning score, TIMI: Thrombolysis in myocardial infarction score, ProACS: Portuguese registry on acute coronary syndromes, C-ACS: Canada acute coronary syndrome score, IQR: Interquartile range

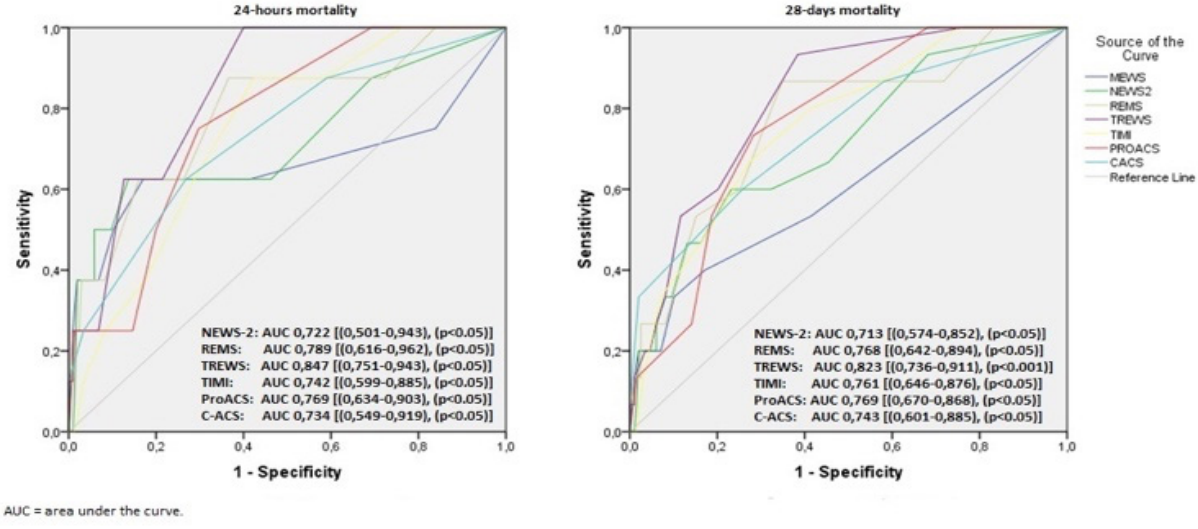

Figure 1. ROC analysis curve showing the diagnostic value of variables on mortality in the first 24 and first 28 days

AUC: Area under the curve, NEWS-2: National early warning score-2, REMS: Rapid emergency medicine score, TREWS: Triage in emergency departments early warning score, TIMI: Thrombolysis in myocardial infarction, ProACS: Portuguese registry of acute coronary syndromes, C-ACS: Canadian acute coronary syndrome

Table 4. Cut-off values of scoring systems for prediction of first 24-hour and 28-day mortality

	Variables	AUC (95% CI)	Sensitivity (%)	Specificity (%)	PPD (%)	NPD (%)
First 24-hour mortality	NEWS-2 > 6	0.722 (0.501-0.943)	62.50	86.30	15.10	98.30
	ProACS > 3	0.769 (0.634-0.903)	75.00	70.20	8.90	98.60
	REMS > 8	0.789 (0.616-0.962)	62.50	83.90	13.10	98.20
	TIMI > 5	0.742 (0.599-0.885)	62.50	71.20	7.81	97.90
	TREWS >6	0.847 (0751-0.943)	62.50	87.30	16.10	98.30
	C-ACS >2	0.734 (0.549-0.919)	62.50	73.20	8.30	98.00
First 28-day mortality	NEWS-2 > 4	0.713 (0.574-0.852)	60.00	76.80	16.30	96.20
	ProACS > 3	0.769 (0.670-0.868)	73.30	71.70	16.40	97.20
	REMS > 7	0.768 (0.642-0.894)	60.00	74.70	15.20	96.10
	TIMI > 5	0.761 (0.646-0.876)	66.70	72.70	15.60	96.60
	TREWS > 5	0.823 (0.736-0.911)	60.00	79.80	18.30	96.30
	C-ACS >2	0.743 (0.601-0.885)	60.00	74.20	15.00	96.00

MEWS: Modified early warning score, NEWS-2: National early warning score-2, REMS: Rapid emergency medicine score, TREWS: Emergency department triage early warning score, TIMI: Thrombolysis in myocardial infarction score, ProACS; Portuguese registry on acute coronary syndromes, C-ACS: Canada acute coronary syndrome score, PPD: Positive predictive value, NPD: Negative predictive value, AUC: Area under the curve, CI: Confidence interval

Huynh et al. (8) analyzed the data of several studies in 2013 and developed an effective, fast, simple, and easily applicable C-ACS score for determining short- and long term. In the study by Huang et al. (24) comparing the C-ACS score with other scoring systems in patients with ACS, the AUC value of C-ACS for in-hospital mortality in the STEMI group was 0.767 (95% CI: 0.740-0.793); p<0.001. In this study, C-ACS was found to have a lower prognostic value than age, creatinine, and ejection fraction, Global Registry of Acute Coronary Events, and age, estimated glomerular filtration rate and ejection fraction scoring systems. In addition, the C-ACS showed the lowest predictive performance in the NSTEMI group. In a study of 589 STEMI cases by He et al. (25), the AUC value of C-ACS for predicting in-hospital mortality was 0.683 (95% CI: 0.551-0.816). In this study, both NT-pro-BNP and C-ACS were found to be risk markers for poor in-hospital outcomes in patients with STEMI, and a combination of these could yield a more accurate prediction of clinical outcomes in these patients. Pogorevici et al. (26) found that C-ACS was effective in demonstrating in-hospital mortality in both the STEMI and NSTEMI groups. In that study, using C-statistics, the AUC value of C-ACS for predicting in-hospital mortality among patients with STEMI was 0.920 (95% CI: 0.89-0.94). Accordingly, the authors concluded that C-ACS was the strongest predictor of in-hospital mortality in all patients with C-ACS and well-predicted mortality in the STEMI subgroup of patients aged >75 years. Our results are consistent with the literature.

ProACS was designed by Portuguese scientists to predict short- and long-term mortality in patients with ACS (6). This newly developed score showed similar performance when the STEMI and NSTEMI groups were compared [STEMI, AUC: 0.799, (95% CI: 0.768-0.830), NSTEMI, AUC: 0.809 (95% CI: 0.774-0.845)] (6). The number of studies on ProACS is low. Some risk scores, such as MEWS, NEWS-2, REMS, and TREWS, have been designed to predict critically ill outcomes, prognosis, and mortality in EDs using a variety of signs and symptoms (14-17). These scores are widely used to predict the prognosis of many critical clinical conditions, such as sepsis, COVID-19, pneumonia, and trauma. These scores are widely used to predict the prognosis of many critical clinical conditions, such as sepsis, COVID-19, pneumonia, and trauma (18-20). There are only few studies in the literature regarding the use of MEWS, NEWS-2, REMS, and TREWS in predicting prognosis in patients with ACS (27,28). Mehmood et al. (28) suggested that the REMS is a simple and highly valid tool that can be used in emergency medicine for the diagnosis of ACS with limited resources. In a machine learning study on the early prediction of in-hospital cardiac arrest in patients with ACS, Wu et al. (29) found that the performance of the MEWS was inadequate compared with other machine learning models [AUC: 0.673 (95% CI: 0.605-0.736)]. Liu et al. (30), on the other hand, found that the AUC of MEWS was 0.672 for the prediction of acute cardiac complications. Ma et al. (27) compared the MEWS with a scale developed to predict the prognosis of patients with type 1 MI. In this study, the predictive AUC value of the MEWS in these patients was 0.800 (95% CI: 0.777-0.823).

Table 5. Logistic regression analysis of variables with 24-hour and 28-day mortality				
	Variables	**OR**	**95% CI**	**p value**
24-hour mortality	Diabetes mellitus	1.636	0.378-7.076	0.509
	Hypertension	1.383	0.336-5.687	0.652
	Heart failure	3.263	0.615-17.308	0.164
	Previous myocardial infarction	2.475	0.567-10.791	0.227
	Male gender	5.406	1.285-22.734	0.021
	Chronic renal failure	2.109	0.241-18.466	0.499
	Age ≥ 65	8.181	1.603-41.754	0.011
	Mean arterial pressure	0.995	0.972-1.019	0.711
	Heart rate	1.022	0.988-1.057	0.198
	Smoking	0.451	0.105-1.939	0.284
	Killip ≥3	4.027	0.932-17.389	0.061
	C-ACS ≥ 2	4.545	1.051-19.657	0.042
	ProACS ≥ 3	7.082	1.390-36.077	0.018
	TIMI ≥ 5	4.124	0.955-17.811	0.057
	TREWS ≥ 6	11.474	2.587-50.878	0.001
	MEWS ≥ 3	8.095	1.848-35.451	0.005
	NEWS-2 ≥6	11.059	2.537-48.199	0.001
	REMS ≥ 8	8.687	1.979-38.124	0.004
28-day mortality	Diabetes mellitus	1.871	0.635-5.514	0.255
	Hypertension	1.212	0.423-3.474	0.72
	Heart failure	2.5	0.645-9.689	0.185
	Previous myocardial infarction	0.987	0.265-3.666	0.985
	Male gender	2.693	0.861-8.421	0.088
	Chronic renal failure	1.016	0.123-8.345	0.987
	Age ≥ 65	12.163	3.296-44885	<0.001
	Mean arterial pressure	0.991	0.969-1.013	0.457
	Heart rate	1.011	0.986-1.036	0.368
	Smoking	2.771	0.913-8.408	0.071
	Killip ≥ 3	3.803	1.293-11.181	0.015
	C-ACS ≥ 2	4.32	1.466-12.744	0.007
	ProACS ≥ 3	6.973	2.131-22.817	0.001
	TIMI ≥ 5	5.333	1.743-16.316	0.003
	TREWS ≥ 5	5.925	1.993-17.617	0.001
	MEWS ≥3	1.616	0.564-4.634	0.371
	NEWS-2 ≥ 4	4.539	1.537-13.402	0.006
	REMS ≥ 7	4.225	0.928-19.236	0.062

MEWS: Modified early warning score, NEWS-2: National early warning score-2, REMS: Rapid emergency medicine score, TIMI: Thrombolysis in myocardial infarction score, TREWS: Emergency department triage early warning score, ProACS: Portuguese registry on acute coronary syndromes, C-ACS: Canada acute coronary syndrome score, OR: Odds ratio, CI: Confidence interval

As mentioned above, we could not find any study that investigated whether some scoring systems (TREWS, MEWS, NEWS-2, and REMS) are effective in predicting the prognosis of these patients and whether there is a relationship between TIMI, ProACS, and C-ACS in STEMI patients presenting to the ED. To our knowledge, this study is the first in the literature in terms of its scope. In this study, we found that TREWS, NEWS-2, REMS, TIMI, ProACS, and C-ACS were significantly different between patients who developed mortality in the first 24 hours and 28 days.

In this study, in the ROC analysis of TREWS, MEWS, NEWS-2, REMS, TIMI, ProACS, and C-ACS in the first 24 hours and 28 days of mortality in patients with STEMI, the TREWS score had the best performance among all mortality predictions in the first 24 hours and 28 days. The AUC values of the TREWS in all three periods were above 0.800. As a result, TREWS can also be used as an effective risk factor for mortality in the first 24 hours and first 28 days with age.

Study Limitations

This study has some limitations. The small number of patients and the single-center nature of the study are among the main limitations. A multicenter study would have been better in terms of patient representation. In addition, only short-term mortality was considered as another limitation in this study. It would have been better to consider mortality and other major cardiac events that may occur in the medium and long term.

Conclusion

In conclusion, we believe that TREWS measured at admission are as effective as TIMI, ProACS, and C-ACS, which are commonly used by cardiologists, in predicting the prognosis of patients with STEMI admitted to the ED. Among these scorings, we found that the TREWS had the best performance. We believe that the TREWS score can be used to predict theprognosis of patients with STEMI.

Ethics

Ethics Committee Approval: Committee approval was obtained from Bursa Yüksek İhtisas Training and Research Hospital Ethical Committee (decision no: 2011-KAEK-25 2021/06-02, date: 23.11.2011).

Informed Consent: Those who agreed to participate in the study were included in this prospective study.

Footnotes

Authorship Contributions

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

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