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To Determine the Significance of Modified Early Warning Score as a Prognostic Factor in Patients Presenting to the Emergency Department with Shock

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ABSTRACT

The present study was conducted on 80 patients in the department of emergency medicine, Narayana Medical College and Hospital, Nellore, over a period of two years. The shock was diagnosed as systolic BP <90mmHg, signs and symptoms of shock with serum lactate level >1.5. Restless and weak rapid pulse were frequent among the symptoms. The males and females are 62.5% and 37.5%. 65 (81.25%) patients had ICU admissions and 15 (18.75%) patients had ward admissions. 57 (71.25%) patients required inotropic support and 23 (28.75%) patients did not require any inotropic support. Mortality was seen in 26 (32.5%) patients and 54 (67.5%) patients were discharged. 37 patients (46.3%) required ventilator support and 43 (53.8%) patients did not require any ventilator support. 70 patients (87.5%) have MEWS score >5 and 10 (12.5%) patients have MEWS score <5. Out of 70 patients have MEWS score >5, sixty-one patients have admitted in ICU and nine patients have admitted in Wards., mortality was seen in twenty-five patients., thirty-six patients required ventilator support. MEWS score was significant predictor for the Length of Hospital stay. MEWS had a significant correlation in predicting outcomes in shock. Only one (1.3%) patient has a NEWS score less than 1, 4 (5%) patients have a score between 5 and 6 and 75 (93.8%) patients have scored >7. Among Seventy-five patients of NEWS score >7, 64 patients were admitted in ICU and 11 patients in Ward., 26 patients attained mortality., 37 required ventilator support. Only 1 (1.3%) patient has REMS score between 0-2, 19 (23.8%) patients have score between3-5, 33 (41.3%) patients have score between 6 to 9, 18 (22.5%) patients have score 10-11, and 9 (11.3%) patients have score between 12-13. Among thirty-three patients of REMS score between 6 and 9, 25 patients were admitted in ICU and eight patients in Ward; 15 patients required ventilator support. The shock index was not a significant predictor of in-hospital mortality. For ICU admissions, AUC values of MEWS, NEWS and REMS are 0.835, 0.856 and 0.712, respectively. For In-Hospital Mortality, AUC values of MEWS, NEWS, and REMS are 0.740, 0.801, and 0.906, respectively. MEWS and NEWS both performed well with significant results, but in a crowded ED population and in ED's lacking O2 supply, NEWS cannot be used. Considering the limitations of the study, And the simplicity and feasibility of MEWS, the overall performance of MEWS in the ED was significance. MEWS to be more accurate, it should be studied in a large group of populations and in multi-centers.

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Key Words
Shock, emergency, MEWS

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INTRODUCTION

Shock is an everyday life-threatening syndrome leading to significant morbidity and Mortality in Emergency and ICU[1,2]. It is viewed as a transition between life and death. It occurs due to inadequacy in cellular oxygen utilization secondary to circulatory failure[3]. Hence early identification and prioritization are mandated[2]. Shock usually results from four pathophysiological mechanisms Hypovolemic, cardiogenic, distributive, and obstructive[3]. The epidemiology of shock in the context of the emergency department is diverse and evolving[3,4]. To achieve the goal of rapidly assessing and triaging the patients in shock, a scoring system that is simple, easy to use accepted globally is mandated[5]. The scoring systems APACHE and SOFA are not suitable in an emergency department as much clinical data needs to be collected and it is time-consuming[2]. Early identification of clinical deterioration in shock improves patient outcomes[6]. Vital signs can accurately predict clinical deterioration, and hence, several Early warning systems were developed based on it. MEWS uses simple physiological parameters that can be easily collected within minutes of the initial presentation[7]. It is widely used in general wards, but data regarding its efficacy in Emergency is limited. Higher MEWS score is associated with a higher probability of ICU admissions and in-hospital Mortality[8]. The NEWS score was developed in conjunction with the Royal College of Physicians, London has a good ability to discriminate early deterioration in Ward patients. The REMS was used in predicting in-hospital Mortality exclusively[9]. Early identification of shock, resuscitation and rapid prognostication is important, especially in a busy emergency setting. Hence an Early Warning Score, which is feasible and widely accepted, needs to be developed. This study aimed to explore the performance of MEWS with regards to predicting adverse outcomes like ICU transfers, increased the length of hospital stay, Mortality. The present study is a prospective observational study from July 2017 to September 2019 conducted in patients in shock, presenting to the Emergency Department, Narayana Medical College, and Hospital, Nellore.

MATERIALS AND METHODS

Study Design: This is a prospective observational study done to determine the performance of existing early warning scores (MEWS, NEWS and REMS) systemically to prognosticate the patients presenting to the Emergency in shock rapidly.

Study Population: This study is a prospective observational type study done in patients who got admitted in the Emergency Department of Narayana Medical College and Hospital, Nellore, between July 2017 and September 2019. All the clinical and laboratory parameters required to obtain clinical prediction scores (MEWS, NEWS, REMS) are obtained.

Methodology: Demographic information such as Age, Sex, Address, chief complaints, present and past history were all collected and recorded in Prsoforma prepared for this study. Clinical examination thoroughly done, signs of shock observed and noted, and all the vitals like Heart Rate, Respiratory rate, Blood pressure, MAP, Temperature, Oxygen Saturation and GCS were stressed. The routine blood investigations such as Complete Blood picture and biochemical parameters required, such as Serum creatinine, CBG, Lactate sent. All the necessary culture samples were set up for microbial analysis., Radiological investigations like Chest Radiograph, Ultrasound were also performed in desired patients. The details of the outcome (ICU transfers, length of hospital stay, mortality) of the study were documented.

Inclusion Criteria:

- Signs and symptoms suggestive of SHOCK.
- Evaluation variables performed at the point of presentation.

Exclusion Criteria:

- Age <18.
- Previously admitted in a hospital for >48.
- Trauma.
- Pregnancy.
- Malnutrition.
- Severe Left Ventricular dysfunction.

Statistical Analysis: The data has been entered into MS-Excel and statistical analysis has been done by using IBM SPSS Version 24.0. For categorical variables, the data values are represented as number and percentages. To test the association between the groups, chi-square test was used. For continuous variables, the data values are shown as mean and standard deviation. To test the mean difference between two groups, Student's t-test was used. To test the correlation between the groups, Pearson's correlation test was used. To test the mean difference between three or more groups, ANOVA test and Kruskal-Wallis test was used. To represent a sensitivity/specificity pair corresponding to a particular decision, Receiver Operating Characteristic (ROC) curve was used and to measure how well a parameter can distinguish between two diagnostic groups, the area under the ROC curve (AUC) was used. All the p values having <0.05 are considered as statistically significant.

RESULTS AND DISCUSSIONS

Out of 80 patients, 50 pattients (62.5%) were male and 30 patients (37.5%) were female. The ratio of males to

Table 1: Patients Socio-Demographic Variables in the Present Study

		Frequency	Percentage (%)
SEX	Male	50	62.5
	Female	30	37.5
Signs and Symptoms	Restless	54	67.5
	Confusion	22	27.5
	Weak Rapid Pulse	54	67.5
	Cool Clammy Skin	23	28.7
ICU	Non-ICU	15	18.8
	ICU	65	81.3
INOTROPES	Yes	57	71.3
	No	23	28.7
MORTALITY	Yes	26	32.5
	No	54	67.5
VENTILATOR	Yes	37	46.3
	No	43	53.8
MEWS Group	>= 5	70	87.5
	< 5	10	12.5
NEWS Group	1-4	1	1.3
	5-6	4	5.0
	>= 7	75	93.8
REMS Group	0-2	1	1.3
	3-5	19	23.8
	6-9	33	41.3
	10-11	18	22.5
	12-13	9	11.3

Table 2: Comparison of Mean Age for MEWS, NEWS and REMS

			Age			
		N	Mean	Std. Deviation	t / F value	P Value
MEWS Group	< 5	10	51.00	12.996	-0.015	0.988 (Not Sig.)
	>= 5	70	51.09	16.998		
	Total	80	51.07	16.480		
NEWS Group	1-4	1	55.00	0.0	0.184	0.833 (Not Sig.)
	5-6	4	46.50	14.549		
	>= 7	75	51.27	16.733		
	Total	80	51.07	16.480		
REMS Group	0-2	1	26.00	0.0	1.226	0.307 (Not Sig.)
	3-5	19	49.16	15.514		
	6-9	33	50.70	17.832		
	10-11	18	51.06	16.423		
	12-13	9	59.33	11.435		
	Total	80	51.07	16.480		

Table 3: Association Between ICU and MEWS Group

	MEWS Group				
ICU	**< 5**	**≥ 5**	**Total**	**Chi-square value**	**P value**
ICU	4 (40.0%)	61 (87.1%)	65 (81.3%)	12.765	< 0.0001(VHS)
Non-ICU	6 (60.0%)	9 (12.9%)	15 (18.7%)		
Total	10 (12.5%)	70 (87.5%)	80 (100.0%)		

Table 4: Association Between ICU and NEWS Group

	NEWS Group					
ICU	**1-4**	**5-6**	**≥ 7**	**Total**	**Chi-square value**	**P-value**
ICU	0 (0.0%)	1 (25.0%)	64 (85.3%)	65 (81.3%)	13.462	0.001 (Sig.)
Non-ICU	1 (100.0%)	3 (75.0%)	11 (14.7%)	15 (18.7%)		
Total	1 (1.25%)	4 (5.0%)	75 (93.75%)	80 (100.0%)		

Table 5: Association Between ICU and REMS Group

	REMS Group							
ICU	**0-2**	**3-5**	**6-9**	**10-11**	**12-13**	**Total**	**Chi-square value**	**P value**
ICU	0 (0.0%)	14(73.7%)	25(75.8%)	17(94.4%)	9 (100.0%)	65 (81.3%)	9.835	0.043 (Sig.)
Non-ICU	1 (100.0%)	5 (26.3%)	8(24.2%)	1(5.6%)	0 (0.0%)	15 (18.7%)		
Total	1(1.25%)	19(23.75%)	33(41.25%)	18(22.5%)	9(11.25%)	80(100.0%)		

Table 6: Association Between Mortality and MEWS Group

	MEWS Group				
Mortality	**< 5**	**≥ 5**	**Total**	**Chi-square value**	**P value**
Yes	1 (10.0%)	25 (35.7%)	26 (32.5%)	2.637	0.104 (Not Sig.)
No	9 (90.0%)	45 (64.3%)	54 (67.5%)		
Total	10 (10.0%)	70 (70.0%)	80 (100.0%)		

Table7: Association Between Mortality and NEWS Group

	NEWS Group					
Mortality	**1-4**	**5-6**	**≥ 7**	**Total**	**Chi-square value**	**P value**
Yes	0 (0.0%)	0 (0.0%)	26 (34.7%)	26 (32.5%)	2.568	0.277(Not Sig.)
No	1 (100.0%)	4 (100.0%)	49 (65.3%)	54 (67.5%)		
Total	1 (1.25%)	4 (5.0%)	75 (93.75%)	80 (100.0%)		

Table 8: Association Between Mortality and REMS Group

	REMS Group							
Mortality	**0-2**	**3-5**	**6-9**	**10-11**	**12-13**	**Total**	**Chi-square value**	**P value**
Yes	0 (0.0%)	0 (0.0%)	7(21.2%)	11(61.1%)	8 (88.9%)	26 (32.5%)	31.31	<0.0001(VHS)
No	1 (100.0%)	19 (100.0%)	26(78.8%)	7(38.9%)	1(11.1%)	54 (67.5%)		
Total	1(1.25%)	19(23.75%)	33(41.25%)	18(22.5%)	9(11.25%)	80 (100.0%)		

Table 9: Association Between Ventilator Support and MEWS Group

	MEWS Group				
Ventilator Support	**< 5**	**≥ 5**	**Total**	**Chi-square value**	**P value**
Yes	1 (10.0%)	36 (51.4%)	37 (46.3%)	6.041	0.014 (Sig.)
No	9 (90.0%)	34 (48.6%)	43 (53.8%)		
Total	10 (10.0%)	70 (70.0%)	80 (100.0%)		

Table 10: Association Between Ventilator Support and NEWS Group

	NEWS Group				
Ventilator Support	**1-4 5-6**	**≥ 7**	**Total**	**Chi-square value**	**P value**
Yes	0 (0.0%)	0 (0.0%)	37 (49.3%)	37 (46.3%)	4.589	0.101(Not Sig.)
No	1 (100.0%)	4 (100.0%)	38 (50.7%)	43 (53.8%)		
Total	1 (1.25%)	4 (5.0%)	75 (93.75%)	80 (100.0%)		

Table 11: Association Between Ventilator Support and REMS Group

	REMS Group							
Ventilator Support	**0-2**	**3-5**	**6-9**	**10-11**	**12-13**	**Total**	**Chi-square value**	**P value**
Yes	0 (0.0%)	1 (5.3%)	15(45.5%)	13(72.2%)	8 (88.9%)	37 (46.3%)	25.18	<0.0001 (VHS)
No	1 (100.0%)	18 (94.7%)	18(54.5%)	5(27.8%)	1(11.1%)	43 (53.8%)		
Total	1(1.25%)	19(23.75%)	33(41.25%)	18(22.5%)	9(11.25%)	80 (100.0%)		

Table 12: Comparison Between the Length of Stay and MEWS Group

						Percentiles		
	N	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**	**25th**	**50th (Median)**	**75th**
Length STAY	80	5.36	2.517	1	14	3.25	5.00	7.00
MEWS_GRP	80	1.8750	.33281	1.00	2.00	2.00	2.00	2.00

Mann-Whitney U test, Z-value=-3.045, P-Value=0.002 (Sig.)

Table 13: Comparison Between the Length of Stay and NEWS Group

						Percentiles		
	N	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**	**25th**	**50th (Median)**	**75th**
Length STAY	80	5.36	2.52	1	14	3.25	5.00	7.00
NEWS Group	80	2.93	0.31	1.00	3.00	3.00	3.00	3.00

Kruskal-Wallis H test=4.554, P-Value=0.103 (Not Sig.)

Table 14: Comparison Between the Length of Stay and REMS Group

						Percentiles		
	N	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**	**25th**	**50th (Median)**	**75th**
Length STAY	80	5.36	2.517	1	14	3.25	5.00	7.00
REMS Group	80	3.1875	.96906	1.00	5.00	2.25	3.00	4.00

Kruskal-Wallis H test=6.317, P-Value=0.177 (Not Sig.)

Table 15: Association Between Shock Index and Mortality

	Mortality				
Shock Index	**Yes**	**No**	**Total**	**Chi-square value**	**P-value**
≤0.9	1 (1.9%)	4 (15.4%)	5 (6.3%)	5.485	0.019 (Sig.)
> 0.9	53 (98.1%)	22 (84.6%)	75 (93.7%)		
Total	54 (67.5%)	26 (32.5%)	80 (100.0%)		

Table 16: Diagnostic Test values of Length of stay, Shock Index, MEWS, NEWS and REMS for Predicting the Mortality

					Asymptotic 95% Confidence Interval	
Test Result Variable(s)	**Area**	**Std. Error**	**Best Cutoff value**	**P Value**	**Lower Bound**	**Upper Bound**
MEWS	0.740	0.062	7.5	0.001 Sig.	0.619	0.861
NEWS	0.801	0.049	12.5	<0.0001 VHS	0.705	0.897
REMS	0.906	0.032	7.5	<0.0001 VHS	0.844	0.968

The test result variable(s): Length_STAY, Shock_Index, MEWS, NEWS, REMS has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

Table 17: Diagnostic Test Values of Length of Stay, Shock Index, MEWS, NEWS and REMS for Predicting the ICU Admission

				Asymptotic 95% Confidence Interval	
Test Result Variable(s)	**Area**	**Std. Errora**	**P Value**	**Lower Bound**	**Upper Bound**
MEWS	.835	.047	<0.0001 VHS	.742	.928
NEWS	.856	.052	<0.0001 VHS	.755	.957
REMS	.712	.067	.011 SIG	.580	.844

The test result variable(s): Length_STAY, MEWS, NEWS, REMS has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area=0.5

Table 18: Relationship Between MEWS, NEWS and REMS Score

Spearman's rho		**MEWS**	**NEWS**	**REMS**
MEWS	Correlation Coefficient	1.000	.767**	.429**
	P Value	.	.000	.000
NEWS	Correlation Coefficient	.767**	1.000	.474**
	P Value	.000	.	.000

**P<0.0001-Very High Significant, *P<0.05-Significant

females were 1.67: 1. In the present study, males were predominent than females. The signs and symptoms in the present study, the majority of patients, 54 (67.5%) patients had restlessness as presenting symptoms to the emergency department, 54 (67.5%) patients had weak rapid pulse, 23 (28.7%) patients had cool clammy skin and 22 (27.5%) patients had confusion. In the present study among 80 patients majority of patients were admitted in ICU. 65 patients (81.3%) were transferred to ICU and 15 (18.8%) patients were treated in medical Wards. In the present study, among 80 patients, 57patients (71.3%) required inotropic support and 23 (28.7%) patients did not require any inotropic support. In the present study, among 80 patients, mortality was seen in 26(32.5%) patients, and 54 patients (67.5%) were discharged. In the present study, among 80 patient's, 37 patients (46.3%) required ventilator support and 43 (53.8%) patients did not require any ventilator support. In the present study, among 80 patients, 70 patients (87.5%) have MEWS score >5 and 10 (12.5%) patients have MEWS score <5. In the present study, among 80 patients, only 1(1.3%) patient has scored <1, 4(5%) patients have score between 5 and 6 and 75(93.8%) patients have score >7. In the present study among 80 patients only 1(1.3%) patient have score between 0-2, 19 (23.8%) patients have score between 3-5, 33(41.3%) patients have score between 6-9, 18 (22.5%) patients have score 10-11, 9(11.3%) patients have score between 12-13.

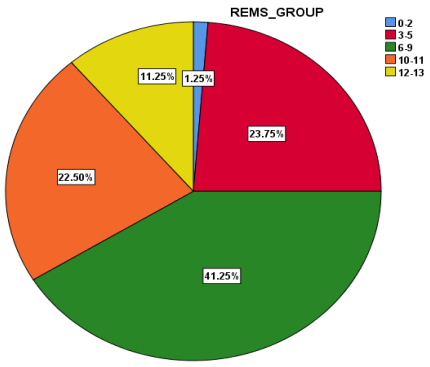

Fig. 1: Distribution of Patients According to REMS Group

Mean age of MEWS group (<5) was 51.00 ± 12.99 years and the mean age of MEWS group (>=5) was 51.09±16.99 years. However, it doesn't show any statistical significant difference between MEWS group for age (P=0.988). Mean age of NEWS group (1-4) was 55.00±0.00 years, the mean age of NEWS group (5-6) was 46.50±14.55 years and the mean age of NEWS group (>=7) was 51.27±16.73 years. However, it doesn't show any statistical significant difference between NEWS group for age (P=0.833). Mean age of REMS group (0-2) was 26.0±0.00 years, the mean age of REMS group (3-5) was 49.16±15.51 years, the mean age of REMS group (6-9) was 50.7±17.83 years, the mean age of REMS group (10-11) was 51.06±16.42 years and the mean age of REMS group (12-13) was 59.33±11.44 years. However, it doesn't show any

statistical significant difference between REMS group for age (P=0.307). Ten patients have MEWS score <5, among ten patients, four patients have admitted in ICU and six patients have admitted in Wards. 70 patients have MEWS score=5 61 patients have admitted in ICU and nine patients have admitted in Wards. There is a significant association between the number of patients admitted in the ICU and the MEWS group (P<0.0001). one patient has NEWS score between 1 and 4 and that patient was admitted in Ward, 4 patients have score between 5 and 6 among 4 patients 3 patients were admitted in Wards and 1 patient in ICU, 75 patients have score >7 64 patients were admitted in ICU and 11 patients in Ward. There is a significant association between the number of patients admitted in the ICU and the NEWS group (P=0.001).

one patient has REWS score between 0 and 2 and that patient was admitted in Ward , 19 patients have score between 3 and 5 among 19 patients 5 patients were admitted in Wards and 14 patient in ICU, 33 patients have score between 6 and 9 among 33 patients 25 patients were admitted in ICU and 8 patients in Ward. 18 patients have score between 10 and 11 among 18 patients 17 patients were admitted in ICU and 1 patient in Ward.9 patients have score between 12 and 13 among 9 patients all patients were admitted in ICU. There is a significant association between the number of patients admitted in the ICU and the REMS group (P=0.043). Ten patients have MEWS score <5, and mortality was seen in 1 patient. Seventy patients have MEWS score >5 and mortality was seen in 25 patients. There is no significant association between Mortality and MEWS group (P=0.104). One patient has a NEWS score between 1 and 4, 4 patients have a score between 5 and 6, no patient attained mortality, 75 patients have score >7 and 26 patients attained mortality. There is no significant association between Mortality and the NEWS group (P=0.277). One patient have REMS score between 0 and 2, 19 patients have score between 3 and 5 no patient attained mortality, 33 patients have score between 6 and 9 among 33 patients 7 attained mortality .18 patients have score between 10 and 11 among 18 patients 11 patients attained mortality. 9 patients have score between 12 and 13 among 9 patients 8 patients attained mortality. There is a significant association between Mortality and the REMS group (P<0.0001). Ten patients have MEWS score <5, only one patient required ventilator support, 70 patients have MEWS score >5 and 36 patients required ventilator support. There is a significant association between the number of patients who needed ventilator support and MEWS group (P=0.014). One patient has a NEWS score between 1 and 4, 4 patients have a score between 5 and 6 did not require ventilator support, 75 patients have score >7, and 37 required ventilator support. There is no significant association between a number of patients who needed ventilator support and the NEWS group (P=0.101). One patient have REMS score between 0 and 2 and did not require ventilator support 19 patients have score between 3 and 5 18 patients required ventilator support, 33 patients have score between 6 and 9 among 33 patients 15 patients required ventilator support. 18 patients have score between 10 and 11 among 18 patients 13 patients required ventilator support. 9 patients have score between 12 and 13 among 9 patients 8 patients required ventilator support. There is a significant association between a number of patients who needed ventilator support and the REMS group (P<0.0001). If the MEWS score was increased, then the length of stay was also increased. There is a significant difference between the length of stay for the MEWS group (P=0.002). If NEWS score was increased, then the length of stay was also increased. However, there is no statistically significant difference between the length of stay for the NEWS group (P=0.103). If the REMS score was increased, then the length of stay was also increased. However, there is no statistically significant difference between the length of stay for the REMS group (P=0.177). If the shock index score was increased, then mortality was also increased. However, there is a statistically significant difference between shock index and mortality (P=0.019).

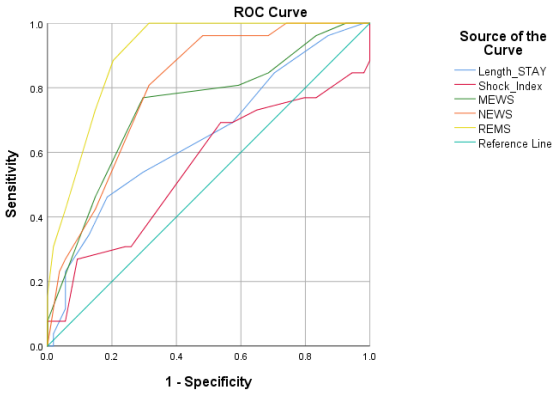

Fig. 2: ROC Curves for MEWS, NEWS and REMS for Predicting the Mortality

AUC values for MEWS, NEWS and REMS are 0.740,0.801 and 0.906 respectively showed statistically significant.

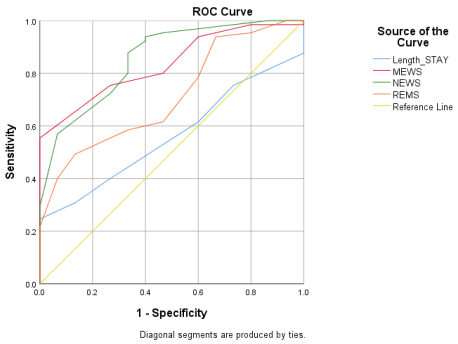

Fig. 3: ROC Curves for the Length of Stay, Shock Index, MEWS, NEWS and REMS for Predicting the ICU Admissions

AUC values for MEWS, NEWS, and REMS are 0.835, 0.856 and 0.712, respectively. MEWS and NEWS were statistically significant in predicting ICU admissions.

The relationship between MEWS and NEWS having significantly very strong positive correlation (r = 0.767, P<0.0001), the relationship between MEWS and REMS having significantly low positive correlation (r = 0.429, P<0.0001) and relationship between NEWS and REMS having significantly low positive correlation (r = 0.474, P<0.0001). Among all of the scoring systems, the MEWS has been widely used in emergency situations because it is simple and easy to use. Burch et al10 indicated that the five basic indexes of the MEWS are practical tools that can be used to rapidly and effectively estimate hospital admission and clinical death risk. The study aimed to provide a new method to early identify and estimate mortality risk in patients with severe shock in the Emergency setting. In the present study, a total of 80 patients were considered out of which 62.3% were males and 32.7% were females. Statistically, gender had no significance to the outcome. Age, as such, was not considered as an independent predictor of adverse outcomes. The mean age in the present study was 51.07±16.48 years and it did not show any statistical significance. In a study conducted by Burch *et al,* the median age was 43 years, and there was no significant difference in age and outcomes.

MEWS: In the present study, conducted in critically ill shock patients out of 80 patients, 70 patients had MEWS score >5 and out of the 61 patients got admitted into the ICU, AUROC value of 0.835 and p-value high significance.

In the study conducted by Innocenti[11]. performance of AUROC was 0.662, the population group is general ED patients with suspected infection. This study implicates that MEWS can be used as a predictor for ICU transfers in shock patients presenting to the emergency department.

NEWS: In the present study, out of 80 patients, 75 patients had a NEWS score greater than 7. Out of 75 patients, 64 patients were admitted to ICU and 11 patients in the wards. NEWS performed well with an AUC of 0.856 and a p-value significant for ICU transfers. In a study conducted by Alam[12], conducted in General ED population, NEWS performed with AUROC 0.768,

G. B. Smith[13] conducted a study in Acute Medical Care Unit, and NEWS was compared with 33 other Early Warning Scores and NEWS performed well with AUROC of 0.857, This implicates that NEWS can be a good predictor for ICU transfers in critically ill patients in shock in the Emergency Department.

REMS: In the present study, out of 80 patients, 33 patients have REMS scores between 6 and 9 among 33 patients, 25 patients were admitted in ICU and eight patients in the ward. 18 patients have score between 10 and 11 among 18 patients 17 patients were admitted in ICU and 1 patient in general wards.9 patients have score between 12 and 13 among 9 patients all patients were admitted in ICU and the AUROC value is 0.712 which is significant. This implicates that the REMS score can be used as a prognosticating tool for ICU transfers in patients presenting to the emergency department in shock.

Mortality:

MEWS: In the present study, 70 patients had a MEWS score of more than 5 out of which 45 are survivors and 25 are non-survivors, with AUC of 0.740 performed well. However, it did not show much of significance due to certain limitations. Possible explanations are, mortality depends not only on acute illness but also on Age, comorbidities which were not considered in the score. One limitation is sample size is only 80 patients; the number of non-survivor groups is also low and in-depth analysis could not be done accurately. And others are variations in the quality of critical care in the ICU. Dundar[14] conducted a study in the geriatric age group of patients presenting to the Emergency Department and AUC 0.891, MEWS score performed well in predicting mortality.

NEWS: In the present study NEWS greater than 7, the number of patients was 75, out of which 49 survivors and 26 are non-survivors, AUC value 0.801, p-value not significant. The present study NEWS, with mortality as an outcome though AUC value is 0.801 it did not show any statistical significance in predicting mortality. The limitation of this study is the low sample size.

REMS: In the present study, REMS score 10-11 number of patients was 18 out of which 7 were survivors and 11 were non-survivors and REMS score 12-13 number of patients was 9 out of which only one survived, and 8 were non-survivors. AUC value of 0.801 showed statistically very high significance. Fourteen years admitted to the hospital over a 4-year period. Higher REMS scores were associated with increased mortality ($p<0.0001$). The present study implicates that the REMS score can be used as a prognostic indicator to predict mortality in patients presenting to the Emergency Department in Shock.

Shock Index: In the present study, the Shock index as a predictor of mortality AUC value is 0.553 and is not statistically significant. Many studies are performed to date to evaluate the predictive capability of SI for mortality and to compare it with traditional vital signs or other potential predictors like serum lactate level.

A study conducted by pandit[15] in geriatric trauma patients, SI was shown to be superior to traditional vital signs for mortality prediction. However, the present study implicates that the shock index is a poor prognostic indicator of mortality as an outcome.

Length of stay:

MEWS: In the present study MEWS score <5, the mean duration of hospital stay is 3.3 days, and greater than 5, the mean duration is 5.6 days, Mann Whitney test Z value -3.045, p-value 0.002 significant. In a study conducted by Juan J Delgado[16], a random sample of 3000 patients in the Emergency department were selected and analyzed the association between mean, maximum and median values of MEWS with the length of stay and it showed a weak correlation.

NEWS: In the present study, NEWS score of 1-4 LOS was three days, 5-6 was 3.2 days, for >7 was 5.5 days, Kruskal-Wallis H test=4.554, P-value 0.103 showed no significance.

REMS: In the present study, the mean length of stay was increasing as the REMS score increased, but, Kruskal-Wallis H test=6.317, p value=0.177, which is not significant. The association length of stay in the hospital in REMS was modest order., one possible explanation is LOS reflects not only the acute severity of illness but also general morbidity. And the mortality index was more in the population of higher REMS scores. MEWS score was compared for correlation with REMS and NEWS for all the three outcomes and was found to be significant.

Clinical Implications: Early identification and prognostication of the at-risk group of patients are crucial in the Emergency Department. Intensive monitoring is an important practice in the ED. Most of the ED's use triage tools such as Emergency Severity Index, Manchester triage scale, Canadian Triage acuity scale. However, longitudinal monitoring for the patients in the ED is not guided by triage scales. Deteriorating patients are usually overlooked in a crowded ED population and the scenario worsens in an understaffed ED. Hypotension is alarming to the ED physician as it causes irreversible damage and serious adverse events if not managed at the earliest. The present study established outcomes that are important for the ED physician, such as in-hospital mortality, ICU admissions and length of stay in the Hospital. Additionally, data pertaining to need for critical care, such as the need for advanced airway and use of vasopressors, were collected and analyzed. The benefit of having an Early Warning Score like MEWS, NEWS, and REMS lies in its ability to predict the outcomes in patients with severe acute illness. Many studies were documented on Modified Early Warning Score, but the study population was generalized in Wards and the general ED population. The present study highlighted only the group of patients in Shock. MEWS uses simple physiological parameters, which take a few minutes to get in the ED. The simplicity and feasibility of the tool make it globally acceptable. The present study implicates that MEWS can be incorporated in the Emergency Department to rapidly and accurately prognosticate the patients in Shock.

CONCLUSION

Identifying at-risk, prognostication at the earliest is crucial in patients in shock in the ED is essential to the ED physician. The following conclusion can be drawn from the present study.

- MEWS can be incorporated in the ED as a tool in predicting the outcomes of patients in shock.
- Out of all the three outcomes, MEWS performed best in identifying ICU admissions and predicting the Length of Hospital stay.
- Correlation with all the three scores for in-hospital mortality was good. However, it was best predicted by REMS score.

- MEWS and NEWS both performed well with significant results, but in a crowded ED population and in ED's lacking O2 supply, NEWS cannot be used.
- Considering the limitations of the study, And the simplicity and feasibility of MEWS, the overall performance of MEWS in the ED was significance. MEWS to be more accurate, it should be studied in a large group of populations and in multi-centers.

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