The Value of Modified Early Warning Score, to Predict Outcome in Patients of Emergency Medicine Department

Vijay Kumar SS[1], Shabbir Shekhli[2], Brinda B[3], Anila Jose[4]

Author's Affiliation:
[1,4]Junior Resident, [3]Professor and HOD, Department of Emergency Medicine, Kempegowda Institute of Medical Sciences, Vishweshwarapura, Basavanagudi, Bengaluru, Karnataka 560004, India. [2]Assistant Professor, Department of Emergency Medicine, SDM College of Medical Sciences and Hospital, Sattur, Dharwad, Karnataka 580009, India.

Corresponding Author:
Shabbir Shekhli, Assistant Professor, Department of Emergency Medicine, SDM College of Medical Sciences and Hospital, Sattur, Dharwad, Karnataka 580009, India.

E-mail: drshabbir9880033401@gmail.com

Received on 10.10.2019,
Accepted on 13.11.2019

Abstract

Aims: To assess the physiological efficiency using Modified Early warning Score (MEWS) in determining the prognosis and need for type of care required to patients presenting to Emergency department (ED). *Setting and Design:* This prospective study was conducted in Emergency department of tertiary care hospital during a period of one month. *Methods and Material:* Patients presenting to ED were evaluated with history and physical examination. The data of the patients fulfilling the study inclusion criteria were recorded: pulse rate; systolic blood pressure, respiratory rate; level of consciousness and temperature. *Statistical analysis used:* Data were analyzed by the use of descriptive and analytical census (Pearson correlation coefficient) and by Statistical Package for Social Sciences [SPSS] for Windows, Version 22.0. Released in 2013. Armonk, NY: IBM Corp., was used to perform statistical analyses. *Results:* One hundred patients were included in the study, of which 21 died and 79 recovered. The mean score in mortality group was 5.819 ($p = 0.001$) and in partial recovery 4.31 ($p = 0.001$) and complete recovery groups 4.20 ($p = 0.88$) respectively. The level of significance (*p*-value) was set at $p < 0.05$. *Conclusion:* In our study, we found Modified early warning score of five or more were associated with increased risk of death or in hospital mortality.

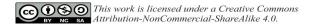**Keywords:** MEWS-Modified early warning score; ED-Emergency department.

Introduction

It is essential to stratify patients who can have higher risks of mortality when presenting to ED which in turn helps in determining the level of care.[1] The scoring system employed for triage in the ED should be based on rapidly obtainable and direct prognosis associated parameter. Physiological scoring system designed by Subbe et al., is one of the standards to determine the fatality of internal patients' condition. Summating and classification systems based on physiological criteria have been implemented in some studies.[2]

This study, aimed to determine the in-hospital

mortality using Modified early warning score (MEWS).

Materials and Methods

Study design: A prospective study was undertaken in emergency department of tertiary care hospital during a period of one month.

Study protocol: Patients in emergency department are being prognosticated based on using Modified early warning score. MEWS score was calculated at time of admission. The physiological criteria's including systolic blood pressure, heart rate, respiratory rate, temperature and consciousness based on AVPU (being alert, verbal response, response to painful stimuli and no response) was collected (Table 1,2). We are analyzing various profiles between two groups, to predict outcome of patients among; recovery group which includes complete recovery and partial recovery with mortality group.

Statistical Analysis

Statistical package for social sciences [SPSS] for Windows, Version 22.0. Armonk, NY: IBM Corp., was used to perform statistical analyses.

Descriptive Statistics

Descriptive analysis of all the explanatory and outcome parameters was done using frequency and proportions for categorical variables, whereas in Mean & SD for continuous variables.

Inferential Statistics

Chi-square test was used to compare the distribution of outcomes based on the different study characteristics of the patients.

Kruskal Wallis test and Mann Whitney test were used to compare the mean values of different vital parameters based on the outcomes among the study patients.

The level of significance (p-value) was set at $p < 0.05$

Inclusion Criteria

1. Patients >18 years age admitted with acute medical complaints.

Exclusion Criteria

1. Traumatic patients
2. Surgical patients.

Table 1: Distribution of modified early warning score 2.

Variable	3	2	1	0	1	2	3
Systolic BP (in mmHg)	<70	71–80	81–100	101–199		≥ 200	
HR (bpm)		<40	41–50	51–100	101–110	111–129	≥130
RR (cpm)		<9		9–14	15–20	21–29	≥30
Temp (in C)		<35	35–38.4			≥38.5	
AVPU Score				Alert	Reacting to voice	Reacting to pain	Unresponsive

Results

One hundred patients presenting in the ED who fulfilled inclusion criteria were included in the study. In our study subjects were all adults, youngest was 18 years of age and oldest was 85 years of age. Maximum number of subjects was in the age group of more than 60 years with male predominance (Table 2). Majority of the study population were male with 57% with higher mortality in male population (Table 4). Mean age was 52.5 among mortality group (Table 3). There was found to be male predominance in death with 24.6% and in females with 16.3% mortality. Among complete recovery group there was 45.6% among males and 55.8% in females.

The outcome was divided into three components:

- Category I as death,
- Category II as partial recovery where recovery was associated with functional disability
- Category III where patients had complete recovery.

The mean physiological score in death population was 5.81 ($p = 0.001$), among partial recovery group was 4.31 ($p = 0.001$) and in complete recovery group was 4.20 ($p = 0.88$). (Table 5)

Table 2: Age and gender distribution among study patients

Age Group	Males		Females		Total	
	n	%	n	%	n	%
12–20 years	3	5.3	2	4.7	5	5
21–30 years	9	15.8	11	25.6	20	20
31–40 years	6	10.5	8	18.6	14	14
41–50 years	12	21.1	3	7.0	15	15
51–60 years	10	17.5	6	14.0	16	16
>60 years	17	29.8	13	30.2	30	30

Table 3: Age wise distribution of outcomes among the study patients using Kruskal Wallis test

Variable	Categories	Mortality		Partial Recovery		Complete Recovery		p-value
		Mean	SD	Mean	SD	Mean	SD	
Age	Mean & SD	52.5	14.8	56.2	18.2	42.8	20.7	0.009*
	Range	17–82		21–85		17–86		

Table 4: Comparison of distribution of outcomes based on the age groups of the study patients using chi-square test

Age Groups	Death		Partial Recovery		Complete Recovery		χ^2 Value	p-Value
	n	%	n	%	n	%		
12–20 years	1	20.0	0	0.0	4	80.0	34.384	<0.001
21–30 years	0	0.0	4	20.0	16	80.0		
31–40 years	2	14.3	2	14.3	10	71.4		
41–50 years	9	60.0	3	20.0	3	20.0		
51–60 years	2	12.5	9	56.3	5	31.3		
>60 years	7	23.3	11	36.7	12	40.0		

Table 5: Comparison of mean total modified early warning scores based on the outcomes using Kruskal Wallis test followed by Mann Whitney post hoc analysis

Outcomes	N	Mean	SD	Min	Max	p-value	Sig. Diff	p-value
Death	21	5.81	1.78	3	9	0.001*	D vs PR	0.001*
Partial Recovery	29	4.31	1.89	2	10		D vs CR	0.001*
Complete Recovery	50	4.20	1.58	1	7		PR vs CR	0.88

Table 6: Distribution of modified early warning score among study patients

Variable	3		2		1		0		1		2		3	
	N	%	n	%	n	%	N	%	n	%	n	%	n	%
Systolic BP (in mmHg)	2	2.1	2	2.1	10	10.5	72	75.8			9	9.5		
HR (bpm)					1	1	69	69	15	15	6	6	9	9
RR (cpm)			2	2.0			9	9	69	69	14	14	6	6
Temp (in C)					91	91					9	9		
AVPU Score							22	22	35	35	28	28	15	15

Discussion

Medical patients presenting to Emergency Department (ED) have high heterogeneous distribution in both spectrum of the disease and severity of disease. Mortality is the most important outcome of ED care, and the rate of mortality can be used as a means for better prioritization of care and resource allocation.[3,4] The rate of mortality among ED patients is high.

In Subbe et al.[2] 2001 45% of sample were male and 55% female with a mean age of 63 years. Score of 5 or more was associated with increased risk of mortality with OR of 5.4, 95%CI

In Bulut et al. study[8] of 2000 patients 51.95% were male and 48.05% female with mean age of 61.41 ± 18.92 and MEWS≥5 increased the risk of death 3.837 (95% CI2.358 to 6.243, p <0.001) times relative to MEWS <5.

In Javasundera R et al.[9] Three studies (n = 1819) demonstrated a significant association between increasing modified EWSs (MEWSs) and increased risk of mortality. Hazards ratios for a composite death/intensive care (ICU) admission with MEWSs ≥5 were significant in this study (p = 0.003).

In our study Mean age was 52.5 among mortality group. Among mortality group Male 24.6% and females 16.3%. Among complete recovery group there was 45.6% among males and 55.8% in females. The mean physiological score in death population was 5.81 (p = 0.001), among partial recovery group was 4.31 (p = 0.001) and in complete recovery group was 4.20 (p = 0.88) Score of 5 or more associated with increased risk of death

In ED, the death of a patient is commonly preceded by a cumulative deterioration of vital signs and clinical abnormalities. Therefore, several prognostic models, including the rapid emergency medicine score, rapid Acute physiology Score and worthing physiological scoring system have been developed to make use of the clinical signs and abnormalities for predicting the risk of death in ED patients.[5-7] Higher MEWS score are more likely to occur during admission, suggesting higher risk of mortality, but if during the course of hospitalization if there is a decline in the score it also suggests beneficial of treatment which also can assess efficacy of medical intervention done.

Limitation

This is a single centric and small sampled study which can't be generalized for the whole population. In this study trauma, surgical and pregnant patients are not included. Serial reassessment of patients with MEWS score was not done.

Conclusion

The modified early warning score (EWS) is a simple physiological scoring system suitable for bedside application. A Score of 5 or more was associated with an increased risk of death. But further studies in this area require making definitive statement about usage for determining the allotment of resources like ICU care and also establishing the mean duration of stay in hospital.

References

1. Ha DT, Dang TQ, Tran NV, et al. Prognostic performance of the Rapid Emergency Medicine Score (REMS) and Worthing Physiological Scoring system (WPS) in emergency department. Int J Emerg Med. 2015 Jun 4;8:18.

2. Subbe CP, Kruger M, Rutherford P, et al. Validation of a modified Early Warning Score in medical admissions. QJM 2001;94(10):521–26. doi: 10.1093/qjmed/94.10.521.

3. Olsson T, Lind L. Comparison of the rapid emergency medicine score and APACHE II in nonsurgical emergency department patients. Academic Emergency Medicine 2003;10(10):1040–48. doi: 10.1197/S1069-6563(03)00342-7.

4. Arora P, Bhavnani A, Kole T, et al. Academic emergency medicine in India and international collaboration. Emerg Med Australas. 2013;25(4):294–96. doi: 10.1111/1742-6723.12110.

5. Subbe CP, Slater A, Menon D, Gemmell L. Validation of physiological scoring systems in the accident and emergency department. Emerg Med J 2006;23:841–45.

6. Straede M & Brabrand M. External validation of the simple clinical score and the HOTEL score, two scores for predicting short-term mortality after admission to an acute medical unit. PLoS One. 2014 Aug 21;9(8):e105695.

7. Consensus statement on the triage of critically ill patients. Society of Critical Care Medicine Ethics Committee. JAMA. 1994 Apr 20;271(15):1200-3.

8. Bulut M, Cebicci H, Sigirli D. et al. The comparison of modified early warning score with rapid emergency medicine score: a prospective multicentre observational cohort study on medical and surgical patients presenting to emergency department. Emergency Medicine Journal 2013;31(6):476–81. doi:10.1136/emermed-2013-202444

9. Javasundera R, Neilly M, Smith TO, et al. Are early warning scores useful predictors for mortality and morbidity in hospitalised acutely unwell older patients? A systematic review. J Clin Med. 2018 Sep 28;7(10) pii:E309.