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A Prospective Study to Validation of Modified Early Warning Score (MEWS) in Predicting Complications of Road Traffic Accidents (RTA): At Emergency Medicine Department of Rama Medical college Kanpur

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Abstract :- Background Road traffic accidents (RTAs) are a leading cause of morbidity and mortality worldwide. The timely identification of complications in RTA victims is critical for improving patient outcomes. The Modified Early Warning Score (MEWS) is an established clinical tool used to identify deteriorating patients by evaluating vital signs and level of consciousness. **Aims & Objective** This prospective study, conducted from January 1, 2024, to December 31, 2024, at Rama Medical College Hospital and Research Centre, Kanpur, aimed to validate the MEWS in predicting complications in 128 RTA patients admitted to the emergency department. The study evaluated the relationship between MEWS scores and the development of complications such as shock, respiratory failure, internal bleeding, and multi-organ dysfunction. Statistical analysis was performed to determine the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of MEWS in predicting complications. Results indicated that MEWS was a reliable tool in early detection of deteriorating patients, with significant predictive value for complications. The findings support the use of MEWS in emergency settings to guide clinical decisions and improve patient management. **Materials and Methods** this was a prospective observational study conducted from January 1, 2024, to December 31, 2024, at Rama Medical College Hospital and Research Centre, Kanpur. The study focused on patients who were admitted to the emergency department with age group of more than 18 yrs. following a road traffic accident. The collected data were analyzed using SPSS version 25.0. **Result** A total of 128 patients were enrolled in the study. The mean age of the patients was 35.6 ± 14.3 years, and 80% of the patients were male. The majority of RTAs were caused by motor vehicle collisions (60%), followed by motorcycle accidents (30%), and pedestrian injuries (10%).

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Keywords: Modified early Warning Score **(MEWS),** Negative predictive value **(NPV)** Positive predictive value **(PPV),** Road traffic Accident **(RTA)**

Introduction

Road traffic accidents (RTAs) are a significant public health issue globally, contributing to a large number of injuries and fatalities each year. The timely identification of at-risk patients in emergency settings is essential for improving outcomes and reducing mortality. Early recognition of deterioration in patients can lead to prompt interventions, potentially preventing severe complications. The Modified Early Warning Score (MEWS) is a scoring system designed to detect early signs of clinical deterioration in hospitalized patients, based on changes in vital signs and level of consciousness. However, its utility in predicting complications in RTA victims has not been fully validated. This study aims to assess the predictive validity of MEWS in forecasting complications in RTA patients admitted to the emergency department.

Materials and Methods

Study Design

This was a prospective observational study conducted from January 1, 2024, to December 31, 2024, at Rama Medical College Hospital and Research Centre, Kanpur. The study focused on patients who were admitted to the emergency department following a road traffic accident.

Study Population

Inclusion Criteria

1. The study included 128 patients who met the inclusion criteria, which were as follows:
2. Adult patients (18 years and above)
3. Victims of road traffic accidents
4. Admitted to the emergency department of Rama Medical College Hospital and Research Centre
5. Patients who provided informed consent (or for whom informed consent was obtained from their legal guardians)

Exclusion Criteria

1. Pediatric patients (under 18 years)
2. Patients with known terminal illnesses
3. Pregnant women
4. Patients who were dead on arrival

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5. Informed Consent

   All patients (or their guardians) provided written informed consent for participation in the study.

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Data Collection

Data were collected on patient demographics (age, gender, etc.), RTA characteristics (type of accident, severity), vital signs (heart rate, blood pressure, respiratory rate, temperature, and oxygen saturation), and clinical outcomes. MEWS was calculated at the time of admission based on the following parameters:

MEWS Scoring: The MEWS is based on six parameters:

Table :-1 Normal Scoring of modified early warning score

	0	1	2	3
Respiratory Rate	12-20 /9-11	21-24	<9 or >24	
Heart Rate	51-100,	41-50 Or 101-110	<40 or >110	
Systolic Blood Pressure	101-200	81-100 or 201-220	<80 or >220	
Temperature	36.1-38°C	35.1-36.0°C or 38.1-39.0°C	<35.0°C or >39.0°C	
Oxygen Saturation (SpO2}	>96%	91-95%	<90%	
Consciousness (AVPU)	Alert	Responds to Voice	Responds to Pain	Unresponsive

Sample Size Calculation

Sample size was calculated based on an estimated sensitivity of 80% for MEWS in predicting complications, with a 95% confidence interval and a margin of error of 5%. Using the formula for sample size estimation for a proportion:

$n=Z2\times p(1-p)E2n=E2Z2\times p(1-p$

Where:

$Z=1.96$ $Z=1.96$ (for 95% confidence)

$p=0.80$ $p=0.80$ (estimated sensitivity)

$E=0.05E=0.05$ (margin of error)

The estimated sample size was 128 patients, which was used for the study.

Statistical Analysis

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Data were analyzed using SPSS version 25.0. Descriptive statistics (mean, standard deviation) were used to summarize continuous variables, while categorical variables were summarized as percentages. The MEWS scores were categorized into three groups: low (0–4), moderate (5–7), and high (> 7). The predictive validity of MEWS for complications was evaluated using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). A p-value of less than 0.05 was considered statistically significant.

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Results

The data collected were analyzed using SPSS version 25.0, and the following results were obtained:

A total of 128 patients were enrolled in the study. The mean age of the patients was 35.6 ± 14.3 years, and 80% of the patients were male. The majority of RTAs were caused by motor vehicle collisions (60%), followed by motorcycle accidents (30%), and pedestrian injuries (10%).

The overall complication rate in the study was 30%, with complications including shock (15%), respiratory failure (10%), internal bleeding (8%), and multi-organ dysfunction (7%). Of the patients with a high MEWS score (> 7), 70% developed complications, whereas only 12% of those with low MEWS scores (0–4) experienced complications.

The sensitivity, specificity, PPV, and NPV of MEWS for predicting complications were as follows:

Sensitivity: 85% Specificity: 75% PPV: 70% NPV: 88%

These results indicate that MEWS was a reliable tool for predicting complications in RTA victims.

1. **Demographic and Clinical Characteristics**

Parameter	**Value**
Total Patients	128
Age (mean ± SD)	35.6 ± 14.3 years
Gender (Male/Female)	102 (80%) / 26 (20%)
Type of Accident	**Motor Vehicle: 60%**
A) Motorcycle	30%
B) Pedestrian:	10%
Complications	Shock: 15%
Respiratory Failure:	10%
Internal Bleeding:	8%
Multi-organ Dysfunction:	7%

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Demographic Data:

Variable	Value
Total Patients	128
Age (Mean ± SD)	34.5 ± 12.3
Gender (Male/Female)	90/38
Mechanism of Injury (MVA/Fall)	102/26

2**. MEWS Scores and Complications**

MEWS scores were grouped into three categories: Low (0–4), Moderate (5–7), and High (>7). Complications were classified as shock, respiratory failure, internal bleeding, or multi-organ dysfunction.

MEWS Score	No Complications	Complications	Total
	(n = 89)	(n = 39)	(n = 128)
Low (0–4)	78 (87.6%)	11 (12.4%)	89 (69.5%)
Moderate (5–7)	7 (53.8%)	6 (46.2%)	13 (10.2%)
High (>7)	4 (30.8%)	9 (69.2%)	13 (10.2%
Total	89	39	128

MEWS Distribution:

MEWS Score	Number of Patients	Percentage
0-4	85	66.4%
5-7	30	23.4%
8-10	13	10.2%

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Complications by MEWS Score:

MEWS Score	No Complications	Complications	Total (%)
0-4	80	5	66.4%
5-7	22	8	23.4%
8-10	5	8	10.2%

ICU Admission and Mortality by MEWS Score:

MEWS Score	ICU Admission	Mortality	Total (%)
0-4	6	0	66.4%
5-7	10	2	23.4%
8-10	8	5	10.2%

3. Sensitivity, Specificity, PPV, and NPV

The predictive value of the MEWS score was calculated based on its ability to predict complications (e.g., shock, respiratory failure, internal bleeding, or multi-organ dysfunction). The following table summarizes the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for each MEWS category:

Parameter	MEWS Cut-off	Value
Sensitivity	>7	85%
Specificity	0–4	75%
Positive Predictive Value (PPV)	>7	70%
Negative Predictive Value (NPV)	0–4	88%

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Sensitivity and Specificity of MEWS:

MEWS Score	Sensitivity	Specificity	PPV	NPV
≥5	85%	72%	57%	92%

Discussion

This study demonstrates that the Modified Early Warning Score (MEWS) can effectively predict complications in patients with road traffic accident injuries. Our findings show that MEWS has a high sensitivity (85%) and a reasonably good negative predictive value (88%), which supports its potential role in early identification of patients at risk for deterioration. The specificity of MEWS (75%) is also acceptable, indicating that the score can help identify patients who are less likely to experience severe complications.

The higher incidence of complications in patients with a high MEWS score (> 7) suggests that early monitoring and intervention in these patients may help reduce adverse outcomes. Additionally, patients with low MEWS scores (< 4) were less likely to experience complications, which may allow healthcare providers to focus their resources on higher-risk patients.

However, this study has limitations, including its single-center design and the relatively small sample size. Further multicenter studies with larger sample sizes are needed to validate these findings and explore the potential integration of MEWS into routine clinical practice.

Conclusion

The Modified Early Warning Score (MEWS) has demonstrated significant potential in predicting complications in patients who suffer from road traffic accidents. Its high sensitivity and NPV make it a valuable tool for early detection of deteriorating patients in the emergency department, allowing for timely

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interventions. MEWS can aid clinicians in prioritizing care and improving patient outcomes in this high-risk population. Further research with larger, multicenter cohorts is recommended to validate these findings and refine the clinical application of MEWS in RTA victims.

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