International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 23s, 2025
https://theaspd.com/index.php

Assessment of Icu Admission and Length of Intensive Care Unit Stay in Acute Medical Presentations to the Emergency Department Using the Rapid Emergency Medicine Score (Rems)

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ABSTRACT

Background: *Efficient triage in the Emergency Department (ED) is essential for optimal resource utilization, particularly for patients requiring Intensive Care Unit (ICU) support. The Rapid Emergency Medicine Score (REMS), derived from routinely available clinical parameters, offers a practical method for early risk stratification in acute medical cases.*

Objective: *To assess the effectiveness of REMS in predicting ICU admission rates, duration of ICU stay, and the allocation of critical care resources in adult patients with acute medical presentations to the ED.*

Methods: *A prospective observational study was conducted at the Department of Emergency Medicine, Sri Ramachandra Institute of Higher Education and Research, Chennai, India. Adults aged ≥18 years presenting with acute medical conditions were enrolled. REMS was calculated on arrival based on six clinical variables: age, heart rate, mean arterial pressure, respiratory rate, Glasgow Coma Scale, and oxygen saturation. Patients were grouped according to REMS scores (≤8 vs. >8). Outcomes measured included ICU admission, length of ICU stay, and categorization of triage resource needs. Data were analyzed using SPSS version 26.0.*

Results: *Among 578 enrolled patients, those with REMS >8 had significantly higher ICU admission rates and longer ICU stays compared to those with REMS ≤8. The REMS showed good predictive value for ICU resource utilization, with an Area Under the Curve (AUC) of 0.8064 in ROC analysis. High REMS scores correlated with greater triage urgency and allocation of intensive monitoring and interventions.*

Conclusion: *REMS serves as a valuable triage tool for predicting ICU admission and estimating ICU stay duration in acute medical emergencies. Its application in the ED can aid in prioritizing critically ill patients and optimizing critical care resource allocation.*

INTRODUCTION

Emergency Departments (EDs) serve as the frontline of acute care, managing a wide spectrum of illnesses ranging from minor ailments to life-threatening conditions. One of the most critical challenges in this setting is the timely identification of patients who require intensive care support. Early recognition of clinical deterioration and prompt triage decisions are essential to optimize patient outcomes and ensure efficient utilization of limited healthcare resources, particularly Intensive Care Unit (ICU) beds. Delays in triage or misjudgment of clinical severity can result in adverse outcomes, increased length of hospital stay, and preventable mortality. Traditionally, several scoring systems have been used to predict disease severity and clinical outcomes, including the Acute Physiology and Chronic Health Evaluation II (APACHE II), Sequential Organ Failure Assessment (SOFA), and Simplified Acute Physiology Score (SAPS). Although these systems are robust and well-validated in ICU settings, their reliance on comprehensive laboratory investigations and time-consuming calculations limits their practical utility in the fast-paced and high-volume environment of the ED.

To address this gap, the Rapid Emergency Medicine Score (REMS) was developed as a simplified, yet effective alternative. REMS incorporates six readily available physiological variables—age, heart rate, mean arterial pressure (MAP), respiratory rate, Glasgow Coma Scale (GCS), and peripheral oxygen saturation (SpO_2)—to provide a quick assessment of patient acuity. Unlike more complex models, REMS is particularly suited for emergency settings where quick, evidence-based decisions are critical. Previous studies have demonstrated REMS to be a reliable predictor of in-hospital mortality and clinical deterioration, with some showing an area under the receiver operating characteristic curve (AUROC) exceeding 0.80. REMS has also been shown to outperform other early warning scores such as the Modified Early Warning Score (MEWS) and the Rapid Acute Physiology Score (RAPS), particularly in the context of non-surgical, non-trauma, and medically acute populations.

In addition to its mortality prediction capabilities, REMS has shown promise in identifying patients likely to require higher levels of care, includes ICU admission. Given its simplicity, objectivity, and reliance on routinely collected ED data, REMS could serve as a valuable triage tool to prioritize ICU admission and estimate length of ICU stay at the point of initial presentation. This study was undertaken to assess the effectiveness of the Rapid Emergency Medicine Score in predicting ICU admission and estimating ICU length of stay in adult patients presenting to the ED with acute medical conditions. By evaluating REMS in a real-world tertiary care setting, this study aims to provide evidence for its clinical utility in guiding early, resource-appropriate decisions in emergency care.

Table 1 Rapid Emergency Medicine Score

	SCORE						
VARIABLES	**0**	**+ 1**	**+ 2**	**+ 3**	**+ 4**	**+ 5**	**+ 6**
Age in (Years)	< 45		45 - 54	55 - 64		65 - 74	> 74
HR (/ min)	70- 109		55- 69 110- 139	40- 54 140 - 179	< 39 >179		
MAP (mmHg)	70 - 109		50 - 69 110 - 129	130 - 159	< 49 >159		
RR (/min)	12-24	10-11 25-34	6- 9	35 -49	< 5 >49		
Glasgow coma scale	>13	11 - 13	8 - 10	5 - 7	< 3		
SpO2(%)	>89	86- 89		75- 85	< 75		

METHODOLOGY

Study Design

This study was a prospective observational cohort study conducted to evaluate the effectiveness of the Rapid Emergency Medicine Score (REMS) in predicting Intensive Care Unit (ICU) admission and estimating the length of ICU stay among adult patients presenting with acute medical illnesses to the Emergency Department (ED). A prospective design was employed to enable real-time data collection and minimize recall bias, ensuring accurate evaluation of REMS-based risk stratification and outcomes.

Study Setting

The study was conducted in the Department of Emergency Medicine at Sri Ramachandra Institute of Higher Education and Research, Chennai, India. This tertiary care academic hospital has a fully functional 24-hour Emergency Department catering to diverse acute medical conditions, offering an appropriate environment for evaluating the clinical utility of REMS in real-world emergency care.

Study Participants

The Adult patients aged 18 years and above, presenting to the ED with acute medical illnesses, were included after obtaining informed consent. Patients were excluded if they had any of the following: Acute coronary syndrome, Surgical or trauma-related conditions, Cardiopulmonary resuscitation (CPR) at arrival, Prior administration of intravenous fluids or vasopressors before ED arrival, Refusal to participate or to be admitted, these exclusion criteria were established to maintain a homogeneous medical cohort and avoid confounding variables.

Data Collection and REMS Calculation

On presentation to the ED, clinical data were collected using a structured proforma. Variables included: age, heart rate, respiratory rate, systolic and diastolic blood pressures, mean arterial pressure (MAP), Glasgow Coma Scale (GCS), and oxygen saturation (SpO_2). The REMS was calculated using these parameters. Patients were categorized into two groups based on REMS scores: Group 1: REMS >8 Group 2: REMS ≤8 This classification enabled comparative analysis of outcomes based on risk stratification at triage.

Outcome Measures

The primary outcomes of this study were the need for Intensive Care Unit (ICU) admission and the duration of ICU stay among patients presenting with acute medical illnesses. These outcomes were chosen to assess the clinical utility of the Rapid Emergency Medicine Score (REMS) in predicting the requirement for critical care and estimating resource utilization. These outcomes were selected to assess the effectiveness of REMS in guiding early clinical prioritization and resource allocation in the Emergency Department. By correlating initial REMS scores with ICU-related outcomes, the study aimed to support triage decisions and improve patient stratification based on the severity of illness. REMS-based triage, helping to determine whether initial REMS scores could effectively guide early clinical decision-making and resource allocation in patients presented to the Emergency Department with acute illnesses.

Ethical Considerations

The study was conducted in accordance with the ethical standards outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee of Sri Ramachandra Institute of Higher Education and Research (DU), Chennai, India, under the approval number CSP-III/24FEB/02/42. Informed consent was obtained from all individual participants included in the study.

Statistical Analysis

Data were analyzed using SPSS software (version 26.0). Descriptive statistics were employed to summarize demographic and clinical characteristics. Categorical variables were compared using the Chi-square test, while continuous variables were analyzed using the Mann-Whitney U test, given the non-parametric nature of the data. A p-value of <0.05 was considered statistically significant, providing a rigorous assessment of the data.

RESULTS:

Table 2 Gender distribution

GENDER	NUMBER OF PATIENTS	PERCENT
Male	341	59
Female	237	41

Gender Distribution

Among the 578 patients, 341 (59%) were male patients and 237 (41%) were female patients in numbers.

REMS SCORE CATEGORIZATION:

The vital parameters on arrival to the emergency were recorded and the REMS score was calculated. REMS score ranges from 0 to 26 and the data was analyzed by categorizing the REMS score into ≤8 and >8.

Out of 578 patients, 354 patients scored ≤8, and 224 patients scored >8.

Figure 1 REMS Score categorization

Distribution of Triage Categories and Predictive Value of REMS

A total of 578 patients were triaged, with 20.3% classified as Priority 1, 59.1% as Priority 2, and 20.7% as Priority 3. The distribution of REMS scores showed a statistically significant correlation with triage categories (p = 0.000). This indicates that higher REMS scores were more frequently associated with higher-priority classifications, supporting its use in early patient prioritization.

Table 3 frequency distribution of the triage category

Variables		Frequency	Percentage
Triage category	1	159	20.3
	2	324	59.1
	3	49	20.7

Table 4 Mean comparison between variables and REMS score

		REMS		p-value
Variables		<8	>8	
	1	72	87	
	2	200	124	
Triage category	3	82	13	0.000*

REMS Score Distribution and ICU Admission

Out of the 578 patients enrolled, 376 (65.1%) required admission to the Intensive Care Unit (ICU), while 202 (34.9%) did not. Patients were grouped based on their REMS scores: 224 patients (38.7%) had REMS >8, and 354 (61.3%) had REMS ≤8.

ICU Admission and REMS Score

A significantly higher proportion of patients with REMS >8 required ICU admission compared to those with REMS ≤8 (p < 0.0001). Among the REMS >8 group, 180 patients (80.4%) were admitted to the ICU, whereas 196 patients (55.4%) in the REMS ≤8 group required ICU care.

Length of ICU Stay

The mean ICU length of stay was 5.00 days (SD 4.5) in the REMS >8 group and 4.14 days (SD 3.9) in the REMS ≤8 group. Although the REMS >8 group had a longer average stay, the difference was not statistically significant (p = 0.216).

Table 5 ICU Admission and Length of Stay by REMS Score:

Parameter	REMS ≤8 (n=354)	REMS >8 (n=224)	p-value
ICU Admissions (n, %)	196 (55.4%)	180 (80.4%)	<0.0001 *
Mean ICU Stay (days ± SD)	4.14 ± 3.9	5.00 ± 4.5	0.216
ROC AUC for ICU Admission (REMS)	-	-	0.8064 (AUC)

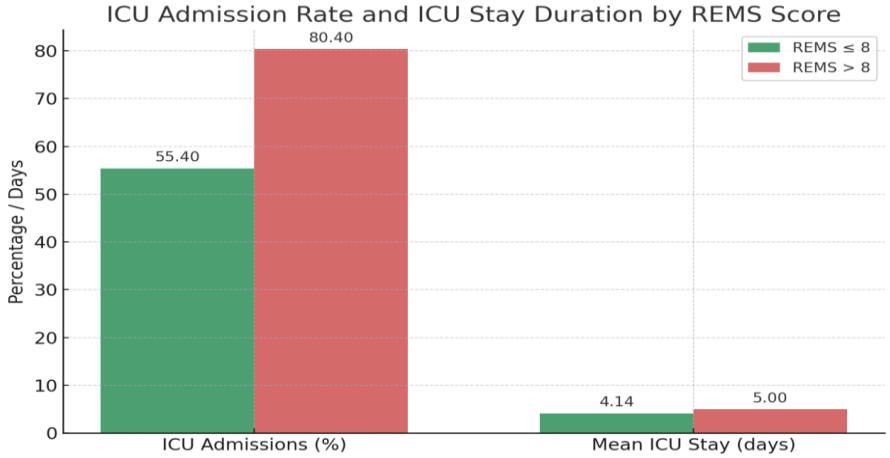


Figure 3 Here is the bar chart showing the comparison of **ICU admission rates** and **mean ICU stay duration** between patients with REMS ≤8 and REMS >8.

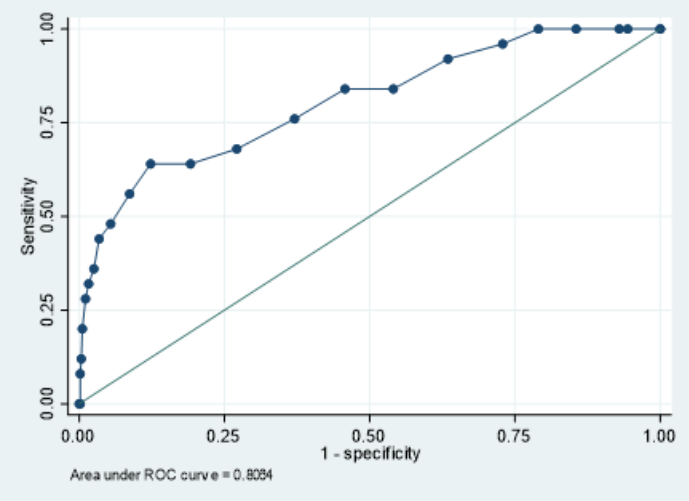
Statistically significant at $p < 0.05$

A significantly higher proportion of patients with REMS >8 were admitted to the ICU compared to those with lower scores. While ICU stay was longer in the REMS >8 group, this difference did not reach statistical significance.

Predictive Value of REMS

Receiver Operating Characteristic (ROC) analysis yielded an Area Under the Curve (AUC) of **0.8064**, indicating that REMS has **good discriminatory power** in predicting ICU admissions among acute medical patients.

Figure 4 ROC curve predictive value of REMS



DISCUSSION

This study highlights the prognostic utility of the Rapid Emergency Medicine Score (REMS) in identifying patients at risk for ICU admission in the emergency department (ED) setting. The statistically significant correlation between higher REMS scores and increased ICU admissions supports its clinical application in early triage decision-making. Patients with REMS >8 had markedly higher ICU admission rates, reinforcing REMS as a valid early warning system for identifying critically ill patients requiring intensive monitoring and care.

While the mean ICU stay was longer in patients with REMS >8, the difference was not statistically significant. This may be attributed to clinical variability in ICU practices, underlying disease severity, or effective early interventions that shortened ICU durations in lower REMS groups.

The AUC of 0.8064 further confirms REMS as a reliable triage tool with good predictive capacity. Its integration into ED protocols can aid in more accurate allocation of ICU resources, thereby optimizing outcomes and minimizing delays in critical care delivery.

CONCLUSION

This study demonstrates that the Rapid Emergency Medicine Score (REMS) is a valuable and practical triage tool for predicting ICU admission among patients presenting to the Emergency Department with acute medical conditions. A significantly higher proportion of patients with REMS >8 required ICU care, confirming the score's ability to identify individuals at increased risk of clinical deterioration. While the mean length of ICU stay was higher in the REMS >8 group, the difference was not statistically significant, suggesting that REMS may be more effective in predicting ICU need rather than the duration of stay. The ROC analysis further supports REMS as a reliable predictor, with good discriminatory power for ICU admission. Given its simplicity, objectivity, and reliance on readily available parameters, REMS can aid in early risk stratification and resource allocation in high-acuity settings. Incorporating REMS into routine ED assessment protocols can enhance clinical decision-making and improve critical care triage efficiency.

Limitations and Future Directions

This study was conducted at a single tertiary care center, which may limit the generalizability of the findings to other clinical settings. Additionally, REMS was assessed only at the time of presentation; dynamic changes in patient condition over time were not evaluated. Despite these limitations, the findings provide meaningful insights into the utility of REMS in emergency care. Future studies should consider multicenter validation and assess the benefit of incorporating serial REMS measurements or integrating the score into electronic triage systems for enhanced clinical decision-making.

Conflict of Interest

The authors declare **no conflict of interest** related to this study.

Funding

This study received **no external funding** and was conducted as part of the institutional academic and clinical research activities of the Department of Emergency Medicine, Sri Ramachandra Institute of Higher Education and Research, Chennai, India.

REFERENCES:

1. Ala A, Vahdati SS, Jalali M, Parsay S. Rapid emergency medicine score as a predictive value for 30-day outcome of nonsurgical patients referred to the emergency department. Indian J Crit Care Med. 2020;24(6):418–22.
2. Yilmaz S, Tatliparmak AC, Karcioglu O. Should lactate levels be combined with rapid emergency medicine scores (REMS) to predict outcomes of patients with dyspnea? Signa Vitae-Journal of Anesthesiology. Available from: https://www.signavitae.com/articles/10.22514/sv.2023.024/htm
3. Bidari A, Talachian E. Rapid Emergency Medicine Score (REMS) as a predictor of early mortality in the setting of emergency department. Iran J Med Sci. 2022;47:81–82.
4. Ruangsomboon O, Phanprasert N, Jirathanavichai S, Puchongmart C, Boonmee P, Thirawattanasoot N, et al. The utility of the Rapid Emergency Medicine Score (REMS) compared with three other early warning scores in predicting in-hospital mortality among COVID-19 patients in the emergency department: a multicenter validation study. BMC Emerg Med. 2023 Dec 1;23(1):45.
5. Özdemir S, Akça Ş, Algın A, Altunok İ, Eroğlu E. Effectiveness of the rapid emergency medicine score and the rapid acute physiology score in prognosticating mortality in patients presenting to the emergency department with COVID-19 symptoms. Am J Emerg Med. 2021 Jun 10;49:259–64.
6. Özdemir S, Algın A, Akça HŞ, Altunok İ, Kokulu K, Eroğlu SE, et al. Predictive ability of the MEWS, REMS, and RAPS in geriatric patients with SARS-CoV-2 infection in the emergency department. Disaster Med Public Health Prep. 2023 May 2;17(3):e60–e66.
7. Olsson T, Lind L. Comparison of the rapid emergency medicine score and APACHE II in nonsurgical emergency department patients. Acad Emerg Med. 2003 Oct;10(10):1040–8.
8. Agilan R, Kalabarathi S. Assess the Rapid Emergency Medicine Score (REMS) and Hotel Score to identify among non-surgical emergency patients. Cardiometry. 2023 Mar 1;(26):686–9.
9. Dundar ZD, Yavuz S, Aksu H, Yavuz S, Yavuz S, Yavuz S. Rapid Emergency Medicine Score as a predictor of ICU admission and in-hospital mortality in geriatric patients. J Emerg Med. 2021;60(4):e97–e104.
10. Nakhjavan-Shahraki B, Zare M, Fadaei R, Fadaei R, Fadaei R, Fadaei R. Comparison of Rapid Acute Physiology Score and Rapid Emergency Medicine Score in trauma outcome prediction: a comparative study. Trauma Mon. 2015;20(1):e17760.
11. Ha DT, Dang TQ, Tran NV, Vo NY, Nguyen ND, Nguyen TV. Prognostic performance of the Rapid Emergency Medicine Score (REMS) and Worthing Physiological Scoring system (WPS) in emergency department. Int J Emerg Med. 2015 Dec 8;8(1):e45.
12. Ruangsomboon O, Boonmee P, Limsuwat C, Chakorn T, Monsomboon A. The utility of the rapid emergency medicine score (REMS) compared with SIRS, qSOFA, and NEWS for predicting in-hospital mortality among patients with suspicion of sepsis in an emergency department. BMC Emerg Med. 2021 Dec 1;21(1):1–9.
13. Bourn SS, Crowe RP, Fernandez AR, Matt SE, Brown AL, Hawthorn AB, et al. Initial prehospital Rapid Emergency Medicine Score (REMS) to predict outcomes for COVID-19 patients. JACEP Open. 2021 Aug 1;2(4):e12552.
14. Imhoff BF, Thompson NJ, Hastings MA, Nazir N, Moncure M, Cannon CM. Rapid Emergency Medicine Score (REMS) in the trauma population: a retrospective study. BMJ Open. 2014;4(6):e4738.
15. Rapid Emergency Medicine score: a new prognostic tool for in-hospital mortality in nonsurgical emergency department patients. Emerg Med J. 2004;21(5):551–4.