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Original Article

Rapid Emergency Medicine Score and HOTEL Score in Geriatric Patients Admitted to the Emergency Department☆,☆☆

Zerrin Defne Dundar [1]*, Mehmet Akif Karamercan [2], Mehmet Ergin [1], Tamer Colak [1], Alpay Tuncar [1], Kursat Ayrancı [1], Sedat Kocak [1], Basar Cander [1]

[1] *Emergency Medicine Department, Necmettin Erbakan University Meram Faculty of Medicine, Konya,* [2] *Emergency Medicine Department, Gazi University Faculty of Medicine, Ankara, Turkey*

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SUMMARY

Background: Emergency risk scoring systems have been defined in order to identify the health status of the patients on admission to the emergency department. In this study, we aimed to investigate the prognostic values of Rapid Emergency Medicine Score (REMS), REMS without age and the HOTEL scores in geriatric patients.

Methods: This prospective, single-centered, observational study was carried out between the January 15, 2014 February 28, 2014. Patients admitted to the emergency department during the study period and aged 65 years or older were included in the study.

Results: In total, 939 patients were included in the study. In predicting the intensive care unit admission, the area under the curve values of the REMS, REMS without age, and HOTEL scores were 0.772, 0.760, and 0.827 ($p < 0.001$, for all), respectively. The median (interquartile range) REMS and REMS without age scores of the nonsurvivors were statistically significantly higher than those of the survivors [10 (6) vs. 6 (3), 5 (6) vs. 1 (2), respectively; $p < 0.001$ for both]. Similarly, the HOTEL scores of the nonsurvivors were also statistically significantly higher than those of the survivors [2 (1) vs. 1(1), $p < 0.001$]. In predicting the in-hospital mortality, the area under the curve values of the REMS, REMS without age and HOTEL scores were 0.833, 0.819, and 0.858 ($p < 0.001$ for all), respectively.

Conclusion: The REMS, REMS without age, and the HOTEL scores cannot be efficiently employed to discriminate geriatric patients requiring hospitalization. Nonetheless, all three scores are proper predictive systems regarding intensive care unit admission and in-hospital mortality in geriatric emergency department patients.

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1. Introduction

A proper triage is an important component of patient management in emergency departments (EDs). For patient follow-up by the physicians, it is vital to determine which patients shall be hospitalized and which have higher mortality risks upon admission. Thus, the risk scoring system employed for triage in the ED should be based on rapidly obtainable and direct prognosis-related parameters. For this reason, many risk-scoring systems have been developed in the past decade utilizing easily acquirable parameters such as vital findings and age[1–5].

Rapid Emergency Medicine Score (REMS) is one of the emergency scoring systems modified by Olsson et al[6] from Rapid Acute Physiological Score (RAPS) in 2003. It is based on six parameters and reported to be a strong predictive of in-hospital mortality[5–7]. There are studies demonstrating that REMS is as equally effective in the scoring systems as MEWS, RAPS, and CURB-65 in predicting mortality[3,7–9]. One of the superiorities of REMS over RAPS is that the REMS includes age as a parameter. In the reference study, five points were defined for patients aged 65–74 years, and six points were defined for patients older than 74 years[6]. However, when only

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* Correspondence to: Dr Zerrin Defne Dundar, Necmettin Erbakan Üniversitesi, Meram Tıp Fakültesi, Acil Tıp ABD 42080, Meram/Konya, Turkey.
E-mail address: zerdef@hotmail.com (Z.D. Dundar).

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the geriatric patient population is considered, the impression arises that the REMS version not including age may also be sufficient to determine which patients shall be hospitalized and which patients may have a mortal prognosis. To test this hypothesis, we defined the REMS without age score with the intention to compare its performance in relation to the native REMS scoring.

HOTEL is a novel scoring system developed by Kellett et al[10] in 2008 for patients in the EDs, which includes the parameters of blood pressure, oxygen saturation and body temperature, in addition to electrocardiography (ECG) findings and loss of independence. In the current literature, there are very few studies evaluating the HOTEL scoring. These studies have revealed that the HOTEL scoring is efficient in predicting early and late in-hospital mortality[10–12].

To the best of our knowledge, there is no study evaluating REMS and HOTEL scores among geriatric patients in the ED. Furthermore, our current investigations will provide the first study evaluating the REMS without age version in the geriatric population.

In this prospective study, it was aimed to investigate the prognostic values of REMS, REMS without age and the HOTEL scorings regarding hospitalization, ICU admission, and in-hospital mortality.

2. Materials and methods

2.1. Patients

This prospective, single-centered, observational study was carried out in a university hospital's ED with an annual admission rate of 62,000, between the January 15, 2014 and February 28, 2014. Patients admitted with acute medical or surgical complaints during the study period and aged 65 years or older were included in the study successively. Patients younger than 65 years, trauma patients, and patients who had undergone cardiopulmonary resuscitation by the emergency medical services were excluded from the study. The study was approved by the local ethics committee of Meram Faculty of Medicine, Necmettin Erbakan University, Konya, Turkey.

2.2. Study protocol

Each patient presenting to our ED was evaluated within 10 minutes of admission by an assistant resident of emergency medicine with the help of an attendant nurse. The vital findings assessed on the first evaluation were recorded onto the patient charts. During the study period, physicians and nurses who were responsible for the primary examination and treatment of the patients, were blinded to the study. The charts of the patients included in the study were daily revised by the study investigators.

The data of the patients fulfilling the study inclusion criteria were recorded as follows: age; sex; systolic and diastolic blood pressure; pulse rate; respiratory frequency; body temperature; peripheral oxygen saturation; Glasgow Coma Scale (GCS) score; presence of abnormal ECG findings; and loss of independence. The patients were followed-up until discharge or death for a maximum duration of 28 days. The information regarding discharge from the ED, referral to regular ward, ICU admission, and mortality were also recorded.

2.3. Measurements

The scores of REMS, REMS without age, and HOTEL were calculated using the recorded patient parameters. The REMS implemented in this study includes six parameters comprising age, pulse rate, respiratory frequency, mean arterial pressure, GCS score, and peripheral oxygen saturation (Table 1)[6]. For calculation of REMS, a basal score of five was assigned to age 65 years. REMS without age was calculated using the same REMS parameters, except the age. The HOTEL score employed in our current study was calculated, based on the parameters of systolic blood pressure, peripheral oxygen saturation, body temperature, abnormal ECG findings, and loss of independence (Table 2)[10].

Hospitalization, ICU admission, and in-hospital mortality were used as the main outcomes of the study. The patients were divided into the following four groups to evaluate hospitalizations: (1) discharged from ED; (2) admitted to a ward; (3) admitted to ICU; and (4) died in ED. For evaluation of the in-hospital mortality, the patients were divided into two groups as survivors and non-survivors. The intergroup differences between the admission parameters and the scores were analyzed.

2.4. Data analysis

The normality analyses of the data were performed using the Kolmogorov–Smirnov and Shapiro–Wilk tests. It was determined that the data did not conform to a normal distribution. The numerical variables were interpreted as median (interquartile range) and the categoricals were evaluated as quantities (percentage). The intergroup differences of the numerical variables were analyzed using the Kruskal–Wallis and the Mann–Whitney *U* (with Bonferroni correction) tests. The intergroup differences of the categorical variables were determined using the Chi-square and Fisher's exact tests.

The strengths of the REMS, REMS without age and HOTEL scores to predict hospitalization, ICU admission, and in-hospital mortality were evaluated with the receiver–operating characteristic (ROC) analysis. The area under the curve (AUC) values were determined. The AUC values of each of the three scores were compared for each of the three main outcomes. For each of the three main outcomes, the optimum cut-off values of each of the three scores were

Table 1
Rapid Emergency Medicine Score.

Point	Age (y)	Pulse rate (beats/min)	Respiratory rate (breaths/min)	MAP (mmHg)	GCS score	Oxygen saturation (%)
4		<40	<6	<49	<5	<75
3		40–54			5–7	75–85
2		55–69	6–9	50–69	8–10	
1			10–11		11–13	86–89
0	<45	70–109	12–24	70–109	>13	>89
1			25–34			
2	45–54	110–139		110–129		
3	55–64	140–179	35–49	130–159		
4		>179	>49	>159		
5	65–74					
6	>74					

GCS = Glasgow Coma Scale; MAP = mean arterial pressure.

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