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Comparison of APACHE II, SAPS II and GRACE 2.0 risk scores to estimate early and late mortality in patients with ST-segment elevation acute myocardial infarction

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Background: Many specific prognostic risk scores have been validated for myocardial infarction (MI), such as the Global Registry of Acute Coronary Events (GRACE) 2.0. Other general risk scores are used in intensive care units (ICUs), such as the Acute Physiologic and Chronic Health Evaluation (APACHE) II and the Simplified Acute Physiology Score (SAPS) II.

Purpose: Compare the ability of GRACE 2.0, APACHE II and SAPS II risk scores to estimate in-hospital, 3- and 12-month mortality after primary angioplasty (PA) for ST-segment elevation MI (STEMI).

Methods: Retrospective cohort of 427 consecutive STEMI patients (64 years [55–75]; 78% men) admitted to a general ICU between November-2013 and February-2017. We used Area under the Receiver Operating Characteristic (ROC) curve (AUC) analysis to asses performance of risk scores, and the Hosmer-Lemeshow (HL) goodness of fit test and the Standardized Mortality Ratio (SMR) to assess calibration.

Results: All risk scores were associated with in-hospital, 3- and 12-month mortality (P<0.001). SAPS II had the highest sensitivity for short-term mortality and the highest AUC for in-hospital, 3- and 12-month mortality (Figure). SAPS II had the highest calibration and the less underestimation of mortality in all follow-up periods analysed (Table).

Conclusions: SAPS II represents the best model to estimate mortality in this cohort of STEMI patients, with an appropriate calibration and less underestimation of mortality. Underestimation of mortality showed by all risk scores suggests the need of creating new risk prediction models that improve identification of high risk STEMI patients.

Performance of prognostic risk scores

	Youden index (J)	Sensitivity (%)	Specificity (%)	AUC (95% CI)	H-L (P value)	SMR
In-Hospital mortality (5.4%)						
SAPS II	32	87.0	89.4	0.938 (0.887–0.988)	1.826 (0.969)	1.64
GRACE 2.0	150	86.9	83.7	0.922 (0.865–0.979)	8.111 (0.423)	1.77
APACHE II	17	82.6	93.8	0.896 (0.841–0.986)	11.941 (0.154)	1.92
3-month mortality (5.6%)						
SAPS II	32	79.2	89.1	0.913 (0.854–0.973)	3.635 (0.821)	1.85
GRACE 2.0	150	79.1	85.4	0.902 (0.842–0.962)	5.149 (0.742)	2.0
APACHE II	17	79.1	93.8	0.882 (0.792–0.971)	9.244 (0.322)	2.0
12-month mortality (7.0%)						
SAPS II	32	73.3	89.7	0.880 (0.809–0.951)	1.994 (0.960)	1.58
GRACE 2.0	150	76.7	84.1	0.878 (0.816–0.941)	4.073 (0.850)	2.31
APACHE II	17	70.0	92.4	0.824 (0.722–0.927)	7.464 (0.487)	2.14

AUC: Area under the curve; H-L: Hosmer-Lemeshow; SMR: Standardized Mortality Ratio.

Area under the ROC curves (AUC)