EDITORIAL

Risk Scores in Acute Coronary Syndrome: Current Applications and Future Perspectives

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Editorial referring to the article: Validation of the Grace Risk Score to Predict In-Hospital and 6-Month Post-Discharge Mortality in Patients with Acute Coronary Syndrome

Acute Coronary Syndrome (ACS) is the most common cause of death worldwide.[1] Nevertheless, ACS represents a heterogenous group of diseases, encompassing since low-risk unstable angina (30-day mortality below 1%), until patients with ST-elevation myocardial infarction (STEMI) and cardiogenic shock (30-day mortality around 50%). Multivariable prediction models have been developed to classify short-term and long-term risk of these patients (Table 1). For patients with the diagnosis of ACS, the TIMI risk score and the Global Registry of Acute Coronary Events (GRACE) score have been largely used in clinical practice; the latter, despite being more complex, has shown better performance as a prognostic tool, including prognostic information not only about the acute phase but also about the risk within six months after the cardiac event.[2]

Neves et al.,[3] analyzed the performance of GRACE score in 160 patients admitted for ACS in a single center in Brazil. The results corroborate the good discrimination and calibration of GRACE score for in-hospital mortality in the Brazilian population and added information regarding its performance for six-month mortality.[3] Despite the limited number of events and wide confidence intervals, the consistency of good discrimination and calibration of this score in different populations reinforces this model as an appropriate tool to estimate the risk of patients with ACS.[2,3]

Keywords

Acute Coronary Syndrome/mortality; Prognosis; Forecasting; Models, Statistical.

Once a model has shown good performance in estimating risk, it is important to determine if this information may change the clinical practice. Patients with STEMI usually receive a standard level of care and changes in the approach are made more due to complications (e.g. cardiogenic shock) than to risk scores. However, patients with non-ST elevation ACS are more heterogenous, and risk stratification models have exerted greater influence on decision making (Table 2).[4-7] High-risk patients (GRACE score > 140) represent a group of patients who benefit from an invasive approach in the first 24 hours,[6,7] meanwhile patients at low risk may be considered for treatment outside the intensive care unit and early discharge.[8] Other risk models have been developed, as the one developed by the National Cardiovascular Data Registry (NCDR®), whose accuracy can be further improved by the continuous use of a very large and diverse database.[8,9] In addition to the individual risk estimation of patients with ACS, these models can also be used to adjust the risk of mortality in quality-improvement registries using the observed/expected ratio, which is of great value for epidemiological analysis.[9]

Finally, the use of artificial intelligence as machine learning and the technique of deep learning may represent the next step in risk prediction of patients with ACS with the potential of integrating this information into the decision-making process of diagnosis and treatment.[10] Until then, we should consider the traditional prediction models as a support in situations where they could provide useful information to the medical team and the patient about the risk of mortality. Finally, the result of a risk score should never be used apart from medical judgment and the combination of both represents the current good clinical practice.

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Table 1 – Risk scores for diagnosis and treatment of Non-ST Elevation Acute Coronary Syndromes

Risk Score	Population	Clinical Information
TIMI Risk Score	Original derivation and validation studies in patients with ACS; also validated in patients with chest pain (with a lower performance compared to the HEART score)	Risk at 14 days of all-cause mortality, new or recurrent myocardial infarction, or severe recurrent ischemia requiring urgent revascularization
GRACE	Original derivation and validation studies in patients with ACS (better performance compared to TIMI); also validated in patients with chest pain (with a lower performance compared to HEART score)	Main outcomes predicted by the GRACE score are in-hospital mortality and six-month mortality + myocardial infarction
ACTION ICU risk score	Developed in patients older than 65 years, with non-ST elevation myocardial infarction and without cardiogenic shock or cardiac arrest on presentation	Predicts complications requiring intensive care – cardiac arrest, shock, high-grade atrioventricular block, respiratory failure, stroke, or death during the index hospitalization
HEART score	Adult patients presenting with symptoms suggestive of ACS without new electrocardiographic changes or other condition that requires admission	Predicts six-week risk of major adverse cardiac event (acute myocardial infarction, percutaneous or surgical coronary revascularization and death)
EDACS	Adult patients with normal vital signs, chest pain consistent with ACS and no ongoing chest pain or crescendo angina	Predicts 30-day major adverse cardiac events (myocardial infarction, cardiac arrest, cardiogenic shock, emergency revascularization, cardiovascular death, ventricular arrhythmia and/or high atrioventricular block)
ADAPT	Suspected ACS with chest pain longer than five minutes and planned observation	Predicts 30-day major adverse cardiac events (myocardial infarction, emergency revascularization, death, ventricular arrhythmia, cardiac arrest, cardiogenic shock, or high-degree atrioventricular block)

TIMI: thrombolysis in myocardial infarction; GRACE: Global Registry of Acute Coronary Events; ACTION: Acute Coronary Treatment and Intervention Outcomes Network ICU risk score; HEART: history, electrocardiogram, age, risk factors and initial troponin; EDACS: Emergency Department Assessment of Chest Pain Score; ADAPT: indicates 2-hour accelerated, diagnostic protocol to access patients with chest pain symptoms using contemporary troponins as the only biomarkers; ACS: acute coronary syndrome.

Table 2 – Current recommendations for the management of patients with suspected or confirmed Non-ST elevation acute coronary syndromes based on risk-score[4-7]

Guidelines	Population	Recommendations based on risk-score
ESC	Confirmed ACS	An early invasive strategy within 24 h is recommended in patients with a GRACE score >140 (even without ECG or troponin abnormality); among patients with GRACE score < 140 and without ECG or troponin abnormality, the invasive strategy is not routinely recommended
BSC	Confirmed ACS	An early invasive strategy within 24 h is recommended in patients with a GRACE score >140 (even without ECG or troponin abnormality); among patients with a GRACE score between 109 and 140, the invasive strategy is recommended within 72 hours
	Suspected ACS	Patients with HEART scores ≤3 associated with negative troponin results, ECG without ischemic change, and no history of coronary artery disease can be discharged from the emergency department for outpatient reassessment
ACC/AHA	Confirmed ACS	An early invasive strategy within 24 hours is recommended in patients with a GRACE risk score >140 (even without ECG or troponin abnormality); among patients with a GRACE score between 109 and 140 (or a TIMI score ≥ 2), the invasive strategy is the standard but can be delayed until 72 hours; finally, a GRACE score < 109 indicates a standard non-invasive approach.
	Suspected ACS	Patients classified as low risk using a clinical-decision pathway (HEART, EDACS, ADAPT or NOTR) could be discharged without additional testing

BSC: Brazilian Society of Cardiology; ESC: European Society of Cardiology; ACC/AHA: American College of Cardiology/American Heart Association; ECG: electrocardiographic; ADAPT: indicates 2-hour Accelerated, diagnostic protocol to access patients with chest pain symptoms using contemporary troponins as the only biomarkers; EDACS: Emergency Department Acute Coronary Syndrome; HEART: pathway, history, ecg, age, risk factors, troponin; NOTR: no objective testing rule; TIMI: thrombolysis in myocardial infarction.

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