



ORIGINAL ARTICLE

## Is it possible to simplify risk stratification scores for patients with ST-segment elevation myocardial infarction undergoing primary angioplasty?



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### KEYWORDS

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### Abstract

**Introduction:** There are several risk scores for stratification of patients with ST-segment elevation myocardial infarction (STEMI), the most widely used of which are the TIMI and GRACE scores. However, these are complex and require several variables. The aim of this study was to obtain a reduced model with fewer variables and similar predictive and discriminative ability.

**Methods:** We studied 607 patients (age 62 years, SD=13; 76% male) who were admitted with STEMI and underwent successful primary angioplasty. Our endpoints were all-cause in-hospital and 30-day mortality. Considering all variables from the TIMI and GRACE risk scores, multivariate logistic regression models were fitted to the data to identify the variables that best predicted death.

**Results:** Compared to the TIMI score, the GRACE score had better predictive and discriminative performance for in-hospital mortality, with similar results for 30-day mortality. After data modeling, the variables with highest predictive ability were age, serum creatinine, heart failure and the occurrence of cardiac arrest. The new predictive model was compared with the GRACE risk score, after internal validation using 10-fold cross validation. A similar discriminative performance was obtained and some improvement was achieved in estimates of probabilities of death (increased for patients who died and decreased for those who did not).

**Conclusion:** It is possible to simplify risk stratification scores for STEMI and primary angioplasty using only four variables (age, serum creatinine, heart failure and cardiac arrest). This simplified model maintained a good predictive and discriminative performance for short-term mortality.

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**PALAVRAS-CHAVE**

Scores de risco;  
Síndromas coronárias  
agudas;  
Prognóstico

## Será possível simplificar os *scores* de estratificação de risco em doentes com enfarte agudo do miocárdio submetidos a angioplastia primária?

**Resumo**

**Introdução:** Existem vários *scores* para estratificação de risco em doentes com enfarte agudo miocárdico com elevação segmento ST (EAMCEST), sendo os mais utilizados o TIMI e o GRACE. Contudo, são complexos e necessitam de várias variáveis para o seu cálculo. Este estudo teve como objetivo encontrar um modelo de predição de risco, com menos variáveis e idêntica capacidade preditiva/discriminativa.

**Métodos:** Estudaram-se 607 doentes (62 anos, SD=13; 76% sexo masculino), admitidos por EAMCEST e submetidos a angioplastia primária com sucesso. Consideraram-se como *outcomes*, a mortalidade intra-hospitalar e aos 30 dias de seguimento. Para identificar quais das variáveis dos referidos *scores* se revelaram mais influentes na previsão da mortalidade, foram efetuadas análises de regressão logística.

**Resultados:** Dos dois *scores* clássicos, o GRACE foi o que apresentou melhor capacidade preditiva/discriminativa para a mortalidade intra-hospitalar, com resultados semelhantes para a mortalidade aos 30 dias. Na construção do modelo reduzido, as variáveis selecionadas foram a idade, a creatinina, a insuficiência cardíaca e a paragem cardíaca. As estimativas das probabilidades de morte intra-hospitalar, obtidas através de validação cruzada, foram comparadas com as do modelo original do *score* GRACE. As capacidades discriminativas foram idênticas tendo ainda sido obtida alguma melhoria nas estimativas das probabilidades de morte (aumento/diminuição para os doentes que morreram/não morreram).

**Conclusões:** É possível uma simplificação dos *scores* de estratificação de risco para EAMCEST e angioplastia primária com apenas as variáveis idade, creatinina, insuficiência cardíaca e paragem cardíaca. O modelo simplificado manteve um bom desempenho preditivo/discriminativo para a mortalidade a curto-prazo.

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**List of abbreviations**

ACEI	angiotensin-converting enzyme inhibitor
ACS	acute coronary syndrome
AUC	area under the curve
CABG	coronary artery bypass grafting
CI	confidence interval
GRACE	Global Registry of Acute Coronary Events
HL	Hosmer-Lemeshow
ICU	intensive care unit
IDI	integrated discrimination improvement
NRI	net reclassification improvement
OR	odds ratio
PCI	percutaneous coronary intervention
ROC	receiver operating characteristic
SD	standard deviation
STEMI	ST-elevation myocardial infarction
TIMI	Thrombolysis In Myocardial Infarction

**Introduction**

Patients with ST-segment elevation myocardial infarction (STEMI) are at increased risk of cardiovascular events, particularly death, in both short- and long-term follow-up.<sup>1,2</sup> In these patients, early risk stratification plays a central role, as the benefits of newer and more aggressive and costly treatment strategies seem to be proportional to the

risk of adverse clinical events. Different scores are now available based on initial clinical history, electrocardiogram, and laboratory tests, which enable early risk stratification on admission. The Thrombolysis In Myocardial Infarction (TIMI) score was developed using the database of a large clinical trial (Intravenous nPA for Treatment of Infarcting Myocardium Early II).<sup>3</sup> The more recent Global Registry of Acute Coronary Events (GRACE) score was based on the registry of the same name, in a population of patients across the entire spectrum of acute coronary syndromes (ACS).<sup>4</sup> Both scores were developed for short-term prognosis.

Although percutaneous coronary intervention (PCI) has significantly improved the outcome of patients with STEMI compared to fibrinolytic treatment, high-risk patients still have considerable mortality and morbidity and implementation of new treatment modalities is highly desirable.<sup>1,5,6</sup> There is no agreement on how to define high-risk patients with STEMI; different studies used different clinical definitions and scores and there is no unanimity on which definition or score should be used to identify a patient's risk category.<sup>1,7-10</sup>

The aim of this study was to compare the performance of the TIMI and GRACE scores for risk stratification of STEMI patients, and to assess the feasibility of developing a simpler model with similar predictive performance.

**Methods**

This is a retrospective study of consecutive patients admitted to our intensive care unit (ICU) with a diagnosis of STEMI

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