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ORIGINAL ARTICLE

ProACS risk score: An early and simple score for risk stratification of patients with acute coronary syndromes

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KEYWORDS
Risk stratification score;
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Abstract
Introduction: There are barriers to proper implementation of risk stratification scores in patients with acute coronary syndromes (ACS), including their complexity. Our objective was to develop a simple score for risk stratification of all-cause in-hospital mortality in a population of patients with ACS.
Methods: The score was developed from a nationwide ACS registry. The development and internal validation cohorts were obtained from the first 31 829 patients, randomly separated (60% and 40%, respectively). The external validation cohort consisted of the last 8586 patients included in the registry. This cohort is significantly different from the other cohorts in terms of baseline characteristics, treatment and mortality. Multivariate logistic regression analysis was used to select four variables with the highest predictive potential. A score was allocated to each parameter based on the regression coefficient of each variable in the logistic regression model: 1 point for systolic blood pressure $\leq$116 mmHg, Killip class 2 or 3, and ST-segment elevation; 2 points for age $\geq$72 years; and 3 points for Killip class 4.
Results: The new score had good discriminative ability in the development cohort (area under the curve [AUC] 0.796), and it was similar in the internal validation cohort (AUC 0.785, p=0.333). In the external validation cohort, there was also excellent discriminative ability (AUC 0.815), with an adequate fit.

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Conclusions: The ProACS risk score enables easy and simple risk stratification of patients with ACS for in-hospital mortality that can be used at the first medical contact, with excellent predictive ability in a contemporary population.

PALAVRAS-CHAVE
Score de estratificação de risco;
Síndromes coronárias agudas;
Prognóstico

Score de risco ProACS: em _score_ simples e precoce para estratificação de risco em doentes com síndromes coronárias agudas

Resumo
Introdução: Existem algumas barreiras à implementação adequada dos *scores* de estratificação de risco em doentes com síndrome coronária aguda (SCA), tais como a sua complexidade. O nosso objetivo foi desenvolver um *score* simples para estratificação de risco de mortalidade hospitalar de todas as causas numa população de doentes com SCA.
Métodos: O *score* foi desenvolvido a partir de um registo nacional de SCA. A coorte de desenvolvimento e de validação interna foi obtida a partir dos primeiros 31 829 doentes, aleatoriamente separados (60 e 40%, respetivamente). A coorte de validação externa é composta pelos últimos 8586 doentes incluídos no registo. Esta coorte é significativamente diferente das restantes (características basais, tratamento e mortalidade). Foi utilizada análise de regressão logística multivariada para selecionar as quatro variáveis com maior potencial preditivo e foi atribuída uma pontuação baseada no coeficiente de regressão de cada variável no modelo de regressão logística: um ponto para TAS $\leq$ 116 mmHg, classe Killip 2 ou 3, e elevação segmento ST, dois pontos para idade $\geq$ 72 anos e três pontos para classe Killip 4.
Resultados: O novo *score* tem uma boa capacidade preditiva na coorte de desenvolvimento (*area under curve* [AUC] 0,796), semelhante à coorte de validação interna (AUC 0,785, p=0,333). Na coorte de validação externa também apresentou uma excelente capacidade discriminativa (AUC 0,815), com calibração adequada.
Conclusões: O *score* de risco ProACS permite uma estratificação de risco precoce e simples em doentes com SCA para mortalidade hospitalar, que pode ser utilizada no primeiro contacto médico, com excelente capacidade preditiva numa população contemporânea.

Introduction

The management of acute coronary syndromes (ACS) has changed dramatically in the past 20 years following demonstration of the benefits associated with invasive strategies, particularly in high-risk patients.[1–5] Selection for these strategies is an important task in every patient with ACS. Several risk scores have been developed for this purpose, from both clinical trials and registries. They differ in predictive accuracy as well as in the number and type of variables included. The first to be developed was the TIMI risk score,[6,7] but its predictive accuracy is usually lower than more recent scores. The most recent and most widely used is the Global Registry of Acute Coronary Events (GRACE) risk score, developed from the GRACE registry.[8,9] This has very high predictive accuracy, but includes many variables with significant complexity, which may explain why it is often underused.[10,11]

Previously, our group and others have demonstrated that these risk scores can be simplified, with a slight reduction in predictive accuracy compared to the GRACE score, but that can be considered acceptable.[12,13] These simplified scores show similar accuracy to the TIMI risk score.[6,7,14]

Our objective was to develop a simple score for risk stratification of in-hospital mortality in patients with ACS, to be used very early in patient management, including at pre-hospital level.

Methods

The Portuguese Registry on Acute Coronary Syndromes (ProACS) is a multicenter nationwide registry of ACS. It is a prospective, continuous observational registry, with 33 participating cardiology departments from Portugal (mainland and islands).[15] Patient inclusion in the registry began on January 1, 2002, and all consecutive adult patients ($\geq$18 years) registered until October 31, 2014 were included in the present study. Criteria for inclusion in the registry were a history of chest pain at rest or other symptoms suggestive of an ACS (with the most recent episode occurring within 48 hours of admission) with or without new or presumed new significant ST-segment or T-wave changes, new left bundle