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CLINICAL PAPER

Chest pain presenting to the Emergency Department—to stratify risk with GRACE or TIMI?☆

Richard Lyon[a,*], Andrew Conway Morris[b], David Caesar[a], Sarah Gray[c], Alasdair Gray[a]

[a] *Department of Emergency Medicine, Royal Infirmary, Little France Crescent, Old Dalkeith Road, Edinburgh EH16 4SA, United Kingdom*
[b] *Intensive Care Unit, Queen Margaret Hospital, Whitefield Road, Dunfermline KY12 0SU, United Kingdom*
[c] *Scottish Trauma Audit Group, Royal Infirmary, Little France Crescent, Old Dalkeith Road, Edinburgh EH16 4SA, United Kingdom*

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Summary
Introduction: There is a need to stratify risk rapidly in patients presenting to the Emergency Department (ED) with undifferentiated chest pain. The Global Registry of Acute Coronary Events (GRACE) and the Thrombolysis in Myocardial Infarction (TIMI) scoring systems predict outcome of adverse coronary events in patients admitted to specialist cardiac units. This study evaluates the relationship between GRACE score and outcome in patients presenting to the ED with undifferentiated chest pain and establishes whether GRACE is preferential to TIMI in stratifying risk in patients in the ED setting.
Materials and methods: Descriptive study of a consecutive sample of 1000 ED patients with undifferentiated chest pain presenting to Edinburgh Royal Infirmary, Scotland. GRACE and TIMI scores were calculated for each patient and outcomes noted at 30 days. Outcomes included ST and non-ST myocardial infarction, cardiac arrest, revascularisation, unstable angina with myocardial damage and all cause mortality at 30 days. Score and outcome were compared using receiver operator characteristic curves (AUC-ROC).
Results: The GRACE score stratifies risk accurately in patients presenting to the ED with undifferentiated chest pain (AUC-ROC 0.80 (95% CI 0.75—0.85), see Table 1). The TIMI score was found to be similarly accurate in stratifying risk in the study cohort with an AUC-ROC of 0.79 (95% CI 0.74—0.85). It was only possible to calculate a complete GRACE score in 76% ($n = 760$) cases as not all the data variables were measured routinely in the ED.

☆ A Spanish translated version of the summary of this article appears as Appendix in the final online version at 10.1016/j.resuscitation.2006.11.023.

* Corresponding author. Tel.: +44 7967731172.
E-mail address: richardlyon@doctors.org.uk (R. Lyon).

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Conclusions: GRACE and TIMI are both effective in accurately stratifying risk in patients presenting to the ED with undifferentiated chest pain. The GRACE score is more complex than the TIMI score and in the ED setting TIMI may be the preferred scoring method.

Introduction

Patients presenting with undifferentiated chest pain account for a significant proportion of the Emergency Department (ED) workload. An accurate and reliable method of stratifying risk in these patients is therefore required to determine which patients are at higher risk of significant cardiac events. The Global Registry of Acute Coronary Events (GRACE)[1,2] and the Thrombolysis in Myocardial Infarction (TIMI)[3] working groups have devised scoring systems to predict outcome in patients presenting with a presumed diagnosis of acute coronary syndrome. The aims of this study were to evaluate the relationship between the GRACE score and outcome in patients presenting with undifferentiated chest pain and establish whether GRACE is preferential to TIMI in stratifying risk in patients in the ED setting.

Materials and methods

The study took place in the Emergency Department of Edinburgh Royal Infirmary, Scotland—a city-centre teaching hospital with approximately 85,000 adult attendances per year. One thousand consecutive patients presenting with chest pain were enrolled into the study over a 2-month period. Epidemiological data were collected for each patient. TIMI and GRACE scores were not calculated from the outset. Exclusion criteria were age under 20 years or where the assessing clinician judged the pain to be of non-cardiac nature.

GRACE scores were calculated retrospectively for each patient. The GRACE score consists of eight variables: age, pulse rate at presentation, systolic blood pressure at presentation, serum creatinine level at presentation, Killip score, ST-segment depression on presenting electrocardiogram, elevated initial serum cardiac biomarker levels and cardiac arrest on admission. Points are scored according to set variables for each element and the sum of the points equates to the GRACE score.[1,2] The first ECG and routine admission creatinine level were used to calculate the GRACE score. Patients with very high-risk scores (GRACE 18—20) were grouped together owing to low patient numbers.

TIMI scores were also calculated for each patient.[4]

The cohort was followed up for a 30-day period by reviewing hospital records and telephone contact with the patient's general practitioner. Outcomes were ST segment elevation myocardial infarction (STEMI) and troponin positive acute coronary syndrome (ACS) not diagnosed at first presentation, in hospital percutaneous angioplasty, all cause mortality at 30 days and re-admission within 30 days with a myocardial infarction. All of these outcomes combined gave a single measure—the 30 day major cardiac event rate.

Each value group from the GRACE score was compared with the risk of adverse outcome event using the Kruskal-Wallis analysis of variance. The GRACE and TIMI scores were evaluated against each other by comparison on Receiver Operator characteristic curves (AUC-ROC) using MS Excel and Analyse-it V1.71. The TIMI and GRACE scores were also analysed by stratification into five risk groups and measuring the correlation between the scores using Spearman's rank Correlation.

Results

The 1000 eligible patients were recruited over 75 days. Data was available for complete GRACE scoring in 760 cases. The majority ($n = 161$, 16% of sample, 75% of excluded patients) of exclusions were due to unavailability of creatinine estimation. Twenty-six patients were excluded as outcome data was incomplete. Thirty-two patients had an MI or troponin positive ACS at presentation and were deemed not to have achieved a positive outcome unless they had a subsequent event. The median age was 68 years (mean 60, range 20—85) and 62% were male. One hundred and twenty-three (16%) had an outcome event. Outcomes identified were STEMI ($n = 40$), troponin positive ACS ($n = 65$), angioplasty ($n = 29$), all cause death within 30 days ($n = 16$) or re-admission with myocardial infarction within 30 days ($n = 1$). Twenty-eight patients had multiple outcomes. The relationship between GRACE scores and outcome is described in Table 1. No patient had the highest possible score group (21).