THE 'GRACE RISK SCORE': ASSESSING HEART ATTACK RISK AND GUIDING TREATMENT

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Cardiovascular disease is the leading cause of death globally. A critical form of cardiovascular disease is Acute Coronary Syndrome (ACS), which includes heart attack and unstable angina that may lead into heart attack. ACS is mainly due to narrowing in the blood vessels supplying the heart, because of plaque build-up in the arteries. There are more than 100,000 heart attacks in the UK each year, and one in five patients is likely to die within five years of their initial heart attack. ACS is also a major burden on healthcare and society around the world.

Before 2000, predicting what would happen in the heart after early ACS symptoms was particularly difficult as the ACS population was uncharacterised. Clinical trials had not taken into consideration the full spectrum of patients and the diversity of clinical practice. As a consequence, clinicians' handling of patient treatment and outcomes was inconsistent, imprecise and often not beneficial to patient outcomes.

In response to this situation, Keith Fox, Professor of Cardiology at the University of Edinburgh, and Professor Joel Gore of the University of Massachusetts established a 10-year research programme and the largest multinational study of ACS.

The result is the Global Registry of Acute Coronary Events (GRACE).

THE RESEARCH

The Global Registry of Acute Coronary Events (GRACE) study involved more than 100,000 patients in 30 countries. This study and others identified a 'risk-treatment paradox' that existed irrespective of geographic region and healthcare system. The paradox was that lower risk rather than higher risk patients received more intensive medical treatment.

The GRACE risk score addressed this flaw in the handling of patient treatments by providing clinicians with a powerful yet user-friendly means of identifying higher risk patients at the time of their presentation. Using the GRACE risk score, eight factors – age, heart rate, systolic blood pressure, renal function, congestive heart failure, ST-segment deviation, cardiac arrest and elevated biomarkers – independently predict risk of heart attack and/or death.

In 2011 the GRACE risk score was made available as an app, and it has since been downloaded more than 10,000 times. Its emergence has received widespread international media coverage.

GRACE ACS Risk Model

At Admission (in-hospital/to 6 months) | At Discharge (to 6 months)

- Age: Years
- HR: bpm
- SBP: mmHg
- Creat.: mg/dL
- CHF: Killip Class

☐ Cardiac arrest at admission
☐ ST-segment deviation
☐ Elevated cardiac enzymes/markers

Probability of	Death	Death or MI
In-hospital	--	--
To 6 months	--	--

SI Units | Reset | Display Score

IMPACT ON CLINICAL PRACTICE

Previously used clinical parameters were inadequate to define risk of heart attack or death. The GRACE programme identified that survivors of 'non-ST elevation ACS' (previously perceived as minor or threatened heart attacks) had high long-term risks of death and recurrent heart attacks. As a consequence, a series of international randomised trials, including Professor Fox's British Heart Foundation-funded RITA 3 trial, focused on improving outcomes in non-ST elevation ACS.

By facilitating more appropriate treatment, the GRACE risk score has contributed to a change in practice and improved outcomes. Professor Fox and colleagues demonstrated temporal changes in outcomes, improved use of evidence-based treatment, a decline in deaths and a reduction by around half of heart failures due to heart attacks.

Today the widely used GRACE risk score app provides user-friendly access to the GRACE risk model. The clinician uses this information alongside his or her clinical evaluation to guide management of the patient. The GRACE score is also incorporated into a 'pocket guidelines' app developed by the European Society of Cardiology for distribution to clinicians in 55 affiliated countries.

Recent publications from others have extended the role of the GRACE risk score to other indications including pulmonary embolism and contrast renal nephropathy. There are around 300 published manuscripts and more than 4,000 citations involving the GRACE risk score, and on Google there are 46 pages of citations using the term 'GRACE risk score'. Examples include studies from clinical settings as diverse as Brazil, Portugal and China that demonstrate the efficacy of the GRACE risk score.

IMPACT ON POLICY AND PUBLIC HEALTH

The National Institute for Health and Care Excellence (NICE) tested all of the published risk scores for ACS using an unselected population of around 70,000 patients in the UK. NICE guideline 94, published in 2010, and guidelines from the European Society of Cardiology, American Heart Association and American College of Cardiology (2012) all recommend that the GRACE risk score is used because of its superior performance compared with the other published risk-scoring tools. Fifty-five countries have pledged to implement the ESC cardiovascular guidelines.

While risk scores are recommended in guidelines to aid the management of patients with ACS, internationally such scores are not always used because they are not easy to apply and some risk indicators are not available at first presentation. However, the GRACE risk score has been designed to be suitable for acute and emergency clinical settings and accessible from mobile devices, and as a consequence it commands a very high reputation among users.

The GRACE risk score has made an invaluable contribution to the evaluation of treatment outcomes and patient care. Modelling by the University of Edinburgh team suggests that implementation of the GRACE risk score produces a saving of 30–80 lives for every 10,000 patients.

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