Editorial

Composite risk scores for acute coronary syndromes

K. Sarat Chandra*

Department of Cardiology, Nizam's Institute of Medical Sciences, Hyderabad, India.

KEY WORDS

GRACE
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TIMI

A B S T R A C T

There have been considerable advances in the management of acute coronary syndromes in the recent past. There are three risk scoring systems used for prognosticating these patients. An attempt is made in this article to discuss the pros and cons of the different risk scoring systems and their clinical utility.

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Introduction

In any field of medicine, risk stratification is of utmost importance, particularly so while dealing with patients who are acutely sick, like those presenting with acute coronary syndromes (ACS). This not only enables the physician to prognosticate the illness but also to decide the mode and urgency of therapy. The management of ACS has received a great attention in the last decade or so. The debate of conservative vs. early invasive therapy continues but slowly the physicians are coming round to the view point that early invasive therapy is safe and saves more lives as seen in the ISAR-COOL and TIMACS trials.^{1,2} In fact, the major benefit of early invasive therapy is largely restricted to those at high-risk as assessed by one of the commonly used risk scoring systems as shown in Figure 1.

There are three commonly used risk scoring systems for ACS:

1. TIMI scoring system This is a simple scoring system and can be used bedside. It has originated from the thrombolysis in myocardial infarction (TIMI) 11b trial and was later validated in many important trials like TACTICS-TIMI 18 trial.^{3,4} The scoring system gives one mark to each of the following:

1. Age >65 years
2. Presence of more than three conventional risk factors
3. Use of aspirin in the previous 1 week before ACS
4. Elevated cardiac biomarkers

5. Electrocardiogram (ECG) changes of ST-deviation
 6. Angiography showing >50% lesion
 7. More than two episodes of angina in the last 24 hours.
- The TIMI score predicts the prognosis before discharge and at 14 days. The combined endpoint of death/myocardial

Figure 1 Use of the TIMI risk score for UA/NSTEMI to predict the benefit of an early invasive strategy. In a prospectively defined analysis, the TIMI risk score was applied in the Treat Angina with Aggrastat and determine Cost of Therapy with an Invasive or Conservative Strategy (TACTICS-TIMI 18 trial. As shown, 75% of patients had a risk score of three or higher, and a significant benefit of an invasive strategy was observed in these patients). (Data from Cannan CP, Weintraub WS, Demopoulos LA, et al. Comparison of early invasive and conservative strategy in unstable coronary syndromes treated with Glycoprotein IIb/IIIa inhibitor Tirofiban. NEJM 2001;344:1879–87). CI: confidence interval, CONS: conservative, INV: invasive, MI: myocardial infarction, OR: odds ratio, TIMI: thrombolysis in myocardial infarction.

*Corresponding author.

E-mail address: saratkoduganti@hotmail.com

infarction (MI)/UR at 14 days has increased from 4.7% with 0/1 risk factor to 40.9% at 6/7 risk factors, a gradient of ten times as shown in Figure 2. The problem with TIMI risk scoring is that subtle discrimination with this scoring system is not possible, also it has not been shown to discriminate the effect of revascularisation. All the same, its simplicity makes it an attractive and useful beside tool.

2. GRACE scoring system The Global Registry of Acute Coronary Events (GRACE) scoring system is the latest and has originated from GRACE registry data.⁵ It is a relatively complex scoring system and needs a computer or personal digital assistant for proper calculation. This system has incorporated more dynamic features like heart rate, blood pressure, survival from cardiac arrest, serum creatinine, and Killip class. The detailed scoring system is given below in Table 1.

3. PURSUIT scoring system The PURSUIT scoring system predicts 30-day-risk and incorporates information from early vital signs.⁶ It comprises of age, gender, worst Canadian Cardiovascular Society (CCS) angina class in previous 6 weeks, heart rate, systolic blood pressure, signs of heart failure, and ST-depression. The PURSUIT scoring system has not gained much popularity.

A comparison of the three scoring systems is shown in Table 2.

In an interesting study published in European Heart Journal, Gonçalves et al. from Portugal have applied the three scoring systems TIMI, GRACE, and PURSUIT to the same group of 460 patients admitted to a single centre.⁷ They have looked at short-term as well as long-term mortality. They have

clearly demonstrated that GRACE score was the best in predicting the risk of death or MI at 1 year after admission. There was a significant interaction between the benefit of myocardial revascularisation during initial hospitalisation and the extent of risk evaluated by GRACE and PURSUIT scores.

In this issue of Indian Heart Journal, Prabhudesai et al. from St. John's Medical College and Hospital, Bengaluru have presented the clinical data of 235 patients of ACS and attempted validation of GRACE risk score.⁸ St. John's Medical College and Hospital is a large tertiary care hospital which caters predominantly to low and middle-class population. This group of authors has well established credentials for clinical research. They have applied GRACE risk score to a cohort of patients which included ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (NSTEMI). Their study has clearly validated most of the risk markers of GRACE score. Only one patient had cardiac arrest at presentation, hence this factor could not be assessed. The increase in heart rate tended to show a correlation with risk but it was not statistically significant. All other variables of GRACE risk score have shown excellent correlation. A GRACE risk score of 217 has emerged as a good cut-off point of risk stratification. They

Table 1
Global Registry of Acute Coronary Events risk score.

GRACE	Age (yr)	Score
(0–258)	<40	0
	40–49	18
	50–59	36
	60–69	55
	70–79	73
	>80	91
Heart rate (bpm)	<70	0
	70–89	7
	90–109	13
	110–149	23
	150–199	36
	>200	46
Systolic BP (mmHg)	<80	63
	80–99	58
	100–119	47
	120–139	37
	140–159	26
	160–199	11
	>200	0
Creatinine (mg/dL)	0.0–0.39	2
	0.4–0.79	5
	0.8–1.19	8
	1.2–1.59	11
	1.6–1.99	14
	2.0–3.99	23
	>4	31
Killip class	Class I	0
	Class II	21
	Class III	43
	Class IV	64
Cardiac arrest at admission		43
Elevated cardiac markers		15
ST-segment deviation		30

BP: blood pressure, GRACE: Global Registry of Acute Coronary Events.

Time risk factors	• Prior aspirin
• Age ≥65 yrs	• ≥ 2 anginal episodes in prior 24 hr
• ≥ 3 CAD risk factors	• ST deviation ≥ 0.5 mm of presenting ECG
• Known CAD (>50% stenosis)	• ↑ Cardiac markers

Figure 2 Thrombolysis in myocardial ischaemia risk score for unstable angina or non-ST-elevation myocardial infarction (UA/NSTEMI). The risk factors are shown at the bottom, and the risk of death (D), myocardial infarction, or urgent revascularisation is shown along the vertical axis. (Modified from Antman EM, Cohen M, Bernink PJLM, et al. The TIMI risk score for unstable angina/non-ST elevation MI: a method for prognostication and therapeutic decision-making. JAMA 2000;284:835). CAD: coronary artery disease, ECG: electrocardiogram, TIMI: thrombolysis in myocardial infarction.

Table 2

A comparison of a three composite scoring system for acute coronary syndrome.

Variables	TIMI	GRACE	PURSUIT
Age	≥65 yr	Risk increases in age 40–80	Risk increases in age 50–80
Gender	Not considered	Not considered	Male 1.0
Conventional risk factors	≥3 risk factors		
Angina	≥one episode of rest angina in ≤24 hr		Worst CCS class
Aspirin in the previous 1 week before ACS	✓		
Heart rate		Score increases from 70–200	
Systolic BP		Rising BP reduces the score	
Cardiac arrest at presentation		✓	
ECG changes	✓	✓	✓
Killips class		✓	✓
Biomarkers	✓	✓	
Serum creatinine		✓	
Angiography	✓ (stenosis >50%)		

ACS: acute coronary syndrome, BP: blood pressure, CCS: Canadian Cardiovascular Society, ECG: electrocardiogram, GRACE: Global Registry of Acute Coronary Events, TIMI: thrombolysis in myocardial infarction.

also found a good correlation between GRACE score and extent of coronary artery disease (CAD) at angiography.

There are a few caveats though. The exact basis for choosing patients for coronary angiogram is not clear. Is it the financial capacity of the patients? A slightly greater number of patients have undergone coronary angiography among patients with lower GRACE score. There is no information on whether ejection fraction (EF) has any correlation with GRACE score. Also, the impact of revascularisation on prognosis and correlation with GRACE score is not clear. Nonetheless, the authors should be congratulated for an excellent study and this should encourage other hospitals to adopt risk scoring system while dealing with patients of ACS.

Despite the availability of these above composite risk scores one cannot get away from the fact that there is a need for more inclusive risk scoring systems. Each of these scoring systems has avoided some factors. Important prognostic factors like anaemia, C-reactive protein, extent of CAD, left ventricular ejection fraction (LVEF), and so on, are not included in any of the above systems.

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