Validity of a Simple ST-Elevation Acute Myocardial Infarction Risk Index: Are Randomized Trial Prognostic Estimates Generalizable to Elderly Patients?

To the Editor:

We read with great interest the article by Rathore et al reporting the performance of a “simple risk index” derived from a highly selected randomized control trial population at predicting 30-day mortality in an elderly community-based cohort of patients. The article showed that the risk index had “limited performance” in predicting 30-day mortality in a general population of patients 65 years and older.

Recently, in an unselected acute myocardial infarction (AMI) population, the Evaluation of Methods of Management of Acute Coronary Events (EMMACE) investigators developed a risk model to predict 30-day mortality on the basis of 3 admission characteristics: Systolic blood pressure, age, and heart rate. This approach was independently assessed and validated by the Thrombolysis In Myocardial Infarction (TIMI) investigators in their development of an ST-elevation MI “simple risk index.” We compared the performance of both methods in our community-based cohort of patients.

From coronary care registers, biochemistry records, and clinical coding, 2153 consecutive patients with acute ST and non–ST-elevation MI were identified (mean age 74.2 years). The EMMACE model (probability of death at 30-days, \( P_{30} = 1/(1 + \exp(-L_{30}) \), where \( L_{30} = -4.703 + (0.069 \times \text{age}) + (0.016 \times \text{heart rate}) - (0.022 \times \text{systolic blood pressure}) \)) was compared with the ST-elevation simple risk index. These models were assessed by measuring the areas under the receiver-operating characteristic (ROC) curves both for mortality at 30 days and from 30 days to 1 year. The areas under the ROC curve for 30-day mortality for each of the models were as follows: EMMACE 0.78, 95% confidence interval (CI) 0.75 to 0.80; ST-elevation MI simple risk index 0.77, 95% CI 0.74 to 0.79. Performance of each model from 30 days up to 1 year achieved areas under the ROC curve of 0.75 (95% CI 0.72 to 0.78, EMMACE) and 0.76 (95% CI 0.73 to 0.79, ST-elevation MI risk index), respectively. The prognostic performance of the risk score was stable over multiple time points (1 to 6 years).

We have externally validated the simple risk index for ST-elevation MI in an unselected community-based cohort of consecutive non-ST elevation and acute ST elevation MI patients. Furthermore, both the EMMACE model and simple risk index have been shown to be predictors of 30-day and long-term survival. We propose that a simple model, using the clinical parameters of age, heart rate, and systolic blood pressure, can be used as a robust predictor of mortality without significant loss of predictive power. Contrary to Rathore’s findings, we found the “simple risk index” derived from a highly selected trial population, to be a robust predictor of short and long-term survival in our elderly community-based cohort of patients with acute myocardial infarction.

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Response

Das and colleagues suggest that age, heart rate, and systolic blood pressure (the common elements of the simple risk index and the Evaluation of Methods and Management of Acute Coronary Events [EMMACE] model) are robust predictors of survival in elderly patients with ST-elevation myocardial infarction (MI). We respectfully disagree. First, their study contains patients with ST-elevation and non–ST-elevation MI, making the simple risk index’s performance in patients with ST-elevation MI unclear. Second, the main EMMACE risk score paper states that models were separately tested in elderly patients, but provides no results of this analysis, leaving its performance in this population uncertain. Third, our study and a previous evaluation of the TIMI ST-elevation myocardial infarction risk score identified notable variations in risk score performance based on eligibility and receipt of reperfusion therapy, which were not addressed in the study by Das et al. Fourth, although Das and colleagues used separate test and validation groups to develop the EMMACE score, they have not presented data concerning EMMACE’s performance in a different population. Without this external validation, its generalizability remains unproven. Finally, the findings of Das et al are based on 2153 ST and non-ST MI patients treated at 20 hospitals in Yorkshire region, United Kingdom, whereas we evaluated 49,711 patients drawn from all US hospitals. In short, EMMACE is not based on a sufficiently generalizable cohort and does not provide the data necessary to contradict our findings.

In addition, Das and colleagues do not answer what we contend is the fundamental question concerning risk-stratification for patients with ST-elevation myocardial infarction. Namely, what is its purpose? Risk scores are used to remove ambiguity and guide management decisions, but there is little uncertainty in the treatment of patients with ST-elevation MI once the diagnosis has been confirmed. The decision to provide reperfusion therapy, aspirin, \( \beta \)-blockers, or other therapies at the time of admission is independent of a patient’s risk score. Uncertainty concerning the role of the simple risk score and its poor performance in our study lead us to be unenthusiastic about using the simple risk score in clinical practice.

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