External validation of the age, creatinine and ejection fraction II score for operative mortality prediction in patients undergoing coronary artery bypass graft surgery

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Introduction: Age, creatinine, and ejection fraction (ACEF) score is a parsimonious risk model to predict operative mortality in elective cardiac surgery patients. In 2017, the ACEF score was updated to the ACEF II score by adding pre-operative anemia and emergency surgery. The ACEF II score was well-calibrated and had excellent discrimination similar to the euroSCORE II. The score has never been validated in Asian patients. Therefore, we aimed to externally validate the ACEF II score in patients undergoing coronary artery bypass graft in our hospital.

Method: We retrospectively studied patients who underwent CABG in our hospital. Patients who received non-coronary cardiac surgery during CABG were included in the study. Patients who had missing variables in the ACEF II score calculation were excluded. Due to low number of emergency CABG in our center, urgent surgery was used instead of emergency surgery in the score calculation. Urgent surgery was defined as an operation required during the admission for a reason other than elective surgery. For instance, if CABG was performed during the index admission for MI, the procedure was counted as urgent.

The primary outcome was operative mortality (in-hospital mortality or mortality within 30 days after surgery). Discrimination and calibration were assessed. The predictive performance of the ACEF II score was compared with the ACEF score. The reclassification index and clinical utility of the two scores were assessed.

Results: Of 703 patients included in the study, 182 were female (25.9%), 32% had diabetes with a mean age of 63.8 years. Median creatinine was 1.43 mg/dL, while the median left ventricular ejection fraction was 51.7%. The proportion of urgent CABG was 12.7%. Isolated CABG was performed in 542 patients.

The operative mortality was 5.4%. The predicted probability of operative mortality by the ACEF and the ACEF II score was 4.6% and 8.3%, respectively. Calibration-in-the-large of the ACEF score was 0.19 (95% CI −0.16 to 0.55) while it was −0.62 (95% CI −0.99 to −0.24) for the ACEF II score. The ACEF and ACEF II scores had calibration slope of 0.20 (95% CI −0.01 to 0.42) and 0.33 (95% CI 0.13 to 0.53), respectively. After logistic recalibration, the agreement between actual and predicted mortality from the ACEF II score was better than the ACEF score. C-statistic of the ACEF and the ACEF II score was 0.63 (95% CI 0.54–0.71) and 0.63 (95% CI 0.53–0.72), respectively. Compared with the ACEF score, the net reclassification improvement of the ACEF II score was 8.87% [95% CI −0.95 to 18.7%], p-value: 0.0767. The integrated discrimination index of the ACEF II score was higher than the ACEF score (7.46%, 95% CI 0.77–14.16%, p-value 0.0290). Decision curve analysis showed that the clinical utility of both scores was similar.

Conclusion: Although the discrimination and calibration of the ACEF II score were better than the ACEF score, clinical utility of both scores was similar.