Risk prediction of 30-day unplanned re-admission or mortality for HF patients: external validation of the OPERA model

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Background: Heart failure patients are at high risk of adverse events such as unplanned readmission or mortality. The OPERA model is a 30-day prediction model for HF developed in the UK. It combines physical frailty and lack of social support with clinical factors (increasing daily pill counts at admission, being in sinus rhythm at admission, dyspnea at rest, NYHA class III or IV, increasing urea and NT-proBNP at discharge, length of stay in the hospital and number of prior emergency hospitalizations in 6 months).

Purpose: The aim of this analysis is to validate the generalizability of the OPERA model in another geography and healthcare system.

Methods: SAPHIRE is an observational prospective study enrolling patients hospitalized for HF in a tertiary care hospital in the US. Data was collected from electronic medical records. Additional questionnaires were administered to the patients once during hospitalization about general demographics, socioeconomic issues, prior hospitalizations, functional limitations and ability to self-care. For frailty assessment, the patients were asked to undergo the timed 'get up and go' test. Discrimination and calibration were used to assess the external validity of the model.

Results: Among 513 study participants diagnosed with HF (mean age 73 years, interquartile range [IQR] 62-82 years and median NT-proBNP 3035 pg/ml, IQR 1411–7117 pg/ml), 166 (34%) had moderate to severe left ventricular systolic dysfunction, 72 (14%) had an unplanned all-cause readmission and 27 (5%) died within 30 days after discharge from the hospital.
Relative to OPERA-HF patients, SAPHIRE patients were younger and more often female. OPERA-HF patients were more likely complex HF patients with more comorbidities, significantly lower BMI, had longer hospital stays and higher average NT-proBNP value at discharge in comparison to the SAPHIRE cohort. OPERA-HF patients also were less often in sinus rhythm and were more likely to experience a readmission.

The OPERA risk model had an area under the receiver operating characteristic curve (AUC) of 0.70. When applied on SAPHIRE, the model showed similar discrimination (AUC 0.70 [95% confidence interval 0.65 – 0.76]) and provided accurate risk estimations (predicted risk 17%, observed 18%). By refitting the model to the study cohort, the performance was improved further (AUC 0.72 [95% CI 0.66 – 0.78]).

Conclusion: External validation demonstrated good calibration of the OPERA model on the US study population. Discrimination of those at low risk versus those at high risk remains

modest, even upon refitting the model, implying a need for better predictors of poor outcome within 30 days after discharge.