Predicting heart failure readmission and all-cause mortality in patients with acute heart failure: a simple predischarge risk score

C. Espersen1, R. Campbell2, B. Claggett3, E. Lewis4, K. Docherty2, M. Lee2, M. Lindner5, P. Brainin1, T. Biering-Sørensen1, S. Solomon3, J. McMurray2, E. Platz3

1Herlev and Gentofte Hospital, Cardiac Non-Invasive Imaging Research Laboratory, The Department of Cardiology, Copenhagen, Denmark
2BHF Glasgow Cardiovascular Research Centre, School of Cardiovascular & Metabolic Health, University of Glasgow, Glasgow, United Kingdom of Great Britain & Northern Ireland
3Brigham and Women’s Hospital, Harvard Medical School, Cardiovascular Division, Boston, United States of America
4Stanford University School of Medicine, Cardiovascular Division, Palo Alto, United States of America
5Zentralklinik Bad Berka, Bad Berka, Germany

Funding Acknowledgements: Type of funding sources: Public grant(s) – National budget only. Main funding source(s): This work was supported by the National Institutes of Health/National Heart, Lung, and Blood Institute (NIH/NHLBI) (K23HL123533 to E.P.) and the British Heart Foundation (PG/13/17/30050 to R.T.C. and J.J.V.M.).

Introduction: Predischarge risk stratification of patients hospitalized for acute heart failure (AHF) could facilitate tailored treatment and follow-up, however, simple scores to predict short-term risk for HF readmission or death are lacking.

Purpose: We sought to develop a congestion-focused risk score to predict HF readmission and all-cause mortality after discharge in patients hospitalized for AHF.

Methods: We used data from a prospective, two-center observational study in adults hospitalized for AHF. Laboratory data were collected on admission. Patients underwent a physical examination, 4-zone, and in a subset 8-zone, lung ultrasound (LUS), and conventional echocardiography at baseline (within a median of 1 day after admission). A second LUS was performed before discharge in a subset of patients. The primary endpoint was the composite of HF rehospitalization or all-cause death. HF hospitalizations were adjudicated blinded to LUS findings.

Results: Among 297 patients with complete data (median age 74 years, 43% women, mean left ventricular ejection fraction 39%), 76 patients (26%) were hospitalized for HF or died within 90 days after discharge. A stepwise Cox regression model selected four significant independent predictors of the composite outcome and each was assigned points proportional to its regression coefficient: NT-proBNP ≥2000 pg/mL (admission) (3 points), systolic blood pressure <120 mmHg (baseline) (2 points), left atrial volume index ≥60 mL/m² (baseline) (1 point) and ≥9 B-lines on predischarge 4-zone LUS (3 points). The weighted risk score provided adequate risk discrimination for the composite outcome (HR 1.48 per 1 point increase, 95% confidence interval: 1.32-1.67, p<0.001, C-statistic: 0.70; Figure 1). In a subset of patients with 8-zone LUS data (n=176), results were similar (C-statistic: 0.72).

Conclusion: A four-variable, weighted risk score integrating clinical, laboratory and ultrasound imaging data provided adequate risk discrimination for 90-day adverse outcomes in patients hospitalized for AHF. If validated in a larger dataset, this score could be used to identify patients needing the closest monitoring, more intensive follow-up and early treatment adjustment.
Figure 1. Cumulative incidence plot of the composite outcome during 90-day follow-up according to the weighted risk score (n=297).