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. Docherty⁵, M. Lee⁶, M. Lindner⁷, P. Brainin¹, T. Biering-Soerensen¹, 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).