Acute Heart Failure Risk Stratification in the Emergency Department: Are We There Yet?

Estratificación del riesgo en pacientes que acuden a urgencias con fallo cardiaco agudo: ¿estamos preparados?

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Imagine you are working in a busy emergency department (ED). You just finished caring for an elderly female with acute heart failure (AHF). She feels better and requests to go home. Do you send her home? Do you admit her? What do you do?

Acute heart failure is a global public health burden.[1-3] In the United States, an estimated 5.7 million Americans have heart failure (HF), and 915 000 cases are newly diagnosed each year.[1] For patients older than 65, AHF is the most common reason for hospitalization and re-hospitalization.[4] Nearly 80% of all patients who present to the ED with AHF will be hospitalized. Already, over 100 billion USD annually is consumed by the cost of HF worldwide.[5] As the population ages and patients live longer with cardiovascular disease, this burden of AHF will continue to grow.[6]

Why are so many patients hospitalized? Emergency physicians tend to be risk-averse and AHF patients have high rates of morbidity and mortality. Within 30 days post-discharge, nearly 1/3 of patients die or are re-hospitalized.[7] Older age, high co-morbid burden, and absence of a past physician-patient relationship contributes to these high admission rates. Not knowing what is 'baseline' for a given patient; there is no way to compare a patient to themselves. Does the patient look better, worse, or the same today as 30 days ago?

This highlights the need for risk-stratification.[8] Risk stratification instruments for AHF have been developed in multiple countries.[9-17] These instruments attempt to discriminate low versus high risk, in an effort to determine which patients with AHF are safe for early discharge. However, their limitations significantly affect their feasibility and applicability in the ED setting. Thus, they have not been widely adapted. As a result, current medical decision making regarding ED disposition is largely based on clinician gestalt, combined with the absence of higher risk features.

One risk-instrument of note is the brilliantly named MEESSI (Multiple Estimation of risk based on the Spanish Emergency Department Score in patients with AHF) score. The MEESSI score was developed to risk stratify AHF patients in Spanish EDs.[18] This score predicted 30-day mortality risk in hospitalized

patients using 13 variables, demonstrating excellent discrimination (c-statistic 0.836) for the derivation cohort. These 13 variables included Barthel index at admission, systolic blood pressure, respiratory rate, age, NT-proBNP level, potassium, troponin, creatinine, New York Heart Association (NYHA) functional class at admission, low output symptoms (i.e. confusion, weakness, poor peripheral perfusion, oliguria), oxygen saturation, episode associated with acute coronary syndrome, and ECG with hypertrophy.[18,19]

In a recently published *Revista Española de Cardiología* paper, Miró et al. set out to further validate their derived risk score. They conducted a prospective observational validation study[19] enrolling 4,711 consecutive patients with AHF from 30 Spanish ED's. Of note, they included hospitals who did not participate in the original derivation study. The only exclusion criteria were patients with ST-segment elevation myocardial infarction. The MEESSI score risk stratified patients into low, intermediate, high and very high risk. In this validation cohort, 10% of patients died within 30-days of ED admission, a mortality rate is consistent with other 'real-world' analyses. Stratified by risk group, 30-day mortality was 2.0%, 7.8%, 17.9%, and 41.4%, respectively, from low, intermediate, high and very high risk. The score demonstrated strong risk discrimination with a c-statistic of 0.810 (95% confidence interval, 0.790-0.830; $P < .001$). With these impressive results we are left wondering, is the MEESSI score ready for everyday use?

The large sample size, number of hospitals, and broad demographic characteristics support its generalizability, at least for Spanish ED's. Several baseline characteristics are worth highlighting, namely the high proportion of patients with preserved ejection fraction (HFpEF) as well as first episode of AHF. Overall, hospitalized HFpEF patients have better outcomes. This is debated however, with several studies showing no differences. However, in this study by Miró et.al.[19], the relatively low proportions of guideline directed medical therapy suggests this is due to the large number of HFpEF patients. Nevertheless, guideline adherence rate was not mentioned stratified by ejection fraction. Thus, its potential impact on outcomes, despite robust adjustment, is uncertain. This adherence rate is probably

also influenced by the > 40% of patients with their first episode of AHF. Whether these are chronic HF patients with their first AHF episode or their very first diagnosis of HF is unknown. In the United States, de novo AHF patients –HF for the very first time– are generally recommended to be hospitalized.[20,21] Comprehensive evaluation to determine the etiology of HF,[22] management of both the AHF episode and the current precipitant, as well as disease education for a potentially life-long chronic condition is challenging to cover expeditiously outside of the hospital.

The score itself involves 13 variables to calculate, with an online risk-calculator for ease of use[23]. However, the Barthel index involves an additional 10 questions[24] that are not routinely asked during a patient encounter. The additional time it takes to obtain this data may be a significant barrier to utilization. Additionally, 3 variables –the Barthel index, NYHA functional class and low cardiac output- are partially based on subjective interpretation and may lead to variability when calculating a score.

Another question involves determining an acceptable threshold for mortality. Patients in the low risk group had a high number of adverse events including 2% morality, 18% ED revisits and 11% re-hospitalization at 30-days. A mortality rate of 2% is relatively high, despite being an acceptable number based on expert consensus recommendation,[25] and may deter clinicians from discharging patients directly from the ED.

The single greatest confounder for the MEESSI risk score, similar to other AHF risk-scores, is the impact of hospitalization. This has plagued risk-score development, as high admission rates are common. The authors acknowledge this very point, as nearly 75% of patients were hospitalized. Management during hospitalization itself may significantly alter the outcome, and thus the risk trajectory of patients. Until a validation study is performed where patients are sent home based on MEESSI scores and event rates captured, we won't truly know whether there is sufficient discrimination to utilize the score in everyday practice.

Overall, the MEESSI score is a major step in the right direction for risk stratifying AHF patients in the ED. The authors are to be congratulated for a well-designed, large, multi-center study addressing a major unmet need in ED AHF management; identifying lower-risk patients safe for discharge. This works helps bridge this gap. While we are getting closer, we are not there yet.

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CONFLICTS OF INTEREST

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