EMERGENCY ROOM IDENTIFICATION OF PATIENTS WITH LOW-RISK ACUTE HEART FAILURE AND DEVELOPMENT OF A SCALE TO IDENTIFY THEM AND IMPROVE THE EVOLUTION OF THOSE WHO ARE DISCHARGED FROM ER

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1. Summary of the original project

Objectives

To develop and validate a clinical scale applicable in patients diagnosed with acute heart failure (AHF) consulting at emergency departments (EDs) to allow the identification of patients with low risk of adverse outcome and determine whether later application of this scale improves this outcome in patients discharged from the ED without hospitalisation.

Design synthesis and main results

1) With data from a previous registry that included at that time 5,560 patients from 29 Spanish EDs consecutively diagnosed with AHF, we performed a set of preliminary studies assessing the potential prognostic factors that can be identified at the ED in patients with AHF. This perspective had scarcely been explored in previous literature, which focuses more on AHF patients who have been hospitalised due to AHF. This focus dismisses the fact that between one sixth and one third of AHF are entirely managed at the ED and directly discharged home without hospitalisation. These initial studies carried out at the beginning of this project demonstrated the need for a specific score using data recorded at the ED and developed for use by emergency physicians in the ED during the decision-making process. We have produced 17 studies in this regard including: 1) Miró et al. Eur J Emerg Med 2016; 23:435-441; 2) Martín-Sánchez et al. Am J Cardiol. 2017; 120:1151-1157; 3) Jacob et al. Biomarkers. 2017; 22:337-344; 4) Miró et al. Clin Res Cardiol. 2017; 106:369-378; and 5)Miró et al. Chest 2017; 152:821-828, among others.

2) Therefore, we expanded the recruitment of patients up to 8,096 and, using all these patients, we developed a scale with bedside clinical data available at in every ED which allows the stratification of risk of death during the 30 days after the index event (ED consultation) with a very good discriminatory capacity in both the derivation cohort (c-statistic 0.836) and the validation cohort (c-statistic 0.828).We have named this risk score MEESSI-AHF (Multiple Estimation of risk based on the Emergency department Spanish Score In patients with Acute Heart Failure), and we published this scale for the first time in Miró et al. Ann Intern Med 2007; 167:698-705. We then tested the MEESSI-AHF scale in different scenarios for new validation and demonstrated its very

good performance in Spanish EDs that had not previously participated in its development (c-statistics 0.832; results published in Miró et al. Rev Esp Cardiol 2019; 72:198-207) and in one Swiss ED (c-statistics 0.80; results published in Wussler et al. Ann Intern Med. 2019; 170:248-256). As the scale has demonstrated a good, sound performance, it is now freely available online at: http://meessi-ahf.risk.score-calculator-ica-semes.portalsemes.org/and has been implemented in the ACODS App.

3) After this achievement, we focused the investigations towards the <u>specific application of the MEESSI-AHF scale</u> in patients classified as at low risk, as this scale is aimed at helping emergency physicians make decisions, especially in improving the selection of patients to be directly discharged home without hospitalisation. Using the MEESSI-AHF scale, we have discovered that almost half of all AHF patients discharged from Spanish EDs are at increased risk of dying, and that about one third of hospitalised patients are, in fact, low risk patients (published in: Miró et al. Ann Emerg Med. 2019; 74:204-215). On the other hand, a specific study focused on patients classified as at low risk showed that the MEESSI-AHF scale poorly predicts 7-day or 30-day reconsultations in these low-risk patients, and this study identified some other factors not included in the MEESSI-AHF scale that could be related to these events (published in Miró et al. Emergencias. 2019; 31:5-14).These results led us to (re)evaluate the MEESSI-AHF scale performance to predict a large number of short-term outcomes (not restricted to 30-day mortality, the only original outcome it was designed to predict), in order to confirm that the MEESSI-AHF scale needs to improve the prediction capacity of other relevant outcomes aside from mortality: risk of return to ED and risk of hospitalisation needed during the short-term follow up after patient discharge (Rosselló et al. Eur J Heart Fail, submitted). Finally, we ran a pre/post trial in 8 EDs assessing the outcomes of AHF managed at the ED using the MEESSI-AHF (post phase, N=1,593) compared with no use (pre phase, N=1,630). Initial preliminary analysis shows that risk stratification using the MEESSI-AHF scale was not associated with improvement in mortality (non-significant relative increase of 30-day all-cause mortality of 1.6%), but it was associated with a trend (although not statistically significant) of better outcomes after patient discharge from the index episode, with relative reductions of 5.2% in 30-day revisit to the ED due to AHF, 4.8% in 30-day hospitalisation due to AHF, 12.8% in all-cause death and 10.0% in 30-day combined endpoint (ED revisit, hospitalisation or death). We have just now completed the one-year follow-up and we hope to analyze and publish the final results of this trial before the end of 2020.

Conclusions

We have developed a new scale (the MEESSI-AHF scale) to reliably stratify the risk of patients with AHF diagnosed in the ED, and have proved that the scale works very well in scenarios different from those in which it was initially derived and validated. We have demonstrated that the decision-making of emergency physicians to hospitalise or discharge AHF patients is currently quite erratic and does not fit well with the patient risk of death during the following 30 days. We have also observed that the scale should evolve to a new improved version with better prediction of ED revisit and need for further hospitalisations after patient discharge. However, the initial results of the clinical use of the current version of the MEESSI-AHF scale in the ED setting suggest that it has potential to improve outcomes of patients with AHF assessed at the ED.