

Frailty phenotypes in patients with heart failure in the early post-discharge period: insights from the iCOR randomised controlled trial and a machine learning-based clustering analysis

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Background/Introduction: Several variables such as clinical, socioeconomic, functional or cognitive, among others can have an impact on the prognosis of heart failure (HF) patients despite the optimisation of follow-up strategies (e.g. telemedicine [TM] solutions). The clustering of HF patients may to identify different patient frailty phenotypes.

Purpose: The aim of this study was to perform a machine learning-based clustering analysis to identify different patient frailty phenotypes in a cohort of HF patients recruited in a randomized clinical trial (The Insuficiència Cardíaca Optimització Remota [iCOR] study).

Methods: We performed the clustering analysis on the basis of 8 frailty-related dimensions. To define the number of clusters, dissimilarity matrix was calculated with Gower's distance. Then, hierarchical divisive clustering was performed. Using then Elbow and Silhouette to analyse how the within sum of squares changes for the different number of clusters, the final number of clusters were chosen. The incidence proportion of the each of the study endpoints (non-fatal HF events as primary endpoint and all-cause hospitalization, all-cause death and the composite endpoint combining of all-cause death or non-fatal HF events as secondary endpoints) was calculated for cluster.

Results: 5 different frailty phenotypes were identified. Cluster 1 (29 patients, 16%) comprised patients with the best reported self-perceived health status (QoL), fair emotional-affective status, but low levels of self-

care. Cluster 2 (41 patients, 23%) included the youngest patients with the highest level of education and a better level of cognition. Cluster 3 (68, 38%) encompassed the patients who had the best level of self-care behaviour (18.9±9.8), greater physical and instrumental functioning for activities of daily living (ADL) and a lower rate of comorbidities. Patients in the Cluster 4 (30 patients, 17%) tended to be elderly females with poor health-related QoL, and a higher level of functional dependence. Finally, Cluster 5 was the smallest group (10 patients, 6%), encompassing the oldest patients with low level of education, a worse affective-emotional state, a significant cognitive decline and a higher proportion of comorbidities compared to the other clusters. Cluster 4 had the highest incidence rate of the primary endpoint (57 per 100 patient-years at risk, 95% CI [37.4–74.5]) and a higher incidence of all-cause hospitalization and of the combined variable of all-cause of death or non-fatal HF events.

Conclusion(s): Using the cluster analysis, we were able to stratify HF patients according to the stage of their impairment and vulnerability in each of the different frailty domains. This will allow clinicians to incorporate holistic multi-domain assessments in HF programmes to identify patients' needs and provide each patient with personalised and structured follow-up programme according to patient's needs (personalised and precision medicine).

