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Original Study

# Prognostic Value and Risk Factors of Delirium in Emergency Patients With Decompensated Heart Failure

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A B S T R A C T

*Objective:* Patients with heart failure (HF) seen at the emergency department (ED) are increasingly older and more likely to present delirium. Little is known, however, about the impact of this syndrome on outcome in these patients. We aimed to investigate the prognostic value and risk factors of delirium at admission (prevalent delirium) in ED patients with decompensated HF.

*Methods and Results:* We performed a prospective, observational study, analyzing the presence of prevalent delirium in decompensated HF patients attended at the ED in 2 hospitals in Spain in the context of the Epidemiology Acute Heart Failure Emergency project. We used the brief Confusion Assessment Method to assess the presence of delirium. Patients were followed for 1 month after discharge. Of 239 enrolled patients (81.7 ± 9.4 years, women 61.1%, long-term care [LTC] 11%), 35 (14.6%) had prevalent delirium (20% LTC vs 9.4% in-home, $P = .078$). The factors associated with delirium in the multivariate analysis were functional dependence ($P = .001$) and dementia ($P = .005$). Prevalent delirium was an independent risk factor of death within 30 days (OR 3.532; 95% CI 1.422–8.769, $P = .007$) whereas autonomy in basic activities of daily living was a protective factor (OR 0.971; 95% CI 0.956–0.986, $P = .001$). The area under the ROC curve for our 30-day mortality model was 0.802 (95% CI 0.721–0.883, $P = .001$).

*Conclusion:* Prevalent delirium in patients with decompensated HF was a predictor of short-term mortality. Routine identification of delirium in patients at risk, particularly those with greater functional dependence, can help emergency physicians in decision-making and enhance care in patients with decompensated HF.



Heart failure (HF) is a common complaint in the emergency department (ED)[1] and its prevalence is rising. This trend is due to the increase in life expectancy and improved survival in patients with heart disease, especially the elderly, reaching rates between 7% and 18% in those older than 70 years.[1] Consequently, patients with HF seen at the ED are increasingly older and more frail, highlighting the importance of evaluation focused on geriatric aspects.[2]

Delirium is one of the most common geriatric syndromes.[3] It has been reported in 7% to 15% of elderly patients visited at the ED. It is associated with increased mortality and longer hospital stays.[4,5] In fact, delirium detection is one of the main quality indicators of geriatric emergency care.[5] Despite this, it is underdiagnosed in more than 50% of the cases, implying a worse prognosis.[2,6,7]

Interest in delirium in patients with HF has increased in recent years. In a study conducted in a residential care home in the United States in 2003, Hutt et al[8] described a prevalence of 35.6% in patients with HF. In 2006, the Canadian Cardiovascular Society recommended assessing delirium in all hospitalized patients with HF (level I, class C).[9] In 2011, in a retrospective study conducted in a medical ward in a US hospital, Uthamalingam et al[10] found that 17% of patients admitted for decompensated HF had delirium at some time during

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admission. In the same period, a prospective study in an ED in a hospital in Spain observed that the prevalence of delirium at admission (11.7%) in patients visited for decompensated HF was associated with poor outcomes.[2]

Despite these findings, no studies have yet been performed in the ED to determine the relevance of delirium at admission as a prognostic factor in patients presenting with HF.

We aimed to investigate the presence of delirium at admission (prevalent delirium) in ED patients with decompensated heart failure (HF), identify their risk factors, and analyze their impact on clinical outcomes with regard to mortality at 30 days.

## Methods

### *Study Design and Setting*

Data concerning our study population were taken from the EAHFE project (Epidemiology Acute Heart Failure Emergency),[11] an observational, prospective, multicentric and cross-sectional study in patients with decompensated HF. The EAHFE-3 was carried out in the ED of 29 hospitals in Spain between November 1 and December 31, 2011. In the context of this project, we performed an observational substudy to investigate the presence of delirium in patients with decompensated HF at admission to the ED. All 29 hospitals were invited to participate in this substudy, but only 2 collected the data accurately (Reina Sofia Hospital, Murcia, and Hospital de la Santa Creu i Sant Pau, Barcelona).

### *Selection of Participants*

Emergency physicians at the 2 centers identified patients with suspected decompensated HF. Inclusion criteria were age older than 18 years and decompensated HF, defined according to Framingham criteria,[12] as the reason for visiting the ED. Diagnosis of decompensated HF requires the simultaneous presence of either at least 2 major criteria or 1 major criterion in conjunction with 2 minor criteria. Major criteria were paroxysmal nocturnal dyspnea or orthopnea, distended neck veins, rales, radiographic cardiomegaly, acute pulmonary edema, S(3) gallop, increased venous pressure, hepatojugular reflux, and weight loss of 4.5 kg in 5 days in response to treatment. Minor criteria were bilateral ankle edema, night cough, dyspnea on ordinary exertion, hepatomegaly, pleural effusion, a decrease in vital capacity by one-third from maximum record, and tachycardia (120 beats per minute or more). We excluded patients with ST-segment elevation and those in whom we could not assess the presence of delirium because of critical illness or coma.

### *Data Collection*

We recruited patients in the ED for a face-to-face interview with them and their caregivers at admission to the ED. Trained clinical researchers (MAR, AA, SH, and PP) extracted data from the interview regarding functional class before admission according to the New York Heart Association (NYHA) classification[13] and functional status (Barthel Index)[14] in the 2 weeks before admission. We recorded data directly for each patient on a preestablished data collection form. Furthermore, we reviewed the medical records and recorded the following variables: demography (sex, age, and place of residence), cardiac antecedents (HF, ischemic cardiopathy, valvulopathy), Charlson Index,[15] preexisting comorbidities (hypertension, atrial fibrillation, diabetes mellitus, dyslipidemia, renal failure, chronic obstructive pulmonary disease, stroke, peripheral arterial vasculopathy, dementia, delirium, and depression), laboratory tests (hemoglobin, serum urea, creatinine, sodium, ratio blood urea nitrogen [BUN]/creatinine, N-terminal pro-brain natriuretic peptide [NT-proBNP]), and number of medications. Systolic left ventricular dysfunction was defined as ejection fraction less than 55%.

Prevalent delirium was diagnosed using the "brief Confusion Assessment Method" (bCAM) and defined as the presence of delirium at the admission assessment in ED patients, criteria commonly used to identify prevalent delirium.[2,16] The bCAM consists of 4 questions that have been widely validated to make the diagnosis of delirium. It has a high sensitivity (82%) and specificity (96%).[17] It assesses 2 fundamental features of delirium (acute onset and fluctuating course, and inattention), and 2 secondary features (disorganized thinking and altered level of consciousness). Delirium was diagnosed by the presence of the 2 fundamental features and at least 1 secondary feature. The bCAM form was completed during the interview with the patients and their caregivers. It was based on the observations of the patients' behavior and their replies throughout the interview.

We recorded mortality and the final discharge destination. All patients, relatives, or caregivers were contacted by phone 30 days after the ED visit and we recorded data concerning mortality. We completed the data obtained in the initial interview and 1 month later by reviewing the hospital and primary care clinical report.

All patients, relatives, or caregivers gave written informed consent to participate. The ethics committees at each center approved the complete protocol and the study was performed in accordance with the Declaration of Helsinki. This project was made without any financial assistance.

### *Statistics*

Qualitative variables were expressed as absolute value and percentage. Quantitative variables were expressed as mean and SD. The $\chi^2$ test or Fisher exact test was used to compare qualitative data and nonparametric tests (Mann-Whitney *U*) for quantitative variables. Subsequently, we performed a multivariate logistic regression analysis using a forward stepwise approach. The multivariate analysis included all the variables that reached statistical significance in the bivariate study and those we considered relevant in our research (sex, age, dementia, ratio BUN/creatinine, Charlson Index, Barthel Index, and delirium). Colinearity was examined using the variance inflation factor.[18] Model goodness-of-fit was evaluated with the Hosmer-Lemershow test statistic. Overall predictive accuracy of the models was assessed using the area under the receiver operating characteristic curves (ROC AUC). An AUC between 0.70 and 0.79 is generally considered acceptable and those between 0.80 and 0.89 are considered excellent.[19] The level of statistical significance was set at $P \leq .05$. Data were analyzed by SPSS 22.0 statistical software (IBM SPSS Statistics, IBM Corporation, Chicago, IL).

## Results

### *Characteristics of Study Subjects*

We included 239 patients with decompensated HF. Their mean (±SD) age was 81.7 ± 9.4 years (94.1% were 65 years or older), 146 were women (61.1%), and 25 (11%) lived in long-term care centers.

Twenty-eight percent of the patients were in NYHA class I, 55.6% were in NYHA II, 15.9% were in NYHA III, 0.4% were in NYHA IV. The main causes of decompensated HF were infection (46.9%), atrial fibrillation (10.5%), nonadherence to medical treatment (5.9%), acute coronary syndrome (4.6%), anemia (3.8%), hypertensive emergency (2.1%), and other causes (4.2%). The cause of decompensation was not determined in 22% of patients. Table 1 shows patients' baseline characteristics. Patients living in long-term care centers were mainly women (92% vs 57.4%, $P = .001$). They were older (85.1 ± 9.7 vs