Original article

Risk factors for onset of depression after heart failure hospitalization

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ABSTRACT

Background: Depression is common in chronic heart failure (CHF) and associated with adverse outcomes. Knowing the risk factors for the development of depression at the early post-hospitalization phase may be a key factor of successful disease management programs. The aim of this study was therefore to identify the risk factors related to the onset of depression after heart failure hospitalization in patients with CHF.
Methods: The study population included participants with an admission diagnosis of acute heart failure or exacerbation of CHF from a multicenter prospective cohort study. Patients completed clinical evaluation at discharge and functional and social status assessment at 1 month after discharge, and depressive symptoms using the Hospital Anxiety and Depression Scale (HADS-D) at discharge and 1-year later.
Results: Of the 131 patients without depression at discharge, 29 (22.1%) had developed significant depressive symptoms (HADS-D $\geq$ 8) at 1-year follow-up. Multiple logistic regression demonstrated that previous ischemic heart disease [odds ratio (OR) 3.09, 95% confidence interval (CI) 1.15–8.33], participation restrictions (OR 0.43, 95% CI 0.26–0.70), and lack of satisfaction with social support (OR 0.48, 95% CI 0.29–0.79) were independent predictors of developing depression.
Conclusions: The three clinically accessible variables and targets for interventions identified as predictors in this study may help to guide the optimal post-discharge disease management planning for these patients who are at high risk for depression.

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Introduction

Depression is a common condition in chronic heart failure (CHF), increasing the risk of adverse outcomes and poor health status, and is an important public health concern [1,2]. Clinically significant depression is estimated to occur in 21.5% of CHF patients and increase sharply with increase in CHF severity [1]. Depressed CHF patients experience a more rapid loss of physical function [3], poorer health-related quality of life, more frequent readmissions, and higher mortality rates than non-depressed CHF patients independently of CHF disease severity [1].

Despite the deleterious consequences of depression in CHF patients, few studies focused on the onset of post-discharge depression. The depression may constitute a transient dysphoric mood and often worsen with discharge from the hospital [4]. Moreover, increasing or new-onset depressive symptoms have been associated with worse outcomes in CHF patients [5]. Such data suggest that preventing worsening depressive symptoms in CHF patients can improve their health. Some researchers have looked at the change in depression symptom severity in CHF patients [6,7]; however, this has not been examined in post-discharge depression. Previous studies suggest that a post-discharge support program involving targeted psychiatric management can be effective and improve health outcomes for patients with CHF [8,9].

Furthermore, few studies have examined the relationship between functional status and the onset of depression. Functional status represents their ability to do basic activities and participate in life situations [10]. To optimize outcomes in post-discharge management programs, an understanding of the relationship between baseline functional status and subsequent depressive symptoms is essential. This may be particularly important in advanced heart failure patients who have been defined as having persistent severe symptoms and functional limitations despite routine therapy [11].

The aim of this study was therefore to identify the risk factors including functional status related to the onset of depressive symptoms after heart failure hospitalization in patients with CHF.

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Methods

Study design and patients

The present study is a predefined sub-study of a large, multicenter cohort study in Japan: the Preventive Effect of Exercise for Management of Daily Functioning in Patients with CHF (PTMaTCH) study—a rehabilitation cohort study of CHF patients [12]. PTMaTCH prospectively investigates the prognostic influence of functional limitations for CHF patients after discharge. We described the PTMaTCH study design previously in detail [13]. Briefly, consenting, eligible patients were assessed at the time of discharge and followed up serially at 1, 3, 5, 12, and 24 months after discharge. The study was approved by the Ethics Review Boards of the Nagoya University School of Medicine (approval no. 493) and the review boards of all other participating hospitals. Written informed consent was obtained from each of the patients before study entry. The study coordination center in Nagoya, Japan, performed data management.

In PTMaTCH, men and women, 40 years of age or older, who were admitted to one of the 24 participating hospitals with an admission diagnosis of acute heart failure or exacerbation of CHF between May 2008 and May 2011, were eligible. Eligibility criteria included left ventricular ejection fraction (LVEF) $\leq 40\%$, or plasma B-type natriuretic peptide (BNP) level ≥ 80 pg/mL as well as New York Heart Association (NYHA) functional classification II–IV. Exclusion criteria included the patients who (1) were unable to walk a minimal distance (50 m) with or without a walking aid; (2) had Mini-Mental State Examination (MMSE) scores ≤ 18; (3) underwent cardiac surgery during hospitalization; (4) had chronic obstructive pulmonary disease; or (5) had severe mental illness including diagnosis of major depression. In addition to the PTMaTCH eligibility criteria, patients were eligible for this analysis if they did not have significant depressive symptoms at discharge, defined as a Hospital Anxiety and Depression Scale for depression (HADS-D) score of ≥ 8.

Predictor variables

As part of PTMaTCH, demographics, physical function variables, the MMSE, and the HADS-D were assessed at the time of discharge. The following clinical information was documented by the attending cardiologist: cause of heart failure and comorbidities, LVEF, NYHA functional classification, discharge laboratory values, and discharge medications. The detailed methods for measurement are published elsewhere [13]. Based on existing literature [6,14], economic and social potential risk factors for developing depression in heart failure were also assessed. Economic burden of medical care represented how severely patients are affected on a 4-point Likert scale from 'severe' to 'none'. The Social Support Questionnaire (SSQ-6) was used to measure social support. The SSQ-6 provides a list of 6 situations potentially requiring social support and asked the respondent who they could rely on for help (social support amount) and their perceived satisfaction with help (satisfaction with social support) in each situation. The reliability and validity of the SSQ-6 were reported previously [15].

To investigate the effect of functional status on onset of depression, two self-administered questionnaires were also assessed. Functional status was measured using the Performance Measure for Activities of Daily Living-8 (PMADL-8) [16] and the Participation Scale for Patients with CHF (PS-CHF) [17], developed specifically to assess functional limitations and participation in CHF patients and covered functional status domain by definition [10]. The PMADL-8 consists of 8-items in daily physical activity in CHF patients and assesses the extent to which patients currently feel difficulty in performing daily physical activity using a 4-category response scale from 1 (very easy) to 4 (very hard). It is scored from 8 to 32, with higher scores indicating more severe functional limitations. This measure is both valid and reliable [16,18] and has been shown to be associated with depression [13] and prognosis in CHF patients [12]. The PS-CHF is composed of 5-items that assess the extent to which patients are limited in interpersonal interactions and activities in community life [17]. The response options for each item were presented using 4-point scales and summary score ranged from 5 (lowest level of participation) to 20 points (highest level of participation). Lower scores correspond with more participation restrictions. The PS-CHF has also good reliability and validity. Because functional status reflects daily life, it could not be evaluated at the time of discharge. Data on functional status were therefore collected 1 month after discharge.

Outcome variables

We used the 14-item HADS questionnaire [19] to screen for depressive symptoms; it includes 7 items for depression. It has good validity and specificity [20], is easy to administer, and has been widely used in heart failure patients [21] and psychiatric patients [20]. Responses are made on a 4-point scale, and possible scores range from 0 to 21, with higher scores indicating higher levels of depressive symptoms. Consistent with previous research [20], participants in the PTMaTCH study were categorized as having depression (HADS-D ≥ 8). The HADS-D was completed initially at the time of discharge (baseline) and then repeated at 3, 5, 12, and 24 months after discharge by postal questionnaire in the PTMaTCH study. To examine the onset of depressive symptoms, 12 months HADS-D were analyzed as outcome variables in this study.

Statistical analysis

Subjects who developed depression over the one year of follow-up were compared with those who did not develop depression using chi-squared analysis and independent group t-tests. Chi-squared tests were used for categorical variables and the independent group t-test was used for continuous variables.

Univariate analyses were used to examine the relations between each of the candidate predictor variables and the outcome variables (depression at one year as indicated by an HADS-D score ≥ 8). Variables with a significance level below 0.15 in univariate analysis were selected for the multivariate logistic regression analyses. The significant variables were tested for multicollinearity. If the correlation coefficient was >0.90, the variable with the lowest correlation coefficient in relation to the outcome measure was omitted from the analysis. Then multiple logistic regression was utilized to define the independent association between the candidate predictor variables and one-year depression status. In the multivariable model, we used a combined stepwise (backward and forward) procedure to obtain the final significant multivariate predictors that had a univariate p value < 0.15 and retaining those variables with $p < 0.05$ in the final model. The SSQ-6, PMADL-8, and PS-CHF were categorized by quartiles because linearity on the logit scale could not be achieved with this continuous covariate. Performance of the final models was evaluated using the c-statistic. Adequate calibration of the final model was confirmed using the Hosmer–Lemeshow test. In secondary analyses, we examined the association between the incidence of depression and the number of independent risk factors. Because clinically meaningful cut off points in SSQ-6 and PS-CHF are not well defined, lower satisfaction score of the SSQ-6 and lower PS-CHF score were defined by less than median score (satisfaction with social support of SSQ-6 score <31 and PS-CHF score <11) in the secondary analyses.