

# Child ego state is associated with high prevalence of repeated hospitalizations in patients with heart failure

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## Abstract

**Aims** Inadequate self-care management is a leading cause of re-hospitalization in patients with heart failure (HF). Psychological factors such as some ego functions interfere with self-care behaviour modification, leading to poor outcomes in patients with several chronic diseases. However, characteristics of ego states in patients with repeated hospitalization for HF remain undefined.

**Methods and results** The present study enrolled 40 HF outpatients with previous history of HF hospitalization and receiving self-care management. Patients' psychological characteristics were assessed by Patient Health Questionnaire (PHQ-9) for screening depressive symptoms, and the Tokyo University Egogram (TEG) New Version II for analysing human behaviour based on five functional ego states; critical parent, nurturing parent, adult, free child, and adapted child (AC). Twelve patients (30.0%) had previous history of repeated (two or more) HF hospitalization. Most of them (75%) had a history of at least one or more re-hospitalizations related to inadequate self-care. Patients with repeated HF hospitalization had significantly lower AC score, which represents uncooperative and uncompromising behaviours, compared with those without repeated HF hospitalization ( $P < 0.05$ ). There were no significant differences in other parameters, including PHQ-9, between the two groups.

**Conclusions** Low AC ego state was associated with high prevalence of repeated hospitalization in patients with HF. Assessing ego functions may be helpful to tailor educational approaches in these patients.

**Keywords** Egogram; Heart failure; Re-hospitalization; Patient education; Self-care behaviour

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## Introduction

Heart failure (HF) is a leading cause of hospitalization in adults older than 65 years, and its increased prevalence is a burden on the healthcare system.<sup>1</sup> HF patients have a high rate of post-discharge re-hospitalization with episodes of acute deterioration throughout their lifetime, which may lead to their gradual functional decline and poor prognosis.<sup>2</sup> Thus, the development of strategies for preventing HF re-hospitalization is necessary to improve quality of life and prognosis in these patients.<sup>3,4</sup>

Inadequate self-care management such as lack of adherence to medication, diet, and activity limitation is a leading cause of re-hospitalization in patients with HF,<sup>5</sup> indicating that educational intervention to improve self-care behaviour is particularly important to prevent re-hospitalization in these patients.<sup>6</sup> However, several studies reported that psychological factors such as impaired cognition, depression, and anxiety interfere with self-care behaviour modification and motivation, leading to poor clinical outcomes in these patients.<sup>7,8</sup> The ego functions are also important psychological characteristics that affect human behaviour modification and are closely linked to mental status including depression.

Previous studies reported that ego states were associated with adherence to treatments in various chronic diseases,<sup>9,10</sup> and prognoses of cancer.<sup>11,12</sup> In the present pilot study, we hypothesized that some ego functions interfere with self-care modification and increase the risk of re-hospitalization in patients with HF, and investigated characteristics of ego states in patients with repeated hospitalization for HF.

## Methods

### Subjects

The present study evaluated 40 HF outpatients with a previous history of HF hospitalization between April 2010 and June 2014 in Matsue Red Cross Hospital. HF was diagnosed according to Framingham criteria as previously described.<sup>13</sup> Acute myocardial infarction was excluded. Patients who had cognitive impairment or were unable to provide consent were excluded. All subjects had received in-hospital educational intervention about HF knowledge and self-care management during the hospitalization according to the multidisciplinary HF management programme implemented since April 2010. Initial hospitalization for HF between April 2010 and June 2014 was defined as the first hospitalization, and the number of HF hospitalizations during this period was counted. Patients with two or more HF hospitalizations were defined as the repeat hospitalization group, whereas those with one episode of hospitalization were defined as the no repeat hospitalization group. We assessed the causes of re-hospitalization during the study period. Patients who had at least one or more episodes of re-hospitalization related to lack of adherence to diet, medication, or restriction of activity were considered as having inadequate self-care.<sup>5</sup> This study complies with the principles outlined in the *Declaration of Helsinki* and was approved by the institutional Review Board for Human Investigation at Matsue Red Cross Hospital. Written informed consent was given by each subject.

### Assessment of psychological characteristics

Psychological characteristics of the study subjects were assessed using the following questionnaire from June 2014 to August 2014.

### Tokyo University Egogram New Version II

To assess the mental state of each patient, we adopted the Tokyo University Egogram (TEG) New Version II, which was developed by the Department of Psychosomatic Medicine, Faculty of Medicine, The University of Tokyo, Japan (Kaneko Shobo, Tokyo, Japan).<sup>14</sup> The TEG attempted to explain and predict human behaviour in terms of the relative strength

of five functional ego states; critical parent (CP), nurturing parent (NP), adult (A), free child (FC) and adapted child (AC). This brief questionnaire comprises 50 items, some of which are listed in *Table 1*. In the written questionnaire, the subject was asked to rate each item as 'yes', 'no', or 'intermediate', which were scored as 2, 0, or 1 points, respectively. The 50 items on the questionnaire fall into five categories (CP, NP, A, FC, and AC). The points on the items in each ego state category were added together, and the total number of points in each ego state category was converted to the percentile value according to the standardized scale that had been constructed for males and females based on data from 1221 healthy Japanese individuals.<sup>14,15</sup>

### Patient Health Questionnaire (PHQ-9)

The PHQ-9, which incorporates DSM-IV depression diagnostic criteria with other leading major depressive symptoms into a brief self-report tool, is a multipurpose instrument for screening, diagnosing, monitoring, and measuring the severity of depression. We used the PHQ-9, Japanese version.<sup>16</sup> This questionnaire is composed of 9 items. The subject was asked to rate each item over the last 2 weeks as 'Column 0' for 'Not at all', 'Column 1' for 'Several days', 'Column 2' for 'More than half the days', or 'Column 3' for 'Nearly every day', which were scored as 0, 1, 2, or 3 point, respectively. A total PHQ-9 score  $\geq 10$  was defined as depressive symptom as previously described.<sup>16,17</sup>

### Data collection

Medical records were retrospectively reviewed with regard to demography, medical history, comorbidities, laboratory data, echocardiograms, medications, and clinical course. Laboratory

**Table 1** Sample items from the Tokyo University Egogram New Version II<sup>12, 14</sup>

Items concerning Critical Parent (CP) (10 items)
I'm strict with my children and my subordinates.
I'm hard on people when they are unjust or make mistakes.
I'm stubborn and inflexible, etc.
Items concerning nurturing parent (NP) (10 items)
I sympathize easily with others.
I take pleasure in public service activities.
I often take care of others, etc.
Items concerning adult (A) (10 items)
When I talk, I use numbers and data.
I take care of things efficiently.
I can express things simply, etc.
Items concerning free child (FC) (10 items)
I'm good at making jokes and teasing.
I easily join in with casual situations.
I'm open and free, etc.
Items concerning adapted child (AC) (10 items)
I change my opinion in the face of somebody else's objection.
I often have to force myself to do things.
I get caught up in regret, etc.

data and echocardiograms were taken after the last hospitalization at the outpatient clinic.

## Statistical analysis

Continuous variables are expressed as mean  $\pm$  standard deviation (SD) for normally distributed variables, and median and interquartile range (IQR) for non-normally distributed variables. The normality of distribution was assessed by the Kolmogorov–Smirnov test. Categorical variables are expressed as percentages. Differences in continuous variables are compared using t-test for normally distributed variables, and Mann–Whitney U-test for non-normally distributed variables. Categorical variables are compared using Fisher’s exact test. Multiple comparisons of continuous variables were made by Kruskal–Wallis, and differences between pairs were assessed using Steel–Dwass test. The correlation between ego functions and PHQ-9 scores was assessed using Spearman’s rank-correlation coefficient. Multivariate logistic regression analysis was used to assess the association

between ego state and repeated HF hospitalization. Age, sex, and well-known prognostic factors were entered into the model. A *P*-value  $< 0.05$  was considered statistically significant. All analyses were performed using EZR.<sup>18</sup>

## Results

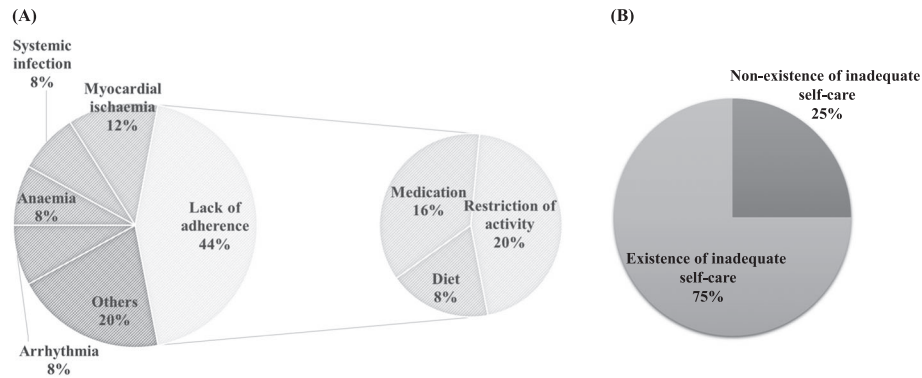
Characteristics of the study subjects are shown in *Table 2*. The mean age of the overall cohort was  $68 \pm 13$  years, and 25 patients were male (62.5%). Twelve patients (30%) had a history of repeat (two or more) HF hospitalization during the study period. There were no significant differences in any parameters, including medical history, New York Heart Association functional class, left ventricular ejection fraction, comorbidities, socio-environmental status, depressive symptoms (PHQ-9 scores  $\geq 10$ ), laboratory data, or medications between patients with and without repeated HF hospitalization. The causes of re-hospitalization were identified in 96% of all episodes of re-hospitalization (25 events) (*Figure 1A*).

**Table 2** Characteristics of patients with or without repeated HF hospitalization

	Overall (n = 40)	No repeat hospitalization (n = 28)	Repeat hospitalization (n = 12)	<i>P</i> -value
Age	68 $\pm$ 13	65 $\pm$ 13	73 $\pm$ 11	0.091
Male (%)	62.5	64.3	58.3	0.736
Vital sign				
SBP (mmHg)	122 $\pm$ 20	124 $\pm$ 21	118 $\pm$ 17	0.401
Heart rate (beats/min)	67 $\pm$ 10	67 $\pm$ 9	65 $\pm$ 11	0.533
Number of prior HF hospitalization				
Twice (%)	17.5	0	58.3	<0.001
$\geq$ Three times (%)	12.5	0	41.7	0.001
NYHA functional class III/IV (%)	10.0	10.7	8.3	1.000
Ischaemic heart disease (%)	30.0	28.6	33.3	1.000
LVEF (%)	50 (41–62)	49 (41–62)	51 (44–62)	0.836
Socio-environmental status				
Living alone (%)	12.5	7.1	25.0	0.149
Married (%)	90.0	92.9	83.3	0.570
Depressive symptom (%)	17.5	21.4	8.3	0.652
Comorbidity condition				
Hypertension (%)	47.5	50.0	41.7	0.736
Diabetes mellitus (%)	40.0	39.3	41.7	1.000
Dyslipidemia (%)	20.0	17.9	25.0	0.677
COPD (%)	5.0	7.1	0.0	1.000
Atrial fibrillation (%)	30.0	35.7	16.7	0.285
Laboratory values				
Haemoglobin (g/dL)	11.7 $\pm$ 1.6	11.9 $\pm$ 1.8	11.2 $\pm$ 1.2	0.269
Sodium (mEq/L)	140 (139–143)	140 (139–143)	140 (139–141)	0.195
BUN (mg/dL)	28.6 (22.1–42.6)	26.2 (21.5–38.9)	36.9 (26.8–46.4)	0.218
Creatinine (mg/dL)	1.4 (0.9–1.8)	1.0 (0.8–1.6)	1.7 (1.4–1.9)	0.147
eGFR (mL/min/1.73 m <sup>2</sup> )	40 (26–62)	49 (27–63)	29 (22–39)	0.101
BNP (pg/mL)	149 (55–279)	113 (44–217)	189 (61–412)	0.140
Medication				
ACEI/ARB (%)	80.0	78.6	83.3	1.000
$\beta$ blockers (%)	77.5	78.6	75.0	1.000
MR blockers (%)	42.5	39.3	33.3	1.000
Loop diuretics (%)	92.5	92.9	91.7	1.000

Data are mean  $\pm$  standard deviation or median (interquartile range). ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; BNP, brain natriuretic peptide; BUN, blood urea nitrogen; COPD, chronic obstructive pulmonary disease; eGFR, estimated glomerular filtration rate; HF, heart failure; LVEF, left ventricular ejection fraction; MR, mineralocorticoid receptor; NYHA, New York Heart Association; SBP, systolic blood pressure.

**Figure 1** Causes of HF re-hospitalization. (A) Frequency distribution of the causes of HF re-hospitalization that occurred during the study period. A total of 25 re-hospitalizations occurred during the study period. Among them, lack of adherence to medication, diet, and limitation of activity were leading causes of re-hospitalization. These factors accounted for 44% of the causes of re-hospitalization. (B) Prevalence of patients with a history of re-hospitalization related to inadequate self-care during the study period. Among patients with repeated hospitalization, 75% of them had at least one or more episodes of HF re-hospitalization related to inadequate self-care.



Lack of adherence to self-care, including medication, diet, and limitation of activity, was the leading cause of re-hospitalization. These factors accounted for 44% of the causes of re-hospitalization (11/25 events). Additionally, most patients with repeated HF hospitalization (9/12, 75%) had at least one or more episodes of re-hospitalization related to inadequate self-care during the study period (Figure 1B).

of less than 50th percentile, the median value for healthy Japanese individuals. Among the five ego states, AC score was the lowest ( $P < 0.01$ ).

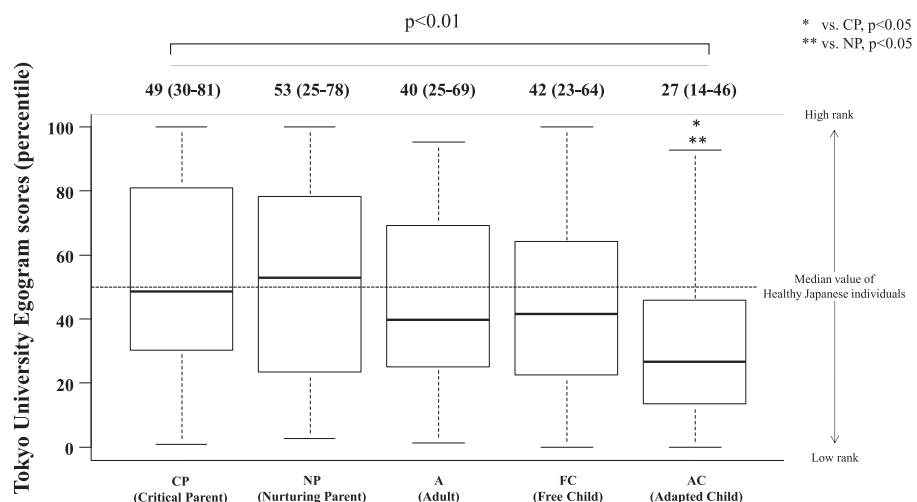
### Ego states and the prevalence of repeated HF hospitalization

### Characteristics of ego states in patients with HF

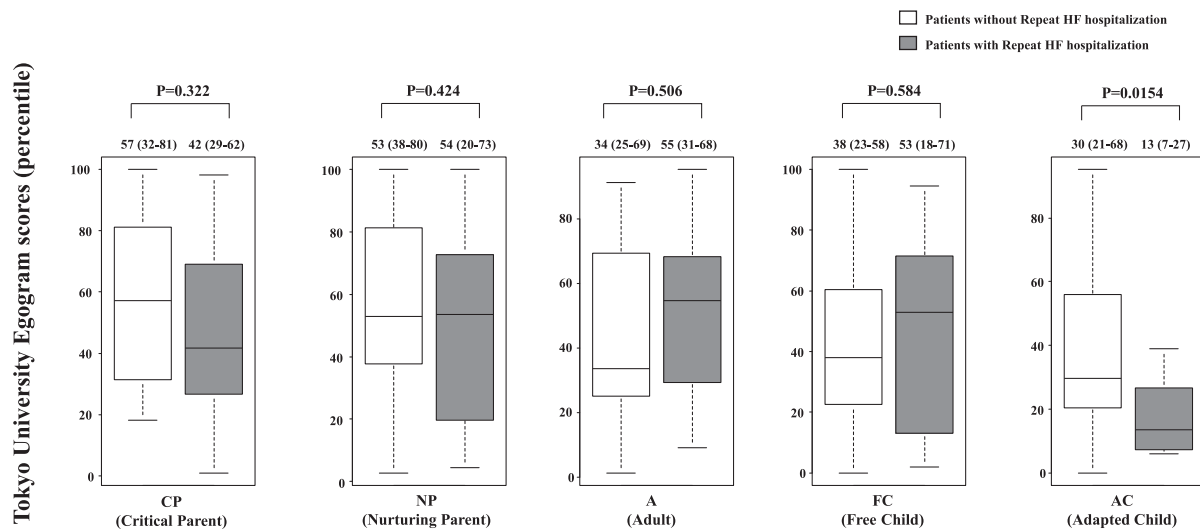
Figure 2 shows the Tokyo University egogram scores of the study subject. The majority of patients (75%) had an AC value

The relationship between egogram scores and repeat HF hospitalization is shown in Figure 3 and Table 3, 4. Patients with repeat HF hospitalization had significantly lower AC scores compared with those without repeat HF hospitalization ( $P < 0.05$ , Figure 3). In addition, the prevalence of

**Figure 2** Tokyo University Egogram scores of all subjects. Data are median (interquartile range).  $P$ -value for multiple comparisons among five ego states. Dotted line indicates 50th percentile as median value for healthy Japanese individuals.



**Figure 3** Tokyo University Egogram scores of patients with or without repeat HF hospitalization. Data are median (interquartile range). *P*-value for comparison between patients with or without repeated HF hospitalization. HF, heart failure.



**Table 3** Area under the curve for the relationship between each ego states and repeat HF hospitalization

	Repeat HF hospitalization (n = 12)	
	Overall (n = 12) AUC (95% CI)	Existence of inadequate self-care (n = 9) AUC (95% CI)
CP	0.601 (0.396–0.806)	0.579 (0.331–0.828)
NP	0.418 (0.216–0.620)	0.429 (0.185–0.672)
A	0.568 (0.366–0.771)	0.603 (0.380–0.826)
FC	0.557 (0.336–0.777)	0.462 (0.207–0.718)
AC	0.746 (0.590–0.902)	0.700 (0.525–0.876)

A; adult, AC; adaptive child, AUC; area under the curve, CI; confidence interval, CP; critical parent, FC; free child, NP; nurturing parent.

repeat hospitalization was significantly higher in subjects with AC score < 50th percentile than in those with AC score  $\geq$  50th percentile (38.7% vs. 0%,  $P < 0.05$ ). Similarly, the AC score was more likely to be low in patients with a history of re-hospitalization related to inadequate self-care than in those without repeated HF hospitalization (18.5<sup>th</sup> percentile vs 29.6<sup>th</sup> percentile,  $P = 0.076$ ). There was no significant relationship between the other ego states and repeated HF hospitalization. The area under the curve (AUC) for the relationship between each ego state and the prevalence of repeated hospitalization is shown in *Table 3*. Among the five ego states, the AC score had the highest AUC for detecting a history of re-hospitalization related to all causes (AUC = 0.746) and inadequate self-care (AUC = 0.700). The optimal cutoff value of AC for detecting repeated HF hospitalization was the 38.9<sup>th</sup> percentile.

*Table 4* shows multivariate logistic regression analysis for the association between ego state and repeated HF

hospitalization. We confirmed that the AC score was significantly associated with the incidence of repeated HF hospitalization, independent of well-known prognostic factors.

### Ego states and depression

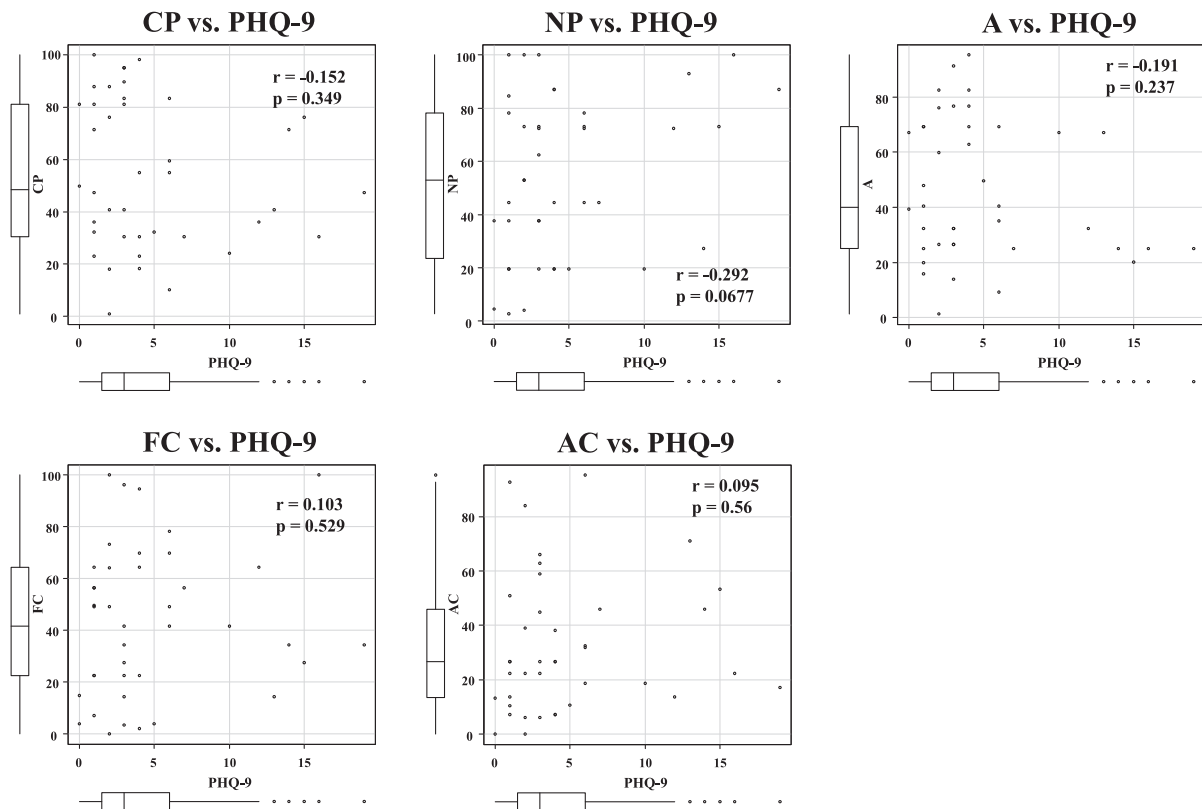
The relationship between ego functions and PHQ-9 scores is shown in *Figure 4*. There was no significant correlation between ego score and PHQ-9 score.

**Table 4** Multivariate logistic regression analysis for association with repeat HF hospitalization

	OR (95% CI)	<i>P</i> -value
Unadjusted AC score	0.946 (0.900–0.994)	0.027
AC score adjusted for		
-Age	0.930 (0.872–0.992)	0.028
-Male	0.944 (0.898–0.991)	0.021
-NYHA class III/IV	0.945 (0.899–0.994)	0.028
-LVEF	0.946 (0.900–0.994)	0.027
-Ischemic heart disease	0.946 (0.900–0.993)	0.026
-Living alone	0.947 (0.902–0.994)	0.026
-Depression	0.947 (0.902–0.995)	0.031
-Atrial fibrillation	0.944 (0.898–0.992)	0.024
-DM	0.942 (0.894–0.993)	0.026
-COPD	0.946 (0.901–0.994)	0.029
-Haemoglobin	0.937 (0.889–0.987)	0.014
-eGFR	0.947 (0.900–0.997)	0.038
-BNP	0.930 (0.874–0.989)	0.021

AC; adaptive child, BNP, brain natriuretic peptide, CI; confidence interval, COPD, chronic obstructive pulmonary disease; eGFR, estimated glomerular filtration rate; HF, heart failure; LVEF, left ventricular ejection fraction; NYHA; New York heart association; OR; odds ratio.

**Figure 4** Correlations between Tokyo University Egogram scores and PHQ-9 scores. PHQ-9, Patient Health Questionnaire; CP, critical parent; NP, nurturing parent; A, adult; FC, free child; AC, adapted child.



## Discussion

The present study showed that low AC ego state was common in patients with HF, and was associated with high prevalence of repeat HF hospitalization.

The TEG is based on the transactional analysis theory formulated by Berne.<sup>19</sup> This theory attempts to explain and predict human behaviour in terms of the relative strength of five functional ego states (CP, NP, A, FC, and AC). According to Williams *et al.*,<sup>20</sup> the CP reflects the rules of society and values of the individual, the NP nurtures and promotes growth, the A is involved with realistic problem solving, the FC is characterized by natural and spontaneous feeling, and the AC engages in conforming and compromising behaviours. Dusay<sup>21</sup> presented a graphic technique for portraying the ego state pattern that he called the 'egogram'. Several objective questionnaires have been developed to measure the ego states using the egogram model in several languages and countries, and their validity has been tested.<sup>20,22</sup> In Japan, Ishikawa *et al.*<sup>23</sup> developed the TEG in 1984. In 1993, Suematsu *et al.* revised the TEG based on data obtained from >5000 healthy Japanese subjects (TEG 2<sup>nd</sup> edition), and the TEG New Version II<sup>14</sup> was modified by Yoshiuchi *et al.* in 2006. Thus, the TEG is an established egogram model for Japanese individuals.

We found that the majority of patients with repeated hospitalization (75%) had issues with lack of adherence to diet, medication, and restriction of activity (*Figure 1*). In addition, there were no significant differences in medical and socio-environmental factors between patients with and without repeated HF hospitalization (*Table 2*). These findings indicated that inadequate self-care was the primary cause of repeated HF hospitalization in the study cohort. Although educational intervention to improve self-care behaviour is indispensable for such patients, psychological factors such as impaired cognition, depression, and anxiety interfere with self-care behaviour modification and motivation, leading to poor outcomes in these patients.<sup>7,8</sup> It is also well recognized that the type A behaviour pattern is associated with increased risk of the development of cardiovascular heart disease (CHD).<sup>24,25</sup> These results showed that psychological factors play a vital role in the development and progression of CHD. In the present study, we reinforced previous findings by demonstrating for the first time that psychological ego state was an additional risk factor associated with the worsening of HF.

Despite the fact that all of the study subjects had received multidisciplinary education on HF, including knowledge and self-care management of HF, patients with a low AC ego state had a high prevalence of repeated HF hospitalization, and potential issues with inadequate self-care. This finding indicated

that a low AC ego state was a barrier to modification of their self-care behaviour. Because low AC represents a person who demonstrates inflexible, uncooperative, and unmalleable behaviour,<sup>14</sup> usual educational intervention may be ineffective to facilitate behaviour modification for promoting self-care management in low AC patients.

The assessment of ego functions gives each patient a chance to realize their own behavioural pattern, and understand the strength and weakness of their ego state. Foster suggested<sup>26</sup> that each of us had at least three levels of functioning in transactional analysis theory. We are capable of acting and reacting as children, parents, or mature adults. None of us will act consistently as only one of these, but switch back and forth between these roles as we react to people and circumstances. Therefore, it is important to provide tailor-made educational approaches and to take into account the strength and weakness of each patient's ego state. It can be easy to fall into the situation whereby health care workers, such as doctors and nurses, play the parent's role, and patients, especially low-AC patients, play the child's role in the hospital. Equally, it is preferable for health care workers to avoid parent-type messages such as 'you need' and 'you should',<sup>27</sup> which further encourage low-AC patients to react as children. To counteract the weakness of adaptation in low-AC patients, it is also important to develop a favourable living environment that is supported by their family, care coordinators, and social workers. Because multidisciplinary interventions corresponding to each behaviour pattern are still challenging, future investigations are required to develop and establish scientific approaches for promoting a behaviour modification in patients with HF.

In the current study, other ego states except for AC were not associated with HF re-hospitalization. A previous study showed that low FC and high AC were associated with poor survival in patients with advanced lung carcinoma.<sup>12</sup> Furthermore, the A ego state is associated with high success rates of diet in obese patients.<sup>15</sup> These results suggest that individual ego states have favourable and unfavourable aspects depending on disease condition. In addition, ego states interact with each other ego, and some combinations of ego state emphasize the strength and weakness of the behaviour pattern.<sup>14</sup> Further investigations are necessary to classify the interaction between low AC and other ego states in patients with repeat hospitalization for HF.

Depression is reportedly highly prevalent among HF patients,<sup>28,29</sup> and is associated with poor clinical outcomes.<sup>8</sup> Yoshiuchi *et al.*<sup>30</sup> reported that AC score was positively correlated with scores of 'Tension-Anxiety' and 'Depression'.

High AC score indicates a person who demonstrates adaptability, sensitivity to others' mood, and tendency to feel inferior. In the present study, we found that 17.5% of patients had depressive symptoms. However, the presence of depression was not related to AC score (*Figure 4*) or repeat HF hospitalization (*Table 2*). The reasons for the discrepancy may be the differences in sample size, study cohort, or the score for depression.

Our study has several limitations. Some indicators such as anxiety, cognitive function, and frailty, which have potential prognostic significance of HF, were not included. Second, this study was retrospective, and whether the relationship between ego states and repeated HF hospitalization was cause or effect is unclear. Disease progression may affect changes in ego states. In addition, our study was a single-centre study with a relatively small sample size. Further well-designed, large, prospective trials are required to confirm the association between psychological characteristics of ego states and prognosis in patients with HF.

We demonstrated that low AC ego state was associated with high prevalence of repeated hospitalization in patients with HF. Assessing ego functions may help provide tailored educational approaches for promoting behaviour modification in these patients.

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## Conflict of Interest

None declared.

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