The Journal of Physical Therapy Science

Factors related to self-care behaviors among hospitalized patients with heart failure in Japan, based on the European Heart Failure Self-Care Behaviour Scale

Ryuji Yoshinaga, MSc, RPT[1, 4]*, Kohei Tomita, RPT[1], Kosuke Wakayama, RPT[1],
Shintaro Furuta, RPT[1], Kotaro Miyamoto, RPT[1], Yohei Matsuda, CN[2],
Takashi Matsuo, MD[3], Koji Oku, PhD, MD[3]

[1] Department of Rehabilitation, National Hospital Organization Nagasaki Medical Center:
   2-1001-1 Kubara, Omura-city, Nagasaki 856-8562, Japan
[2] Department of Nursing, National Hospital Organization Nagasaki Medical Center, Japan
[3] Department of Cardiology, National Hospital Organization Nagasaki Medical Center, Japan
[4] Department of Physical Therapy Science, Nagasaki University Graduate School of Biomedical
   Sciences, Japan

Abstract. [Purpose] The characteristics of heart failure in hospitalized patients with poor self-care behaviors are unknown. We investigated factors associated with self-care behaviors by using the European Heart Failure Self-Care Behaviour Scale (EHFScBS) in heart failure patients based on three comprehensive concepts. [Participants and Methods] This was a cross-sectional single-center study of heart failure patients hospitalized at a tertiary-care hospital. We investigated age, gender, family living together/apart, employment, and the Specific Activity Scale (SAS). A physical therapist provided the EHFScBS one time to determine the patients' pre-hospital self-care behavior status. The 12 items of the EHFScBS were classified into the following three categories: Maintenance, Monitoring, and Management. [Results] The median age of the 39 consecutive patients was 81 years. A multiple regression analysis revealed that the factors exhibiting significant associations were the SAS score (β=0.504) for Management and age (β=−0.403) for the total EHFScBS score (adjusted by the number of hospitalizations for heart failure). Maintenance and Monitoring were not significantly associated with the survey items. [Conclusion] These data indicate that self-care education for hospitalized patients with heart failure leads to individualized approaches based on characteristics such as age and physical activity capacity.
Key words: Heart failure, Self-care behavior, European Heart Failure Self-Care Behaviour Scale

INTRODUCTION

There has been a rapid increase in the number of heart failure (HF) patients in Japan, due in part to the super-aging of the population, and because the onset of HF increases geometrically from the age of 65 years; this increase has been called the "heart failure pandemic"[1]. The number of individuals with HF in Japan is projected to reach 1.3 million by 2030[1]. In many HF patients, repeated readmissions due to acute exacerbations are accompanied by gradual declines in cardiac function and exercise tolerance[2]. It is therefore very important to prevent readmissions in HF patients.

Self-care education is essential for the prevention of readmissions among patients with HF[3]. The European Heart Failure Self-Care Behaviour Scale (EHFScBS) is an effective patient-reported questionnaire that measures the self-care behaviors (ScBs) of HF patients[4]. It has been reported that poor ScBs revealed by the EHFScBS are associated with mortality[5], depression[6], cognitive function[7], and health-related quality of life[8]. Since poor ScBs affect a patient's prognosis, it is important to understand problems related to ScBs before HF patients' hospitalization. In the EHFScBS, ScBs comprise a comprehensive concept based on three main categories: Maintenance, Monitoring, and Management[9]. Most of the previous research examined mainly the total score on the EHFScBS[5–7, 9]. The specific characteristics of HF patients with poor ScBs according to the three categories on the EHFScBS are unknown.

The identification of these characteristics will contribute to the understanding of poor ScBs and will strengthen patient education on disease management. We speculated that HF patients who are elderly and/or who live alone would have poor ScBs in all three EHFScBS categories, and we conducted the present study to examine the factors associated with ScBs in HF patients in light of the three categories.

PARTICIPANTS AND METHODS

This was a cross-sectional study conducted at a single-center. The participants were HF patients who were admitted to the National Hospital Organization Nagasaki Medical Center (a tertiary-care hospital) between July 2020 and January 2021. The eligibility criteria were: (1) diagnosis of HF, (2) HF stage C or D, (3) undergoing physician-prescribed cardiac rehabilitation, and 4) providing written informed consent to participate. The exclusion criteria were: (1) history of dementia or suspected cognitive impairment, (2) in-hospital death, and (3) visual impairment. The diagnosis of HF was made by a cardiologist based on the Framingham Study criteria[10]. The HF stage was defined according to the American College of Cardiology Foundation (ACCF)/American Heart Association (AHA) guidelines[11]. This study was conducted with the approval of the Ethics Committee of Nagasaki Medical Center (approval no. 2020037). Written informed consent was obtained from all enrolled patients.

We collected clinical information on each patient's background, comorbidities, life background, coronary risk factors, blood data, echography, and medications. The Specific Activity Scale (SAS) was administered by a physical therapist to the patients at the initial cardiac rehabilitation evaluation. Heart failure was classified according to Japanese guidelines as follows: a left ventricular ejection fraction (LVEF) <40% was 'heart failure with reduced LVEF (HFrEF)', 50% >LVEF ≥40% was 'heart failure with a mid-range LVEF (HFmrEF)', and LVEF ≥50% was 'heart failure with a preserved LVEF (HFpEF)'[12].

A physical therapist provided the EHFScBS one time to the patients for the determination of the patients' pre-hospital ScB status, at the beginning of the patient's cardiac rehabilitation. The EHFScBS is a self-administered questionnaire first reported in 2003 that measures ScBs of HF patients with 12 items[13]. It uses a Likert scale with five possible responses for each item, from 1 ('I completely agree') to 5 ('I completely disagree') points. The score range is thus 12–60 points, with higher scores indicating worse ScBs. The concept of the EHFScBS-12 items is based on three dimensions[14]. The first dimension, "adherence to a regimen", consists of six items: daily weight measurement, water restriction, sodium restriction, taking medication(s), influenza vaccination, and regular exercise. The second dimension, "asking for help", consists of four items: shortness of breath, swollen feet, a 2-kg increase in body weight within 1 week, and contacting a physician or nurse if fatigue increases. The third dimension, "adapting activities", consists of two items related to the behavior of adapting one's activity status. The reliability and validity of the Japanese version of the EHFScBS were confirmed in 2008[15].

The comprehensive concept of ScBs has also been described as consisting of Maintenance, Monitoring, and Management, as the "middle-range theory"[16]. Maintenance is the behaviors used to maintain physical and emotional stability, such as adherence to treatment and healthy behaviors (e.g., medication, exercise, salt-restricted diet, etc.). Monitoring is the process of observing oneself for signs and changes in symptoms, such as daily blood pressure and weight measurements and general signs and symptoms. Management is the response when signs or symptoms occur, such as an adaptation of one's activity level or contact with physicians/nurses[16]. In the three dimensions of the EHFScBS, the "adherence to a regimen" consisting of six items is Maintenance (items 6, 9, 10, 11, and 12) and Monitoring (item 1); "asking for help" and "adapting activities" consisting of six items correspond to Management (items 2, 3, 4, 5, 7, and 8)[17, 18]. We therefore classified the ScB concepts in this study into three categories: Maintenance (range 5–25 points on the EHFScBS), Monitoring (range 1–5 points), and Management (score range 6–30 points).

The results of our analyses are presented as numbers, percentages, mean ± SD, or median [25th and 75th percentiles]. The data were tested for normal distribution using the Shapiro–Wilk test. A multiple regression analysis was performed to clarify the relationship between the EHFScBS and the survey items (age, gender, living with family vs. living alone, employment, and SAS result). Due to the small sample size of this study, the selection of independent variables was limited to the pre-hospital social background of HF patients. The dependent variables in a univariate analysis were the total EHFScBS score, the Maintenance score, the Monitoring score, and the Management score. The independent variables were age, gender, living with family, employment, and SAS with probability (p)-values <0.2. For the univariate analysis, Spearman's correlation coefficient was used for continuous data and the Mann–Whitney U-test was used for qualitative data. The covariate was the number of hospitalizations for HF; the reason for this is that HF patients who are hospitalized for the first time may

not be well educated about ScBs. The stepwise method was used for variable selection. To avoid multicollinearity between the independent variables, a variable with a variance inflation factor (VIF) greater than 10 was excluded. We used EZR on R commander (ver. 1.54) for all statistical analyses[19]. All statistical tests were two-tailed, and statistical significance was defined as $p<0.05$.

RESULTS

Thirty-nine consecutive Japanese patients with HF were enrolled (Fig. 1). The patients' characteristics are summarized in Table 1. The 25 males (64.1%) and 14 females (35.9%) were 81.0 [73–87.5] years old. The percentage of patients with a left ventricular EF was $45.0 \pm 18.6\%$, and that of HFrEF was 35.9%; the SAS revealed a median of 3.5 [2.5–6.5] Mets. The proportion of first hospitalization for heart failure was 46.2%.

The EHFScBS results of the patients are shown in Table 2. The total score for the EHFScBS was 31 [26–38] points.

The results of the multiple regression analysis for the EHFScBS total score, Maintenance, Monitoring, and Management are provided in Table 3. In the univariate analysis, the independent variables that resulted in $p<0.2$ were age for total score ($r=-0.296$, $p=0.067$), gender for Maintenance (median, female 14.5 vs. male 12.0 points, $p=0.08$), and SAS for Management ($r=0.411$, $p=0.016$). Independent variables were not clarified for Monitoring. There was no multicollinearity among the independent variables. The items that showed significant differences were age ($\beta=-0.403$, $p=0.014$) for the total EHFScBS score and SAS ($\beta=0.504$, $p=0.006$) for Management (adjusted by the number of hospitalizations for HF). Maintenance and Monitoring were not significantly associated with the survey items.

DISCUSSION

Our analyses clarified the characteristics of HF patients based on the categories of Maintenance, Monitoring and Management, which are related to ScBs as follows: the characteristic related to Management was the SAS score, and the HF patients with higher pre-hospital SAS scores had poorer ScBs. Our study hypothesis, i.e., that elderly HF patients and/or HF patients who live alone would have poor ScBs, was thus not supported by the results of our analyses. In particular, the patients' total EHFScBS scores showed that the ScBs were worse among the younger patients compared to the elderly patients. This is clinically important because (1) Management requires more education, such as contacting physicians and nurses, for HF patients who are more physically active compared to those who are less physically active before admission, and (2) ScB education in general needs to be strengthened more for younger HF patients than elderly patients.

Most of the previous research focused on the total EHFScBS score of HF patients[20]. One study examined the causes of death and hospitalization in relation to 'asking for help' and 'adapting activities' in Management, and its authors reported that only adapting activities were associated with death[21]. Adapting activities include taking a break during the day or resting when shortness of breath occurs due to awareness of HF symptoms. Although our present findings cannot be directly compared with those of previous studies since this study was based on three categories of ScBs, it is important to ensure adequate ScB education because some poor Management practices increase patient mortality. For example, special attention to ScB education should be provided for HF patients with a high pre-hospital capacity for physical activity. This may be due to the tendency of HF patients to hold off on going to the hospital because they are able to walk and perform activities of daily living even when symptoms of HF such as shortness of breath and swelling appear.

It has been recommended that education that will accelerate HF patients' consultation behavior (Management) be provided based on the urgency, with a categorization such as a 'red-alert' zone, 'amber-warning' zone, and 'green-safety' zone[17]. It is necessary to make effective use of such a method. ScB education may be difficult for inpatients with initial HF, but sufficient ScB education for inpatients with HF stage B (i.e., before the onset of HF) may help prevent future readmissions.
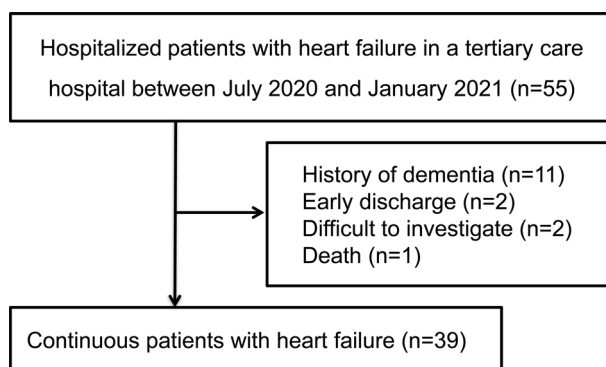

Fig. 1. Flowchart of the patient selection process.

J. Phys. Ther. Sci. Vol. 34, No. 6, 2022

418

Table 1. Characteristics of the patients with heart failure (n=39)

Age, years	81.0 [73, 87.5]
Female, n (%)	14 (35.9)
Body mass index, kg/m^2	21.9 [19.3, 24.2]
Charlson Comorbidity Index, scores	2.5 [2, 4]
Eemployment, n (%)	7 (17.9)
Live-together, n (%)	32 (82.1)
Hospitalization for HF, n (%)	1 [0, 2]
Hospitalization for HF, days	18 (46.2)
BI before hospital, scores	100 [95, 100]
NYHA, n (%)	
I	2 (5.1)
II	20 (51.3)
III	17 (43.6)
LVEF classification, n (%)	
HFpEF	16 (41.0)
HFmrEF	9 (23.1)
HFrEF	14 (35.9)
LVEF, %	45.0 ± 18.6
Medications, n (%)	
RAS inhibitors	26 (66.6)
β-blockers	22 (56.4)
Diuretics	34 (87.2)
Digitalis	6 (15.4)
Statins	10 (25.6)
Anticoagulant	9 (23.1)
Antiplatelet	10 (25.6)
Underlying disease, n (%)	
Hypertension	18 (46.2)
IHD	11 (28.2)
Valvular	11 (28.2)
Arrhythmia	4 (10.3)
Others	6 (15.4)
Laboratory findings	
BNP, pg/mL	650 [243, 1,099]
Albumin, g/dL	3.52 (0.44)
Hemoglobin, g/dL	11.57 (2.38)
Creatinine, mg/dL	1.2 [0.8, 1.7]
eGFR, mL/min/1.73 m^2	42.7 [28.3, 60.4]
Hand-Grip strength, kg	19.5 ± 10.1
SAS, Mets	3.5 [2.5, 6.5]
Length of stay, days	17.0 [11.0, 21.5]

The data are mean ± SD or median [25th, 75th percentile]. BI:
Barthel Index; BNP: brain natriuretic peptide; eGFR: estimated
glomerular filtration rate; HF: heart failure; HFmrEF: heart fail-
ure with mid-range ejection fraction; HFpEF: heart failure with
preserved ejection fraction; HFrEF: heart failure with reduced
ejection fraction; IHD: ischemic heart disease; LVEF: left ven-
tricular ejection fraction; NYHA: New York Heart Association
functional classification; RAS: renin-angiotensin system; SAS:
Specific Activity Scale.

Table 2. Details of the Japanese version of EHFScBS in Heart Failure patients (n=39)

1	I weigh myself every day	3 [1, 4.5]
2	If I get short of breath, I take it easy	1 [1, 3]
3	If my shortness of breath increases, I contact a hospital, my doctor or nurse	2 [1, 3]
4	If my feet/legs become more swollen than usual, I contact a hospital, my doctor or nurse	3 [1, 5]
5	If I gain 2 kg in 1 week, I contact a hospital, my doctor or nurse	4 [3, 5]
6	I limit the amount of fluids I drink (not more than 1–1.5 L/day)	4 [3, 5]
7	I take a rest during the day	2 [1, 3]
8	If I experience increased fatigue, I contact a hospital, my doctor or nurse	3 [1, 5]
9	I eat a low-salt diet	2 [1, 3]
10	I take my medication as prescribed	1 [1, 1]
11	I get a flu shot every year	1 [1, 4]
12	I exercise regularly	2 [1, 4]
	The total score of the EHFScBS	31 [26, 38]
	Maintenance	13 [9.5, 15]
	Monitoring	3 [1, 4.5]
	Management	16 [12, 21]

Median [25th, 75th percentile].
EHFScBS: the European Heart Failure Self-Care Behaviour scale for measurement of Heart Failure self-care adherence: low scores imply better self-care behaviour. total score range 12–60, individual item score range 1–5. Maintenance (score range 5–25): 6, 9, 10, 11, and 12 items, Monitoring (score range 1–5): 1 item, Management (score range 6–30): 2, 3, 4, 5, 7, and 8 items.

Table 3. Results of multiple regression analysis of EHFScBS in three comprehensive concepts

Dependent variable	Independent variable	B (95% CI)	β	Adjusted R^2
EHFScBS-12 total score	Age, 1 year	−0.29 (−0.53 to −0.06)	−0.403*	0.13
Maintenance	Gender (Male: 1, female: 0)	−1.76 (−4.49 to 0.98)	−0.222	0.01
Monitoring	—	—	—	—
Management	SAS, 1 Mets	1.58 (0.5 to 2.66)	0.504**	0.17

*$p<0.05$, **$p<0.01$.
Adjusted each independent variable the number of hospitalizations for heart failure, Variable selection: step wise method.
B: non-standardized regression coefficient; β: standardized regression coefficient; EHFScBS: The Japanese version of European Heart Failure Self-Care Behavior Scale-12 items; Maintenance: 5 items in EHFScBS-12 (6, 9, 10, 11, and 12 items); Monitoring: 1 item in EHFScBS-12 (1 item); Management: 6 items in EHFScBS-12 (2, 3, 4, 5, 7, and 8 items); SAS: specific activity scale.

Our present results revealed that the total score on the EHFScBS was more closely associated with poorer ScBs among the younger HF patients compared to the elderly HF patients. This finding is similar to that of another investigation[22], although other studies indicated that elderly HF patients had poorer ScBs[23, 24]. All of these prior studies examined HF patients with an average age of 60–70 years. By contrast, the median age of the present patient series was 81 years. It is thus possible that the research results differed due to the differences in the attributes of the study participants.

ScBs have been reported to be poor not only at the individual level, but also at the family level (e.g., based on family support, medication management) and at the community level (e.g., access to hospitals, availability of healthy food)[18]. A systematic review of ScBs among HF patients stated that the factors associated with ScBs are inconsistent among studies[20]. Thus, ScBs may be affected in various ways, and it is necessary to investigate the characteristics of HF patients in various settings and regions.

This study has two limitations. First, due to the small sample size, only a few variables could be used as independent variables; many related factors could not be examined. Second, regarding the concept of Monitoring, the measurement accuracy was low because there was only one monitoring-related item in the EHFScBS. In the future, a detailed study of Monitoring using the ScBs of the Heart Failure Index (SCHFI)[25], another ScB assessment, is needed.

In conclusion, the factors associated with self-care behaviors in patients with heart failure were the SAS score for Management, and age for the total EHFScBS score. Management requires more education, such as contacting physicians and nurses, for HF patients who are more physically active before admission. ScB education in general needs to be strengthened more for younger HF patients than for elderly patients.

J. Phys. Ther. Sci. Vol. 34, No. 6, 2022

420

Conflict of interest

The authors declare no conflicts of interest.

REFERENCES

1) Komuro I, Kaneko H, Morita H, et al.: Nationwide actions against heart failure pandemic in Japan—what should we do from academia? Circ J, 2019, 83: 1819–1821. [Medline] [CrossRef]

2) Murad K, Kitzman DW: Frailty and multiple comorbidities in the elderly patient with heart failure: implications for management. Heart Fail Rev, 2012, 17: 581–588. [Medline] [CrossRef]

3) Liljeroos M, Kato NP, van der Wal MH, et al.: Trajectory of self-care behaviour in patients with heart failure: the impact on clinical outcomes and influencing factors. Eur J Cardiovasc Nurs, 2020, 19: 421–432. [Medline] [CrossRef]

4) Cameron J, Worrall-Carter L, Driscoll A, et al.: Measuring self-care in chronic heart failure: a review of the psychometric properties of clinical instruments. J Cardiovasc Nurs, 2009, 24: E10–E22. [Medline] [CrossRef]

5) Vidán MT, Martín Sánchez FJ, Sánchez E, et al.: Most elderly patients hospitalized for heart failure lack the abilities needed to perform the tasks required for self-care: impact on outcomes. Eur J Heart Fail, 2019, 21: 1434–1442. [Medline] [CrossRef]

6) Müller-Tasch T, Löwe B, Lossnitzer N, et al.: Anxiety and self-care behaviour in patients with chronic systolic heart failure: a multivariate model. Eur J Cardiovasc Nurs, 2018, 17: 170–177. [Medline] [CrossRef]

7) Uchmanowicz I, Jankowska-Polańska B, Mazur G, et al.: Cognitive deficits and self-care behaviors in elderly adults with heart failure. Clin Interv Aging, 2017, 12: 1565–1572. [Medline] [CrossRef]

8) Peters-Klimm F, Kunz CU, Laux G, et al.: Patient- and provider-related determinants of generic and specific health-related quality of life of patients with chronic systolic heart failure in primary care: a cross-sectional study. Health Qual Life Outcomes, 2010, 8: 98. [Medline] [CrossRef]

9) Jaarsma T, Cameron J, Riegel B, et al.: Factors related to self-care in heart failure patients according to the middle-range theory of self-care of chronic illness: a literature update. Curr Heart Fail Rep, 2017, 14: 71–77. [Medline] [CrossRef]

10) McKee PA, Castelli WP, McNamara PM, et al.: The natural history of congestive heart failure: the Framingham study. N Engl J Med, 1971, 285: 1441–1446. [Medline] [CrossRef]

11) Rickham PP: Human experimentation. Code of ethics of the World Medical Association. Declaration of Helsinki. BMJ, 1964, 2: 177. [Medline] [CrossRef]

12) Tsutsui H, Isobe M, Ito H, et al. Japanese Circulation Society and the Japanese Heart Failure Society Joint Working Group: JCS 2017/JHFS 2017 guideline on diagnosis and treatment of acute and chronic heart failure—digest version. Circ J, 2019, 83: 2084–2184. [Medline] [CrossRef]

13) Jaarsma T, Strömberg A, Mårtensson J, et al.: Development and testing of the European Heart Failure Self-Care Behaviour Scale. Eur J Heart Fail, 2003, 5: 363–370. [Medline] [CrossRef]

14) Jaarsma T, Arestedt KF, Mårtensson J, et al.: The European Heart Failure Self-care Behaviour scale revised into a nine-item scale (EHFScB-9): a reliable and valid international instrument. Eur J Heart Fail, 2009, 11: 99–105. [Medline] [CrossRef]

15) Kato N, Ito N, Kinugawa K, et al.: Validity and reliability of the Japanese version of the European Heart Failure Self-Care Behavior Scale. Eur J Cardiovasc Nurs, 2008, 7: 284–289. [Medline] [CrossRef]

16) Riegel B, Jaarsma T, Strömberg A: A middle-range theory of self-care of chronic illness. ANS Adv Nurs Sci, 2012, 35: 194–204. [Medline] [CrossRef]

17) Jaarsma T, Hill L, Bayes-Genis A, et al.: Self-care of heart failure patients: practical management recommendations from the Heart Failure Association of the European Society of Cardiology. Eur J Heart Fail, 2021, 23: 157–174. [Medline] [CrossRef]

18) Riegel B, Moser DK, Buck HG, et al. American Heart Association Council on Cardiovascular and Stroke Nursing; Council on Peripheral Vascular Disease; and Council on Quality of Care and Outcomes Research: Self-care for the prevention and management of cardiovascular disease and stroke: a scientific statement for healthcare professionals from the American Heart Association. J Am Heart Assoc, 2017, 6: e006997. [Medline] [CrossRef]

19) Kanda Y: Investigation of the freely available easy-to-use software 'EZR' for medical statistics. Bone Marrow Transplant, 2013, 48: 452–458. [Medline] [CrossRef]

20) Sedlar N, Lainscak M, Mårtensson J, et al.: Factors related to self-care behaviours in heart failure: a systematic review of European Heart Failure Self-Care Behaviour Scale studies. Eur J Cardiovasc Nurs, 2017, 16: 272–282. [Medline] [CrossRef]

21) Abe R, Sakata Y, Nochioka K, et al. CHART-2 Investigators: Gender differences in prognostic relevance of self-care behaviors on mortality and hospitalization in patients with heart failure—a report from the CHART-2 Study. J Cardiol, 2019, 73: 370–378. [Medline] [CrossRef]

22) Peters-Klimm F, Freund T, Kunz CU, et al.: Determinants of heart failure self-care behaviour in community-based patients: a cross-sectional study. Eur J Cardiovasc Nurs, 2013, 12: 167–176. [Medline] [CrossRef]

23) Holzapfel N, Löwe B, Wild B, et al.: Self-care and depression in patients with chronic heart failure. Heart Lung, 2009, 38: 392–397. [Medline] [CrossRef]

24) Pulignano G, Del Sindaco D, Minardi G, et al.: Translation and validation of the Italian version of the European Heart Failure Self-care Behaviour Scale. J Cardiovasc Med (Hagerstown), 2010, 11: 493–498. [Medline] [CrossRef]

25) Riegel B, Barbaranelli C, Carlson B, et al.: Psychometric testing of the revised self-care of heart failure index. J Cardiovasc Nurs, 2019, 34: 183–192. [Medline] [CrossRef]