

## Factors Affecting Adherence to Self-care Behaviors among Outpatients with Heart Failure in Korea

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**Purpose:** To evaluate heart failure knowledge and adherence to self-care behaviors, and to identify factors affecting adherence to self-care behaviors among Korean patients with heart failure. **Methods:** Correlational research using the European Heart Failure Self-care Behavior Scale, the Duke Activity Status Index, the Dutch Heart Failure Knowledge Scale, the New York Heart Association Functional Classification, and the Medical Outcomes Study Social Support Survey was conducted. A total of 280 outpatients with heart failure responded to the five questionnaires. **Results:** The mean scores for self-care adherence and heart failure knowledge were  $31.98 \pm 6.81$  and  $8.78 \pm 2.53$ , respectively, indicating lower adherence and knowledge than those previously reported. Subjects with lower functional status, more social supports, and greater knowledge of heart failure are more likely to adhere to prescribed regimens. **Conclusion:** Nurses should focus on patient education and support to improve their adherence to self-care behaviors.

**Key Words:** Heart failure, Self-care, Patient adherence

### INTRODUCTION

Due to changes in lifestyle, the prevalence and mortality rate of cardiovascular disease has reached a high rate in Korea. Although the survival rate of ischemic heart disease is high, if patients cannot effectively control or manage their disease, they suffer from heart failure; thus, the prevalence and mortality rate of heart failure has increased[1]. In addition, heart failure is closely related to age, and Korea is becoming an aging society; therefore, the prevalence of heart failure is thought to be increasing rapidly, especially among persons aged 75 years and older. However, there is no accurate information on the prevalence, health care costs, and admission or readmis-

sion rates due to heart failure in Korea[2].

Heart failure can cause physical, emotional, and functional impairment and result in a low quality of life and a substantial medical burden on the patient and his or her family members[3]. In previous studies, the adherence of patients with heart failure to self-care prevented the aggravation of symptoms and influenced whether they were admitted or readmitted to a hospital[4,5]. Another study reported that participation in heart failure self-care programs reduced hospitalization durations[6]. Therefore, heart failure self-care is considered vital[6-8], but it is not fully understood yet.

Self-care is an active and cognitive process in which persons engage in maintaining their health or managing their disease and illness[9]. Therefore, the self-care be-

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aviors consist of maintenance and management categories. Self-care maintenance involves compliance with positive health practices, including a proper diet, exercise, and taking medications as prescribed. Self-care management includes recognizing subtle changes in health status, evaluating the importance of signs and symptoms, taking actions to treat those changes, and monitoring the effectiveness of those actions. Self-care for patients with heart failure includes taking medication, adhering to prescribed dietary and exercise regimens (maintenance), monitoring heart failure symptoms, and dealing with symptoms effectively (management)[10].

Although, adherence to self-care can make the condition of patients with heart failure more stable and prevent aggravation, self-care does not seem easy to adhere to, especially for the elderly. Nurses are able to help patients with heart failure, and their families, with health education and social support systems[7]. Furthermore, education and support to enhance adherence should be based on information on influencing factors on adherence. However, there have only been a few studies conducted on the adherence to self-care behaviors in Korean patients with heart failure.

Previous studies conducted in other countries have reported varying factors such as demographic variables (e.g., gender[11], age[11], and education level[10]); physical or disease-related variables (e.g., symptom severity [10,11], comorbidity[11], and functional status[12]); and cognitive, emotional, and social variables (e.g., heart failure knowledge[13], sense of control[12], social support[14,15], and depressive symptoms[15,16]) affected compliance in patients with heart failure. However, the results have showed inconsistency and the need for repetitive studies.

The purpose of this study was to identify factors affecting adherence to self-care behaviors of Korean patients with heart failure. Among various factors affecting adherence identified in previous studies, this study includes some demographic factors; symptom severity, and functional status as disease and physical factors; heart failure knowledge as a cognitive factor; and social support as a social factor. Demographic and physical factors affecting adherence could show a high risk of noncompliance, and cognitive and social factors could provide a focus for nursing interventions. Furthermore, the results would improve the quality of life of patients with heart failure and their family members and could contribute to reducing the health care costs of these patients, as well.

## METHODS

### 1. Study Design

This study employed a correlational design to identify influencing factors on adherence to self-care behaviors among Korean heart failure outpatients.

### 2. Study Sample and Setting

Participants were patients with heart failure who visited the outpatient cardiology clinics of three tertiary hospitals in a metropolitan area. The sample size was calculated using G\*Power 3.1 program [17] for a multiple regression analysis based on the nine independent variables,  $\alpha = .05$ , .80 of power, and medium effect size ( $f^2 = 0.15$ ); at least 114 samples were needed. However, due to the lack of study results regarding factors influencing adherence to self-care behaviors among Korean patients with heart failure, the effect size should be considered smaller than medium.

Inclusion criteria included 1) outpatients aged 18 years and older with a primary diagnosis of heart failure, 2) no diagnosis of psychiatric or cognitive problems, and 3) New York Heart Association Functional classification (NYHA Fc) I to III. Patients with NYHA Fc IV were excluded in this study because most got admitted into hospitals. Through consecutive sampling, 315 outpatients met the eligibility criteria over a three-month period. Among them, 300 were recruited and participated in this survey and 20 patients were excluded from the analysis due to missing data.

### 3. Ethical Considerations

The Institutional Review Board granted approval prior to initiation of the study (KUH 1010249). In addition, interviewers explained the purpose of this study, anonymity policy, and right to withdrawal to each participant and obtained written informed consent from all involved.

### 4. Measurements

Patients were requested to fill out a self-administered questionnaire. However, patients who had visual disturbances, fatigue, or general weakness completed the survey questionnaire with the help of an interviewer. It took 15 to 20 minutes to complete this questionnaire.

#### 1) Adherence to heart failure self-care

The European Heart Failure Self-care Behavior Scale

(EHFScBS)[18] was used. This is a 12-item, 5-point Likert-type scale with a score ranging from 12~60; a higher score indicates poorer adherence to self-care. This instrument can discriminate good adherence and bad adherence in each item. It contains self-care maintenance (weighing the body, limiting fluid intake, resting, eating a low salt diet, taking medicines, receiving a flu shot, and exercising) and self-care management (contacting health care providers when they experience symptom aggravation, such as dyspnea, edema, weight gain, and fatigue). Researchers translated the original English version of this questionnaire into Korean and then it was reverse translated by a native speaker. The equivalence of these two English versions was identified by the researcher who developed this measurement. Cronbach's  $\alpha$  was .81 when this scale was developed[18] and .66 in this study.

## 2) Heart failure knowledge

The Dutch Heart Failure Knowledge Scale was used to assess heart failure knowledge[19]. The knowledge scale consists of 15 multiple-choice items, including heart failure in general (four items), heart failure treatment (six items on diet, fluid restriction, and activity), and symptoms and symptom recognition (five items). The score ranges from 0~15. Each item has three options, with one of the options being the correct answer. A higher score indicates better knowledge of heart failure. Researchers also translated the English version of this questionnaire into Korean and then a panel of 10 experienced cardiologists and two cardiologists assessed the face validity of the translated Korean scale.

## 3) Social support

The Medical Outcomes Study (MOS) Social Support Survey[20,21] was used to assess social support. This is a 20-item, 5-point Likert-type scale with a total score ranging from 0~100, and a higher score indicating better social support. The Korean version was used in this study. The Cronbach's  $\alpha$  was .97 in another study[21] and .94 in this study.

## 4) Symptom severity

The New York Heart Association Functional classification (NYHA Fc)[22] was used for assessment of symptom severity. The NYHA classification, introduced in 1928 and updated in 1994, could measure heart failure symptoms by medical staff by analyzing dyspnea, angina, and physical activity limitations. According to the characteristics of each group, symptom severity worsens

from class I to class IV. The information about NYHA Fc was collected from patients' medical records in the current study.

## 5) Functional status

The Duke Activity Status Index (DASI)[23] was used to assess functional status. This has been commonly used to measure heart failure patients' physical functioning [12,23]. It is a 12-item scale assessing the abilities to perform specific daily activities, such as dressing, showering, walking, doing household tasks (e.g., washing up, vacuuming), exercising (e.g., swimming, skiing, and tennis). Each item is weighted based on the known metabolic range of an activity in metabolic equivalent units (METs). The possible range of this measure is from 0~58.2, with a higher score indicating better functional status. Researchers translated the original English version of this questionnaire into Korean and two cardiologists confirmed the face validity. In a previous study[23], the Cronbach's  $\alpha$  was .82; it was .85 in this study.

## 5. Data Analysis

The sample size of 280 in this regression analysis with 9 independent variables showed an effect size of 0.06 (small and medium effect sizes are 0.02 and 0.15, respectively). SPSS/WIN 17.0 program was used, and detailed statistical analysis consisted of the following: 1) descriptive data analyses, such as means, standard deviations, and percentages were used to describe the demographic characteristics of the participants, adherence to self-care behaviors, and knowledge on heart failure; 2) an ANOVA was used to identify the differences in adherence according to demographic and disease related characteristics; and 3) multiple regression analysis was performed to identify factors affecting adherence to self-care behaviors.

# RESULTS

## 1. Characteristics of Participants

Characteristics of the participants are shown in Table 1. The mean age of the participants was  $59.5 \pm 13.83$  years; of note was the fact that 27.1% and 26.1% were in their 50s and 60s, respectively. Sixty-five percent were men, most patients were married (73.6%), and most had completed high school or more formal education (71.4%). Roughly half of the participants had retired (55.7%). The mean number with comorbidities was  $1.82 \pm 1.55$ ,

**Table 1.** Demographic and Clinical Characteristic of the Participants (N=280)

| Characteristics                | Categories        | n (%) or M±SD |
|--------------------------------|-------------------|---------------|
| Gender                         | Male              | 182 (65.0)    |
|                                | Female            | 98 (35.0)     |
| Age                            |                   | 59.5±13.83    |
|                                | 20's              | 11 (3.9)      |
|                                | 30's              | 15 (5.4)      |
|                                | 40's              | 31 (11.1)     |
|                                | 50's              | 76 (27.1)     |
|                                | 60's              | 73 (26.1)     |
|                                | 70's              | 61 (21.8)     |
|                                | Over 80           | 13 (4.6)      |
| Marital status                 | Married           | 206 (73.6)    |
|                                | Single            | 26 (9.3)      |
|                                | Bereavement       | 35 (12.5)     |
|                                | Divorce           | 10 (3.6)      |
|                                | Other             | 3 (1.1)       |
| Education                      | Illiterate        | 21 (7.5)      |
|                                | Elementary school | 47 (16.8)     |
|                                | Middle school     | 40 (14.3)     |
|                                | High school       | 86 (30.7)     |
|                                | ≥ University      | 86 (30.7)     |
| Occupation                     | Yes               | 124 (44.3)    |
|                                | No                | 156 (55.7)    |
| The number of comorbid disease |                   | 1.82±1.55     |
| The type of comorbid disease   | Cardiovascular    | 166 (59.3)    |
|                                | Diabetes mellitus | 56 (20.0)     |
|                                | Cancer            | 19 (6.8)      |
|                                | Others            | 121 (43.2)    |
| Symptom severity               | NYHA Fc I         | 142 (50.7)    |
|                                | NYHA Fc II        | 111 (39.6)    |
|                                | NYHA Fc III       | 27 (9.6)      |

NYHA Fc=New York Heart Association Functional Classification.

and the type of comorbidity varied. Regarding symptom severity, 50.7% of patients were classified NYHA Fc I and 39.6% were classified NYHA Fc II.

## 2. Adherence to Self-care Behaviors and Knowledge about Heart Failure

The total mean score of adherence to self-care behaviors was  $31.98 \pm 6.81$ . Adherence to each self-care behavior is shown in Table 2. To identify which self-care behavior has good or bad adherence, good adherence was defined operationally as a score of 1 or 2 (often or always), and poor adherence as a score of 3, 4, or 5 (sometimes, not often, or not at all)[24]. Self-care behav-

iors reported as having poor adherence included dealing with fatigue (80.7%), weight gain (78.5%), leg edema (63.2%), and daily weight measurement (70.7%). Whereas, self-care behaviors classified as good adherence included taking prescribed medication (97.5%), resting during dyspnea (63.9%), limiting fluid intake (50.3%), and receiving the flu shot (50.0%).

The mean score for heart failure-related knowledge of the participants was  $8.78 \pm 2.53$ . Percentages of the correct answer are shown in Table 3. Patients showed a particularly low rate (below 50%) of correct answers on six items including: the cause of worsening heart failure (30.3%), leg edema (35.7%), frequency of weighing (34.6%), the reason for weighing regularly (45.0%), low salt diet (37.1%), and the acceptable amount of fluid intake (49.6%). The highest correct rate was 90% on the question about medications and 88.9% on the question about exercising at home.

## 3. Adherence to Self-care Behaviors with Characteristics of Patients

The mean differences of adherence to self-care behaviors according to demographic and disease characteristics are shown in Table 4. Women had lower scores for adherence to self-care behavior than men ( $t=7.93$ ,  $p=.005$ ). Patients aged 40~64 years showed higher scores of adherence than patients aged 65 years and older ( $F=5.59$ ,  $p=.004$ ). Unemployed patients ( $t=6.71$ ,  $p=.010$ ), and bereaved spouses ( $F=6.71$ ,  $p<.001$ ) also showed lower scores of adherence to self-care behaviors. In addition, NYHA Fc III patients, representing higher symptom severity, had lower scores for adherence to self-care behaviors ( $F=3.06$ ,  $p=.048$ ). The lower score indicates better adherence, thus, the results show that female patients, aged 65 years and older, who are bereaved and unemployed, with higher symptom severity, had better adherence to self-care behaviors.

## 4. Factors Affecting Adherence to Self-care Behaviors

Functional status, NYHA Fc, heart failure knowledge, social support, and demographic characteristics, including sex, age, marital status, and employment were analyzed as independent variables. Demographic variables were specifically selected according to the results of the ANOVA indicating participants' characteristics that were significantly associated with self-care behavior ( $p<.05$ ). The means and standard deviations of functional status, heart failure knowledge, and social support were  $36.26$

**Table 2.** Adherence to Heart Failure Self-care Behaviors

(N=280)

| Self-care behavior  | Not at all   | Not often     | Some times    | Often        | Always        | BA   | GA   |
|---|--------------|---------------|---------------|--------------|---------------|------|------|
|   | n (%)        | n (%)         | n (%)         | n (%)        | n (%)         | %    | %    |
| 1. I take my weight every day   | 38<br>(13.6) | 56<br>(20.0)  | 104<br>(37.1) | 51<br>(18.2) | 31<br>(11.1)  | 70.7 | 29.3 |
| 2. If I am out of breath, I will take a rest  | 9<br>(3.2)   | 18<br>(6.4)   | 74<br>(26.4)  | 67<br>(23.9) | 112<br>(40.0) | 36.0 | 63.9 |
| 3. If I feel respiratory distress is worse, I will contact with a doctor or a nurse               | 35<br>(12.5) | 39<br>(13.9)  | 74<br>(26.4)  | 52<br>(18.6) | 80<br>(28.6)  | 52.8 | 47.2 |
| 4. If my feet or legs become swollen more than usual, I will contact with a doctor or a nurse     | 44<br>(15.7) | 70<br>(25.0)  | 63<br>(22.5)  | 40<br>(14.3) | 63<br>(22.5)  | 63.2 | 36.8 |
| 5. If my body weight is increased by over 2 kg in a week, I will contact with a doctor or a nurse | 62<br>(22.1) | 100<br>(35.7) | 58<br>(20.7)  | 24<br>(8.6)  | 36<br>(12.9)  | 78.5 | 21.5 |
| 6. I limit my fluids (soup, coffee, water, and beverage) intake                                   | 26<br>(9.3)  | 44<br>(15.7)  | 69<br>(24.6)  | 72<br>(25.7) | 69<br>(24.6)  | 49.6 | 50.3 |
| 7. I take a rest during the day   | 2<br>(0.7)   | 35<br>(12.5)  | 104<br>(37.1) | 43<br>(15.4) | 96<br>(34.3)  | 50.3 | 49.7 |
| 8. If I feel more fatigue, I will contact with a doctor or a nurse                                | 58<br>(20.7) | 106<br>(37.9) | 62<br>(22.1)  | 17<br>(6.1)  | 37<br>(13.2)  | 80.7 | 19.3 |
| 9. I take a low-salt diet   | 38<br>(13.6) | 47<br>(16.8)  | 72<br>(25.7)  | 75<br>(26.8) | 48<br>(17.1)  | 56.1 | 43.9 |
| 10. I take the prescribed medicines well  | 0<br>(0)     | 3<br>(1.1)    | 4<br>(1.4)    | 31<br>(11.1) | 242<br>(86.4) | 2.5  | 97.5 |
| 11. I receive a flu shot (inoculation) every year   | 51<br>(18.2) | 47<br>(16.8)  | 42<br>(15.0)  | 26<br>(9.3)  | 114<br>(40.7) | 50.0 | 50.0 |
| 12. I exercise regularly  | 28<br>(10.0) | 68<br>(24.3)  | 67<br>(23.9)  | 48<br>(17.1) | 69<br>(24.6)  | 58.2 | 41.7 |
| The total score M±SD  | 31.98±6.81   |               |               |              |               |      |      |

BA=bad adherence: participant's response of (not at all + not often + sometimes); GA=good adherence: participant's response of (often + always).

±17.12, 8.78±2.53 and 74.21±19.72, respectively.

Results of the multiple regression analysis are shown in Table 5. In this model, each variable was independent as the Durbin Watson statistic was 1.83 for residual analysis and there was no problem of multicollinearity, as the variance inflation factor (VIF) ≤ 10.

The model explained 15.9% of adherence to self-care behavior and was statistically significant ( $F=5.09$ ,  $p<.001$ ). Significant independent variables were heart failure knowledge ( $\beta=-.17$ ,  $p=.006$ ), social support ( $\beta=-.23$ ,  $p<.001$ ), functional status ( $\beta=.19$ ,  $p=.036$ ), marital status ( $\beta=.14$ ,  $p=.020$ ), and age ( $\beta=-.16$ ,  $p=.031$ ). Those indicate that married patients showed lower adherence, whereas, those with worse functional status, better heart failure knowledge, better social support, and older were more likely to adhere to self-care behaviors.

## DISCUSSION

The mean score of adherence to self-care behaviors for heart failure in this study was similar to the results of a Japanese study[24], but higher than the scores of European studies[18,25], indicating lower adherence than European patients. In particular, there was lower adherence to self-care management behaviors shown after feeling fatigue, weight gain, and edema than in other studies[18,24]. Among the self-care maintenance behaviors, weighing daily was the behavior with the least compliance.

This low adherence might reflect a lack of knowledge on heart failure pathophysiology or no recognition of signs and symptoms of worsening disease[9]. This result might be associated with a low rate of correct answers on the items on symptoms of worsening heart failure,

**Table 3.** Heart Failure Knowledge

(N=280)

| Items  | PCA<br>n (%) |
|--|--------------|
| 1. How often does a patient with severe heart failure need to take his or her own weight?                              | 97 (34.6)    |
| 2. Why is it important for a heart failure patient to take his or her own weight regularly?                            | 126 (45.0)   |
| 3. How much water intake is allowed for a day?   | 139 (49.6)   |
| 4. Which of the following statements is correct regarding medicine intake?   | 252 (90.0)   |
| 5. What action should the patient take if he or she is out of breath or the legs are swollen?                          | 221 (78.9)   |
| 6. Which of the followings can increase the symptoms of heart failure?   | 84 (30.3)    |
| 7. What dose 'heart failure' mean?   | 194 (69.3)   |
| 8. Why are the legs swollen when there is heart failure?   | 100 (35.7)   |
| 9. What is the function of the heart?  | 156 (55.7)   |
| 10. Why should a heart failure patient follow low-salt diet?   | 104 (37.1)   |
| 11. What is the main cause of heart failure?   | 198 (70.7)   |
| 12. Which of the following statements is correct regarding the physical exercise for a heart failure patient at home?  | 249 (88.9)   |
| 13. Why should a heart failure patient take diuretics?   | 162 (57.9)   |
| 14. Which of the following statements is correct regarding the relationship between heart failure and weight increase? | 164 (58.6)   |
| 15. What is the best when feeling thirsty?   | 212 (75.7)   |

PCA=percentage of correct answer.

**Table 4.** Heart Failure Self-care Behavior according to the Participants' Characteristics

(N=280)

| Variables                      | Categories               | n   | Self-care behavior |       | t or F | p      | Scheffé     |
|--------------------------------|--------------------------|-----|--------------------|-------|--------|--------|-------------|
|                                |                          |     | M                  | ±SD   |        |        |             |
| Gender                         | Female                   | 98  | 30.43              | ±7.19 | 7.93   | .005   |             |
|                                | Male                     | 182 | 32.81              | ±6.46 |        |        |             |
| Age (year)                     | 18~39 <sup>a</sup>       | 26  | 32.50              | ±6.21 | 5.59   | .004   | b < c       |
|                                | 40~64 <sup>b</sup>       | 142 | 33.16              | ±6.57 |        |        |             |
|                                | ≥ 65 <sup>c</sup>        | 112 | 30.35              | ±6.96 |        |        |             |
| Employment                     | No                       | 156 | 31.05              | ±6.92 | 6.71   | .010   |             |
|                                | Yes                      | 124 | 33.15              | ±6.50 |        |        |             |
| Marital status                 | Married <sup>a</sup>     | 206 | 32.34              | ±6.54 | 6.71   | < .001 | a, b, d < c |
|                                | Single <sup>b</sup>      | 26  | 33.96              | ±6.34 |        |        |             |
|                                | Bereavement <sup>c</sup> | 35  | 27.54              | ±7.74 |        |        |             |
|                                | Others <sup>d</sup>      | 13  | 34.15              | ±4.57 |        |        |             |
| Education                      | Illiterate               | 21  | 29.19              | ±8.37 | 1.81   | .127   |             |
|                                | Elementary school        | 47  | 31.00              | ±7.63 |        |        |             |
|                                | Middle school            | 40  | 32.80              | ±6.72 |        |        |             |
|                                | High school              | 86  | 31.77              | ±5.71 |        |        |             |
|                                | ≥ University             | 86  | 33.02              | ±6.85 |        |        |             |
| Symptom severity               | NYHA Fc I <sup>a</sup>   | 142 | 32.61              | ±6.58 | 3.06   | .048   | a < c       |
|                                | NYHA Fc II <sup>b</sup>  | 111 | 31.87              | ±6.94 |        |        |             |
|                                | NYHA Fc III <sup>c</sup> | 27  | 29.11              | ±6.95 |        |        |             |
| The number of comorbid disease |                          |     |                    |       | 1.56   | .147   |             |
| The type of comorbid disease   | Cardiovascular           | 105 | 32.05              | ±6.77 | 1.63   | .182   |             |
|                                | Diabetes mellitus        | 88  | 31.35              | ±7.09 |        |        |             |
|                                | Cancer                   | 27  | 30.48              | ±6.27 |        |        |             |
|                                | Others                   | 60  | 33.45              | ±6.57 |        |        |             |

**Table 5.** Regression Analysis of Adherence to Self-care Behaviors

(N=280)

| Variables                              | B     | SE   | $\beta$ | t     | p     | VIF  |
|--|-------|------|---------|-------|-------|------|
| Social support                         | -0.08 | 0.02 | -.23    | -3.77 | <.001 | 1.23 |
| Heart failure knowledge                | -0.46 | 0.17 | -.17    | -2.77 | .006  | 1.22 |
| Marital status (Married <sup>†</sup> ) | 2.14  | 0.92 | .14     | 2.34  | .020  | 1.13 |
| Age (year)                             | -0.08 | 0.04 | -.16    | -2.16 | .031  | 1.71 |
| Functional status                      | 0.08  | 0.04 | .19     | 2.10  | .036  | 2.59 |
| Gender (Male)                          | 0.75  | 0.90 | .05     | 0.82  | .409  | 1.28 |
| Occupation (Employed)                  | 0.37  | 0.91 | .03     | 0.40  | .686  | 1.41 |
| NYHA Fc I                              | 1.21  | 1.58 | .09     | 0.76  | .444  | 4.31 |
| NYHA Fc II                             | 1.61  | 1.45 | .12     | 1.10  | .269  | 3.48 |

NYHA Fc=New York Heart Association Functional Classification; <sup>†</sup> Currently married state.

frequency of weighing, and the reason for weighing regularly. For example, adherence to weighing daily is significantly associated with knowledge on the frequency and reason of weighing, respectively ( $\chi^2=26.33$ ,  $p<.001$ ;  $\chi^2=7.11$ ,  $p=.006$ ). Good adherence to managing edema and weight gain was also associated with knowing what to do to deal with leg swelling and weight gain, respectively ( $\chi^2=17.34$ ,  $p<.001$ ;  $\chi^2=10.31$ ,  $p=.001$ ). These low levels of knowledge and adherence indicated the areas to focus on in education.

One of the self-care maintenance behaviors showing good adherence was flu shots, which was similar to the adherence of European patients with heart failure[18]. However, participants with this answer did not know much about flu as a risk factor for worsening heart failure. Therefore, the relatively high adherence rate might be due to the unique health insurance system and easy accessibility of hospitals in Korea. In other words, health centers were offering free influenza vaccinations for people aged 65 years and older in Korea, therefore, most of the elderly received a flu shot without knowledge of the importance of influenza vaccinations for patients with heart failure.

The score on knowledge about heart failure in these participants was lower than that in Western patients with heart failure[19, 26]. Considering that the participants are outpatients of tertiary health care center cardiology clinics in a metropolitan area that offer frequent education about self-care, a more systematic and specific plan considering participants' health literacy is needed in order to achieve educational goals and to consider the education effective[13]. Evaluation of adherence using an objective method following educational interventions is al-

so needed. However, these results should be interpreted with caution because this study was not a population-based study using a probabilistic sampling method and thus, it may not have been representative of the Korean population.

Earlier studies showed that female[27], older [11,24,27], unemployed[27], and functionally less able[10] patients with heart failure adhere to self-care behaviors more. This study also showed older and functionally less able patients were more adhere to self-care behaviors. However, bereaved spouses had better adherence to self-care behaviors in this study; that may be because they were mostly elderly ( $F=48.77$ ,  $p<.001$ ) and female ( $\chi^2=45.43$ ,  $p<.001$ ).

Among demographic variables, adherence to self-care was not statistically different according to education level, which was inconsistent with the findings reported in earlier studies[10,28]. Thus, specific knowledge on heart failure was more important than the level of education. And another study[29] have identified that advancements in adherence to self-care behaviors can be made with nursing interventions, regardless of the education level of the patient.

Multiple regression analysis showed patients with heart failure who had better social support[14] and more heart failure knowledge[13,29], as well as lower functional status[12] had higher adherence to self-care behavior. These results supported those reported in previous studies. Social support may facilitate adherence to self-care through cognitive and affective mechanisms such as self-efficacy of control over heart failure[15]. However, symptom severity using the NYHA Fc was not a significant predictor of adherence to self-care behaviors.

The possible causes might be that the NYHA Fc is based partly on the limitation of physical activity, which conceptually overlaps with functional status, and perceived functional status might have a greater effect on adherence to self-care than symptom severity as evaluated by medical staff.

This study had several limitations. First, there may have been selection bias. Adherence to self-care behaviors and heart failure knowledge might vary under different health center systems. Since the accessible population was restricted to university hospitals in a city, this point must be taken into consideration when interpreting the results. The samples in this study were also predominantly patients with NYHA functional class I or II. Therefore, it makes difficult to draw inferences from this study sample to all heart failure patients. Even though most patients with NYHA functional class IV and many with class III were hospitalized mainly due to dyspnea in reality, self-care behaviors are still important for outpatients with NYHA functional class III. Therefore, a study including more participants with NYHA functional class III may be needed.

Second, this regression model explained only 15.9% of the variance in adherence to self-care behaviors. This meant that 84.1% of the variance in adherence to self-care behavior remains unexplained by this model and non-selected various predictors could affect adherence to self-care behaviors. As a result, other variables need to be studied in order to develop more effective nursing interventions, which could improve an understanding of adherence to self-care behaviors and thus promote better adherence.

## CONCLUSIONS

The results of this study provided general information about heart failure knowledge and adherence to self-care behaviors among Korean outpatients with heart failure. In addition, this study was significant in that it may serve to help identify high risk groups of patients who are noncompliant with self-care and guide possible nursing interventions to increase adherence such as social supports and patient education programs.

## REFERENCES

1. The Korean Society of Heart Failure. Heart failure manual. Seoul: The Korean Society of Heart Failure; 2007. p. 18-21.
2. Choi D, Han S, Jeon E, Cho M, Kim J, Yoo B, et al. Characteristics, outcomes and predictors of long-term mortality for patients hospitalized for acute heart failure: a report from the Korean heart failure registry. *Korean Circulation Journal*. 2011; 41:363-71. <http://dx.doi.org/10.4070/kcj.2011.41.7.363>
3. Yancy C, Jessup M, Bozkurt B, Butler J, Casey D Jr, Drazner M, et al. 2013 ACCF/AHA guideline for the management of heart failure: executive summary: a report of the American college of cardiology Foundation/American heart association task force on practice guidelines. *Circulation*. 2013;128:1810-52. <http://dx.doi.org/10.1161/CIR.0b013e31829e8807>
4. Michalsen A, Konig G, Thimme W. Preventable causative factors leading to hospital admission with decompensated heart failure. *Heart*. 1998;80:437-41. <http://dx.doi.org/10.1136/hrt.80.5.437>
5. Happ M, Naylor M, Roe-Prior P. Factors contributing to re-hospitalization of elderly patients with heart failure. *Journal of Cardiovascular Nursing*. 1997;11:75-84.
6. Krumholz H, Amatruda J, Smith G, Mattera J, Roumanis S, Radford M, et al. Randomized trial of an education and support intervention to prevent readmission of patients with heart failure. *Journal of the American College of Cardiology*. 2002; 39:83-9. [http://dx.doi.org/10.1016/S0735-1097\(01\)01699-0](http://dx.doi.org/10.1016/S0735-1097(01)01699-0)
7. Riegel B, Moser D, Anker S, Appel L, Dunbar S, Grady K, et al. State of the science: promoting self-care in persons with heart failure: a scientific statement from the American Heart Association. *Circulation*. 2009;120:1141-63. <http://dx.doi.org/10.1161/CIRCULATIONAHA.109.192628>
8. Heart Failure Society of America. Executive summary: HFSA 2006 comprehensive heart failure practice guideline. *Journal of Cardiac Failure*. 2006;12:10-38. <http://dx.doi.org/10.1016/j.cardfail.2005.12.001>
9. Carlson B, Riegel B, Moser D. Self-care abilities of patients with heart failure. *Heart & Lung*. 2001;30:351-9. <http://dx.doi.org/10.1067/mhl.2001.118611>
10. Rockwell J, Riegel B. Predictors of self-care in persons with heart failure. *Heart & Lung*. 2001;30:18-25. <http://dx.doi.org/10.1067/mhl.2001.112503>
11. Chriss P, Sheposh J, Carlson B, Riegel B. Predictors of successful heart failure self-care maintenance in the first three months after hospitalization. *Heart & Lung*. 2004;33:345-53. <http://dx.doi.org/10.1016/j.hrtlng.2004.03.004>
12. Heo S, Moser D, Lennie T, Riegel B, Chung M. Gender differences in and factors related to self-care behaviors: a cross-sectional, correlational study of patients with heart failure. *International Journal of Nursing Studies*. 2008;45:1807-15. <http://dx.doi.org/10.1016/j.ijnurstu.2008.05.008>
13. Chen A, Yehle K, Albert N, Ferraro K, Mason H, Murawski M, et al. Relationships between health literacy and heart failure knowledge, self-efficacy, and self-care adherence. *Research in Social & Administrative Pharmacy*. 2014;10:378-86. <http://dx.doi.org/10.1016/j.sapharm.2013.07.001>

14. Sayers S, Riegel B, Pawlowski S, Coyne J, Samaha F. Social support and self-care of patients with heart failure. *Annals of Behavioral Medicine*. 2008;35:70-9.  
<http://dx.doi.org/10.1007/s12160-007-9003-x>
15. Maeda U, Shen B-J, Schwarz ER, Farrell KA, Mallon S. Self-efficacy mediates the associations of social support and depression with treatment adherence in heart failure patients. *International Journal of Behavioral Medicine*. 2013;20:88-96.  
<http://dx.doi.org/10.1007/s12529-011-9215-0>
16. van der Wal M, Jaarsma T, van Veldhuisen D. Non-compliance in patients with heart failure; how can we manage it? *European Journal of Heart Failure*. 2005;7:5-17.  
<http://dx.doi.org/10.1016/j.ejheart.2004.04.007>
17. Faul F, Erdfelder E, Buchner A, Lang A. Statistical power analyses using G\*Power 3.1: test for correlation and regression analyses. *Behavior Research Methods*. 2009;41:1149-60.  
<http://dx.doi.org/10.3758/BRM.41.4.1149>
18. Jaarsma T, Stromberg A, Martensson J, Dracup K. Development and testing of the European heart failure self-care behaviour scale. *European Journal of Heart Failure*. 2003;5:363-70. [http://dx.doi.org/10.1016/S1388-9842\(02\)00253-2](http://dx.doi.org/10.1016/S1388-9842(02)00253-2)
19. van der Wal M, Jaarsma T, Moser D, van Veldhuisen D. Development and testing of the Dutch heart failure knowledge scale. *European Journal of Cardiovascular Nursing*. 2005;4:273-7.  
<http://dx.doi.org/10.1016/j.ejcnurse.2005.07.003>
20. McDowell I. *Measuring health: a guide to rating scales and questionnaires*. 3rd ed. New York: Oxford University Press; 2006. p. 165-7.
21. Sherbourne C, Stewart A. The MOS social support survey. *Social Science & Medicine*. 1991;32:705-14.  
[http://dx.doi.org/10.1016/0277-9536\(91\)90150-B](http://dx.doi.org/10.1016/0277-9536(91)90150-B)
22. Bennett J, Riegel B, Bittner V, Nichols J. Validity and reliability of the NYHA classes for measuring research outcomes in patients with cardiac disease. *Heart & Lung*. 2002;31:262-70.  
<http://dx.doi.org/10.1067/mhl.2002.124554>
23. Arena R, Humphrey R, Peberdy M. Using the Duke Activity Status Index in heart failure. *Journal of Cardiopulmonary Rehabilitation*. 2002;22:93-5.
24. Kato N, Kinugawa K, Ito N, Yao A, Watanabe M, Imai Y, et al. Adherence to self-care behavior and factors related to this behavior among patients with heart failure in Japan. *Heart & Lung*. 2009;38:398-409.  
<http://dx.doi.org/10.1016/j.hrtlng.2008.11.002>
25. Hwang B, Moser D, Dracup K. Knowledge is insufficient for self-care among heart failure patients with psychological distress. *Journal of Health Psychology*. 2014;33:588-96.  
<http://dx.doi.org/10.1037/a0033419>
26. van der Wal M, Jaarsma T, Moser D, Veeger N, van Gilst W, van Veldhuisen D. Compliance in heart failure patients: the importance of knowledge and beliefs. *European Heart Journal*. 2006;27:434-40.  
<http://dx.doi.org/10.1093/eurheartj/ehi603>
27. Cocchieri A, Riegel B, D'Agostino F, Rocco G, Fida R, Alvaro R, et al. Describing self-care in Italian adults with heart failure and identifying determinants of poor self-care. *European Journal of Cardiovascular Nursing*. 2015;14:126-36.  
<http://dx.doi.org/10.1177/1474515113518443>
28. Chen A, Yehle K, Albert N, Ferraro K, Mason H, Murawski M, et al. Health literacy influences heart failure knowledge attainment but not self-efficacy for self-care or adherence to self-care over time. *Nursing Research & Practice*. 2013; ID 353290: 1-8. <http://dx.doi.org/10.1155/2013/353290>
29. Baker D, Asch S, Keesey J, Brown J, Chan K, Joyce G, et al. Differences in education, knowledge, self-management activities, and health outcomes for patients with heart failure cared for under the chronic disease model: the improving chronic illness care evaluation. *Journal of Cardiac Failure*. 2005;11:405-13.  
<http://dx.doi.org/10.1016/j.cardfail.2005.03.010>