Title

Knowledge Is Insufficient for Self-Care Among Heart Failure Patients With Psychological Distress

Permalink

https://escholarship.org/uc/item/5309t4g5

Journal

Health Psychology, 33(7)

ISSN

0278-6133

Authors

Hwang, Boyoung
Moser, Debra K
Dracup, Kathleen

Publication Date

2014-07-01

DOI

10.1037/a0033419

Peer reviewed

Knowledge Is Insufficient for Self-care among Heart Failure Patients with Psychological Distress

Boyoung Hwang, PhD, RN[a], **Debra K. Moser, DNSc, RN, FAAN**[b], and **Kathleen Dracup, PhD, RN, FAAN**[c]

[a]School of Nursing, University of California, Los Angeles, Los Angeles, CA

[b]College of Nursing, University of Kentucky, Lexington, KY

[c]School of Nursing, University of California, San Francisco, San Francisco, CA

Abstract

Objective—We conducted a study to identify barriers to, and factors promoting, self-care among heart failure (HF) patients with higher or lower levels of knowledge.

Methods—Baseline data from 612 patients with HF enrolled in the REMOTE-HF trial were analyzed. Using median splits on the HF Knowledge Scale and the European HF Self-care Behavior Scale, patients were divided into four groups: 1) low knowledge and good self-care; 2) low knowledge and poor self-care; 3) high knowledge and good self-care; and 4) high knowledge and poor self-care. Characteristics of the groups were compared using ANOVA, Kruskal-Wallis tests, and chi-square tests, followed by pairwise tests with Bonferroni correction. Variables significant in the univariate analyses were evaluated as predictors of self-care using hierarchical multiple linear regression. The potential moderating effect of knowledge was tested by adding interaction terms to the model.

Results—The four groups did not differ in sociodemographics or health literacy scores, but were different in New York Heart Association (NYHA) class, comorbidities, and scores on depression, anxiety, and perceived control. In post-hoc pairwise tests, patients with high knowledge and poor self-care tended to have worse NYHA class, higher depression and anxiety and lower levels of perceived control than others. In the multivariate analysis, knowledge, depressive symptoms and perceived control were significant predictors of self-care, as was the interaction between knowledge and anxiety.

Conclusions—Screening and treatment of depression and anxiety is important in improving self-care among HF patients. HF management programs need to include strategies for increasing patients' perceived control over their heart disease.

Keywords

Heart failure; self-care; knowledge; psychological distress

Corresponding author: Boyoung Hwang, RN, PhD, School of Nursing, University of California, Los Angeles, Box 95-6918, Los Angeles, CA 90095-6918, phone: 1-310-825-6233, fax: 1-310-794-7482, bhwang@sonnet.ucla.edu.

Introduction

Heart failure (HF) places a significant burden on our society and health care system. Currently, 5.7 million Americans suffer from HF, and its prevalence is expected to rise with improvement in treatment of cardiovascular disease and the aging of the population (Heidenreich et al., 2011; Roger et al., 2012). Total direct medical costs of HF are estimated to triple from $24.7 billion in 2010 to $77.7 billion in 2030 (Heidenreich, et al., 2011), with most of the costs attributable to hospitalizations (Dunlay et al., 2011; Lee, Chavez, Baker, & Luce, 2004). According to the 2007 National Hospital Discharge Survey (Hall, DeFrances, Williams, Golosinskiy, & Schwartzman, 2010), HF was the primary discharge diagnosis for approximately one million hospitalizations and was the most common reason for hospital admission in people aged 65 years and older. Moreover, early rehospitalization is common among HF patients, with a 30-day all-cause readmission rate of nearly 25% (Ross et al., 2010).

The importance of self-care has been highlighted in the management of HF as inadequate self-care management has been identified as the most common reason for rehospitalization in patients with HF (Lainscak et al., 2011; Riegel et al., 2009). Self-care is a complex process that involves decision-making and actions undertaken by individuals in order to maintain health and well-being or manage chronic illness (Jaarsma, Stromberg, Martensson, & Dracup, 2003; Moser & Watkins, 2008; Riegel et al., 2004). Thus, self-care in HF includes behaviors such as monitoring weight and symptoms, adhering to medication, diet and exercise, and contacting health care providers when symptoms worsen (Jaarsma, et al., 2003; Moser & Watkins, 2008). Although knowledge about HF and its management is necessary to perform appropriate HF self-care, it is not sufficient. The association between level of knowledge about HF and self-care behaviors in HF patients has been found to be small to moderate (Artinian, Magnan, Sloan, & Lange, 2002; Ni et al., 1999). A number of other factors have been examined in relation to HF self-care, including depression (Holzapfel et al., 2009; Riegel & Carlson, 2002; van der Wal et al., 2006), anxiety (Riegel & Carlson, 2002), perceived control (Heo, Moser, Lennie, Riegel, & Chung, 2008; Riegel & Carlson, 2002), social support (Sayers, Riegel, Pawlowski, Coyne, & Samaha, 2008), health literacy (Macabasco-O'Connell et al., 2011), physical function (Heo, et al., 2008; Riegel & Carlson, 2002; Suwanno, Petpichetchian, Riegel, & Issaramalai, 2009) and comorbidities (Holzapfel, et al., 2009; Riegel & Carlson, 2002; Suwanno, et al., 2009).

An important gap in the current literature is the lack of information about the factors that facilitate or impede appropriate self-care among HF patients with higher or lower levels of knowledge, because most previous investigators examined a limited number of factors, often not including levels of knowledge. Addressing this gap will provide critical information to help clinicians identify patients who need further resources in addition to education about HF and its management. Another gap is that most studies in the area lack a guiding conceptual framework that addresses the complex nature of factors affecting self-care (Moser & Watkins, 2008). One of the few comprehensive conceptual frameworks of HF self-care is the one developed by Moser and Watkins (2008). The model is derived from the literature on HF self-care and includes factors affecting self-care: aging status (i.e., cognitive impairment, sensory impairment, changing symptom intensity, poor functional status,

comorbidities, and low-grade proinflammatory state), psychosocial status (i.e., depression, anxiety, low perceived control, lack of social support, low education level, and low socioeconomic status), low health literacy, current symptom status, and prior experiences with symptoms and with the health care system. The model also addresses the interrelatedness among these factors. For example, low levels of perceived control are not only associated with poor HF self-care but also associated with high levels of anxiety and depression. Accordingly, we conducted a study to identify barriers to, and factors promoting, self-care among HF patients with higher or lower levels of knowledge using the model of self-care in HF (Moser & Watkins, 2008) as a guiding conceptual framework.

Methods

Study Design and Participants

This study was a cross-sectional analysis of baseline data from 612 patients with HF enrolled in a multicenter, randomized clinical trial designed to evaluate the effects of a focused education intervention on clinical outcomes of HF patients (Rural Education to Improve Outcomes in Heart Failure [REMOTE-HF] study; Figure 1). The study was approved by the Institutional Review Board of each participating institution. Patients were recruited from multiple cardiology practices in rural areas of California, Kentucky, and Nevada. Recruitment was conducted by clinicians at the participating sites during a regularly scheduled appointment, as well as by letters to the eligible patients and flyers. To be eligible for the primary study, patients had to be 18 years or older and live in a rural area defined as a town of < 2,500 persons, a metropolitan center of < 50,000 persons, or open country ("Measuring rurality: New definitions in 2003," 2003). Other inclusion criteria for the primary study were having been hospitalized for HF within the past 6 months, being able to read and write English, and living independently (i.e., not institutionalized). Patients were excluded if they had a complicating serious co-morbidity (e.g., a psychiatric illness or untreated malignancy), had a neurological disorder that impaired cognition, or were already participating in a HF disease management program.

Procedure

After written informed consent was obtained from each patient, sociodemographic (i.e., age, gender, race/ethnicity, education, annual household income, marital status, and number of people living in the household) and psychological data were collected using self-administered structured questionnaires. Clinical data were abstracted from hospital medical records by trained research personnel using a standardized form.

Measurements

HF knowledge—The level of patients' knowledge about HF was measured with the Heart Failure Knowledge Scale (Simons-Morton et al., 1998). The questionnaire was originally developed for the acute myocardial infarction population and was later modified for the HF population (Robinson et al., 2011; Simons-Morton, et al., 1998). Content validity of the modified version was established by expert review, and predictive validity was established in a previous study (Caldwell, Peters, & Dracup, 2005; Howie, Banks, Caldwell, & Dracup, 2003). The questionnaire contains 20 questions, including multiple choice, yes/no, and true/

false questions, each of which addresses patients' knowledge about HF in general, symptoms of HF, and self-care management. Several symptoms are listed and participants are asked to answer with yes or no whether the listed item is a symptom of HF. A sample true/false question is, 'Heart failure is a condition where the heart cannot pump enough blood to meet the needs of the body.' Higher scores indicate higher knowledge about HF, and scores can range from 0 to 100% (Caldwell, et al., 2005; Robinson, et al., 2011).

HF self-care behavior—The nine-item European HF Self-care Behavior Scale (Jaarsma, Arestedt, Martensson, Dracup, & Stromberg, 2009) was used to measure HF-related self-care behaviors. Sample items include: 'I weigh myself every day' and 'If my shortness of breath increases, I contact my doctor or nurse.' Responses on each item are measured on a 5-point Likert scale ranging from 1 (completely agree) to 5 (don't agree at all). Thus, the total score can range from 9 to 45, with lower scores indicating better self-care. A thorough psychometric evaluation of the scale was reported previously (Jaarsma, et al., 2009; Jaarsma, et al., 2003). This is one of the only two valid and reliable instruments that measure disease specific self-care behaviors (Cameron, Worrall-Carter, Driscoll, & Stewart, 2009). The internal consistency of the scale in our sample was acceptable with Cronbach's alpha of .72.

Functional status—The functional status of patients was assessed with the New York Heart Association (NYHA) classification system (Lindenfeld et al., 2010). The system classifies patients into one of four classes based on the extent to which symptoms limit the patient's level of physical activity. Class IV indicates being unable to carry out any physical activity without discomfort (Lindenfeld, et al., 2010). The NYHA classification is widely used in both clinical practice and research (Bennett, Riegel, Bittner, & Nichols, 2002).

Comorbidity—Using the Charlson Comorbidity Index (Charlson, Pompei, Ales, & MacKenzie, 1987), data on patients' comorbidities were collected from medical records. The Charlson index includes 19 major disease categories and generates a weighted index based on the number and severity of comorbid diseases (Charlson, et al., 1987). It has been extensively tested, has good reliability and validity, and has been used frequently in clinical research (De Groot, Beckerman, Lankhorst, & Bouter, 2003).

Health literacy—Health literacy is the degree to which an individual has the capacity to obtain, process, and understand basic health information and services (Ratzan & Parker, 2000). To measure the level of patients' health literacy, we used the reading comprehension section of the Short-form Test of Functional Health Literacy in Adults (Baker, Williams, Parker, Gazmararian, & Nurss, 1999). It is a timed test, containing two health-related passages with 36 cloze items. A sample item is, 'The day of the x-ray: Do not eat [ ].' The response options for this item are 'appointment,' 'walk-in,' 'breakfast,' and 'clinic.' Total scores range from 0 to 36 (Baker, et al., 1999). The instrument has been used in many HF clinical trials (Evangelista et al., 2010), and its validity and reliability were reported previously (Baker, et al., 1999). In our sample, the 36 items showed acceptable internal consistency with Cronbach's alpha of .76.

Depression—Patients' depressive symptoms were measured with the nine-item depression scale of the Patient Health Questionnaire (PHQ-9) (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 is a brief and valid tool for depression screening with reasonable sensitivity and specificity (Kroenke & Spitzer, 2002). Possible scores range from 0 to 27, and a score of 10 or greater suggests clinical depression (Kroenke & Spitzer, 2002; Kroenke, et al., 2001). In the present study, the PHQ-9 showed good internal consistency with Cronbach's alpha of .87.

Anxiety—The level of anxiety was measured using the anxiety subscale of the Brief Symptom Inventory (Derogatis & Melisaratos, 1983). The subscale contains 6 items that measure state anxiety. Unlike trait anxiety that is a relatively stable personality trait, state anxiety is a transitory emotional response, and therefore, has been an outcome of interest in many clinical studies (Abu Ruz et al., 2010; Endler & Kocovski, 2001). Each item is scored on a 5-point Likert scale ranging from 0 to 4. The overall score is the average score of all items, and therefore, can range from 0 to 4. Higher scores indicate higher levels of anxiety (Derogatis & Melisaratos, 1983). Its reliability and validity have been tested in patients with acute myocardial infarction (Abu Ruz, et al., 2010) and patients with HF (Khalil, Hall, Moser, Lennie, & Frazier, 2011). The internal consistency of the scale was good (α = .89) in the present study.

Perceived control—Patients' perceived control over their heart disease was measured with the Control Attitudes Scale-Revised (Moser et al., 2009). The scale consists of eight items, each of which is rated on a 5-point Likert scale. The total score can range from 8 to 40, with higher scores indicating greater perceived control. The psychometrics of the scale was reported in patients with cardiac disease, including coronary heart disease, acute myocardial infarction, and heart failure (Moser, et al., 2009). In the present study, Cronbach alpha of the scale was .78.

Statistical Analysis

Data were analyzed using IBM-SPSS 20.0. Descriptive statistics including means, standard deviations, medians, and frequencies were used to describe characteristics of HF patients and other study variables. Initially, we compared sociodemographic, clinical and psychological characteristics among four groups of patients with HF: 1) patients with low knowledge and good self-care; 2) patients with low knowledge and poor self-care; 3) patients with high knowledge and good self-care; and 4) patients with high knowledge and poor self-care. Because there are no levels set for either instrument to indicate high or low knowledge or self-care, we used the median splits for the HF knowledge scores and the HF self-care behavior scores to divide patients into these four groups. The characteristics of the four groups were compared using ANOVA, Kruskal-Wallis tests, and chi-square tests depending on the type and distribution of the data. All assumptions for each statistical test were checked. For those variables that did not meet the assumptions for ANOVA, non-parametric alternatives (Kruskal-Wallis tests) were used. When the overall ANOVA or Kruskal-Wallis test was significant, pairwise comparisons were performed using t-tests or Mann-Whitney tests, as appropriate.

Intercorrelations between these characteristics were examined by computing Pearson product moment correlation coefficients, Spearman's correlation coefficients, or point-biserial correlation coefficients, as appropriate. Variables significant in the univariate analyses (ANOVA, Kruskal-Wallis tests, and chi-square tests) were evaluated using hierarchical multiple linear regression with self-care as a dependent variable. The assumptions of multiple linear regression analysis were checked. To control for its effect, HF knowledge was entered first in a block, and the variables significant in the univariate analyses were entered in the second block using the forced enter method. This method was used to determine the unique contribution of each variable. In the third block, all possible interaction terms between HF knowledge and the variables in the second block were entered using the stepwise method in order to create a parsimonious model with only significant interaction terms. The statistical significance level was set at $p < .05$, and the Bonferroni method was used to adjust the p values for multiple pairwise comparisons ($p < .05/6 = .0083$; corrected for 6 pairwise comparisons).

Results

Sociodemographic, clinical and psychological characteristics of the sample are presented in Table 1. In the total sample (*N*=612), the mean and median scores for the HF Knowledge Scale were 69.5% (*SD*, 13.0%) and 70.0% (range, 25–100%), respectively. The mean score for the HF Self-care Behavior Scale was 20.1 (*SD*, 7.0), and the median was 19.0 (range, 9–45).

Table 1 also presents sociodemographic, clinical and psychological characteristics of the four groups. Among the four patient groups, divided based on the levels of HF knowledge and self-care, we found significant differences in NYHA class ($p = .01$), Charlson Comorbidity index ($p = .03$), and scores on depression ($p < .001$), anxiety ($p < .001$), and perceived control ($p < .001$). The four groups had no significant differences in other sociodemographic variables (i.e., age, gender, race/ethnicity, education, household income, marital status, and number of people living in the household) or in the level of health literacy (all *p*'s > .05).

Post-hoc pairwise tests revealed that patients with high knowledge and good self-care had lower NYHA class than those with high knowledge and poor self-care ($p = .005$). There was no significant difference in NYHA class among the rest of the groups. We also found that patients with low knowledge and poor self-care had higher Charlson index scores compared to those with low knowledge and good self-care ($p = .004$). No significant difference was found in Charlson index among the rest of the groups.

The differences in psychological characteristics among the four patient groups were also examined. The mean depression score for patients with high knowledge and poor self-care was 9.5 (SD, 7.0), significantly higher than 7.3 (SD, 6.6) for those with low knowledge and good self-care ($p = .006$), 7.4 (SD, 6.5) for those with low knowledge and poor self-care ($p = .007$), and 5.7 (SD, 5.1) for those with high knowledge and good self-care ($p < .001$). Forty-five percent of patients in the group with high knowledge and poor self-care had a PHQ-9 score of 10 or higher, compared with 29% in the group with low knowledge and

good self-care, 32% in the group with low knowledge and poor self-care, and 22% in the group with high knowledge and good self-care. In the analysis of anxiety scores, patients with high knowledge and poor self-care had higher anxiety scores (mean, 1.0; *SD*, 0.98) than those with low knowledge and poor self-care (mean, 0.76; *SD*, 0.93; *p* = .003) and those with high knowledge and good self-care (mean, 0.64; *SD*, 0.80; *p* < .001). The differences in anxiety scores were not significantly different among the rest of the groups. In addition, the mean perceived control score for patients with high knowledge and poor self-care (mean, 28.0; *SD*, 5.3) was significantly lower than the mean score for patients with low knowledge and good self-care (mean, 29.7; *SD*, 5.0; *p* = .005) and the mean score for patients with high knowledge and good self-care (mean, 30.5; SD, 4.8; *p* < .001). The rest of the groups did not differ in terms of the level of perceived control.

Table 2 displays associations among study variables, including self-care, HF knowledge, and other characteristics of patients. There were moderate correlations between age and health literacy (*r* = −.395), between education level and income (*r* = .312), and between depressive symptoms and perceived control (*r* = −.409). Depressive symptoms were also highly correlated with anxiety (*r* = .673). Results from hierarchical multiple linear regression analysis are summarized in Table 3. In the model with HF knowledge and the variables significant in the univariate analyses, higher HF knowledge (β = −.190, *p* < .001), lower depressive symptoms (β = .204, *p* < .001) and higher perceived control (β = −.131, *p* = .002) were significant in predicting better self-care, after controlling for NYHA class, comorbidities, and anxiety (R^2 = .109, *adj.* R^2 = .100, $F_{6,604}$ = 12.35, *p* < .001). When interaction terms were entered into the model using the stepwise method, only the interaction between HF knowledge and anxiety was significant (β = −.503, *p* = .017) and depressive symptoms and perceived control remained significant (R^2 = .118, *adj.* R^2 = .107, $F_{7,603}$ = 11.48, *p* < .001, R^2 = .008, *p* = .017). That is, for those patients with low levels of anxiety, higher levels of knowledge were associated with better self-care (*b* = −.157, β = −.332, *p* < .001), after controlling for NYHA class, comorbidities, depression, and perceived control. However, no such relationship was found for those patients with high levels of anxiety (*b* = −.055, β = −.093, *p* = .094).

Discussion

The findings of the present study underscore the role of psychological factors in self-care among patients with HF. In the univariate analyses, patients who had high HF knowledge but performed poor HF self-care tended to be more depressed and anxious and to have lower perceived control than patients with high knowledge who performed good self-care. Depression has been reported as a barrier to self-care in HF patients (Holzapfel, et al., 2009; Riegel & Carlson, 2002; van der Wal, et al., 2006). It has been suggested that depression may interfere with patients' ability to learn, recognize worsening of symptoms, and make decisions on how to deal with symptoms and may negatively affect patients' motivation to engage in self-care activities (Bauer et al., 2012; Riegel, et al., 2009). As patients who had high HF knowledge but performed poor self-care were more likely to be depressed than others in the present study, poor self-care in depressed HF patients may be more attributable to difficulties in decision-making and lack of motivation regarding self-care than to difficulties in learning. Similar differences were found for anxiety among the four groups in

the present study. However, the long-term effects of anxiety on HF self-care warrant further investigation. In a previous longitudinal study that followed depressed patients hospitalized for heart disease over a 6-month period, improvement of depression was significantly associated with better self-care behaviors throughout the 6-month period, but improvement of anxiety was associated with better self-care only at 6 weeks (Bauer, et al., 2012). These findings suggest that severe anxiety may hinder patients' ability to engage in self-care (Riegel, et al., 2009), while some symptoms, such as worrying and vigilance, may contribute to better adherence to self-care recommendations (Bauer, et al., 2012). Perceived control is defined as one's belief of his or her ability to cope with negative events and can be increased by providing information and resources and encouraging active participation in decision-making (Moser & Dracup, 1995). Although it has not been fully explored in the context of HF self-care, our findings that patients who had high knowledge but performed poor self-care had lower perceived control than those with high knowledge and good self-care and those with low knowledge and good self-care are in line with the findings of previous research (Heo, et al., 2008; Riegel & Carlson, 2002).

The results of the multivariate analysis also highlight the role of psychological factors in promoting self-care, in which HF knowledge, depression, anxiety, and perceived control, as well as the interaction between HF knowledge and anxiety, were found to be significant in predicting self-care. While higher levels of knowledge were associated with better self-care among patients with low levels of anxiety, no such relationship existed among patients with high levels of anxiety. As we also found a strong correlation between anxiety and depression in our sample, we suggest that educational interventions may not be effective in promoting self-care when patients are psychologically distressed. In previous studies, while educational interventions for patients with HF have resulted in improvement in patient knowledge, their effects on self-care have been inconsistent (Boyde, Turner, Thompson, & Stewart, 2011). The inconsistent results might be due to psychological factors that were not measured in these studies. Therefore, given the high prevalence of depression and anxiety in HF patients (Konstam, Moser, & De Jong, 2005), intervention programs that aim to promote self-care in HF patients need to include assessment and treatment strategies for depression and anxiety. Additional strategies, such as education and counseling to improve patients' perceived control may enhance the effect of these programs.

Clinical characteristics of patients, such as physical function and comorbidities, have been examined in relation to HF self-care. In our study, patients with high knowledge and poor self-care had higher NYHA class, indicating worse physical function, compared to those with high knowledge and good self-care. However, in the multivariate model with self-care as a dependent variable, NYHA class was not significant after controlling for HF knowledge, comorbidities, depression, anxiety, and perceived control. Previous studies have been inconclusive about the relationship between physical function and self-care. While one study found that poor physical function was associated with poor HF self-care (Suwanno, et al., 2009), another study found that poor physical function was associated with better self-care among female HF patients (Heo, et al., 2008). Poor physical function may limit patients' ability to engage in self-care, but asymptomatic patients may be less motivated to engage in self-care (Riegel, Lee, & Dickson, 2011). Therefore, the relationship between physical function and HF self-care appears to be complex and needs to be further examined

in future research. In the univariate analyses of our study, among the two groups with low levels of knowledge, patients who performed good self-care had fewer comorbidities than those who performed poor self-care. Similarly, previous studies showed that HF patients with more comorbidities performed poorer self-care (Holzapfel, et al., 2009; Suwanno, et al., 2009). Researchers attributed this relationship to the additional barriers to self-care that may arise from simultaneous demands of comorbid conditions, which include requiring multiple medications and complex dietary modifications (Bayliss, Steiner, Fernald, Crane, & Main, 2003). However, in the multivariate analysis of our study, the effect of comorbidities became non-significant after adjusting for psychological factors. Because psychological factors were not fully examined in the two aforementioned studies that showed a significant relationship between comorbidities and self-care, additional research is needed to determine their relationship. In this study, we did not find any significant difference in levels of health literacy among the four groups or any significant association between health literacy and either HF knowledge or self-care. Although there are only a few studies examining the impact of health literacy on self-care in patients with HF, one study found that levels of health literacy were associated with levels of HF knowledge but not with self-care behaviors (Dennison et al., 2011). In another study of patients with HF, using a structural equation model analysis, researchers showed that health literacy had a significant direct effect on HF knowledge but no direct effect on self-care (Macabasco-O'Connell, et al., 2011). In the same study, the effect of health literacy on self-care was mediated by levels of HF knowledge and self-efficacy. Thus, further investigation is warranted to examine health literacy in relation to HF knowledge and self-care.

While social support has been identified as an important factor facilitating self-care, the four groups in the present study did not differ in sociodemographic variables, some of which are often used as a proxy for social support, such as marital status and number of people living in the household. This finding may be attributable to the fact that such variables measure structural social support, not functional social support. Functional social support is the degree to which an individual's relationships serve particular functions, such as emotional support, tangible support, informational support, and social companionship, and is considered to be the most essential aspect of social support (Sherbourne & Stewart, 1991). Indeed, in a previous study, higher levels of perceived social support, especially emotional support, were associated with better self-care in patients with HF (Sayers, et al., 2008). The fact that functional social support was not measured in the present study may explain why we did not find any significant difference, except for comorbidities, between the two groups with low levels of knowledge. It has been reported that family caregivers often provide emotional support for patients with HF and help them with various self-care activities, especially those related to HF management (Hwang, Fleischmann, Howie-Esquivel, Stotts, & Dracup, 2011; Riegel & Carlson, 2002). Therefore, patients who had low knowledge but performed good self-care may have received more functional social support from family and friends than those with low knowledge and poor self-care. They may also have had a family caregiver helping them with self-care activities and decision-making related to self-care. Thus, future research should measure functional social support and assess whether patients have a family caregiver providing assistance and support for their self-care activities.

It is important to note a few limitations of this study. First, the findings of this study need to be interpreted with caution due to the cross-sectional design. Longitudinal research is needed to determine causal relationships among the variables. Second, because this was a secondary analysis study, the analysis was limited to the variables for which data were collected for the primary study. Therefore, not all variables in the conceptual model of self-care in HF (Moser & Watkins, 2008) were examined. As noted above, other variables not measured in this study, including social support and assistance from family caregivers, may provide a better insight into the contributing factors and barriers to self-care among patients with low levels of HF knowledge. Third, the patients in this study were predominantly white, recruited from rural areas, and were not participating in a HF disease management program. Therefore, the results of this study may not be generalized to ethnic minorities, patients living in areas where more resources are available, or those receiving care from specialized HF management programs. Also, because patients had to have been hospitalized within past six months to be eligible for the primary study, our results may not be generalized to patients who have been newly diagnosed with HF or patients who have not had a recent hospitalization. However, our findings provide an important addition to the current knowledge about HF self-care in rural population where limited information is currently available.

Conclusion

Over the past decades, a growing emphasis has been placed on promoting self-care among HF patients in both research and clinical practice. Patient education has been a key component of HF management programs because patients' knowledge about HF and its management is believed to be the foundation of successful self-care. However, various factors also contribute to adherence to self-care. Our findings highlight the importance of screening and management of psychological distress in patients with HF and suggest that educational programs are not sufficient to promote self-care, especially in depressed and/or anxious patients. The results of our study also suggest that enhancing perceived control can lead to improved self-care. Thus, intervention programs to promote self-care in HF patients should include strategies to identify and provide proper care for patients who are psychologically distressed. In clinical settings, HF patients need to be screened for depression and anxiety and should be referred for further evaluation and treatment if required. Finally, both patients and their families need to be involved in communication and decision-making regarding self-care.

Acknowledgments

References

Abu Ruz ME, Lennie TA, Riegel B, McKinley S, Doering LV, Moser DK. Evidence that the brief symptom inventory can be used to measure anxiety quickly and reliably in patients hospitalized for acute myocardial infarction. Journal of Cardiovascular Nursing. 2010; 25(2):117–123. [PubMed: 20168191]

Artinian NT, Magnan M, Sloan M, Lange MP. Self-care behaviors among patients with heart failure. Heart & Lung. 2002; 31(3):161–172. [PubMed: 12011807]

Baker DW, Williams MV, Parker RM, Gazmararian JA, Nurss J. Development of a brief test to measure functional health literacy. Patient Education and Counseling. 1999; 38(1):33–42. [PubMed: 14528569]

Bauer LK, Caro MA, Beach SR, Mastromauro CA, Lenihan E, Januzzi JL, Huffman JC. Effects of depression and anxiety improvement on adherence to medication and health behaviors in recently hospitalized cardiac patients. American Journal of Cardiology. 2012; 109(9):1266–1271. [PubMed: 22325974]

Bayliss EA, Steiner JF, Fernald DH, Crane LA, Main DS. Descriptions of barriers to self-care by persons with comorbid chronic diseases. Annals of family medicine. 2003; 1(1):15–21. [PubMed: 15043175]

Bennett JA, 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(4):262–270. [PubMed: 12122390]

Boyde M, Turner C, Thompson DR, Stewart S. Educational interventions for patients with heart failure: A systematic review of randomized controlled trials. Journal of Cardiovascular Nursing. 2011; 26(4):E27–E35. [PubMed: 21076308]

Caldwell MA, Peters KJ, Dracup KA. A simplified education program improves knowledge, self-care behavior, and disease severity in heart failure patients in rural settings. American heart journal. 2005; 150(5):983. [PubMed: 16290977]

Cameron J, Worrall-Carter L, Driscoll A, Stewart S. Measuring self-care in chronic heart failure: A review of the psychometric properties of clinical instruments. Journal of Cardiovascular Nursing. 2009; 24(6):E10–E22. [PubMed: 19786882]

Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. Journal of Chronic Diseases. 1987; 40(5):373–383. [PubMed: 3558716]

De Groot V, Beckerman H, Lankhorst GJ, Bouter LM. How to measure comorbidity. A critical review of available methods. Journal of Clinical Epidemiology. 2003; 56(3):221–229. [PubMed: 12725876]

Dennison CR, McEntee ML, Samuel L, Johnson BJ, Rotman S, Kielty A, Russell SD. Adequate health literacy is associated with higher heart failure knowledge and self-care confidence in hospitalized patients. Journal of Cardiovascular Nursing. 2011; 26(5):359–367. [PubMed: 21099698]

Derogatis LR, Melisaratos N. The Brief Symptom Inventory: An introductory report. Psychological medicine. 1983; 13(3):595–605. [PubMed: 6622612]

Dunlay SM, Shah ND, Shi Q, Morlan B, VanHouten H, Long KH, Roger VL. Lifetime costs of medical care after heart failure diagnosis. *Circulation* . Cardiovascular quality and outcomes. 2011; 4(1):68–75. [PubMed: 21139091]

Endler NS, Kocovski NL. State and trait anxiety revisited. Journal of anxiety disorders. 2001; 15(3): 231–245. [PubMed: 11442141]

Evangelista LS, Rasmusson KD, Laramee AS, Barr J, Ammon SE, Dunbar S, Yancy CW. Health literacy and the patient with heart failure - implications for patient care and research: A consensus statement of the Heart Failure Society of America. Journal of Cardiac Failure. 2010; 16(1):9–16. [PubMed: 20123313]

Hall MJ, DeFrances CJ, Williams SN, Golosinskiy A, Schwartzman A. National Hospital Discharge Survey: 2007 summary. National health statistics reports (29). 2010; 1–20:24.

Heidenreich PA, Trogdon JG, Khavjou OA, Butler J, Dracup K, Ezekowitz MD, Woo YJ. Forecasting the future of cardiovascular disease in the United States: A policy statement from the American Heart Association. Circulation. 2011; 123(8):933–944. [PubMed: 21262990]

Heo S, Moser DK, Lennie TA, Riegel B, Chung ML. 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(12):1807–1815. [PubMed: 18674762]

Holzapfel N, Lowe B, Wild B, Schellberg D, Zugck C, Remppis A, Muller-Tasch T. Self-care and depression in patients with chronic heart failure. Heart & Lung. 2009; 38(5):392–397. [PubMed: 19755189]

Howie J, Banks A, Caldwell MA, Dracup K. A pilot educational intervention improves patient knowledge of symptoms of heart failure. American Journal of Critical Care. 2003; 12:278–279.

Hwang B, Fleischmann KE, Howie-Esquivel J, Stotts NA, Dracup K. Caregiving for patients with heart failure: Impact on patients' families. American Journal of Critical Care. 2011; 20(6):431–441. quiz 442. [PubMed: 22045140]

Jaarsma T, Arestedt KF, Martensson J, Dracup K, Stromberg A. The European Heart Failure Self-care Behaviour scale revised into a nine-item scale (EHFScB-9): A reliable and valid international instrument. European Journal of Heart Failure. 2009; 11(1):99–105. [PubMed: 19147463]

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(3):363–370. [PubMed: 12798836]

Khalil AA, Hall LA, Moser DK, Lennie TA, Frazier SK. The psychometric properties of the Brief Symptom Inventory depression and anxiety subscales in patients with heart failure and with or without renal dysfunction. Archives of psychiatric nursing. 2011; 25(6):419–429. [PubMed: 22114796]

Konstam V, Moser DK, De Jong MJ. Depression and anxiety in heart failure. Journal of Cardiac Failure. 2005; 11(6):455–463. [PubMed: 16105637]

Kroenke K, Spitzer RL. The PHQ-9: A new depression and diagnostic severity measure. Psychiatric Annals. 2002; 32(9):509–521.

Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. Journal of General Internal Medicine. 2001; 16(9):606–613. [PubMed: 11556941]

Lainscak M, Blue L, Clark AL, Dahlstrom U, Dickstein K, Ekman I, Jaarsma T. Self-care management of heart failure: Practical recommendations from the Patient Care Committee of the Heart Failure Association of the European Society of Cardiology. European Journal of Heart Failure. 2011; 13(2):115–126. [PubMed: 21148593]

Lee WC, Chavez YE, Baker T, Luce BR. Economic burden of heart failure: A summary of recent literature. Heart & Lung. 2004; 33(6):362–371. [PubMed: 15597290]

Lindenfeld J, Albert NM, Boehmer JP, Collins SP, Ezekowitz JA, Givertz MM, Walsh MN. HFSA 2010 Comprehensive heart failure practice guideline. Journal of Cardiac Failure. 2010; 16(6):e1–e194. [PubMed: 20610207]

Macabasco-O'Connell A, DeWalt DA, Broucksou KA, Hawk V, Baker DW, Schillinger D, Pignone M. Relationship between literacy, knowledge, self-care behaviors, and heart failure-related quality of life among patients with heart failure. Journal of General Internal Medicine. 2011; 26(9):979–986. [PubMed: 21369770]

Measuring rurality: New definitions in 2003. Economic Research Service United States Department of Agriculture. 2003 Aug 21. Retrieved from http://www.ers.usda.gov/briefing/rurality/NewDefinitions

Moser DK, Dracup K. Psychosocial recovery from a cardiac event: The influence of perceived control. Heart & Lung. 1995; 24(4):273–280. [PubMed: 7591794]

Moser DK, Riegel B, McKinley S, Doering LV, Meischke H, Heo S, Dracup K. The Control Attitudes Scale-Revised: Psychometric evaluation in three groups of patients with cardiac illness. Nursing Research. 2009; 58(1):42–51. [PubMed: 19092554]

Moser DK, Watkins JF. Conceptualizing self-care in heart failure: A life course model of patient characteristics. Journal of Cardiovascular Nursing. 2008; 23(3):205–218. quiz 219–220. [PubMed: 18437061]

Ni H, Nauman D, Burgess D, Wise K, Crispell K, Hershberger RE. Factors influencing knowledge of and adherence to self-care among patients with heart failure. Archives of Internal Medicine. 1999; 159(14):1613–1619. [PubMed: 10421285]

Ratzan, SC.; Parker, RM. Introduction. In: Selden, CR.; Zorn, M.; Ratzan, SC.; Parker, RM., editors. National Library of Medicine Current Bibliographies in Medicine: Health Literacy. Bethesda, MD:

National Library of Medicine; 2000. Retrieved from http://www.nlm.nih.gov/archive//20061214/pubs/cbm/hliteracy.pdf.

Riegel B, Carlson B. Facilitators and barriers to heart failure self-care. Patient Education and Counseling. 2002; 46(4):287–295. [PubMed: 11932128]

Riegel B, Carlson B, Moser DK, Sebern M, Hicks FD, Roland V. Psychometric testing of the Self-Care of Heart Failure Index. Journal of Cardiac Failure. 2004; 10(4):350–360. [PubMed: 15309704]

Riegel B, Lee CS, Dickson VV. Self care in patients with chronic heart failure. *Nature reviews* . Cardiology. 2011; 8(11):644–654. [PubMed: 21769111]

Riegel B, Moser DK, Anker SD, Appel LJ, Dunbar SB, Grady KL, Whellan DJ. State of the science: Promoting self-care in persons with heart failure: A scientific statement from the American Heart Association. Circulation. 2009; 120(12):1141–1163. [PubMed: 19720935]

Robinson S, Moser D, Pelter MM, Nesbitt T, Paul SM, Dracup K. Assessing health literacy in heart failure patients. Journal of Cardiac Failure. 2011; 17(11):887–892. [PubMed: 22041324]

Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, Turner MB. Heart disease and stroke statistics-2012 update: A report from the American Heart Association. Circulation. 2012; 125(1):e2–e220. [PubMed: 22179539]

Ross JS, Chen J, Lin Z, Bueno H, Curtis JP, Keenan PS, Krumholz HM. Recent national trends in readmission rates after heart failure hospitalization. *Circulation* . Heart Failure. 2010; 3(1):97–103. [PubMed: 19903931]

Sayers SL, Riegel B, Pawlowski S, Coyne JC, Samaha FF. Social support and self-care of patients with heart failure. Annals of Behavioral Medicine: a Publication of the Society of Behavioral Medicine. 2008; 35(1):70–79. [PubMed: 18347906]

Sherbourne CD, Stewart AL. The MOS social support survey. Social Science & Medicine. 1991; 32(6):705–714. [PubMed: 2035047]

Simons-Morton DG, Goff DC, Osganian S, Goldberg RJ, Raczynski JM, Finnegan JR, Luepker RV. Rapid early action for coronary treatment: Rationale, design, and baseline characteristics. REACT Research Group. Acad Emerg Med. 1998; 5(7):726–738. [PubMed: 9678398]

Suwanno J, Petpichetchian W, Riegel B, Issaramalai SA. A model predicting health status of patients with heart failure. Journal of Cardiovascular Nursing. 2009; 24(2):118–126. [PubMed: 19242277]

van der Wal MH, Jaarsma T, Moser DK, Veeger NJ, van Gilst WH, van Veldhuisen DJ. Compliance in heart failure patients: The importance of knowledge and beliefs. European Heart Journal. 2006; 27(4):434–440. [PubMed: 16230302]
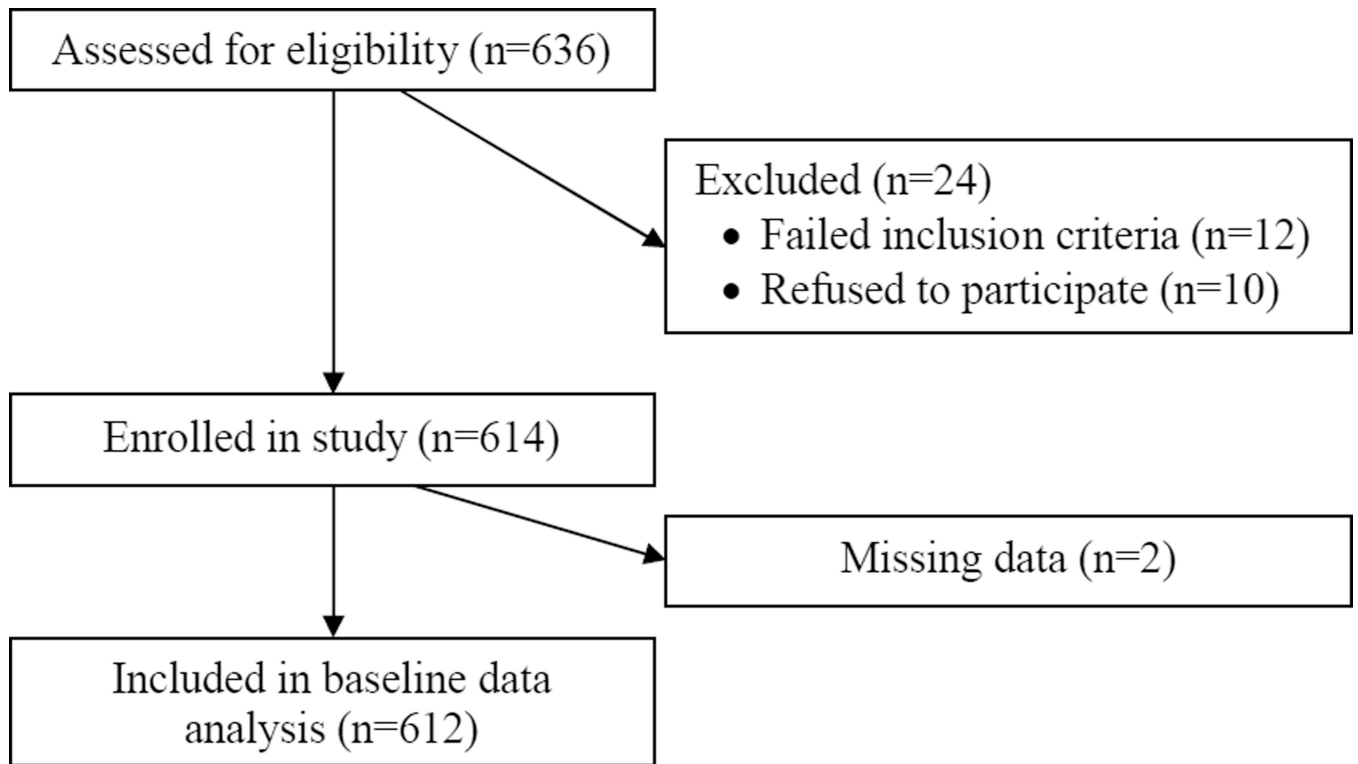
Figure 1.
CONSORT flow diagram of REMOTE-HF study (baseline data only)

Table 1

Characteristics of the study population*

Characteristic	All patients (N=612) n (%)	Low Knowledge Good Self-care (n=127) n (%)	Low Knowledge Poor Self-care (n=148) n (%)	High Knowledge Good Self-care (n=185) n (%)	High Knowledge Poor Self-care (n=152) n (%)	P-value**
Gender						.30
Female	253 (41)	48 (38)	56 (38)	77 (42)	72 (47)	
Race/Ethnicity						.11
White, non-Hispanic	521 (85)	110 (87)	134 (91)	151 (82)	126 (83)	
Education level						.48
< High school	117 (19)	28 (22)	28 (19)	31 (17)	30 (20)	
Completed high school	293 (48)	64 (50)	71 (48)	92 (50)	66 (43)	
> High school	202 (33)	35 (28)	49 (33)	62 (34)	56 (37)	
Household income ($)						.46
< 20,000	217 (36)	49 (39)	46 (31)	72 (39)	50 (33)	
20,000 – 40,000	180 (29)	30 (24)	41 (28)	60 (32)	49 (32)	
40,000 – 75,000	95 (16)	26 (20)	21 (14)	21 (11)	27 (18)	
> 75,000	46 (8)	7 (6)	13 (9)	14 (8)	12 (8)	
Missing/decline to state	74 (12)	15 (12)	27 (18)	18 (10)	14 (9)	
Marital status						.97
Currently married	345 (56)	73 (57)	85 (57)	103 (56)	84 (55)	
Living at home						.79
Alone	142 (23)	26 (21)	27 (18)	51 (28)	38 (25)	
NYHA functional class						.01
I	64 (11)	17 (12)	14 (9)	23 (12)[†]	10 (7)[†]	
II	332 (54)	68 (54)	74 (50)	110 (59)	80 (53)	
III	190 (31)	38 (30)	52 (35)	47 (25)	53 (35)	

Characteristic	All patients (N=612) n (%)	Low Knowledge Good Self-care (n=127) n (%)	Low Knowledge Poor Self-care (n=148) n (%)	High Knowledge Good Self-care (n=185) n (%)	High Knowledge Poor Self-care (n=152) n (%)	P-value**
IV	25 (4)	3 (2)	8 (5)	5 (3)	9 (6)	
Charlson comorbidity index		‡	‡			.03
1 – 2	220 (36)	59 (46)	42 (28)	63 (34)	56 (37)	
3 – 4	252 (41)	44 (35)	66 (45)	81 (44)	61 (40)	
> 5	140 (23)	24 (19)	40 (27)	41 (22)	35 (23)	
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	P-value**
Age (year)	65.9 ± 12.9	67.1 ± 12.5	67.1 ± 10.4	65.2 ± 13.6	64.5 ± 14.6	.35
Health literacy (STOFLA)	25.5 ± 8.8	24.9 ± 9.1	25.1 ± 9.2	25.6 ± 8.7	26.4 ± 8.5	.59
Depression (PHQ-9)	7.4 ± 6.4	7.3 ± 6.6¶	7.4 ± 6.5§	5.7 ± 5.1†	9.5 ± 7.0†§¶	< .001
Anxiety (BSI)	0.83 ± 0.93	0.91 ± 0.97	0.76 ± 0.93§	0.64 ± 0.8†	1.0 ± 0.98†§	< .001
Perceived control (CASR)	29.4 ± 5.0	29.7 ± 5.0¶	29.3 ± 4.6	30.5 ± 4.8†	28.0 ± 5.3†¶	< .001

*
Data on some characteristics were not available for all subjects. Due to rounding, not all percentages total 100. NYHA denotes New York Heart Association, STOFLA short test of functional health literacy, PHQ-9 patient health questionnaire 9 items, BSI brief symptom inventory, and CASR control attitudes scale-revised. Scores on the STOFLA can range from 0 to 36; on the PHQ-9 from 0 to 27; on the BSI from 0 to 4; on the CASR from 8 to 40.

**
p-values are for the overall comparison of four patient groups (determined by the levels of HF knowledge and self-care) and are based on chi-square tests, Kruskal-Wallis tests, and analyses of variance, as appropriate.

†,‡,¶,§Significant pairwise differences at a corrected p-value of .0083 (Bonferroni corrected p-value of .05 for 6 pairwise comparisons)

Table 2

Intercorrelations between study variables

	1	2	3	4	5	6	7	8	9	10	11
1. Heart failure self-care*	—										
2. Heart failure knowledge	$-.181^{\ddagger}$	—									
3. Age	$-.013$	$-.120^{\ddagger}$	—								
4. Education level	$.035$	$.045$	$-.025$	—							
5. Household income	$.050$	$-.041$	$.095^{\dagger}$	$.312^{\ddagger}$	—						
6. NYHA class	$.117^{\ddagger}$	$.017$	$.083^{\dagger}$	$-.080^{\dagger}$	$-.149^{\ddagger}$	—					
7. Comorbidities	$.081^{\dagger}$	$.047$	$.029$	$-.037$	$-.082$	$.216^{\ddagger}$	—				
8. Health literacy	$-.002$	$.060$	$-.395^{\ddagger}$	$.234^{\ddagger}$	$.161^{\ddagger}$	$-.152^{\ddagger}$	$-.082^{\dagger}$	—			
9. Depressive symptoms	$.230^{\ddagger}$	$.022$	$-.204^{\ddagger}$	$-.056$	$-.190^{\ddagger}$	$.269^{\ddagger}$	$.219^{\ddagger}$	$.021$	—		
10. Anxiety	$.121^{\ddagger}$	$.024$	$-.268^{\ddagger}$	$-.057$	$-.183^{\ddagger}$	$.068$	$.108^{\dagger}$	$.027$	$.673^{\ddagger}$	—	
11. Perceived control	$-.204^{\ddagger}$	$-.024$	$.053$	$.030$	$.165^{\ddagger}$	$-.167^{\ddagger}$	$-.156^{\ddagger}$	$.095^{\dagger}$	$-.409^{\ddagger}$	$-.296^{\ddagger}$	—

* Lower scores indicate better self-care.

NYHA denotes New York Heart Association.

† $p < .05$;

‡ $p < .01$

Table 3

Hierarchical multiple linear regression model predicting heart failure self-care behaviors[*]

Variable	Model 1				Model 2				Model 3			
	b	SE	β	p	b	SE	β	p	b	SE	β	p
Heart failure knowledge	−.098	.022	−.181	**<.001**	−.102	.021	−.190	**<.001**	−.145	.027	−.269	**<.001**
NYHA class					.484	.403	.049	.230	.488	.401	.049	.224
Comorbidities[**]					.173	.371	.019	.641	.194	.370	.021	.601
Depressive symptoms					.224	.062	.204	**<.001**	.240	.062	.218	**<.001**
Anxiety					−.406	.396	−.054	.306	−4.146	1.618	−.548	**.011**
Perceived control					−.184	.059	−.131	**.002**	−.175	.059	−.125	**.003**
Heart failure knowledge X Anxiety									.053	.022	.503	**.017**

[*]
Lower scores indicate better self-care.

[**]
Comorbidities are expressed using the Charlson Comorbidity Index categories.

NYHA denotes New York Heart Association, b unstandardized regression coefficient, SE standard error, β standardized regression coefficient.

Model summary: $R^2 = .033$, $adj. R^2 = .031$, $F(1,609) = 20.63$, $p < .001$ (Model 1); $R^2 = .109$, $adj. R^2 = .100$, $F(6,604) = 12.35$, $p < .001$, $R^2 = .076$, $p < .001$ (Model 2); $R^2 = .118$, $adj. R^2 = .107$, $F(7,603) = 11.48$, $p < .001$, $R^2 = .008$, $p = .017$ (Model 3).