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Predictors of Adherence to Self-Care in Rural Patients with Heart Failure

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Abstract

Background—The common reality of not following a recommended course of treatment is a major cause of poor health outcomes in patients with heart failure (HF). The purpose of this study was to identify predictors of adherence to HF self-care recommendations in rural HF patients who received an intervention to promote symptom management and self-care.

Methods—Data from 349 rural HF patients (42% female, 90% Caucasian) randomized to the intervention arms of the study were used. Adherence was measured using the European Heart Failure Self-Care Scale questionnaire, a brief measure that asks patients to report their adherence to a variety of recommended HF symptom management behaviors (ie, daily weight monitoring, when to call the physician, medications, diet, and exercise). The following predictors were tested: age, gender, marital status, education level, depression score (measured using PHQ-9), anxiety score (measured with the Brief Symptom Inventory), and level of perceived control (measured using Control Attitudes Scale-R). Multivariate linear regression was used to test the model.

Results—The model to predict adherence was significant ($P < .0001$). Of the covariates tested in the regression model, being a male ($P = .009$), having less anxiety ($P = .018$), not being depressed ($P = .017$), and having higher perceived control ($P = .003$) were predictors of improved self-care score at 3 months.

Conclusion—Adherence is a multifaceted and a challenging behavior based on the assumption that the patient agrees with self-care recommendations. These data suggest interventions designed to promote adherence behaviors should include an assessment of gender, anxiety, depression, and perceived control for optimal outcomes.

Keywords

adherence; heart failure; rural; self-care

Heart failure carries a risk of mortality comparable to common cancers, and it has one of the highest rehospitalization rates seen in all chronic conditions.[1] Advancement in understanding pathophysiology of heart failure and an array of new therapeutic options have

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substantially improved the ability to treat and manage this chronic condition. Yet, treatment plans involve complex self-care behaviors for patients to manage,[2,3] and the common reality of not following a recommended course of treatment is a major cause of poor health-related outcomes in patients with heart failure. Treatment plan adherence rates range from 35% to 50% depending on illness acuity, specific self-care behaviors, patients' social and financial status, and health care providers' communication approaches.[4]

Remote and rural geographic regions of the United States have reported worse health outcomes than metropolitan areas.[5,6] Rural Americans suffer higher rates of disease and disability and are more often uninsured than their counterparts in urban areas of the country.[7] A lack of health insurance coverage is associated with lower use of preventative services and higher rates of hospitalizations for cardiac disease, HF and uncontrolled diabetes.[8] Patients with HF who live in rural areas have reduced access to HF specialty clinicians than patients living in metropolitan areas, thus making them vulnerable to worse health-related outcomes commonly associated with HF.[5,9,10]

The detection of worsening HF can be challenging for HF specialty clinicians. Clinicians must rely on the patient's history, diagnostic studies, and physical assessment to identify heart failure exacerbation. Therefore, patients must be personally attuned to signs and symptoms of worsening HF as they can occur acutely or develop gradually.[11] Clinical symptoms can be exacerbated or attenuated, depending on fluid volume status, adequacy of compensatory mechanisms, and success of therapeutic interventions. Fluid volume overload can occur as a result of dietary sodium indiscretion, changes in medication therapy, overexertion, or as a worsening of the underlying cardiac dysfunction.[12] Thus, patients are required to manage their condition by recognizing, treating, and monitoring their HF symptoms, and seeking medical care when necessary.[13,14].

Complex treatment regimens for HF often involve the need to change or modify lifelong health behaviors and pose a significant challenge to patients. Education and counseling interventions help patients engage in self-care support efforts to decrease the morbidity and mortality associated with HF.[11,15–19] The importance of patient self-care has shifted the patient education paradigm from an authoritative, prescriptive model to one of empowerment that is patient-centered with a collaborative approach to health.[17].

Self-care involves complex knowledge, skills and motivation which can impose a daily burden on patients with HF. The Theory of HF Self-Care[20,21] identifies self-care as a decision-making process for choosing appropriate behaviors to maintain and manage HF.[22] Symptom recognition and confidence in one's ability to manage one's own care[23] are recognized as vital components to successful self-care. Poor adherence to self-care behaviors lead to worse health-related outcomes. Therefore, we sought to identify potential predictors of adherence to self-care behavior based on predictors identified in a research literature review and supported by theory. Variables identified as potential predictors of adherence to self-care are perceived control,[24,25] anxiety,[26,27] depression,[26,27] comorbidity,[28,29] and health literacy.[30–32] The purpose of this study was to identify which rural patients with HF demonstrated greater adherence to the self-care recommendations after receiving an intervention to promote symptom monitoring and self-care management.

Methods

Design

This was a secondary analysis of data from a randomized, multicenter trial titled Rural Education to Improve Outcomes in Heart Failure (REMOTE-HF).[33] In REMOTE-HF, patients were randomly assigned to 1 of 3 groups, a usual care group and 2 intervention groups. For this study, only those patients randomized to either of the 2 intervention groups were included (N=349) because our purpose was to examine predictors of adherence to the self-care intervention.

Sample

Patients were recruited from academic health care settings (inpatient and outpatient) in Kentucky, Nevada, and California. The study was approved by the Institutional Review Board of each participating institution. Eligible patients had to be older than 18 years of age and live in a rural area defined as a town of <2,500 or a metropolitan area of <50,000 people. Additionally, patients had to have a hospitalization for HF within the prior 6 months. Patients were excluded if they were enrolled in an HF disease management program, had a terminal illness, or had a neurological condition with impaired cognition. Impaired cognition was screened by using the Mini-Cog Exam.[34] Patients who had a Mini-Cog score of 0 or a word recall of ≤2 with an abnormal clock drawing were excluded from participation.

Procedures

The study consisted of 2 groups of patients: an intervention group called Fluid Watchers Lite and a second intervention group called Fluid Watchers Plus. Patients were referred to the study by HF clinicians and the first contact was a face-to face meeting in a place of convenience for the patient (clinic setting or patient's home). Patients were provided with a detailed explanation of the study protocol and informed consent was obtained. Baseline data were collected after consent and prior to randomization to 1 of 2 groups. Subsequent data were collected at 3 months. Group randomization assignment was blinded to the patient and the attending physician. The research nurse, who delivered the intervention, identified the assignment from a sealed envelope which was sequentially allocated to each enrollment site based on random block assignments of 5 patients.

Data were collected at 2 time points and were entered directly onto TeleForms (OpenText Corp., Waterloo, Canada) and faxed to the Clinical Trials Coordinating Center. Clinical data were abstracted from hospital or clinic medical records using a standardized form. Current medication lists were obtained from the patient and were reconciled with the medical record.

Intervention

The intervention was designed to provide for the easy assimilation of enhanced self-care monitoring, as well as to motivate patients to seek care promptly to prevent decompensation. The intervention was developed within the framework of the Theory of Heart Failure Self-Care.[22,35] Key components of the theory include: (1) symptom recognition; (2) increased knowledge and skills; and (3) confidence in self-care mediates and moderates health outcomes.[20,22] The intervention was a tailored education and counseling session conducted

in a quiet, private setting, delivered face-to-face with the patient and their spouse, family member or caregiver. The intervention session included questions to assess individual barriers to self-care (eg, difficulty determining if symptoms are directly related to HF or embarrassment if the symptom was related to other disease process and not HF). The intervention session also provided knowledge to assist with self-monitoring for signs and symptoms of worsening HF (eg, weight gain of 3 pounds in a day, swollen ankles, sleeping with extra pillows due to difficulty breathing). The interventionist used motivational interviewing techniques to help the participant gain confidence for interpreting and responding to signs and symptoms.[36,37] The educational materials included brochures about HF from the American Heart Association and Heart Failure Society of America. Current clinical practice guidelines provided the evidence for knowledge content that was provided during the intervention.[38] Information was provided by a trained cardiovascular research nurse, and a laminated “flip-chart” format was utilized to promote standardization of information delivery across the study sites.

The education and counseling intervention included detailed information about the following: how to measure daily weight with a bathroom scale which was provided to all study participants; how to record daily weights on a diary; how to recognize contributing factors to weight variances and when to notify HF providers for rapid weight gain of more than 3 pounds over 24 hours. Patients were given daily weight and symptom diaries which were collected each month during the study. The diaries were returned to the project directors in self-addressed stamped envelopes. Patients in the Fluid Watchers Lite group received the intervention session at baseline enrollment then received follow-up phone calls at 2-week intervals to reinforce the educational session. Patients in the Fluid Watchers Plus group received the same education and counseling intervention at baseline enrollment. In addition, the Plus group received an audiotape of the education session to review at their convenience and biweekly follow-up phone calls to reinforce the education session. These follow-up calls were continued until the research nurse was able to determine successful competency achievement of self-care behaviors with recording daily weights, interpreting any variances, and symptom monitoring related to fluid volume status. The research nurses delivering the intervention used the “teach-back” method along with brief motivational interviewing techniques to facilitate learning and confidence of self-care management behaviors.[39] The average number of follow-up phone calls required for patients to demonstrate successful competency was 5.3 ± 3.6 (range 1–19).

Scripting was also used to facilitate self-care behavior changes in the education and counseling intervention. The intervention included a written set of scripted questions and information for the patient to use when calling an HF clinician to report symptoms or weight gain. The research nurse used the script to help the patient become more comfortable and to role-play collaborative conversations with the HF clinician. Similar interventions using written scripts have demonstrated improved outcomes when used in clinical trials.[40,41].

Measures

Dependent Variable

Self-care: The European Heart Failure Self-care Behavior Scale[42] was used to measure HF related self-care. This is a brief 9-item, self-administered questionnaire. The questionnaire covers items concerning self-care behaviors of HF including questions which directly measure behaviors associated with fluid and weight management. Item questions include "I weigh myself daily" 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 (do not agree at all). The total score can range from 5 to 45. Lower scores indicate better self-care behaviors. This instrument has excellent validity and reliability.[42,43] The Cronbach's alpha for the European HF Self-care Behavior scale in our sample was 0.76 at baseline. Adherence was determined by the improvement of the score on the European HF Self-care Behavior Scale.

Potential Predictors

Perceived control: The Control Attitudes Scale-Revised (CAS-R)[44] was used to measure perceived control in our sample of patients. This 8-item questionnaire assesses the perception of being able to manage one's heart condition. Item questions include "When I manage my personal life well, my heart condition does not bother me as much," and "I have considerable ability to control my symptoms." Patients' rate their level of agreement with the statements on the CAS-R using a 7-point Likert scale. Responses are summed from each item and the total score can range from 8–56. Construct and predictive validity have been previously established.[44–46].

Anxiety: The anxiety subscale of the Brief Symptom Inventory (BSI) was used to measure anxiety.[47,48] The BSI anxiety subscale is a reliable and valid instrument that has demonstrated sensitivity to anxiety in a variety of clinical populations.[48–50] Each item on the BSI is rated by the patient on a 5-point scale (0–4) of distress ranging from "not at all" to "extremely." Item scores are summed and a higher score indicates higher levels of anxiety.

Depression: Depression was assessed using the 9-item Patient Health Questionnaire-Depression Scale (PHQ-9).[51] Each of the 9 items uses a scale of 0–3 (0 = "not at all" to 3 = "nearly every day") to rate specific problems patients have encountered in the previous 2 weeks. The sum of the score (range 0–27) is used to determine the overall depression score, with higher scores indicating higher levels of depression. A PHQ-9 score ≥ 5 indicates mild depression and is commonly used to identify the patient as having the "presence of depressive symptoms." A PHQ-9 score of ≥ 10 indicates moderate to severe depression. The validity and reliability of the PHQ-9 for assessing depression in a variety of clinical populations has been well documented.[52–54].

Comorbidity: Patients' comorbid conditions were assessed using the Charlson Comorbidity Index (CCI).[43] The CCI has well established reliability and validity for the prediction of cumulative mortality attributable to comorbid disease. The CCI is weighted for severity of comorbidity and is computed as a total score. A higher CCI score implies higher comorbidity burden.

Health literacy: Health literacy was measured at baseline using the Short Test of Functional Health Literacy in Adults (STOFLA).[55] This instrument is a 36-item, timed test of reading comprehension. The STOFLA measures the patient's ability to read and understand health-related passages with the use of a written description of an X-ray procedure and a Medicaid application. The STOFLA has excellent reliability and validity in a variety of patient populations.[55].

Demographic and clinical data: A standardized form was used to collect demographic data from the patients. These data were age, gender, marital status, education, and annual household income. Clinical data were obtained by the research nurse at time of enrollment and also abstracted from the medical record. These data were blood pressure, BMI, and B-type natriuretic peptide levels which were measured with point-of-care testing equipment. The patient's most recently measured left ventricular ejection fraction (LVEF) was obtained from the medical record. New York Heart Association functional classification was assessed by a trained cardiovascular research nurse based on the patient's report of functional ability at the time of enrollment.

Data Analysis

All data were analyzed using SPSS for Windows (version 22.0, IBM Corp., Armonk, New York). Data are presented as means ± standard deviations or frequencies and percentages. Patients were divided into 2 groups according to the change in self-care score at 3 months compared to baseline and whether they "improved" or "did not improve." Adherence was categorized as "improved" or "not improved" and was calculated by subtracting the 3-month self-care score from the baseline self-care score. A negative self-care score indicated an improvement in self-care behaviors while a score of 0 and above indicated no improvement. The 2 groups were compared at baseline using Chi-Square or independent sample *t* test as appropriate to level of measurement.

We used multiple linear regression modeling to determine the predictive ability of the self-care score at 3 months (dependent variable) with the covariates of age, gender, education, marital status, anxiety, depression, perceived control, comorbidity burden, and health literacy. The covariates included in the model were force entered simultaneously. There was no autocorrelation in the regression analysis with a Durbin-Watson statistic test of 1.9. Multicollinearity was not a problem in the regression model as evidenced by the variance inflation factor.

Results

Sample Characteristics

This sample of 349 patients (Table 1) with HF was predominantly Caucasian (90.2%), male (57.9%), and over the age of 65 years (56.3%). See Figure 1 CONSORT diagram for enrollment, follow-up and analysis. Seventeen percent of the sample reported having less than a high school education level. The majority of the patients were married (57.0%) and reported having a household income of less than or equal to $40,000 annually (62.0%). The patients were primarily NYHA (New York Heart Association) functional class I and II

(67.3%), and 52.3% of the sample had an LVEF of less than 40%. Only 12.3% identified as being “current smokers” and 70.9% reported “having ever smoked.” Patients had a mean score on the health literacy measurement (STOFLA) of 26.65 ± 8.5; this score indicates “average” health literacy. The Charlson comorbidity index mean score for the total sample was 3.21 ±1.7 with a range of 1–10.

Change in Self-care Scores from Baseline to 3 Months

The mean scores on the self-care questionnaire in the total sample at baseline and at 3 months were 19.9 ± 6.7 to 16.3 ± 5.3, respectively, $P < .0001$). With regard to change in self-care score, 70% (n = 243) of participants demonstrated improvement in adherence (score range −6 to −34). Among the 30% who did not improve, the range of score change was 0 to 14. Of this 30% (n= 106), 78% had a worse self-care score at 3 months than they did at baseline, while the remainder had the same score (n=23).

Comparison of Characteristics between Self-care Improvement Groups

There were no sociodemographic or clinical differences between the group whose self-care scores improved from baseline to 3 months and the group whose scores did not improve from baseline measurement (Table 1).

Predictors of Improvement in Self-care from Baseline to 3 Months

The predictive model was statistically significant for estimating the relationship among the selected variables ($P < .0001$). Patients who did not show an improvement in self-care scores at 3 months were more likely to be female, have higher levels of anxiety, were depressed, and had lower levels of perceived control, compared to those who did improve their self-care score. Patients’ age, race, marital status, health literacy, and comorbidity index were not predictors of self-care scores at 3 months.

Discussion

Results of this multicenter, randomized study contribute to the body of knowledge regarding rural patients with HF and predictors of adherence to self-care recommendations. The most commonly reported factors that impede adherence to self-care are gender, low socioeconomic status, poor health literacy, comorbid burden, poor cognitive function, and psychological distress.[56,57] Our data revealed similar results related to gender, but it did not find supportive evidence for health literacy or comorbid burden as a predictor of self-care in our sample of rural patients.

Anxiety is a negative affective state specific to a person’s perception of a threat and their ability to control or respond to the threatening situation.[58] Anxiety is a well-known independent risk factor for patients with heart failure,[59,60]and evidence indicates the importance of accounting for the presence of anxiety when implementing interventions to optimize self-care management.[56,61] Yet, the data are inconsistent in clearly identifying if increased anxiety levels lead to poor adherence to self-care behaviors.[21,62–64] Our data indicate a negative relationship exists between anxiety and adherence to self-care as similarly reported in a meta-analysis published by Kessing and associates.[56].

Depression is a significant problem in patients with HF, as approximately 20%−35% of HF patients have a major depressive disorder or symptoms.[65] Depression is associated with decreased motivation, which can cause a reduction in self-care behaviors or a reduction in adherence to treatment plans, making the patient with HF and depression more vulnerable to poor health-related outcomes.[15] In a meta-analysis of self-management interventions in patients with HF and depression, the data indicated self-management interventions had an overall hazard ratio (HR) of 0.95 (95% CI: 0.94–0.97) on time to HF-related hospitalizations, and subgroup analysis did not indicate a differential treatment effect for patients with or without depression (HR for patients with depression, 1.00; 95% CI: 0.74–1.35; HR for patients without depression, 0.92; 95% CI: 0.71–1.18; interaction $P = .64$).[15] These data, similar to our findings, suggest patients with HF and depression may need additional treatment strategies prior to implementing self-management interventions, as the increased obligation of self-care may be too difficult for the depressed patient to manage.

One potential psychological variable which may mediate the relationship between depression and self-care management is the patient's perception of perceived control.[66] Perceived control is essential for successful self-care as it describes the patient's perception of their own coping skills.[45,67] Patients with less perceived control are more likely to have poor outcomes than those with higher levels of perceived control, as they are more likely to engage in activities to promote self-care. In our study, patients who reported higher levels of perceived control had lower levels of depression ($P < .0001$). These results are consistent with findings reported by Dracup and colleagues[46] in which patients with higher perceived control had significantly less depression ($P < .0001$) than those with low perceived control.

As many as 55% of all HF readmissions identify poor adherence to prescribed treatment plans (ie, medications or diet) as a precipitating cause of the readmission.[68–70] In this investigation we sought to identify the predictors of adherence to self-care and found significant relationships exist with improved self-care and psychological factors (ie, anxiety, depression, and perceived control). Health behaviors are difficult to modify and even more difficult in the presence of negative psychological distress.[56] Interventions designed to improve self-care behavior must take into consideration the patient's existing behaviors, health care resources, and complexity of psychological factors. When psychological stressors are predominant in a patient's life, the ability to make change is even more challenging than normal.

Study Limitations

This study's findings are limited by secondary analysis and a rural population sample, which may limit the generalizability of the findings. The measurement time points were relatively short-term; however, we and others have demonstrated in previous studies the ability to achieve improvement of outcomes with implementation of complex behavioral interventions in similar clinical populations.[45,71–73].

Conclusion

Our data suggest education and counseling interventions designed to promote adherence to self-care behaviors in rural patients with HF should include consideration of a patient's

gender, anxiety and depression levels, and perception of perceived control. These psychological determinants are closely related to a person's ability to self-manage and may adversely affect health-related outcomes of HF if not addressed in a collaborative and comprehensive manner by HF specialty providers.

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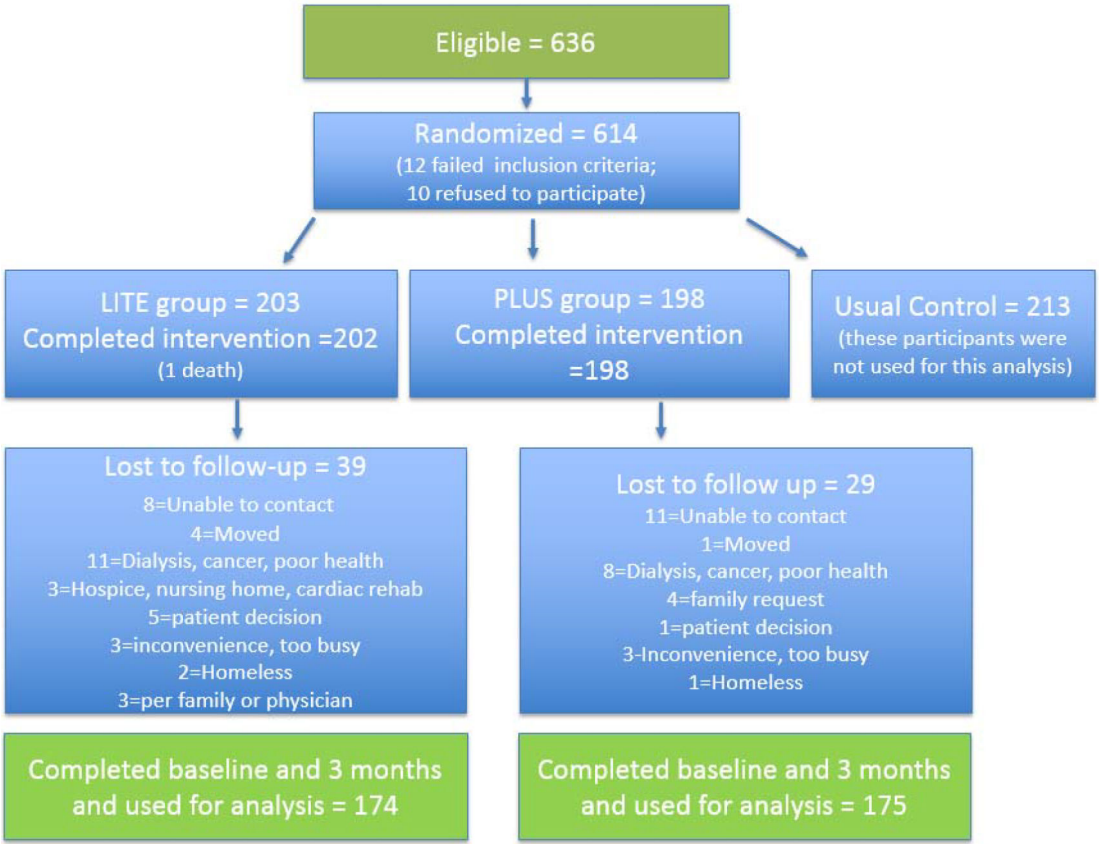

Figure 1:
CONSORT diagram

Table 1.

Demographic, Clinical and Psychosocial Characteristics of Intervention Group Participants (N= 349), Grouped by Those Who Had Improved Self-care Behavior Scores and Those Who Did Not Improve Self-care Behavior Scores.

Patient Characteristics	**Total Mean ± SD or N (%) N = 349**	**Improved Self-Care N = 243 Mean ± SD or N (%)**	**Did not Improve Self-Care N = 106 Mean ± SD or N (%)**	***P* value***
Age (years)	65.44 ± 12.75	65.31 ± 12.5	65.7 ± 13.5	.774
Gender				.75
Female	147 (42.1)	101 (41.6)	46 (43.4)	
Male	202 (57.9)	42 (58.4)	60 (56.6)	
Race				.962
Caucasian	313 (90.2)	219 (90.1)	96 (90.3)	
Not Caucasian	34 (9.8)	24 (9.9)	10 (9.7)	
Marital Status				.403
Married	199 (57.0)	135 (55.6)	64 (60.4)	
Not Married	150 (43.0)	108 (44.4)	42 (39.6)	
Education Level				.134
Less than HS	61 (17.5)	37 (15.2)	24 (22.6)	
Completed HS	175 (50.1)	121 (49.8)	54 (50.9)	
More than HS	113 (32.4))	85 (35.0)	28 (26.4)	
NYHA classification				
Class I-II	235 (67.3)	167 (68.7)	68 (64.2)	.402
Class III-IV	114 (32.6)	76 (31.3)	38 (35.8)	
Self-care score				
Baseline	19.9 ± 6.7	22.1 ± 6.5	14.8 ± 4.7	< .001
3 months	16.3 ± 5.3	15.5 ± 5.0	17.9 ± 5.7	< .001
Baseline Control Attitude Scale-Revised score	29.7 ± 4.9	29.6 ± 5.1	29.9 ± 4.4	.604
Baseline Brief Symptom Inventory, anxiety score	.77 ± .87	.80 ± .89	.73 ± .83	.545
Baseline Patient Health Questionnaire, depression score	6.9 ± 6.2	7.1 ± 6.5	6.4 ± 5.3	.283

* = *P* value for comparison of improvement of self-care score at 3 months.

NYHA= New York Heart Association

Table 2.

Summary of Regression Analysis for Variables Predicting Self-care Scores at 3 months.

Variable	Unstandardized Coefficients	Standardized Coefficients	*P* value
Age	−.022	0.052	.368
Gender	1.428	0.135	.019 *
Race	1.171	0.069	.203
Education	−.291	−.037	.504
Marital Status	−.814	−.077	.170
Anxiety	−1.048	−.169	.014 *
Depression	1.785	0.155	.015 *
Perceived Control	−.191	−.179	.002 *
Health Literacy	−.037	−.042	.457
Comorbidity	0.223	0.071	.196

* $P < .05$