

The Impact of Resilience, Health Literacy, and Social Support on Medication Adherence and Self-care Among Adults With Heart Failure

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Background: Personal and psychological factors, such as depression, have a considerable influence on nonadherence to medications and self-care in those with heart failure. More evidence is needed about positive personal factors that motivate adherence to medications and self-care in those with heart failure. **Objective:** The purpose of this study was to investigate whether there was a relationship between the personal resources of resilience, hope, health literacy, social support, and self-care activation and adherence to HF self-care and medications and whether race impacts adherence. **Methods:** This study used a cross-sectional, correlational design. Stepwise regression was used to test whether resilience, hope, health literacy, self-care activation, and race significantly predicted medication adherence and self-care. A diverse sample was recruited for this study. **Results:** Of the 174 participants, 51% were female, 51.7% were White, and the mean age was 62 years. After adjustment for differences in age and depressive symptoms, a predictive relationship remained between resilience, health literacy, and medication adherence. Hope, activation, and race were not selected in the final regression model. A high level of perceived social support was the only predictor of better HF self-care. **Conclusion:** Persons with heart failure may have better medication adherence and overall self-care if sufficiently resilient, health literate, and supported regardless of their degree of hope or activation. Race and age may be important factors to consider. More research is needed to understand the connection between resilience and medication adherence.

KEY WORDS: health literacy, heart failure, medication adherence, resilience, self-care, social support

Heart failure (HF), a chronic and progressive condition, is a growing public health problem.¹ Approximately 6 million Americans have HF, and it is estimated that more than 8 million Americans may be living with this chronic condition by 2030.¹ Heart failure most often affects older adults, although the prevalence of HF is rising in persons younger than 65 years.^{2,3} Furthermore, almost half of the population with HF are persons of color who carry the greatest illness burden

with higher rates of hospitalizations, morbidity, and mortality when compared with Whites.⁴

Despite advances in HF treatment and technology, HF remains a major cause for frequent hospitalization, morbidity, and mortality.¹ Poor outcomes in HF are commonly attributed to suboptimal self-care and poor medication adherence.^{5,6} It is estimated that approximately 50% of all patients with HF do not take medications as prescribed, and 25% of HF hospital readmissions have been attributed to imperfect medication adherence.⁷ It has been suggested that disparities in HF outcomes among racial/ethnic groups seem to be reflective

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underlying determinants of health, such as poor engagement in HF self-care activities, rather than genetic or physiological differences.^{4,8} Given the prevalence of medication nonadherence and the associated risks, alternative interventions are needed to improve adherence.

There are myriad reasons for persons living with HF not taking their medications or following self-care recommendations. Many of those reasons stem from personal factors that negatively impact intrinsic motivation such as depression, attitude toward medication, inadequate HF knowledge, and low self-efficacy.^{9,10} It is well established in the cardiovascular literature that personal factors and psychological characteristics have a considerable influence on nonadherence to self-care.^{11–15} A review of the HF literature from recent years, however, revealed a small number of reports on positive intrinsic factors (eg, positive emotions, personal strengths, and psychosocial characteristics) that motivate adherence to HF self-care and medications.^{16,17}

There is some research that suggests that resilience (ie, the capacity within an individual to protect against stress and positively adapt despite adversity¹⁸) and hope (ie, an optimistic feeling about the future that helps initiate and sustain action toward attaining a goal¹⁹) are positive intrinsic factors that can motivate adherence to medications and self-care among those with HF,^{15–17} yet empirical evidence is lacking.¹⁶ It is believed that resilient and hopeful individuals make better decisions, persevere despite challenges, and exhibit an inner strength that connotes competence, flexibility, and adaptive coping skills.^{18,19} Resilient individuals also seek data to inform their decisions, seek out support from others, and actively engage tasks rather than avoiding them.¹⁸ Thus, resilience, hope, health literacy, and social support may have the potential to positively impact adherence behaviors.

It may be that those with better self-care activation, the willingness and capacity (ie, the necessary knowledge, confidence, and skills) of an individual to manage his/her own care,^{20,21} would have better medication adherence. There are few study authors, however, examining the influence of self-care activation on medication adherence, in those with HF, and the results have been inconsistent.^{22–24} In this study, we investigated whether there was a relationship between the personal resources of resilience, hope, health literacy, social support, and self-care activation and adherence to HF self-care and medications and whether race impacts adherence.

Theoretical Framework

In this study, decisions to include the constructs of resilience, hope, health literacy, and social support were guided by the situation-specific theory of HF self-care.^{9,25,26} In this theory, HF self-care is a naturalistic decision-making process that is influenced

by the interactions between problem, person, and environmental factors. Person factors believed to influence HF self-care include demographic characteristics, attitudes, activation, health literacy, and coping. As a result, characteristics that are within the individual such as emotions, thoughts about a situation, knowledge, and personal motivations impact self-care adherence decisions. Social support is considered an influential environmental factor. Self-care maintenance behaviors (eg, medication adherence), perception of symptoms, and the response to symptoms (self-care management) are all thought to be influenced by support from friends and family members.

Methods

Study Design

This study was a cross-sectional survey of 174 adults with HF. Institutional review board approval was obtained before all research activities. Study participants were recruited using the commercial online survey sampling company, Qualtrics (<https://www.qualtrics.com/>), in July 2020. Qualtrics recruited participants who met the study's inclusion and exclusion criteria from existing research panels, which are groups of people who have agreed to be profiled and screened for research surveys. We chose to use Qualtrics to gain a study sample that was representative of the percentage of persons of color in the population with HF. Stratified random sampling, based on race, was used to achieve a study sample that was approximately 50% persons of color. For the purposes of this study, persons of color were defined as any race other than White, although we recognize that there are between-group differences among persons of color.

Inclusion criteria for this study were English-speaking adults older than 18 years who are being treated for HF with prescribed medications and live independently in a community setting. Those with drug-related HF, cognitive impairment that prevented accurate completion of the survey, or a past heart transplant were excluded from this study. Individuals meeting these criteria were invited to participate in the study and opted in by following the Qualtrics survey link. The study survey asked questions to confirm eligibility. Ineligible respondents were immediately exited from the survey upon providing a response that did not meet study inclusion or exclusion criteria. Respondents who were eligible for the study proceeded to an online consent form. In this study, we enrolled 174 adults with HF.

Sample size was based on an a priori power analysis to find significance with a desired power of 0.95, an α level at .05, and a moderate-small effect size of 0.15 (f^2). For a multiple linear regression model with 5

predictors, the minimum sample size needed was 138 participants. Thus, the obtained sample size of $N = 174$ is adequate.

Measures

Psychosocial and adherence data were collected using standardized instruments. Heart failure self-care and medication adherence are closely associated. However, they were measured separately in this study given that their conceptual and behavioral distinctness may require different interventions.^{12,25,27} Demographic data were collected using an investigator-developed questionnaire. The following instruments discussed hereinafter were used in this study.

Outcome Variables

Medication Adherence

Medication adherence was measured using part 1 of the Domains of Subjective Extent of Nonadherence scale.²⁸ This 3-item, self-report scale assesses the extent to which patients miss, skip, or do not take medications for the past 7 days. The score for each question is 1 to 5 points, representing “always” to “never.” A score of 3 on the Domains of Subjective Extent of Nonadherence scale is consistent with never missing a dose of a heart medication for the past 7 days and perfect adherence. A score of 4 to 5 represents medication nonadherence (rarely, sometimes, often, or always missing or skipping at least 1 dose of a heart medication for the past 7 days), with higher scores representing greater nonadherence. The instrument has evidence for reliability and validity in measuring the extent of nonadherence to cardiovascular medications.^{29,30} Among those with hypertension, the extent of nonadherence items significantly predicted blood pressure with a Cronbach α of 0.84 over 21 days.²⁹ When the predictive validity of the instrument was evaluated in 236 patients taking cholesterol medications, self-reported nonadherence significantly predicted cholesterol levels better than the serum cholesterol levels predicted self-reported nonadherence.³⁰ Cronbach α for the current study was 0.92 with an interitem correlation of 0.79 (0.71–0.86).

Heart Failure Self-care

Heart failure self-care was assessed using the 9-item European Heart Failure Self-Care Behavior Scale.³¹ The 9-item European Heart Failure Self-Care Behavior Scale is a valid and reliable measure of practical HF self-care behaviors (ie, taking medications, exercising, weighing daily, adhering to diet recommendations, monitoring symptoms) with a Cronbach α of 0.80.³¹ The scores on this 9-item Likert scale range from 0 to 100, with a score greater than 70 suggesting adequate HF self-care.³² The measure demonstrated a Cronbach α of 0.81 for this study.

Predictor Variables

Resilience

The 14-item Resilience Scale³³ was used to measure resilience. This 14-item scale assesses the degree to which individuals agree with each statement on a scale from 1 (strongly disagree) to 7 (strongly agree). The resilience score ranges from 14 to 98, with higher scores representing more resilience. A score of less than 74 indicates low resilience. Scores between 74 and 90 indicate moderate resilience, and scores greater than 90 indicate high resilience. The 14-item Resilience Scale measures 5 core characteristics of resilience: meaning in life, perseverance, self-reliance, equanimity, and authenticity. This scale is a widely used instrument that has demonstrated reliability with a Cronbach α from 0.89 to 0.96.^{34–36} It has also been used among those with heart disease.³⁴ In this current study, the Cronbach α was 0.94.

Hope

The Adult Hope Scale was used to measure hope.¹⁹ This 12-item scale is divided into 2 subscales, agency (ie, goal-directed energy) and pathway (ie, planning to accomplish goals). Each item is answered using an 8-point, Likert-style scale ranging from definitely false to definitely true. A score of 40 or higher is considered hopeful. In a sample of older adults, with and without cognitive impairment, this scale demonstrated good reliability (Cronbach $\alpha = 0.85$) and validity among older adults despite level of cognitive functioning.³⁷ The Cronbach α for this current study was 0.65.

Health Literacy

Health literacy was measured using the Newest Vital Sign, which is one of the most widely used health literacy assessment instruments.^{38,39} This 6-item self-report measure assesses respondents' ability to interpret and apply information from an ice cream nutrition label. The measure is scored by giving 1 point for each correct answer, and a score of 4 to 6 indicates adequate health literacy. The measure has demonstrated reliability (Cronbach $\alpha > 0.76$) and correlates with the Test of Functional Health Literacy in Adults.³⁹ In this current study, the Cronbach α was 0.77.

Perceived Social Support

The Multidimensional Scale of Perceived Social Support⁴⁰ was used to assess perceptions of support from 3 sources: family, friends, and a significant other. The scale is composed of 12 items, with 4 items in each subscale. The amount of social support an individual receives from the 3 sources is rated on a 7-point Likert scale. Responses are averaged to yield a total score ranging from 1 to 7. Higher scores indicate higher levels of social support. Among those with chronic illness and HF, this measure showed consistency between perceived social support and measures of actual social support. The measure also has strong internal reliability

with a Cronbach α of 0.91.⁴¹ This current study demonstrated a similar Cronbach α of 0.94.

Self-care Activation

The Patient Activation Measure was used to measure participants' level of self-care activation.⁴² The measure is composed of 13 items with a 5-point Likert scale, with scores from 0 to 100 (with 100 being the highest activation in self-care). The measure segments individuals into 1 of 4 activation levels along the empirically derived 100-point scale, describing the knowledge, skills, and confidence a person has in managing his/her own health (ie, level 1, disengaged and overwhelmed; level 2, becoming aware but still struggling; level 3, taking action and gaining control; level 4, maintaining behaviors and pushing forward).⁴³ In psychometric testing, the Rasch person reliability was acceptable (0.85–0.87), and the Cronbach α was 0.87. This measure also showed good criterion validity.^{42,44} The Cronbach α in this current study was 0.91.

Depression

The Patient Health Questionnaire-2 was used to inquire about the frequency of depressed mood and anhedonia (ie, inability to feel pleasure) for the past 2 weeks.⁴⁵ Depression was measured as a control variable. Responses are scored from 0 (not at all) to 3 (nearly every day). A score of 3 or higher indicates the presence of depressive symptoms. This 2-item questionnaire has good validity where a score of 3 or greater yields a sensitivity level of 83% and a specificity level of 92% for major depression.⁴⁵ In this current study, this measure was reliable, with a Cronbach α of 0.90.

Data Analysis

Data were analyzed using SPSS version 27. To answer the research questions, correlational statistics and multiple linear regression models were used to check the effects of resilience, hope, health literacy, perceived social support, and self-care activation on medication adherence and self-care behaviors. Research has shown that age and depression may have a significant influence on resilience^{46,47} and adherence decisions in patients with HF^{48,49}; thus, these factors were entered into the models as covariates. These factors were entered into the preliminary linear regression models as independent variables. Medication adherence and self-care behaviors were entered into the models as dependent variables separately. Stepwise model selection method was used to select the final regression model using $P < .05$ as cutoff probability for adding variables and $P > .10$ as cutoff probability for removing variables.

Demographic variables were summarized as means and standard deviations for continuous variables and as counts and percentages for discrete variables. Descriptive statistics were calculated for all variables.

Distributions of the continuous and ordinal variables were examined to determine whether normality assumptions were met. χ^2 Tests were used to test for differences between demographic variables and resilience, hope, health literacy, perceived social support, and activation on medication adherence and self-care behaviors. Correlation analysis was conducted to measure the strength and direction of associations between study variables.

Results

Sample Demographics and Descriptive Statistics

This study included 174 adults, aged 19 to 91 years (mean [SD], 62.22 [13.78] years; median, 65 years). Most of the participants were married (61.5%), female (51%), White (51.7%), and urban residents (61.5%) with some college (34.5%). Approximately 10% ($n = 17$) of participants were hospitalized at least once for HF in the 6 months leading up to the survey. The detailed data are presented in Table 1.

Medication adherence ($t = -1.98$; $P = .049$) was significantly lower among persons of color (Black, 24.1%; Asian, 11.5%; American Indian or Alaskan Native, 2.9%; Native Hawaiian or Pacific Islander, 1.1%; Other, 8.6%) than White participants. Persons of color (48.3%) were more likely to be younger than 65 years (mean, 56.64 years; $\chi^2 = 19.160$, $df = 1$, $P \leq .001$, Cramer's phi = -0.332), be not married ($\chi^2 = 4.305$, $df = 1$, $P = .038$, Cramer's phi = 0.157), and have an annual household income less than \$50,000 ($\chi^2 = 5.735$, $df = 1$, $P = .017$, Cramer's phi = -0.182) compared with White persons. In addition, health literacy ($t = 4.367$, $P \leq .001$) was significantly lower among persons of color in this sample than White participants. There were no significant differences in adherence to medications or HF self-care by gender, marital status, annual household income, or level of education among this study sample ($N = 174$).

The mean (SD) medication adherence score was 4.49 (2.45), with a score of 3 representing perfect medication adherence. Of the study sample, 60.9% ($n = 106$) reported adherence to medications and 39.1% ($n = 68$) reported nonadherence in the past 7 days. The mean (SD) score on the 9-item European Heart Failure Self-Care Behavior Scale (HF self-care) was 54.26 (21.16), with a score of 70 or greater representing adequate self-care.³² Overall, self-care in this sample was low with only 21.8% ($n = 38$) reporting adequate levels of HF self-care.

The mean (SD) activation (Patient Activation Measure) score was 54.36 (21.16). This is consistent with an activation level of 3, taking action and gaining control. Participants in this study were hopeful (Adult Hope

TABLE 1 Demographic Characteristics of the Sample (N = 174)

Demographic Variable	N	Value, %	Mean (SD)
Age, y	174	100	62.22 (13.77)
Race	174	100	
White	90	51.7	
Persons of color ^a	84	48.3	
Black or African American	42	24.1	
Asian	20	11.5	
American Indian or Alaska Native	5	2.9	
Native Hawaiian or Pacific Islander	2	1.1	
Other	15	8.6	
Gender	174	100	
Male	85	48.9	
Female	89	51.1	
Ethnicity	174	100	
Hispanic or Latino	12	6.9	
Not Hispanic or Latino	162	93.1	
Marital status	174	100	
Married	107	61.5	
Not married (divorced, widowed, single)	67	38.5	
Highest education level	174	100	
High school	25	14.4	
Some college	60	34.5	
Bachelor's degree	53	30.5	
Graduate degree	53	30.5	
Annual household income	174	100	
<\$50000	63	36.2	
\$51000–\$100000	64	36.8	
>\$100000	47	27.0	

^aPersons of color was defined as any race other than White.

Scale score: mean [SD], 42.87 [7.85]) and moderately resilient (14-item Resilience Scale score: mean [SD], 74.61 [12.56]). The mean (SD) health literacy (Newest Vital Sign) score was 3.71 (1.94), indicating inadequate health literacy. Perceived social support (Multidimensional Scale of Perceived Social Support) was moderate with a mean (SD) score of 5.27 (1.12). The mean (SD) depression (Patient Health Questionnaire-2) score was 6 (1.64), suggesting the presence of depressive symptoms. Descriptive statistics for measurement instruments are detailed in Table 2.

Correlational Analyses

Age was significantly associated with medication adherence ($r = -0.436, P \leq .001$) where older age was associated

with better medication adherence. We assessed differences between the groups of older and younger than 65 years to further describe the association between age and medication adherence, which is a common indicator for older and younger adults.⁵⁰ Those younger than 65 years (mean [SD], 5.32 [3.23]) were significantly more likely to be nonadherent than those 65 years and older (mean [SD], 3.68 [1.08]; $t_{93,1} = 4.05, P \leq .001, d = 0.657$). Age was not significantly associated with HF self-care.

Bivariate correlations were performed to explore the relationships among the predictor variables (resilience, hope, health literacy, social support, self-care activation, and depression) and medication adherence. There was a medium negative correlation between both resilience ($r = -0.312, P \leq .001$) and health literacy

TABLE 2 Descriptive Statistics for Measurement Instruments

	Mean (SD) Scores	Cronbach α	Interpretation
Medication adherence ^a	4.49 (2.45)	0.92	Inadequate adherence
HF self-care	54.26 (21.16)	0.81	Inadequate HF self-care
Self-care activation	70.03 (17.21)	0.91	Level 3: taking action and gaining control
Resilience	74.61 (12.56)	0.94	Moderate resilience
Hope	42.87 (7.85)	0.65	Hopeful
Health literacy	3.71 (1.94)	0.77	Inadequate health literacy
Perceived social support	5.27 (1.12)	0.94	Moderate social support
Depression	6 (1.64)	0.90	Presence of depressive symptoms

Abbreviation: HF, heart failure.

^aA high score (>3) equals medication nonadherence.

TABLE 3 Correlations Among Study Variables

	1	2	3	4	5	6	7	8	9
1. Medication adherence ^a	—	-0.015	0.312 ^b	-0.268 ^b	-0.337 ^b	-0.198 ^b	-0.245 ^b	-0.436 ^c	0.396 ^b
2. HF self-care		—	0.147	0.175 ^c	0.093	0.282 ^b	0.141	0.044	0.051
3. Resilience			—	0.730 ^b	0.072	0.437 ^b	0.409 ^b	0.135	-0.373 ^b
4. Hope				—	0.145	0.472 ^b	0.395 ^b	0.233 ^b	-0.388 ^b
5. Health literacy					—	0.143	0.043	0.341 ^b	-0.106
6. Social support						—	0.305 ^b	0.226 ^b	-0.259 ^b
7. Self-care activation							—	0.118	-0.207 ^b
8. Age								—	-0.318 ^b
9. Depression									—

N = 174.

Abbreviation: HF, heart failure.

^aA high score (>3) equals medication nonadherence.^bCorrelation is significant at the .01 level (2-tailed).^cCorrelation is significant at the .05 level (2-tailed).

($r = -0.337$, $P \leq .001$) and medication adherence. There was a small negative correlation between self-care activation ($r = -0.245$, $P = .001$), hope ($r = -0.268$, $P \leq .001$), and medication adherence and a small positive correlation between depression ($r = 0.256$, $P \leq .001$) and medication adherence.

Bivariate correlations were performed to explore the relationships among the predictor variables (resilience, hope, health literacy, social support, self-care activation, and depression) and HF self-care. Both hope ($r = 0.175$, $P = .021$) and perceived social support ($r = 0.282$, $P \leq .001$) had a small, positive correlation with self-care scores. No other significant associations between predictor variables and HF self-care were found. See Table 3 for correlations among all study variables.

Regression Analyses

Medication Adherence

Stepwise regression was used to test whether resilience, hope, health literacy, self-care activation, and race significantly predicted medication adherence. Two of the predictor variables (resilience and health literacy), including the controlling variables (age and depression), were selected into the final regression model after stepwise model selection procedure. Table 4 summarizes the results of the final regression model, which includes age ($B = -0.048$, $P < .001$), depression ($B = 0.331$, $P < .01$), resilience ($B = -0.262$, $P < .01$), and health literacy ($B = -0.035$, $P < .05$). Age and depression are significantly related to medication adherence. The older the age, the lower the medication adherence score, suggesting better adherence. The higher the depression score, the higher the medication adherence score, suggesting worse adherence. Controlling for age and depression, resilience and health literacy remained significantly related to medication adherence. The higher the resilience score, the lower the medication adherence score. The higher the health literacy score, the lower the

medication adherence score, which suggested better medication adherence.

Heart Failure Self-care

For the preliminary linear regression model with HF self-care as the dependent variable, only one of the predictor variables (social support) was selected into the final regression model after stepwise model selection procedure. Age and depression were not selected into the final regression model and could not be used as controlling variables. Table 5 summarizes the results of the final regression model, which includes social support ($B = 5.359$, $P < .001$). It shows that social support is significantly related to HF self-care. The higher the social support score, the higher the HF self-care score, which means better self-care.

Discussion

This study tested the relationships between, resilience, hope, health literacy, perceived social support, self-care activation, medication adherence, and HF self-care. The relationships between race, medication adherence, and self-care behaviors were also examined. After adjustment for differences in age and depressive

TABLE 4 Final Regression Model With Medication Adherence as the Dependent Variable

Variable	B	R ²	F
Medication adherence		0.332	20.951
Age	-0.048 ^a		
Depression	0.331 ^b		
Resilience	-0.262 ^b		
Health literacy	-0.035 ^c		

^aCorrelation is significant at the .05 level (2-tailed).^bCorrelation is significant at the .01 level (2-tailed).^cCorrelation is significant at the .001 level (2-tailed).

TABLE 5 Final Regression Model With Heart Failure Self-care as the Dependent Variable

Variable	B	R ²	F
Heart failure self-care		0.080	14.913
Social support	5.359 ^a		

^aCorrelation is significant at the .001 level (2-tailed).

symptoms, a predictive relationship remained between resilience, health literacy, and medication adherence. Those who were resilient and health literate had better medication adherence. A high level of perceived social support was a predictor of better HF self-care. Although self-care activation and hope were positively associated with better adherence behaviors, these factors were not selected into the final regression models. In this study, persons of color were more likely to be nonadherent to medications and have inadequate health literacy when compared with Whites; however, race was not significant in the regression model.

To our knowledge, this is one of the first published studies directly assessing the association between resilience and medication adherence in this population. This study demonstrated that resilience may protect against medication nonadherence in those with HF. The authors of few published studies investigating the association between resilience and chronic illness management among other populations have also demonstrated a similar positive association between resilience and medication adherence.^{51–53} One possible interpretation of the relationship between resilience and medication adherence is that resilient people may be better able to adapt to changing circumstances, are self-reliant, persevere despite obstacles, and have a sense of purpose, all of which may benefit those taking HF medications.¹⁸ In addition, resilience has been shown to protect against depression,^{54,55} which is a strong predictor of nonadherence to medications treating chronic illness.⁵⁶ Our findings suggests that resilience is an important aspect of medication adherence to explore in those with HF.

The finding that adequate health literacy is associated with medication adherence is consistent with the literature.^{57–59} A review of the literature regarding health literacy and HF concluded that higher levels of health literacy have been associated with lower odds of misunderstanding cardiac medication recommendations and higher medication adherence.⁵⁷ Conversely, low health literacy was associated with lower HF knowledge and decreased medication adherence.⁵⁷ Almost half of the participants (43.1%) in this study had inadequate health literacy and were more likely to be younger, single persons of color, with an annual household income less than \$50000. Inadequate health literacy is a matter of concern because it is directly related

to the patient's ability to locate, interpret, and apply HF information, thereby undergirding patients' medication-taking decisions.

In this study, greater perceived social support was predictive of better HF self-care. This is consistent with previous research showing that HF self-care is enhanced by social support.^{60–62} Previous research sheds light on the relationship between social support and HF self-care, suggesting that the support of family and friends facilitates treatment adherence, symptom management, emotional well-being, and practical assistance with health-promoting tasks.^{61–64} In this study, perceived levels of social support tended to increase with age. Taken altogether, this study supports the idea that social support positively influences patients' self-care adherence and indicates that younger patients with HF, in terms of self-care, may benefit from more social support.

Several findings of this study warrant further discussion, such as HF self-care and medication adherence being closely related; however, these variables did not have the same predictors. Specifically, social support was not a significant predictor of medication adherence, nor were resilience and health literacy significant predictors of HF self-care. We surmise that the lack of an explanatory relationship between social support and medication adherence could relate to the medication adherence measurement used in this study. For example, a few studies reporting social support as a predictor of medication adherence in those with HF used Medication Event Monitoring System data versus self-report.^{65,66} It is also important to consider that the relationship between social support and treatment adherence is complex and influenced by a variety of confounding factors, such as patients' self-efficacy,^{67–69} the type of support provided (ie, practical, emotional), and family dynamics.⁷⁰ Thus, the pathway between social support and medication adherence in those with HF may not be fully understood. The findings in this study suggest that HF patients' medication adherence may not be dependent upon perceived levels of social support.

This study also did not demonstrate a relationship between resilience and self-care. We propose that medication-taking and general HF self-care activities are different behavioral phenomena, involving different decisions and commitments.^{12,71} Thus, resilient patients may see adherence to medications and self-care in different ways. Specifically, patients with HF may not view adhering to other self-care activities (ie, reducing salt intake, weighing daily, exercising) as demanding as taking medications, and therefore, self-care may not require the same level of resilience. Future studies are needed to further our understanding of resilience in the patient with HF.

There were inconsistencies in the literature regarding the relationship between health literacy and HF

What's New and Important

- Resilience and adequate health literacy may be important personal resources that protect against medication nonadherence and should be considered by healthcare providers caring for patients with HF.
- Social support may be an important resource for enhancing overall HF self-care behaviors.
- Younger, single persons of color with a lower income were more likely to be medication nonadherent and have inadequate health literacy.

self-care. The results of this study were similar to previous studies, which demonstrated that better health literacy is not associated with adherence to HF self-care.^{22,57} In fact, Chen and colleagues⁷² showed an inverse relationship between health literacy and HF self-care, whereas patients with lower health literacy had better HF self-care. The findings of this current study continue to suggest that patients with HF may be able to adequately perform HF self-care behaviors regardless of health literacy status.

Clinical Implications

The results of this study have several implications for those providing care for patients with HF. Resilience and adequate health literacy may be important personal resources that protect against medication nonadherence and should be considered by healthcare providers caring for patients with HF. Resilience and health literacy assessment may be useful to identifying those at risk for medication nonadherence with particular attention to patient characteristics. We also suggest more research to further examine the relationship between resilience and medication adherence in those with HF. Resilience has been associated with a variety of personal strengths, such as optimism, adaptive coping, and meaning in life,⁷³ and understanding which factors have the most influence on adherence behaviors is important to developing future interventions. Efforts should also be made to improve health literacy skills among patients with HF and particularly among younger and diverse patient populations.

Testing interventions that bolster resilience while also helping patients to recognize the value of HF medications may have the best potential for improving medication adherence. Because social support may be key for enhancing overall HF self-care behaviors, including friends and family members in the care of individuals with HF may promote better self-care. Further investigation of social support between younger and older groups is warranted.

This investigation has some limitations. First, the results of this cross-sectional study should be carefully considered because they do not determine cause and effect and may not be generalizable to all patients with HF. Second, adherence behaviors were assessed using self-report measures, which are vulnerable to recall and reporting bias. In addition, study recruitment and data collection were conducted online, limiting study participants to those who have access to the Internet. We suggest further exploration or replication of study findings with a longitudinal study design.

Conclusion

In this study, we investigated whether there was a consistent and predictable relationship between resilience, hope, health literacy, social support, and self-care activation, on HF self-care, including medication adherence. We found resilience and health literacy to be significant predictors of medication adherence, whereas social support was a predictor for self-care. Although race was not found to be a predictor of medication or self-care adherence, we recommend that patient characteristics be used to assess for inadequate resilience, health literacy, and social support. In addition, there is a need for personalized HF programs to support targeted interventions that will increase patients' personal resources and maximize benefits to patients with HF. Future research should build on the current study by examining the relationship between resilience and medication adherence in those with HF.

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