

IDENTIFYING FACTORS INFLUENCING HEART FAILURE SELF-CARE WITH THE INTEGRATED THEORY OF HEALTH BEHAVIOR CHANGE

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INTRODUCTION

Heart failure (HF) is a common disease with high morbidity and mortality. An estimated 5.7 million Americans have HF with the prevalence projected to reach over 8 million by 2030¹. Over the same time period, this growing problem is projected to cost \$5.6 billion dollars in annual health care expenditures². In the United States, inpatient and outpatient healthcare utilization is high for the HF population with an annual total of 1 million discharged inpatients, 1.7 million physician office visits, and 553,000 ED visits¹. Failure of HF patients to follow recommended behaviors and monitor for symptoms of worsening HF often results in declining health necessitating hospital readmission^{3,4}.

The primary means of managing HF outside the hospital is patient self-care. Riegel and Dickson describe HF self-care as a naturalistic decision-making process involving behaviors that maintain physiologic stability (maintenance) and the response to symptoms when they occur (management)⁵. Performing appropriate self-care activities can minimize poor health and avert cardiac crisis⁶ while non-adherence to such activities is attributed to causing up to 50% of HF rehospitalization⁷.

Identifying behavioral risk factors that limit HF self-care behavior is vital in addressing poor HF outcomes.

The Integrated Theory of Behavioral Health Change (ITHBC) provides a framework to conceptualize and evaluate health behavior⁸. It was developed with the specific purpose of guiding advanced practice nurses as they assist patients in self-management. According to this theory, individuals undertake health-sustaining behaviors based on internal perceptions of their health and disease, their ability to perform behaviors, and social support. This middle range theory describes three primary antecedents (knowledge & beliefs, self-regulation, and social facilitation). These constructs have the potential to support self-care behavior in the presence of contextual factors (clinical, demographic, and personal factors) that influence the outcome of health behavior. However, in the presence of HF, little is known about the relationship of the constructs and how they support self-care behavior.

Due to limited knowledge of what factors do and do not support HF self-care behavior, it is difficult to identify individuals at risk for not taking on appropriate self-care in order to target interventions. Therefore, the purpose of this study was to investigate if and how ITHBC constructs and contextual factors influence HF self-care maintenance and management in HF outpatients.

METHODS

Design and Participants

This cross-sectional observational study explored factors that influence outpatient HF self-care behavior. Participants were recruited from a HF outpatient clinic between January and June 2016 by trained research assistants. Participants were included if they had a confirmed diagnosis of HF (systolic or diastolic) and were able to read, write, and understand English. Individuals were excluded if they lived in a nursing home, reported a language other than English as their preferred language, and/or had a diagnosis of dementia or cognitive impairment. Participants were assessed for cognitive ability with the Montreal Cognitive Assessment (MoCA). Those with moderate or severe cognitive impairment (MoCA<19) were excluded from the analysis.

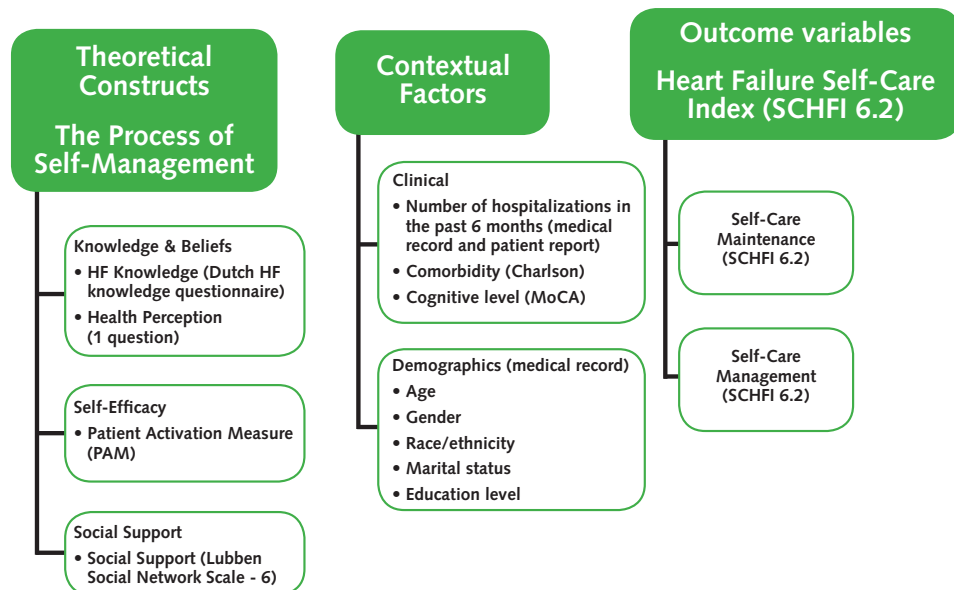
Procedure

The study was approved by the Institutional Review Board at the affiliated hospital and academic institution. During routine office visits, patients were approached, introduced to the study, and provided an opportunity to ask questions. If willing and eligible, individuals provided informed consent and completed study questionnaires in a private environment during the clinic visit. All responses were checked for accuracy by the study coordinator. A \$10 gift card was offered as a token of appreciation.

Measures

The guiding theoretical framework was the ITHBC⁸. For the purpose of this study, and to retain integrity of the theory, scale measurements that align with the model constructs were used (Figure 1).

Figure 1. The Integrated Theory of Health Behavior Change (Constructs and Measures)



Heart Failure Knowledge. HF knowledge was measured with the Dutch Heart Failure Knowledge Scale (DHFKS)⁹. The DHFKS consists of fifteen multiple choice questions assessing understanding of HF topics including general knowledge, treatment, and symptom recognition. It has been used to measure baseline and improvements in HF knowledge following interventions¹⁰⁻¹². In this study, the percentage of correct responses was used as a measure of HF knowledge (range: 0 – 100%).

Health Perception. Self-reported health was operationalized with a single question, ‘*Would you say your health is excellent, very good, good, fair, or poor?*’ (5 = excellent, 4 = very good, 3 = good, 2 = fair, 1 = poor).

Self-Efficacy. Self-efficacy was measured with the Patient Activation Measure-10 (PAM)¹³. Patient activation is described as ‘the degree to which the individual understands they must play an active role in managing their own health and health care, and the extent to which they feel able to fulfill that role’¹⁴. The PAM is a 10-item instrument designed to reflect general preventative and disease specific health behavior adoption. An indexed score of 0-100 is produced measuring patient engagement in a range of health behaviors that include preventative behaviors, self-management of disease, health maintenance behaviors, and health-information seeking. Higher scores represent increased self-efficacy. The PAM has been used in a variety of patient populations including healthy adults, adults with chronic diseases, and multi-morbid older adults^{13,15}.

Social Support. Social support was measured with the Lubben Social Network Scale-Brief (LSNS-6)¹⁶. The LSNS-6 consists of six questions answered on a 5-point Likert scale that measures the size of an individual’s social network and quality of the perceived support from friends and family. The scale produces an aggregate score that ranges from 0–30. Lower scores represent greater social isolation with a greatest risk for those scoring 12 and lower.

Demographics and Clinical Factors. Self-reported demographic and clinical information collected were: age, gender, race/ethnicity, marital status, education level, presence and number of hospitalizations over the past six months and co-morbidities. Patient self-reported co-morbidity was used to determine a Charlson Comorbidity Index score¹⁷. Self-reported hospitalization was cross-referenced with the medical record to ensure accuracy of rehospitalization history.

Heart Failure Self-Care. The outcome measures of HF self-care maintenance and management were measured with the Self-Care for Heart Failure Index 6.2 (SCHFI). Maintenance refers to the self-reported ability to adhere to treatment advice and perform healthy HF behaviors. Management refers to an individual's response to HF symptoms when they occur. The SCHFI is a validated instrument that assesses HF self-care with twenty-two questions measured on 4-point Likert scales¹⁸. Responses to the 22 questions produce composite scores that range from 0 to 100. Scores of 70 or higher represent adequate self-care behavior¹⁹. Self-care maintenance was measured in all participants. Self-care management was measured only in participants experiencing HF symptoms in the past 30 days (n=91).

Statistical Analysis

Analyses were done using SPSS version 22. Descriptive statistics and frequency distributions were calculated for demographic, clinical history, cognitive level, and behavior measures. Relationships among variables and self-care behavior were examined with Pearson correlation.

Hierarchical multiple regression was performed to investigate the impact of contextual factors (demographic, clinical, and cognitive status) and behavioral factors (knowledge and health perceptions, self-efficacy, and social support) on outcome variables (self-care maintenance, management). Preliminary analyses were conducted to ensure the assumptions for multiple regression were met. A theory-driven approach was used to identify variables associated with self-care. The first block included contextual factors such as demographics, clinical characteristics and cognitive ability. The second block included behavioral characteristics identified in the ITHBC. A p-value of < 0.05 was considered statistically significant.

RESULTS

Participant Characteristics

Demographic and clinical information was obtained from 144 participants (Table 1). The sample was predominantly white, male, married, and well-educated. Participants ranged in age from 34 to 98 years (M= 66.5, SD = 12.57) years. Fifty seven percent of the participants were hospitalized within the past 6 months with an average of 0.99 (SD=1.22) hospitalizations in the past 6 months. Participants had a high comorbidity burden. The most common comorbid conditions were history of high blood pressure, high cholesterol, diabetes, and heart attack.

Table 1: Demographics and Characteristics

	Mean(SD) or n (%)	
Age	66.46	(12.57)
Male	99	(68.8)
Race		
White	107	(74.3)
Black or African American	21	(14.6)
Hispanic	8	(5.6)
Asian	2	(1.4)
American Indian/Alaskan	1	(0.7)
Other	2	(1.4)
Two or more Races	3	(2.1)
Marital Status		
Single/Never married	23	(16)
Married/Domestic Partner	78	(54.2)
Separated	8	(5.6)
Divorced	15	(10.4)
Widowed	20	(13.9)
Education		
Less than High School	2	(1.4)
High School	32	(22.2)
Some College	46	(31.9)
4 year College Degree	29	(20.1)
Masters Degree	25	(17.4)
Doctoral Degree	10	(6.9)
Clinical History		
Heart failure	144	(100)
High blood pressure	99	(68.8)
High cholesterol	77	(53.5)
Diabetes	62	(43.1)
Heart attack	46	(31.9)
Clinical Factors		
Charlson Comorbidity Index Score	4.47	(2.14)
Hospitalizations in the past 6 months	0.99	(1.22)
Montreal Cognitive Assessment Score	25.14	(2.97)
Self-Care and Behavior Measures		
Self Care Maintenance	68.2	(14.86)
Self Care Management	57.72	(23.66)
Heart Failure Knowledge	80.93	(12.19)
Social Support	17.01	(6.1)
Self-Efficacy	64.98	(15.11)
Health Perception	2.48	(0.84)

Heart failure specific measures (HF self-care behavior and knowledge) and general health measures (self-efficacy, social support, health perception) are also shown in Table 1. Heart failure self-care was less than adequate (SCHFI \leq 70) for self-care maintenance and management in more than half of the sample. Average scores for HF self-care were: self-care maintenance (M = 68.20, SD = 14.86) and management (M = 57.72, SD = 23.66). While HF self-care behavior was less than optimal, most participants demonstrated adequate HF specific knowledge as measured by the DHFKS (M = 80.93, SD = 12.19). Participants reported moderate levels of social support (LSNS-6 score, M= 17.01, SD = 6.10; risk for social isolation <12) and self-efficacy (PAM score, M = 61.55, SD = 12.50).

Heart failure patients perceived their health status broadly throughout the spectrum of poor to excellent. The average score was midway between fair and good (M=2.48, SD = 0.84).

Heart Failure Self-care

Self-care maintenance, which measured treatment adherence and adoption of healthy HF behaviors, was positively associated with self-efficacy, number of hospitalizations in the past 6 months, and social support. Self-care management, the response to HF symptoms when they occur, was positively associated with self-efficacy and the number of hospitalizations in the past 6 months and negatively associated with self-reported health (Table 2).

Table 2: Factors Correlated with Self-care Maintenance and Management using Pearson Correlation Coefficients

	Maintenance Score (n=144)	Management Score (n=91)
Cognition	0.068	0.026
Age	0.047	-0.201
Gender	-0.156	-0.067
Number of hospitalizations in the past 6 months	0.287**	0.258*
Highest education level	-0.081	-0.045
Charlson Comorbidity Index	0.146	0.135
Heart failure knowledge	0.166	-0.091
Social Support	0.202*	0.135
Self-Efficacy	0.442***	0.300**
Health Perception	0.007	-0.251*

*p<0.05, **p<0.01, ***p<0.001

In the hierarchical multiple regression analyses, the block of contextual factors was significantly associated only with self-care maintenance (Block 1: R²=0.145, p<0.01). The block of behavioral factors was associated with both self-care maintenance (Block 2: R²=0.278, p<0.001) and management (R²=0.208, p<0.001).

Table 3: Summary of Hierarchical Regression Analysis for variables associated with self-care maintenance (n=144)

Variable	Model 1			Model 2			Model 3		
	B	SE B	β	B	SE B	β	B	SE B	β
Block 1 - contextual factors									
Cognition	0.48	0.46	0.09				-0.10	0.45	-0.02
Age	0.05	0.11	0.04				0.01	0.10	0.01
Gender	-5.35	2.70	-0.17				-2.30	2.40	-0.072
Hospitalizations in the past 6 months	4.00	1.08	0.33***				3.89	0.97	0.32***
Highest education level	-0.29	1.05	-0.02				0.16	0.93	0.01
Charlson Comorbidity Index	0.44	0.70	0.06				-0.08	0.65	-0.01
Block 2 - behavioral factors									
Heart Failure Knowledge				0.17	0.09	0.14	0.15	0.10	0.13
Social Support				0.37	0.18	0.15*	0.35	0.18	0.14*
Self-Efficacy				0.49	0.08	0.49***	0.47	0.08	0.47***
Health Perception				-3.32	1.45	-0.18*	-1.92	1.50	-0.11*
R ²	.145			.278			.374		
F-Statistic	3.612**			12.50***			7.412**		

*p<0.05, **p<0.01, ***p<0.001

R² – percent of variance explained

Individual variables associated with self-care are shown in a full model consisting of both contextual and behavioral factors (Model 3 in Tables 3 and 4). Self-care maintenance was significantly associated with one contextual variable (number of hospitalizations in the past 6 months: $\beta = 0.32$, $p < 0.001$) and two behavioral variables (self-efficacy: $\beta = 0.47$, $p < 0.001$; social support: $\beta = 0.14$, $p < 0.05$). Self-care management was significantly associated with one contextual factor (number of hospitalizations in the past 6 months: $\beta = 0.30$, $p < 0.01$) and two behavioral factors (self-efficacy: $\beta = 0.38$, $p < 0.001$; and self-reported health status: $\beta = -0.31$, $p < 0.01$). Collectively, the variables described in the ITBHC explained 37.4% of the variance in self-care maintenance and 31.9% in self-care management.

Table 4: Summary of Hierarchical Regression Analysis for variables associated with self-care management (n=91)

Variable	Model 1			Model 2			Model 3		
	B	SE B	β	B	SE B	β	B	SE B	β
Block 1 - contextual factors									
Cognition	-0.26	0.92	-0.03				0.23	0.95	0.03
Age	-0.37	0.24	-0.18				-0.44	0.22	-0.21
Gender	-5.95	5.29	-0.12				-4.02	4.92	-0.08
Hospitalizations in the past 6 months	5.43	1.95	0.31***				5.15	1.78	0.30**
Highest education level	1.42	2.16	0.07				2.51	2.00	0.13
Charlson Comorbidity Index	1.23	1.29	0.11				-0.44	1.30	-0.04
Block 2 - behavioral factors									
Heart Failure Knowledge				-0.15	0.21	-0.07	-0.22	0.23	-0.10
Social Support				0.40	0.38	0.01	0.42	0.37	0.11
Self-Efficacy				0.55	0.16	0.37**	0.58	0.16	0.38***
Health Perception				-10.54	3.28	-0.33**	-9.81	3.52	-0.31**
R ²		0.136			.208			.319	
F-Statistic		2.039			5.25***			3.465**	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ R² – percent of variance explained

DISCUSSION

Findings from this study suggest that a number of theoretical constructs derived from the ITHBC differentially contribute to appropriate HF self-care. These differences may help explain why some patients are at greater risk for diminished self-care and rehospitalization²⁰⁻²². Grounded in the holistic model, this study was conducted in a multifaceted manner in which many contextual and behavioral factors were evaluated for their influence on self-care behavior. According to the ITHBC, self-care behavior is influenced by a variety of factors including behavioral variables that measure knowledge and perceptions, self-efficacy, and social support in the contextual setting of clinical, demographic, and person factors⁹. Although contextual factors, such as demographic and clinical factors such as comorbidity, cognitive ability and hospitalization history (Block 1), demonstrated a modest but significant effect on self-care maintenance and a non-significant effect on self-care management, behavioral characteristics (Block 2) significantly explained the largest proportion of the variance for both self-care maintenance and management. Collectively, behavioral factors in the ITHBC (knowledge & perceptions, self-efficacy, and social support) are core components in how patients with HF perform self-care.

With respect to individual factors, self-efficacy and number of hospitalizations were most strongly associated with self-care maintenance and management. Self-efficacy reflects a patient's understanding of the need to take an active role in their care and the confidence to carry out self-care behaviors. Intuitively, patients that have high self-efficacy would seem to have excellent self-care behavior. Patients that are active participants in their care are more likely to meaningfully participate in HF self-care behavior. However, according to the findings, those that had a more troubled hospitalization history also self-report higher self-care behavior. One explanation for this finding is that while these patients may return to the hospital with greater frequency, the experience has favorably impacted the self-care behavior they perform after hospital discharge. It is possible that these individuals would have been hospitalized more without appropriate self-care behavior. Another interpretation is that patients with refractory HF may demonstrate proficiency in self-care yet may still not be able to avoid hospitalization. Given the cross-sectional design, the temporal relationship of these measures remains beyond the scope of this study.

Prior regression-based HF self-care studies have focused on single domains with consideration for demographic/clinical factors with only a modest percentage of the variance explained (<20%)^{23,24}. Most of these studies lacked a theoretical framework to describe the multifaceted environment in which self-care occurs. While these studies have provided insight into factors that influence self-care, few studies have successfully integrated a holistic approach that includes a full range of contextual and behavior factors. Due to the large proportion of variance explained by behavioral factors, this study underscores the importance of assessing these factors when evaluating patients at risk for diminished self-care.

The models investigated in this study underscore that unique mechanisms (knowledge, social support, self-efficacy, and health perception) might impact different types of self-care behavior (maintenance versus management). For example, social support may play an important role in daily HF wellness behaviors (self-maintenance). In contrast, the perception of health as measured by self-reported health may play a greater role in patient symptom response (self-management).

The construct of self-efficacy was found to be the strongest predictor of self-care behavior. However, in contrast to other studies, HF knowledge, cognitive impairment (CI) and comorbidity were not associated with HF self-care maintenance or management²⁵⁻²⁷. Furthermore, similar to previous findings from HF inpatients with CI, the majority of patients demonstrated sub-optimal self-care maintenance and management (i.e. mean SCHFI scores<70) yet demonstrated adequate HF knowledge^{26,28}. This is consistent with other studies that have identified the importance of self-efficacy^{27,29}.

Together these findings support that while educational interventions that promote HF knowledge are a traditional component of patient care, use of interventions that promote self-efficacy may more effectively improve self-care behavior.

LIMITATIONS

This study had a number of limitations. Convenience sampling may have resulted in a non-representative sample. Participants completed a cognitive assessment prior to survey completion and those wary of cognitive testing may have declined participation. Consequently, those with CI may be under represented in the population. The study sample was predominantly white, male, and college educated. Furthermore, participants were excluded from the study if English was not their preferred language. This may limit the ability to generalize the findings to other samples. The diversity of the study could have been enhanced with inclusion of non-native speaking individuals with culturally sensitive measures. Additionally, most of the measures were self-reported by patients. To encourage an honest response, participants completed the questionnaires in a private manner and were assured that the information would only be used as aggregate data. Nevertheless, self-reported questionnaires lack objective verification of behaviors. This study was a cross sectional design. While this design is appropriate given the unpredictable clinical history and potential lack of follow up, a cause and effect relationship among the all the variables and self-care behavior could not be tested.

IMPLICATIONS

This study has theoretical, research and practice implications. The use of the integrated theory for health behavior change provided a rich framework to explore heart failure self-care. Recently this theory has provided the foundation for research in only a few wellness intervention studies. Areas of self-management research include post-partum weight loss³⁰, vitamin D and calcium intake³¹, adoption of personal health care records^{32,33}, and parental promotion of healthy cardiovascular behaviors in children³⁴. Situation-specific consideration is needed to solidify the use of this framework to describe and predict self-care behavior in the HF population.

Research implications include identifying factors that place patients at risk for poor self-care and rehospitalization. In this cross sectional study, hospitalization was evaluated retrospectively. While hospitalization history was strongly associated with self-care behavior, future work is needed to prospectively evaluate the role of contextual and behavioral factors on self-care and rehospitalization. Prospective studies that evaluate the predictive ability of these variables on rehospitalization and mortality may permit enhanced assessment of patients that are vulnerable for poor outcomes.

Practice implications include the potential to improve care in the outpatient clinical setting. Providers have financial and time limitations that impact the patient interaction. In a brief clinic visit they address acute healthcare needs, supplement disease management knowledge gaps, and offer limited resources aimed at reducing HF hospitalization. How should a provider best spend the brief appointment time to support their patients? While contextual factors, often available in a medical record review, may provide insight into a patient's risk for poor self-care, this study identifies behavioral factors as an important component of the clinic visit. Providers are advised to perform a focused interview that assesses knowledge, health perception, social support, and, most importantly, self-efficacy in order to identify patients at risk for diminished self-care.

CONCLUSION

This study presents a model of contextual and behavioral variables that impact HF self-care. The contextual factor of previous hospitalization in the past 6 months and behavioral factors including health perception, social support, and self-efficacy were associated with HF self-care. Given that self-care behavior is the primary means in which HF patients avoid rehospitalization, this model provides a helpful framework of factors that identify patients at risk for poor outcomes.

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