Development and testing of a clinical tool measuring self-management of heart failure

Barbara Riegel, DNSc, RN, CS, FAAN,[a,b] Beverly Carlson, MS, RN, CCRN,[b] and Dale Glaser, PhD,[c,d] San Diego, California

BACKGROUND: Self-management is a primary goal of treatment for heart failure. Yet no measure of self-management in this patient group currently exists.

OBJECTIVES: To develop a clinically useful measure of the abilities of patients with heart failure to manage their disease. Self-management in this context was defined as a cognitive decision-making process undertaken in response to signs and symptoms of heart failure. A panel of experts agreed that the process involved 4 distinct stages: recognizing a change, evaluating the change, implementing a treatment strategy, and evaluating the treatment. The tool was developed to reflect this process.

METHODS: Face validity of the process model was assessed in a sample of 25 patients with heart failure and used to develop a 65-item tool with 6 subscales. The subscales measure the 4 stages as well as the patients' ease in evaluating the signs and symptoms and their self-efficacy. The tool was pilot tested with 2 samples of patients with heart failure (N = 17; N = 129). Psychometrics of the final tool were then tested in a sample of 127 patients with heart failure.

RESULTS: Face and content validity of the tool were demonstrated adequately through this study. Internal consistency scores of the 6 subscales of the Self-Management of Heart Failure instrument ranged from 0.79 (ease of evaluating treatment) to 0.92 (evaluating the change). Reliability could not be calculated for 1 subscale (evaluating the treatment) because of missing data that resulted from patients skipping sections because they had not experienced a symptom.

CONCLUSION: Clinicians interested in evaluating the self-management abilities of their patients with heart failure are encouraged to use this tool and to contribute to additional testing. (Heart Lung® 2000;29:4-12)

Heart failure is a clinical syndrome resulting from an inability of the heart to maintain adequate blood circulation. Many chronic disease states culminate in heart failure (eg, myocardial infarction, hypertension) and more than 400,000 new cases of heart failure are diagnosed annually. Currently, heart failure afflicts almost 5 million Americans,[1] and the incidence and cost are expected to reach epidemic proportions in the next century.[2]

Until recently, treatment for heart failure primarily focused on symptoms. Repeated visits to emergency departments and hospitals were typical until patients eventually died. Publication of heart failure treatment guidelines in 1994[3] and recognition that patients with heart failure consume a huge proportion of the money spent on health care have focused national attention on this illness. Now efforts are aimed at helping patients with heart failure better care for themselves.[4]

Heart failure is recognized clinically by a constellation of signs and symptoms including shortness of breath, fatigue, peripheral swelling, diffi-

From the [a]School of Nursing, San Diego State University; [b]Sharp HealthCare; [c]Pacific Science and Engineering Group; [c]Department of Psychology, San Diego State University; [d]Department of Psychology, University of San Diego.

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Reprint requests: Barbara Riegel, DNSc, RN, CS, FAAN, Clinical Research Department, Sharp HealthCare, 8695 Spectrum Center Ct., San Diego, CA 92123.

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culty sleeping in a supine position, coughing, inability to perform normal activities of daily living, and a sudden weight gain because of fluid retention. Dizziness, lightheadedness, and palpitations are common, worrisome symptoms that suggest dysrhythmias or hypotension. A sudden, unintentional weight loss may be an indication of cardiac cachexia.[5] If people with heart failure are to be successful in self-management, they must monitor their symptoms routinely and be knowledgeable about which symptoms are important to address immediately, adventuresome in trying therapeutic options, and capable of evaluating the effectiveness of those actions. Prior research has shown that patients who take an active role in caring for themselves perceive less helplessness, feel more able to influence their disease, and experience better psychologic outcomes.[6-10] Patients who participate in their care experience fewer disease-related complications than those who remain passive.[11]

The purpose of this methodologic study was to develop a tool for use by clinicians and investigators interested in measuring self-management in patients with heart failure. Clinicians could use the tool to evaluate deficiencies in the self-management process and to identify specific patient education and counseling needs. Investigators could use the instrument to evaluate the effectiveness of various interventions designed to improve self-management.

THEORETICAL FRAMEWORK

Self-management is one component of self-care. Self-care involves a process of maintaining health through positive health practices, and managing illness and disease. Self-care is performed in both healthy and diseased states, although patients with a chronic illness such as heart failure engage in self-care primarily to manage what may be a precarious balance between relative health and symptomatic heart failure. That management process involves cognitive decision making undertaken in response to signs and symptoms.[12] Thus the term "self-management" is used in this study rather than the broader term, "self-care."

In this study, self-management was made operational using cognitive theory, which is the study of how people organize their world and make sense of their experiences. People are assumed to be thinking beings who behave rationally, even when they are not fully aware of the reasons behind their behavior.[13] People use their past experiences to make decisions, a process referred to as naturalistic decision making. Decision making in natural settings is distinctive in that the decision makers typically focus on sizing up the situation and obtaining feedback on their interpretation of the situation (an early stage of the decision-making process) rather than on developing and comparing multiple action options.[14] Effective decision making largely depends on having a good understanding of the situation at hand.[15] Most models of decision making emphasize recognition; however, recognition is inadequate when no familiar pattern fits the current situation. Therefore for naïve decision makers, like most patients, recognition must be followed by a process of critiquing and correcting assumptions through additional observation, additional information retrieval, and reinterpretation of cues.[16]

Attention is the first step in a natural decision-making process; attention is the product of selection or direction.[17] When an individual focuses his or her attention, selection is typically determined by salience or relevance of a cue. Cues are important influences on the ways in which people plan, act out, and regulate behavioral decisions. Cues judged as salient command more attention than do those rated as irrelevant. People who are high self-monitors are sensitive to environmental or external cues, whereas low self-monitors typically display behaviors that reflect their inner feelings.[18]

Attention has been shown to play an important role in symptom reporting; selective attention is crucial in the process of noticing and interpreting physical symptoms.[19] Once symptoms are recognized as relevant, inference occurs in which diverse and often complex information is collected and combined into a judgment or decision about subsequent behavior. The link between cognition and behavior is often obscure, but cognitions are clearly linked to behavior in certain situations, such as when direct experience influences attitudes. For example, if patients link symptom relief directly to a medication, their attitudes about that medication will probably influence subsequent medication-taking behavior. The relationship between cognition and behavior, however, will never be predictable because it is moderated by situational factors, individual differences, beliefs, values, goals, and knowledge.[13,20,21]

REVIEW OF LITERATURE

Previous investigations have proposed models of self-care. Levin et al[22] and then Dodd[23] defined self-care as a decision-making process involving self-observation, symptom perception and labeling, judgment of severity, and choice of assessment and

treatment options. Sorofman et al[24] specified 5 categories of self-care: symptom recognition, symptom evaluation, treatment consultation, treatment implementation, and symptom outcome. These approaches to the conceptualization of self-care were used as the origin for the model proposed by these authors.

Only 2 instruments were found in the literature that focused on the management component of self-care. Connelly defined self-care as "behaviors to promote health, prevent illness, and treat and cope with health problems."[25] She developed a model of self-care in chronic illness with 3 related concepts: general and therapeutic self-care behaviors, predisposing variables (eg, self-concept), and enabling variables (eg, social support), and she developed the 45-item Self-Care in Chronic Illness Questionnaire. Only pilot testing of the instrument with 49 subjects has been reported. Internal consistency was 0.73, and content validity was established by a panel of experts. This instrument was limited by its conceptual overlap between the construct of self-care and factors influencing self-care, making construct validity problematic.

Dodd[23] developed the Self-Care Behavior Questionnaire as an indicator of what the patient (or family and friends) did to alleviate chemotherapy side effects. This instrument made operational Dodd's theory that the patient who practices self-care labels symptoms, judges severity, implements self-care behaviors, and evaluates the effectiveness of self-care behaviors. Respondents indicate the severity of each reported side effect on a 5-point Likert-type scale. Then they indicate the actions taken to alleviate the side effect and the effectiveness of each self-care behavior. Only test-retest reliability ($r = 0.79$, $P = .002$) was reported for a 4 to 9-week interval. This instrument is well conceptualized and logically developed. It is not appropriate, however, for the heart failure population because it focuses on side effects of therapy rather than on management of the subtle symptoms of an illness.

The limitations identified in other studies were addressed in this study. For example, some researchers have approached the study of self-care with the assumption that knowledge is sufficient for self-care.[26] Dodd[23] noted that many investigators in this field have confused the concepts of self-care and treatment compliance. Treatment compliance is a poor substitute for the level of participation required for management of a complex illness such as heart failure. Others have used scenarios or open-ended health diaries to measure self-care[24]; however, reliability and validity are difficult to demonstrate in health diary data.[27]

METHODS

Development and testing of the Self-Management of Heart Failure instrument involved a process of conceptual refinement and content validation, face validation of the model with patients with heart failure, item generation, and pilot testing of the preliminary item pool. Internal consistency was tested after the format had been finalized.

Conceptual refinement and content validation

Important stages in the self-management process were identified from the literature (eg, references 22, 23, and 24) and refined for patients with heart failure based on discussions among 4 master's-prepared clinical nurse experts. These discussions were conducted to establish content validity of the proposed process. There was consensus among the experts on the proposed stages. Further, they identified 4 key beliefs that guided subsequent efforts. First, symptom importance was judged to be more salient than symptom severity because the symptoms of heart failure are subtle initially. Patients' conditions are typically unstable and physiologically compromised by the time their symptoms are severe, demonstrating the need to focus self-management efforts on symptoms' importance (early) rather than severity (late). Second, although health care providers speak about "signs and symptoms," patients respond to episodic changes in their baseline health status. Thus the instrument was written in lay terminology rather than the terms health care providers use. Third, patients cannot be expected to accurately measure their own ability to identify their symptoms; the accuracy of such a measure would require outside validation. Fourth, the cognitive decision-making process was specified as an essential component of the self-management process because of the belief that successful self-management of an illness requires patients to become rationally involved, knowledgeable, and willing to participate in their treatment.

Self-management in the context of chronic disease management was conceptualized as consisting of 4 stages: (1) recognizing that a change in signs or symptoms is related to the illness, (2) evaluating the change, (3) implementing a selected treatment strategy, and (4) evaluating the effectiveness of treatment. The first stage, recognizing a change in signs and symptoms, involves the patient's recognition that a change from baseline health status has occurred and that change is related to heart failure.

The change does not need to be a new symptom, just a difference from that individual's norm or baseline. The second stage, evaluating the change, involves a cognitive process that occurs as the patient attempts to distinguish between important and unimportant changes in health status.

At this stage in the process the person is assumed to make a judgment about whether a particular change is important enough to require action. If a sign or symptom is judged to be important, it is likely that the patient will be stimulated to make a decision about the need to take action and will take into account the risks and the benefits of a particular action or inaction. The patient may proceed through the first few stages and still not take action for various reasons. He or she may lack knowledge about what to do, make a judgment that the costs of the action outweigh the benefits,[28] fail to understand the importance of the change, or believe that no effective strategy is available. The decision itself is an important part of self-management but one that is extremely difficult to measure with quantitative methods. Therefore, the actual decision is assumed to be imbedded in the preceding concept and is not measured directly.

The third stage, implementing a selected treatment strategy, is defined as an action or behavior undertaken by the patient in response to the previous stages and initiated in response to the perceived change in symptoms. Action is taken with the intention of influencing the change in symptoms. The fourth and final stage, evaluating the treatment, involves a process wherein the patient evaluates the selected treatment strategy primarily in terms of its effectiveness (ie, symptom relief). These 4 stages are often linear, but patients may experience them simultaneously or rapidly pass through them. Some patients may omit entire stages. For example, patients may recognize a change and skip stage 2 (ie, evaluate the change), immediately implementing a treatment strategy because of past experience with a particular symptom. They may also delay treatment evaluation until a therapy has been tried several times.

Face validity

Face validity of the proposed stages was tested by descriptive methods. Twenty-five patients with heart failure were interviewed by telephone through the use of a semistructured discussion guide designed to elicit detailed information on the proposed stages. Potential subjects were identified by discharge diagnosis from the hospital computer database; patients discharged from 1 of 6 hospitals in southern California with the primary diagnosis of heart failure were invited to participate. Verbal consent was accepted for this voluntary telephone discussion with a master's-prepared advanced practice nurse; all the contacted patients agreed to participate. Sixteen of the 25 subjects were women and nine were men. The mean age of this sample was 75.6 ± 8.9 years (range, 52 to 90 years).

Patients were asked questions designed to determine if they could recognize changes in their signs and symptoms (stage 1); most could readily identify episodic changes and relate them to their heart failure. Then they were asked their perceptions of the importance of each heart failure symptom they reported (stage 2). All patients labeled all their heart failure symptoms as important or very important. Patients were asked what influenced their decision to take action when they had symptoms. Although the patients had difficulty articulating the process they used to come to a decision, most (n = 17) indicated that they would do something if the symptoms became severe. That is, they were making their decisions regarding self-management based on the severity, not the importance, of the signs and symptoms.

Patients were asked to describe what they did to treat each of the changes in signs and symptoms they reported (stage 3). It was evident from the responses that patients were trying a variety of self-management measures, but the specific treatment used did not necessarily match the symptom. For example, one patient reported taking 3 tablets of sublingual nitroglycerin daily, though she was not experiencing angina. Others clearly did not understand their symptoms; one patient increased her consumption of fruits, vegetables, and brown rice to treat her weight gain. Although consultation with family and friends is a treatment commonly included in other self-care models,[24] few patients with heart failure consulted any resource except their physician. These data were returned to the content experts who reaffirmed their decision that consultation was not essential to the self-management process for patients with heart failure.

These 25 patients with heart failure were able to evaluate the effectiveness (stage 4) of most strategies they tried and rated them as ineffective (eg, rest for fatigue), mildly effective (eg, nitroglycerin for chest pain), moderately effective (eg, limit fluids for ankle swelling), effective (eg, resting for shortness of breath), or very effective (eg, diuretics for swelling).

Following the semistructured interview, patients were engaged in a discussion to determine if addi-

Table I
Sample items and subscale response formats of the Self-Management of Heart Failure instrument (using shortness of breath as an example)

Stage	Sample item	Response format
Recognizing a change	"The last time you had [shortness of breath], how quickly did you recognize it as a symptom of heart failure?"	1. I didn't 2. It took me a while 3. Fairly quickly 4. Immediately
Evaluating the change	"If you had it, how much importance would you place on [shortness of breath] with regard to your heart failure?"	1. Not important 2. Somewhat important 3. Important 4. Very important
Implementing a treatment strategy	"The last time you had [shortness of breath], did you rest to relieve the [shortness of breath]?"	Yes or no
Evaluating the treatment strategy	"When you rested, did it relieve your [shortness of breath]?"	Able to evaluate ("No, it did not help" or "Yes, it helped") or unable to evaluate ("I'm not sure if it helped")
Ease of evaluating the treatment strategy	"How easy was it to tell if any of the actions you used were helpful in relieving your [shortness of breath]?"	1. Not easy 2. Somewhat easy 3. Very easy 4. Extremely easy Also: I did not use any of them
Self-efficacy	"How confident are you that you could do something to [relieve your symptoms]?"	1. Not confident 2. Somewhat confident 3. Very confident 4. Extremely confident

tional stages were involved in self-management. Lack of self-confidence in the ability to perform self-management, or poor self-efficacy, was repeatedly identified as a barrier to treatment success. Self-efficacy did not appear to be a stage of self-management but an important factor influencing self-management ability. Although the importance of self-efficacy was not anticipated before the phone calls, the finding was consistent with the theoretic postulates of Bandura,[29,30] who argued that self-efficacy is a potent cognitive factor mediating the effectiveness of any treatment aimed at helping people change. Bandura noted,

> Efficacy in dealing with one's environment is not a fixed act or simply a matter of knowing what to do. Rather, it involves a generative capability in which component cognitive, social, and behavioral skills must be organized into integrated courses of actions to serve innumerable purposes. A capability is only as good as its execution.[30]

A self-efficacy subscale was added to the instrument as a result of the pilot data.

No other stages were added to the model because of these phone conversations. Interviews lasted 20 to 30 minutes. Interviews were stopped after discussions with 25 patients because no new relevant data emerged.

Item generation

Results of the patient interviews were used to guide the content of specific items and item stems. Initially, 8 to 20 items were developed for each of the 4 self-management stages.[31] Sample items and subscale response formats are illustrated in Table I. Likert-type scale and dichotomous response descriptors were designed to match the various subscale stems. All of the items within each subscale are evaluated with the same response format. All of the items are scored in the same direction (ie, greater numbers represent higher degrees of agreement) because

response set bias is less of an issue than confusion in this ill, elderly patient population. When asked to evaluate a potential change in baseline health status in terms of perceived importance (stage 2), only signs and symptoms judged by the clinical experts to be very important were included as items.

The implementing (stage 3) and evaluating (stage 4) stages of self-management were measured with the 7 most commonly reported symptoms from the phone survey (ie, shortness of breath, sudden weight gain, fatigue, difficulty breathing during sleeping, ankle swelling, chest pain, and palpitations). Each symptom was listed along with 6 to 8 treatment choices for each symptom. Only treatment options judged by the experts as correct were listed. Use of a particular treatment (stage 3) was noted in a dichotomous fashion (ie, tried an action or not). Patients were then asked to evaluate each chosen treatment strategy to determine if they could evaluate (stage 4) the strategy. When patients chose "yes or no" they were rated as able to evaluate the treatment; an "unsure" response indicated an inability to rate or evaluate the treatment. A subscale measuring the ease of evaluation was added as an additional measure of stage 4. Because patients rarely experience all 7 symptoms, a skip pattern format was used (ie, "Go to item x if you have not experienced this symptom").[32] Self-efficacy was measured with a single item following each stage in the process rather than after each symptom (eg, stage 2: "How confident are you that you could evaluate the importance of your symptoms?").

Pilot testing

A small initial pilot study was conducted with a convenience sample of 17 volunteers drawn from an active cardiac transplantation program in southern California. That sample, enrolled from both an outpatient clinic (n = 11) and a hospital (n = 6), ranged in age from 27 to 69 years (mean, 48.7 ± 13.47 years); 71% were men. Subjects were asked to complete the paper-and-pencil instrument, note their comments in the margins, and then discuss their impressions (face validity) with the nurse research associate. Revisions made to the instrument as a result of this feedback included primarily format changes and wording simplifications.

A second pilot study was conducted with a sample of 129 patients, 53.3% of whom were women. The mean age of this sample was 72.1 ± 13.1 years. Functional status was available for this group; 12.1% were class I, 16.4% class II, 51.7% class III, and 19.8% class IV on the Specific Activity Scale,[33] a 4-point scale measuring ability to perform specific activities of daily living based on metabolic load. The data from these subjects were used to further formulate and refine the conceptualization of the process of self-management among patients with heart failure.

At the completion of this second pilot study a focus group of 3 patients with heart failure from this sample (2 men, 1 woman with ages ranging from 68 to 75 years) was convened to discuss the stages of self-management and wording of the questions. The instrument was revised, and then 2 experts in instrument formatting were consulted. The feedback from the 2 pilot samples, the focus group of patients with heart failure, and the 2 consultants was used to refine the final instrument. An example of the questions asked regarding one symptom from the final formatted instrument is presented in Fig 1.

Changes made to the instrument were significant enough to eliminate the possibility of combining the data sets. These changes included eliminating 1 of the 7 symptoms (chest pain) because it was reported rarely. Some treatment options were eliminated, such as "call your doctor or nurse" (originally listed as an option for every symptom), because it was thought by the experts to be a poor reflection of self-management. Vague options (eg, "other") and those not directly related to the symptom (eg, "weigh yourself" for ankle swelling) were eliminated because they were confusing to patients. These deletions decreased the instrument from 80 items initially to a 65-item instrument with 6 subscales. Only 2 to 4 possible self-management treatment strategies were listed for each of 6 symptoms (ie, shortness of breath, sudden weight gain, fatigue, difficulty breathing while sleeping, ankle swelling, palpitations). Changes were made to the response descriptors to make them clearer to patients. The formatting of the instrument was changed significantly to make it easier to read and to follow.

Administration and scoring

The Self-Management of Heart Failure instrument is intended to be a self-report tool, although some of the elderly, ill patient population for whom it is intended may have difficulty completing it by themselves. In these situations, it is acceptable to assist with administration if the interviewer takes care to avoid leading the patient toward specific responses.[34] Administration time for the self-report format is approximately 15 to 20 minutes. A single-use form of the Self-Management of Heart Failure instrument asks patients to think about whether they have recently experienced particular symptoms of heart failure. A parallel follow-up form is available from the authors that allows for the evaluation of change

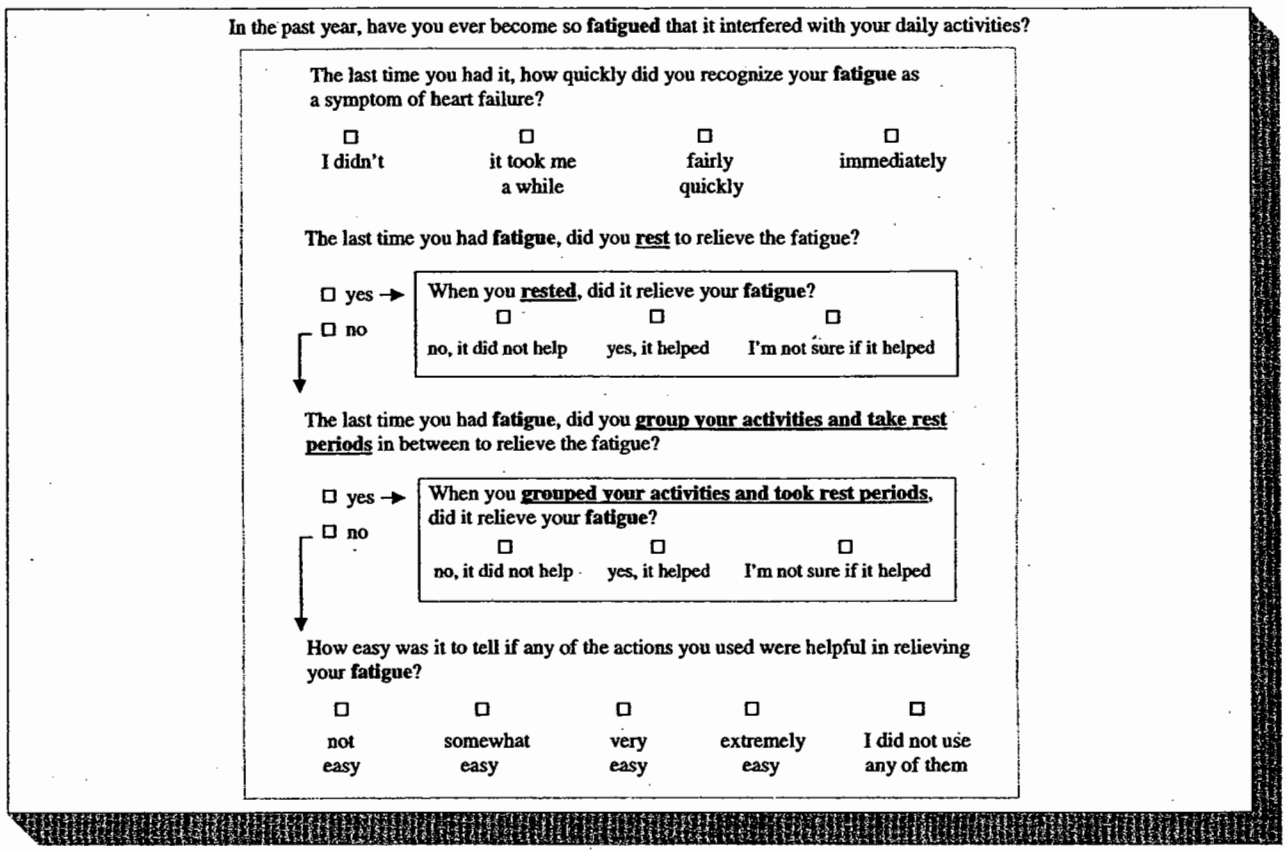

Fig 1 Example of the skip pattern and formatting used to assess each of the 6 symptoms.

over time. The only difference in the follow-up version is that patients are asked about only the past month to avoid carryover effects if they remember how they responded to the baseline measure.

In addition to the 6 subscale scores computed for the Self Management of Heart Failure instrument, the number of symptoms experienced is noted. If a symptom has not been experienced, all the questions related to it in the recognizing, implementing, evaluating, and ease of evaluating subscales are skipped. Two of 6 symptoms must have been experienced for these subscales to be calculated, otherwise scores may be deflated artificially. If scores are deflated, improvement in self-management abilities may not be detected. No summary Self-Management of Heart Failure instrument score is computed because of the skip patterns in the instrument design.[32]

A computerized scoring algorithm yielded subscale scores for the Self-Management of Heart Failure instrument. In that program, all subscale scores are standardized as percentages so that they make intuitive sense to the user (Table II). The self-efficacy score remains separate from the scores of the other subscales and thereby minimizes the potential for conceptual blurring of the self-management model.

Internal consistency

A sample of 127 English-speaking persons with heart failure was recruited to test the Self-Management of Heart Failure tool as part of their participation in an ongoing disease management program for patients with heart failure. The mean age of these patients was 70.9 ± 13.5 years; 46.5% were women. Functional class of the sample, as measured by the Specific Activity Scale, was distributed as follows: 27.6% were class I, 22.4% class II, 38.8% class III, and 11.2% class IV.

Internal consistency reliability was tested for each individual subscale. Cronbach's alpha statistic was used for those responses that were measured at an interval level and the Kuder-Richardson 20 (KR-20) was used for dichotomous items. An internal consistency of 0.70 was identified as the goal for the reliability coefficients. Characteristics of individual items, each subscale, and the relationship

Table II
Scoring the Self-Management of Heart Failure instrument

Subscale	Characteristics	Calculation
Recognizing a change	6 items (1/symptom), 4-point Likert-type response format	Subscale total is divided by the number of symptoms experienced (6 potential) and multiplied by response metric (ie, 4).*
Evaluating the change	15 items (in a separate subscale), 4-point Likert-type response format	Subscale scores are computed by adding all the scores and dividing by 60, the total number of points possible; blanks are computed as missing data.
Implementing a treatment	18 items (2-4/symptom), dichotomous response format	For every symptom experienced, a score of 1 is given for each action and 0 if not tried. Subscale score is divided by the number of actions available.*
Evaluating a treatment	18 items (2-4/symptom, corresponding to each item in the prior subscale), dichotomous response format	Number of actions able to be evaluated (ie, marked "yes" or "no") is divided by the total number of actions taken.*
Ease of evaluation	6 items (1/symptom), 4-point Likert-type response format	Subscale total is divided by the number of actions evaluated and multiplied by response metric (ie, 4).*
Self-efficacy	4 items (1 for each of the first 4 subscales), 4-point Likert-type response format	Computed only if all 4 items are answered. Divided by the total possible points (ie, 16).

*Scores are computed only if 2 of 6 symptoms have been experienced at that testing interval.

between individual items and the subscale were examined. Interitem correlations were evaluated to assure that items were related. Item total correlations were assessed to determine if the elimination of particular items would significantly improve overall subscale reliability. Then, intercorrelations among subscales were evaluated (Table III).

Subscale alpha and KR-20 coefficients are reported in Table IV. The default option for reliability analyses, listwise deletion, resulted in a substantially reduced sample size for many of these analyses. Data were missing because the items were designed around specific symptoms (ie, skip pattern). Only 20 subjects implemented treatments for all 6 symptoms. If a symptom was not experienced, the item was not answered and data were "missing."

Isolated issues were encountered when analyzing the homogeneity of 2 particular subscales. There were 17 possible actions to choose from in the implementing treatment subscale, but one item had no variability ("did you rest?" under the fatigue symptom) (Table V). That is, because all the subjects chose "yes," this item was not included in the reliability analyses. The sample size for this subscale analysis varied between 49 and 117 patients because people implemented different treatments when they experienced symptoms. In the evaluating the treatment subscale, a single KR-20 coefficient could not be calculated because of insufficient sample size. No score could be calculated for evaluating the treatment for difficulty breathing during sleeping because few patients experienced that symptom. No items, if deleted, would improve the reliability of any subscale.

DISCUSSION

A clinical measure of self-management in heart failure is greatly needed for clinicians to quantify the self-management abilities of these patients. To be adequate, such an instrument must be conceptually sound, reliable, and valid. Content validity of the Self-Management of Heart Failure instrument

Table III
Correlations among the Self-Management of Heart Failure subscales

	Recognizing a change	Evaluating the change	Implementing treatment	Evaluating treatment	Ease of evaluation	Self-efficacy
Recognizing a change	—	n = 91	n = 91	n = 89	n = 89	n = 89
		$r = 0.24$	$r = 0.25$	$r = 0.009$	$r = 0.45$	$r = 0.33$
		$P = .02$	$P = .02$	P = NS	$P = .000$	$P = .001$
Evaluating the change	—	—	n = 115	n = 113	n = 89	n = 125
			$r = 0.04$	$r = 0.09$	$r = 0.26$	$r = 0.16$
			P = NS	P = NS	$P = .01$	$P = .07$
Implementing treatment	—	—	—	n = 113	n = 89	n = 113
				$r = 0.05$	$r = 0.125$	$r = 0.16$
				P = NS	P = NS	$P = .09$
Evaluating treatment	—	—	—	—	n = 89	n = 111
					$r = 0.31$	$r = 0.199$
					$P = .003$	$P = .04$
Ease of evaluation	—	—	—	—	—	n = 87
						$r = 0.54$
						$P = .04$
Self-efficacy	—	—	—	—	—	—

Table IV
Internal consistency reliability for the Self-Management of Heart Failure instrument

Subscale	Sample size available for testing (subjects)	Alpha or KR-20 coefficient
Recognizing a change	17	.86
Evaluating the change	87	.92
Implementing a treatment	49-117	.83
Evaluating a treatment*	—	.83 (palpitations)
		.93 (ankle swelling)
		–.03 (shortness of breath)
		.57 (sudden weight increase)
		.65 (fatigue)
		— (difficulty breathing while sleeping)
Ease of evaluation	14	.79
Self-efficacy	125	.81

*No subscale coefficient could be calculated because of insufficient sample size due to skip-pattern format.

Table V
Mean interitem correlations for the implementing and evaluating treatment subscales

Signs/symptoms	Implementing treatment subscale	Evaluating treatment subscale
Shortness of breath	.11	−.005
Sudden increase in weight	.34	.39
Fatigue	*	.51
Difficulty breathing while sleeping	.17	†
Swelling of ankles	.20	.78
Palpitations or rapid/irregular heart beat	.67	.71

*Correlation unable to be calculated because of lack of response variability.
†Correlation unable to be calculated because of insufficient sample size.

was achieved through an intensive study of existing literature and repeated discussions among 4 nurse heart failure experts. This process resulted in a 4-stage process that is measured by this instrument. Face validity of the stages was assessed through patient interview. Reliability was tested in a sample of 127 patients with heart failure. We believe that this instrument is adequate for clinical use at this point. Additional research is needed before the Self-Management of Heart Failure instrument can be advocated for research purposes.

Preliminary reliability analyses suggest that internal consistency is adequate for most subscales even with the amount of error inherent in the small sample sizes available for testing. Reliability is typically calculated with larger sample sizes because a small sample size–to–item ratio increases the chance of sampling error. For example, the 6-item recognizing a change subscale was tested with only 17 subjects, yielding a ratio of 2.83 (17/6 = 2.83).[35,36] Even though sample size issues are critical to inferential statistics, there are no strict conventions for the item-to-subject ratio when estimating reliability. Large sample sizes are sought because they may attenuate measurement error. The prevailing concern in any psychometric study, however, is the homogeneity or unidimensionality of the items, the number of items, and extent of item intercorrelations.[37] Even with the amount of sampling error sure to be in these small samples, most alpha coefficients were of an acceptable level (ie, above 0.70). At this point, testing with larger samples is needed.

The skip-pattern format in this instrument was an excellent method of reflecting the decision-making process of patients, although it made psychometric analysis challenging. The signs and symptoms of heart failure are extremely difficult for patients to recognize. The constellation of symptoms is broad, and patients may not experience the same symptom consistently enough to observe it, relate it to precipitating behaviors (eg, excess sodium intake), trial relief strategies, and evaluate those attempts. For this reason, patients with heart failure may not learn well from their symptom experiences. The skip-pattern format was ideal because it allowed patients to focus on various symptoms and various stages of the self-management process. Without the skip-pattern format, patients probably would have skipped items on their own.

The testing conducted suggested some conceptual issues that were not revealed in the content validity process. The assumption that patients evaluate the effectiveness of the self-management measures they implement appears to be in question. Three of the 5 subscale correlations involving the evaluating treatment subscale were low and nonsignificant. So few patients evaluated the treatments they implemented that no total subscale reliability coefficient could be calculated. Qualitative research aimed at understanding how patients view the evaluation process would help to refine this particular subscale.

When the specific signs and symptoms within the subscale were examined, the responses to the shortness of breath questions were particularly problematic. The treatment choices offered for this symptom were to slow down, rest, and increase diuretic dose. For some reason, patients do not appear to see the link between these treatments and their experience of shortness of breath. Additional work is needed to understand this symptom

and the treatments that patients with heart failure perceive to be most effective.

After these conceptual issues are resolved, higher levels of validity testing are needed. An important area of research would be validation that inadequate self-management, in fact, predicts heart failure deterioration or health care resource use. Existing measures of self-care (eg, reference 25) could be used in criterion-related validity testing. For construct validity testing, self-management could be conceptualized as a specialized form of cognitive decision making[38] that occurs in response to heart failure signs and symptoms.

Self-management is a timely and important construct for clinicians to address in practice. Changes in the organization and provision of health care services in the United States have resulted in a system in which patients are required to assume much of their own care. Yet the challenges of shifting care to patients have long been recognized. Patients fail to recognize problems, forget treatments, and delay decision making in the best of situations. To complicate matters, heart failure is notable for the subtlety of the early symptoms. Clinicians must find ways to assess the cognitive processes (ie, knowledge, skills, attitudes, and motivation) of patients with heart failure so they can focus their teaching and counseling efforts in the most productive manner. The Self-Management of Heart Failure instrument can be used by clinicians to identify where in the self-management process a particular patient with heart failure is having difficulty. The results of preliminary testing suggest that some individuals fail to recognize early changes, whereas others lack knowledge about the importance of particular heart failure symptoms. Some are hesitant to try potential solutions and others lack self-efficacy. Use of the Self-Management of Heart Failure tool in practice can direct the clinician toward the specific problem area for each patient. We encourage clinicians to use the Self-Management of Heart Failure instrument and share their insights with the authors.

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