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Psychometric properties of the Kansas City Cardiomyopathy Questionnaire (KCCQ)

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Abstract

Background—The Kansas City Cardiomyopathy Questionnaire (KCCQ) is a well-established instrument used to evaluate the health status of heart failure (HF) patients. There has been a lack of clarity about the best way to conceptualize the KCCQ. The purpose of this investigation of the KCCQ was to: (1) explore the factor structure with an exploratory factor analyses; (2) perform reliability and validity testing to determine the best factor solution for item groupings; and (3) determine the most meaningful components of health status captured by the KCCQ.

Methods and Results—A secondary analysis of data from 280 adults with stage-C HF enrolled from three US northeastern sites was conducted to test the KCCQ subscale structure. Criterion-related validity for the Self-efficacy subscale was tested with the Dutch Heart Failure Knowledge Scale and the Self-care of Heart Failure Index Self-care Confidence Scale. Overall, internal consistency reliability (Cronbach's alpha) for the KCCQ and subscales was 0.92, social interference (seven items, 0.90), physical limitation (four items, 0.84), symptoms (eight items, 0.86), independent care (two items, 0.80), and self-efficacy (two items, 0.63). Two items failed to correspond to a previously identified factor so the independent care subscale was added. Items intending to measure quality of life were loaded in the social interference subscale.

Conclusions—We recommend eliminating the quality of life subscale and including those items in the social interference subscale, and eliminating the self-efficacy items and re-evaluating the items related to independent care.

Keywords

Factor analysis; health-related quality of life; health status; heart failure; psychometric testing; self-efficacy

Introduction

Heart failure (HF) is a common clinical syndrome characterized by progressive symptoms of fatigue, dyspnoea, oedema, cognitive impairment, decreased functional capacity, and difficulty performing activities of daily living.[1] In the USA, the incidence of HF after 65 years of age is about 10 per 1000 population,[2] affecting nearly 6 million people. HF can

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have a profound impact on all aspects of ‘progression, improve quality of life, relieve symptoms, and minimize negative consequences on physical and psychosocial well-being’.[3,4]

It is critically important to assess patient-reported outcomes such as health status to gauge response to therapies instead of relying solely on assessments by health providers. The measurement of health status can be challenging due to variations in conceptual definitions and issues unique to specific health problems.[5] The term health status has been used interchangeably with health-related quality of life (HRQoL), although others argue that they are distinct concepts.[6–8] Providing definitional clarification is critical. Overall, health status includes measures of symptoms, functional limitations, and quality of life.[9] Quality of life is closely related to health status, yet also distinct from it because it is influenced by a number of factors including but not limited to economic, political, spiritual, and cultural factors. HRQoL is a generic term typically used to encompass clinically relevant aspects of life including physical symptoms and effects of treatment, social wellbeing, and functionality in the sense of physical, emotional, cognitive, and sexual dimensions of life.[5,8]

A growing number of health status and HRQoL tools have been developed for populations with HF. Among these is the Kansas City Cardiomyopathy Questionnaire (KCCQ) a multidimensional scale, which has substantial clinical utility for measuring outcomes of HF over time. The original authors of the KCCQ use the terms health status and HRQoL interchangeably, and so these will also be applied in a similar context.[9–11] Validity, reliability, and responsiveness of the KCCQ are well established, and yet there is a lack of clarity around the best way to conceptualize the KCCQ in terms of what it measures and the value of the subscales. Tests of construct validity for the KCCQ have shown strong associations with NYHA class, the Short Form (SF)-36 physical and social functioning domains, and the 6-minute walk test.[10] Convergent validity exists for each of the five KCCQ subscales representing the intended conceptual domains.[10] Moreover, acceptable reliability (e.g. internal consistency reliability with Cronbach’s alphas) and validity have been demonstrated for the KCCQ in HF populations with anaemia, heart transplantation, and a prior myocardial infarction.[10–12] The KCCQ is versatile for culturally diverse patients. It has been translated into Swedish, Italian, German, Portuguese, Spanish, and Norwegian languages.[12,13,14–17] Cross-cultural testing using both forward and backward validation techniques has been done.[12–14]

Though the KCCQ has been widely used, there are existing gaps in the literature including the following: an exploratory factor analysis has not been published and the original study explaining the development and evaluation of the tool was published more than 10 years ago.[10] In this 10-year period, the clinical management and profile of HF patients has changed greatly. Therefore, in this study we re-examined the conceptual and item structure of the instrument as it was originally conceived using a diverse group of HF patients managed in the current era. The specific aims of this investigation were to: (1) explore the factor structure; (2) perform reliability and validity testing of the KCCQ; and (3) determine the most meaningful components of HRQoL captured by the KCCQ. This work has important implications for reconceptualizing KCCQ subscales and advancing its use in future studies of HF populations.

Methods

Design and study procedures

A secondary data analysis was performed on the cross-sectional baseline data prospectively collected from a sample of 280 noninstitutionalized adults with HF who were prospectively enrolled from three outpatient settings in Philadelphia, Pennsylvania and Newark, Delaware between 2007 and 2009. Data were collected within a prospective cohort study examining the effect of excessive daytime sleepiness on HF self-care.[18] Inclusion criteria specified enrolment of adults with chronic stage-C[19] HF based on echocardiographic and clinical evidence. Potential subjects had to be fully capable of participating in the study so they were screened for visual acuity, hearing sufficient to engage in dialogue, and English literacy satisfactory for accurate completion of questionnaires. Cohorts with mild cognitive impairment were included by study design. At baseline, all participants completed the KCCQ, the Dutch Heart Failure Knowledge Scale, and the Self-care of Heart Failure Index (SCHFI) because a secondary aim was to establish the longitudinal relationships among excessive daytime sleepiness, HF self-care, and HRQoL. Knowledge was assumed to be required for HF self-care. Patients were excluded if they resided in a long-term care setting, worked nights or rotating shifts, had renal failure requiring dialysis, or if they had an imminently terminal illness, plans to move out of the area, history of serious drug or alcohol abuse within the past year, or major depressive illness. Research assistants collected data during home visits and clinical information was abstracted from the medical record by registered nurses. New York Heart Association (NYHA) functional class was obtained from a standardized interview,[20] and then scored by a single board-certified cardiologist. Following enrolment and baseline evaluations, patients were followed up at 3 and 6 months. The complete study methodologies and procedures are reported elsewhere.[18]

Sample size calculation

Using an estimation of 10 observations per item as the minimum number for factor analysis techniques,[21] at least 230 subjects were needed to establish construct validity of the KCCQ. Our sample of 280 subjects at baseline satisfied the requirement for an adequate sample size to evaluate the factor structure of the KCCQ.

Outcome measures

The KCCQ is a 23-item (15 question) self-administered questionnaire designed to quantify physical limitations, symptoms (frequency, severity and recent change over time), social limitations, self-efficacy, and quality of life.[10] All items are measured on a Likert scale with 5–7 response options. There are five individual subscales, and all, except the Self-efficacy subscale, are aggregated into clinical and overall summary scores. Scores for each subscale are standardized to range from 0 to 100 with higher scores indicating better health status, fewer symptoms, and greater disease-specific HRQoL.[11]

The SCHFI version 6.2 is a 22-item, self-reported, HF-specific tool designed to quantify self-care maintenance, self-care management, and self-care confidence.[22] Only the Self-care Confidence Scale was used in this analysis. In this sample, the internal consistency was 0.84

for self-care confidence, which is consistent with that reported by the instrument author (0.83).[22]

The Dutch Heart Failure Knowledge Scale is a 15-item multiple choice, self-administered questionnaire that measures HF knowledge in general, knowledge of HF treatment, and HF symptoms and recognition.[23] The scale has a maximum summary score of 15 (indicating optimal knowledge) and a minimum score of 0 (indicating no knowledge). The published reliability of the instrument has a Cronbach's alpha of 0.62.[23] According to Nunnally and Bernstein,[24] 0.7 is an acceptable score for overall reliability; however, lower thresholds are sometimes used in the literature. The content of the questionnaire underwent face validation by 10 HF nurses from the Dutch Society of Cardiovascular Nursing, two cardiologists and six patients. For construct validation, the authors used a known groups technique, comparing people who were newly diagnosed with HF and had received no education and patients who had already received comprehensive education. There was a statistically significant ($p<0.0001$) difference in mean Dutch Heart Failure Knowledge Scale scores between these two groups.[23]

Statistical analysis

Baseline sample characteristics are reported using frequencies, percentages for categorical variables, and means and standard deviations for continuous variables. The distribution of patient responses to the KCCQ was examined, including the frequency and means and standard deviations. Psychometric analyses used to evaluate the KCCQ were consistent with traditional psychometric methods described by Nunnally and Bernstein,[24] and included both measures of internal consistency reliability (Cronbach's alpha) and construct and criterion-related validity. Correlation statistics were used to examine relationships among variables, and Student's t-tests for independent groups to detect between group differences. All analytical procedures were performed using SPSS version 17.0 for Windows (SPSS, Chicago, IL, USA).

Psychometric testing

Criterion-related validity—Criterion-related validity of the KCCQ Self-efficacy subscale was assessed by examining bivariate correlations with both the SCHFI Self-care Confidence Scale and the Dutch Heart Failure Knowledge scale. The KCCQ Self-efficacy subscale was validated against the Dutch Heart Failure Knowledge Scale because the two KCCQ Self-efficacy subscale items ask pragmatic HF knowledge questions. Conceptually, self-care confidence is closely related with self-efficacy, which is why the Self-efficacy subscale was validated against the SCHFI Self-care Confidence Scale.

Construct validity—For construct validity, exploratory principal components factor analyses with orthogonal and oblique rotations established the basis for a covariance matrix to examine item groupings. Both varimax (orthogonal assuming independence of factors) and promax (oblique presupposing correlation among two or more factors) rotations were done to determine the best factor structure.[25] Criteria for examining the factor structure and assignment of items to factors included Eigen values >1, a scree plot to visualize in descending order of magnitude of Eigen values from the correlation matrix, and factor loading coefficients >0.40 for individual items from the principal component exploratory factor analysis. The best factor solution was determined by the intuitive relevance of the item within the subscale, retention of item groupings from the original KCCQ version, and Cronbach's alpha values for each factor structure with and without the item. The factor analysis was performed on data obtained at baseline.

Once the factor structure was identified, subscale scores were calculated and transformed to a scale of 0 to 100 (highest level of functioning) using standard procedures described by Green et al.[10] The item scores for a given subscale were summed, then the lowest possible score for the scale was subtracted from the scale sum (each item's lowest score was 1). The total value was divided by the range for the subscale and multiplied by 100. Cases that had missing data for any of the subscale items were not transformed into a score for that respective subscale.

Reliability—Internal consistency reliability for the instrument and subscales was measured by Cronbach's alpha values. Item analyses were performed considering item-to-item intercorrelations, item-to-subscale correlations, and internal consistency reliability (Cronbach's alpha) with item deletion. Cronbach's alpha values >0.70 were considered acceptable, above 0.80 good, and above 0.90 excellent.[24]

Consistent with Green and colleagues'[10] approach to establishing test–retest reliability for the stability of performance, paired t-tests were used to compare mean scores for each of the subscales using study data from baseline and 6 month data collection points. Mean differences in subscale scores between time points were also obtained. Intraclass correlation (ICC) was used as a measure of stability by Ortega et al.,[15] and so ICC coefficients were calculated for each subscale as an indicator of a subscale's measurement stability using baseline and 6 month data.

Results

Demographic and clinical characteristics

Data related to sample characteristics (*n*=280) are reported in Table 1. The mean age of respondents was 61.9±12.5 years and 64% were male. Thirty-seven per cent had an ischaemic HF aetiology, and 77% were diagnosed with NYHA class III or IV HF. The majority (81%) lived with a partner. Minority racial groups represented 37% of the sample, and 54% had at least some college education.

Exploratory factor analyses

Both principal component varimax and promax rotations were performed on all baseline data for the 23-item KCCQ. Presupposing correlations among two or more factors with the promax rotation factor structure (oblique rotation) yielded higher factor loadings and a more interpretable factor structure. This factor structure was more similar to the original KCCQ item groupings when compared to the varimax rotation method, which assumed independence of factors. The principal component promax factor analysis confirmed a five-factor solution with Eigen values >1, which explained 67.2% of the variance in the measure. Factor loading coefficients were examined to determine the placement of items on factors, and coefficients >0.4 were considered acceptable to retain in an item grouping. High factor loadings >0.7 existed for all but five items, which loaded on their respective factors with lower coefficients (Table 2).

The factor structure from this analysis includes five subscales, consistent with the original factor structure. However, compared to the original publication, five items loaded differently across three subscales. No items loaded on the Quality of Life subscale. Instead, the items intended to measure quality of life in the original questionnaire (items 17–19) loaded on Social Interference with loading coefficients >0.76. In the interpretation of the factor analysis, the Quality of Life subscale was eliminated because no items loaded on a single factor representative of this overall domain. The two items for Quality of Life in the original version demonstrated higher factor loadings on the Social Interference subscale, and when evaluating their relevance to this domain it was intuitively a good fit. The two Self-efficacy items (15 and 16) loaded with high factor coefficients >0.84 in the Self-efficacy subscale, yet the items themselves were not consistent with the concept of self-efficacy. Conceptual clarity around self-efficacy is addressed later in the discussion. Two items (1 and 2) intended to measure physical limitations had high factor loadings (>0.83) on a separate, previously undefined, subscale. These items pertained to dressing and bathing, and the new subscale was named Independent Care.

Table 2 indicates the discrepancies between the original version where items were classified by author consensus and the results of our exploratory factor analysis. To reconcile differences from the original version to the new factor structure, changes to the KCCQ included: (1) a new subscale for Independent Care (items 1 and 2); (2) elimination of the Quality of Life subscale; and (3) integration of the two previous items in this subscale into the Social Interference subscale.

To explore relationships among the newly formed subscales, an intercorrelation matrix of the KCCQ was completed. The subscale Social Interference (items 17–23) was highly correlated with Physical Limitations (items 3–6) (r=0.683, p<0.001) and Symptoms (items 7–14) (r=0.742, p<0.001). A moderate correlation existed (r=0.417, p<0.001) between Independent Care (items 1–2) and Physical Limitations (items 3–6). This was an expected finding because the Independent Care items were originally designed to fit in the Physical Limitations subscale. Correlation coefficients less than 0.415 were found between Independent Care and all the other subscales. The Self-efficacy subscale (items 15 and 16) had very low correlations (r<0.23) with all other subscales, revealing the independent nature of these two items.

Reliability and item analysis

Overall internal consistency reliability (Cronbach's alpha) for all items in the KCCQ was 0.92 for the baseline data and 0.928 for data obtained at 6 months. Table 3 shows the item-to-total correlations and changes in overall Cronbach's alpha with each item deleted from the questionnaire. The weakest correlations were noted for the two Self-efficacy items (15 and 16; r=0.184 and 0.189, respectively. If they were deleted, the overall Cronbach's alpha would increase to 0.93. Cronbach's alpha values for each of the new subscale configurations were ≥0.80 for all subscales at both baseline and 6 months with the exception of Self-efficacy (Table 3). Self-efficacy was 0.626 and 0.608, respectively, for the two time points. Again, Nunnally and Bernstein[24] has established 0.7 as an acceptable level for overall reliability; however, lower thresholds are accepted, especially for subscales with fewer items.

The results for test–retest reliability, including mean subscale scores, paired *t*-test p-values, and ICC using the one-way method and average measures coefficient are reported in Table 4. There was a statistically significant difference between the baseline and 6-month mean subscale scores for only Social Interference (p=0.005) meaning that there was significant improvement, albeit small (a mean difference of 4.23 points, 0–100) over the 6 months in this relatively stable cohort of patients. ICC coefficients for the Social Interference, Physical Limitations, and Symptoms subscales all demonstrated high test–retest reliability (≥0.81), and Self-efficacy was 0.66, indicating moderate test–retest reliability. The ICC coefficient for Independent Care, however, was lower at 0.47 and this may be indicative that perceptions of the ability to perform self-care behaviours may not be as stable in patients with NYHA functional class III and IV or even as relevant to their overall health status.

Additional tests for validity

Concurrent validity for the Self-efficacy subscale was assessed by examining the strength of the relationship between the KCCQ Self-efficacy subscale and SCHFI Self-care Confidence Scale. Using Cohen's guide for social phenomena to classify the effect size,[26] a moderate correlation was found (r=0.40, p<0.001) between the KCCQ Self-efficacy subscale and the SCHFI Self-care Confidence Scale. Further analyses sought to establish a relation between a self-efficacy and knowledge because the self-efficacy questions relate to knowledge of HF. The correlation between the KCCQ Self-efficacy subscale and the Dutch Heart Failure Knowledge score was weak, and not statistically significant (r=0.115, p=0.06).

Discussion

This analysis provides concrete suggestions for how the KCCQ can be improved to meet the needs and profile of current HF patients. Our investigation verifies the reliability and supports a related but different factor structure for the KCCQ. While the KCCQ is a reliable and valid outcomes measurement tool for assessing HRQoL or health status in HF patients, our analysis raises questions about the component factors and questions the general usefulness of the Self-efficacy and Quality of Life subscales.

In terms of internal consistency reliability, the analyses for both the overall questionnaire and the subscales, yielded acceptable Cronbach's alphas. Table 4 shows that there was minimal change in the mean subscale values from baseline to 6 months, demonstrating test–retest reliability. This was expected because the population consisted of stable stage-C HF patients maintained on medical therapy with no intervention implemented as part of the study. ICC coefficients based on baseline and 6 month data were also acceptable in demonstrating test–retest reliability, except for the new Independent Care subscale. In fact, coefficients for the Social Interference, Physical Limitations, and Symptoms subscales, all above (space) 0.8.80, were similar to those reported by Ortega et al.[15] who studied a population (n=186) with a significant portion of the sample classified as NYHA functional class I and II. The relative importance of the Independent Care items will need to be further evaluated in subsequent studies.

The results of this study are consistent with seven published studies since 2000 that conducted KCCQ psychometric analyses with different patient populations from the following countries: USA, Portugal, Germany, Italy, Spain, Sweden, and Norway.[10,13–16] All of these investigations reported Cronbach's alpha scores greater than 0.70 for Physical Limitations, Symptoms, and Social Interference. The lowest Cronbach's alpha scores across all studies were for the Self-efficacy subscale, which ranged from 0.46–0.67.

Since the original publication by Green et al.,[10] there has been growing consensus that the KCCQ subscales fit best in four rather than five subscales. In a publication of a psychometric analysis of anaemic and non-anaemic HF patients, Spertus et al.[11] reported that the KCCQ has four subscales including: (1) Physical Limitations; (2) Symptoms (frequency, severity, and change over time); (3) Quality of Life/perception of social interference due to heart failure; and (4) Self-efficacy. Consistent with this finding, Ortega et al.[15] found that the Quality of Life items loaded on Social Interference rather than a separate Quality of Life subscale. Our results suggest that the items intended to measure quality of life be reclassified under the Social Interference subscale. As such, we also recommend eliminating the Quality of Life subscale because the items are a poor measure of global quality of life, and the subscale is redundant in a HRQoL tool.

Limitations

A limitation of this exploratory factor analysis is that the results could be due to differences between the original sample population and the one reported here. However, our sample demographics were similar to the population in the original validation study of the KCCQ by Green et al.[10] in terms of mean age, 61.9 years and 64.3 years and male gender, 64% and 70%, in this and the previous study, respectively. The mean per cent ejection fraction (EF) for our sample was higher than the previous study sample (23.5% compared to 35.4%). We attribute this difference to our inclusion of systolic, diastolic, and mixed HF patients. Other than specifying that patients had a diagnosis of HF and EF <40%, Green et al. did not further specify the aetiology of HF in either the stable reliability cohort or less stable responsiveness cohort.[10] With similar sample demographics, the results from this study cannot solely be explained by differences in the sample populations.

Another limitation with this factor analysis was that it was performed on a single sample of cross-sectional data. Before consideration for revision of this questionnaire, these results should be confirmed in other patient populations, including testing the tool in a more progressively debilitated or unstable cohort to observe for uniformity in the strength of factor loadings across the new factor structure.

Conclusions

Based on the psychometric evaluation results, we recommend that items 1 and 2 related to limitations from shortness of breath and fatigue while dressing, showering, and bathing receive further consideration and potentially be considered for deletion. These items may not have loaded with the other physical limitations because they are relatively uncommon for people with HF.

We found only a moderate relationship between the KCCQ Self-efficacy subscale and the SCHFI Self-care Confidence Scale. A strong correlation was not anticipated considering that the KCCQ Self-efficacy subscale measures a respondent's knowledge of disease,[13] rather than the operational understanding of self-efficacy, which is an individual's level of confidence in his/her ability to successfully attain specific goals despite known barriers.[27] The magnitude of this correlation might be explained by the likelihood that these two concepts, while distinct, co-vary in the context of experiences with HF. There was a weak correlation between the KCCQ Self-efficacy subscale and the Dutch Heart Failure Knowledge score. This finding was not expected because both the Dutch Knowledge score and KCCQ self-efficacy items (15 and 16) address aspects of symptom recognition. Though both instruments address symptom recognition, the KCCQ self-efficacy items relate more to responding to symptom changes, whereas the Dutch Knowledge score integrates a holistic understanding of general and specific HF knowledge about treatment, symptoms, and symptom recognition.[23]

The measurement of self-efficacy is important because it is a good predictor of functional capacity in terms of behaviour, persistence, thoughts, and emotional reactions.[28–30] Self-efficacy is influenced by both internal and external environmental factors and is based on four sources of information: performance accomplishments, vicarious experience, verbal persuasion, and physiological information.[31] It is also essential to measure self-efficacy across multiple circumstances and disease trajectories to capture the full scope of a person's ability to persist despite setbacks and to self-evaluate their capacity to achieve a goal.[30,32,33]

The original concept for the Self-efficacy subscale was based on the hypothesis that patients with HF exacerbations are less knowledgeable about disease management than stable outpatients,[10] and thus at risk for poorer outcomes. While there is agreement that measuring patients' knowledge about how to manage their disease is of value, the items in the KCCQ Self-efficacy subscale are not consistent with the theoretical concept of self-efficacy and therefore are not representative of the concept. Further, we propose a revision to the questionnaire's factor structure that is based on an exploratory factor analysis from a sample of NYHA class III and IV HF patients with relatively stable disease receiving medical management. It will be important for replication studies to confirm this factor structure in other HF populations and intervention-based research.

Few instruments are available to accurately measure self-efficacy in HF patients. While the KCCQ is purported to capture the domain of self-efficacy, this assumption remains questionable. Researchers interested in aspects of self-efficacy as a means to profile this concept in HF patients or as a determinant of therapeutic interventions should strongly consider a more robust measure representing the complexity of conceptual features of self-efficacy. The KCCQ could be improved by deleting the Self-efficacy subscale, renaming the subscale to be more consistent with the nature of the items or redesigning self-efficacy items in ways that are aligned with more current conceptualization of the domain. Any one of these options would not substantially alter the instrument as the Self-efficacy subscale is not factored into either the functional or clinical summary score. The functional score combines the Physical Limitation and Symptom subscales and the clinical score combines the functional status summary score with the Quality of Life and Social Limitation subscales.[10] Because prior research using the KCCQ relies on the numerous composite subscale and summary scores, it would still be possible to derive meaningful comparisons across studies even if the Self-efficacy subscale was modified or eliminated.

Nonetheless, the KCCQ is one of the most comprehensive, useful, and valid disease-specific HRQoL instrument for measuring the health status of patients with HF. Across all items, there is congruence with various aspects of HRQoL in HF patients. Specifically the dimensions of social interference, physical limitations, and disease symptoms characterize perceptions and experiences unique to stable and progressive presentations of HF. There is no dispute regarding its value and accuracy in gaining a broader understanding of HF-specific health status. As with all patient-reported outcomes, it is necessary to subject instruments to ongoing psychometric testing in ways that will uncover opportunities to improve their reliability, validity, responsiveness, and utility. In moving forward, the authors plan to collaborate with the developers of the KCCQ to establish the basis for further confirming a new factor structure that better accommodates items representing conceptual domains. With now more than 10 years since the original publication of the KCCQ, perhaps it is the time to reconceptualize certain aspects of the instrument and publish an updated version.

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Table 1

Demographic, clinical, and treatment characteristics of the sample of adults with heart failure participating in the psychometric evaluation of the Kansas City Cardiomyopathy Questionnaire

Variables	**Total (*n*)**	**Sample**
Age (years)	280	61.9±12.5
Ejection fraction	279	35.4±17.0
Gender		
Male	180	64
Female	100	36
Marital status		
Married or living with a partner	226	81
Single	54	19
Race		
Black	96	34
White	175	63
Other	9	3
Education		
< High school	27	10
High school	102	36
At least some college	151	54
Income		
More than needed	98	35
Enough to meet needs	137	49
Less than needed	45	16
Heart failure type		
Systolic	194	69
Diastolic	53	19
Mixed	32	11
Unspecified	1	0
Heart failure aetiology[a]		
Ischaemic	102	37
Nonischaemic	177	63
NYHA functional class		
I	12	4
II	54	19
III	164	59
IV	50	18

Values are mean±SD or %.

[a] Indicates missing data.

NYHA, New York Heart Association.

Table 2

Principal component factor analysis with promax rotation, Kansas City Cardiomyopathy Questionnaire

KCCQ 23 items	**Factor components**				
	Social Interference	**Physical Limitations**	**Symptoms**	**Independent**	**Care Self-efficacy**
Total variance (explained=67.16%)	40.36%	8.70%	6.93%	5.80%	5.37%
Cronbach's alpha at baseline (*n*=280)	0.904	0.842	0.856	0.80	0.626
Cronbach's alpha at 6 months (*n*=243)	0.874	0.856	0.852	0.885	0.608
1. Dressing yourself	0.352	0.382^{a}	0.283	0.832	0.043
2. Showering/bathing	0.261	0.318^{a}	0.155	0.893	−0.021
3. Walking 1 block on level ground	0.450	**0.784**^{a}	0.445	0.204	0.037
4. Doing yard work, housework or carrying groceries	0.570	**0.812**^{a}	0.269	0.267	0.062
5. Climbing a flight of stairs without stopping	0.555	**0.837**^{a}	0.379	0.295	0.137
6. Hurrying or jogging (as if to catch a bus)	0.478	**0.763**^{a}	0.164	0.268	0.146
7. My symptoms have changed over 2 weeks	0.411	0.511	**0.369**^{a}	−0.079	0.281
8. How many times did you have swelling in your feet, ankles or legs when you woke up in the morning	0.214	0.275	**0.863**^{a}	0.137	0.069
9. How much has swelling in your feet, ankles or legs bothered you?	0.321	0.410	**0.913**^{a}	0.121	0.056
10. How many times has fatigue limited your ability to do what you want?	0.778	0.588	**0.407**^{a}	0.015	0.121
11. How much has your fatigue bothered you?	0.754	0.607	**0.427**^{a}	−0.020	0.154
12. How many times has SOB limited your ability to do what you wanted?	0.694	0.808	**0.528**^{a}	0.112	0.142
13. How much has your SOB bothered you?	0.619	0.778	**0.557**^{a}	0.061	0.210
14. How many times have you been forced to sleep sitting up in a chair with at least 3 pillows because of SOB?	0.368	0.463	**0.668**^{a}	0.094	−0.009
15. How sure are you that you know what to do, or whom to call, if your HF gets worse?	0.193	0.143	0.012	0.021	**0.840**^{a}
16. How well do you understand what things you are able to do to keep your HF from getting worse?	0.182	0.130	0.110	−0.055	**0.860**^{a}
17. How much has your HF limited your enjoyment of life?	0.834	0.605	0.342	0.173^{a}	0.234
18. If you had to spend the rest of your life with HF as it is now, how would you feel about this?	0.769	0.483	0.335	0.170^{a}	0.219
19. How often have you felt discouraged because of your HF?	0.770	0.424	0.243	0.050^{a}	0.223
20. How much does HF affect your … hobbies, recreational activities	**0.789**^{a}	0.559	0.145	0.303	0.148

KCCQ 23 items	**Factor components**				
	Social Interference	**Physical Limitations**	**Symptoms**	**Independent**	**Care Self-efficacy**
21. Working or doing household chores	**0.813**[a]	0.696	0.287	0.306	0.132
22. Visiting family or friends out your home	**0.821**[a]	0.587	0.330	0.290	0.138
23. Intimate relationships with loved ones	**0.721**[a]	0.402	0.138	0.256	0.094

This table includes new suggested subscale names. Independent care was added as a subscale and the Quality of Life subscale has been eliminated. Numbers in bold represent the best factor fit for this analysis; numbers in italic are those that differ between this analysis and those originally published.

[a] Original items that belong to each subscale.

HF, heart failure; SOB, shortness of breath.

Table 3

Subscale item-to-total correlations and Cronbach's alpha

	Subscale mean if item deleted	Scale variance if item deleted	Corrected item–total correlation	Cronbach's alpha if item deleted
Social Interference				
17. How much has your HF limited your enjoyment of life?	89.78	349.69	0.750	0.923
18. If you had to spend the rest of your life with HF as it is now, how would you feel about this?	90.30	348.61	0.649	0.924
19. How often have you felt discouraged because of your HF?	89.73	360.63	0.602	0.926
20. How much does HF affect your … hobbies, recreational activities	89.86	344.40	0.669	0.924
21. Working or doing household chores	90.03	341.82	0.775	0.922
22. Visiting family or friends out your home	89.34	347.91	0.734	0.923
23. Intimate relationships with loved ones	89.51	348.52	0.554	0.926
Physical Limitations				
3. Walking 1 block on level ground	89.55	349.90	0.616	0.925
4. Doing yard work, housework or carrying groceries	90.10	346.66	0.674	0.924
5. Climbing a flight of stairs without stopping	90.03	342.07	0.706	0.923
6. Hurrying or jogging (as if to catch a bus)	90.69	341.75	0.587	0.926
Symptoms				
7. My symptoms have changed over 2 weeks	89.73	359.46	0.459	0.928
8. How many times did you have swelling in your feet, ankles or legs when you woke up in the morning	89.24	368.83	0.349	0.929
9. How much has swelling in your feet, ankles or legs bothered you?	88.54	359.59	0.464	0.928
10. How many times has fatigue limited your ability to do what you want?	88.78	334.69	0.694	0.924
11. How much has your fatigue bothered you?	89.85	343.49	0.697	0.923
12. How many times has SOB limited your ability to do what you wanted?	88.48	326.87	0.780	0.922
13. How much has your SOB bothered you?	89.51	341.81	0.731	0.923
14. How many times have you been forced to sleep sitting up in a chair with at least 3 pillows because of SOB?	89.18	359.78	0.467	0.927
Independent Care				
1. Dressing yourself	88.89	369.57	0.433	0.928
2. Showering/bathing	88.83	373.26	0.338	0.929
Self-efficacy				
15. How sure are you that you know what to do, or whom to call, if your HF gets worse?	89.10	377.03	0.184	0.931
16. How well do you understand what things you are able to do to keep your HF from getting worse?	89.00	379.13	0.189	0.930

SOB, shortness of breath.

Table 4

KCCQ test–retest reliability using paired t-test and intraclass correlation (ICC) coefficient

	Means				**ICC**
	Baseline	**6 month**	**Difference (6 month–baseline)**	***p*-value**[a]	
Social Interference	65.25	69.48	4.23	0.005	0.82
Physical Limitations	60.54	61.84	1.30	0.427	0.85
Symptoms	68.69	70.57	1.87	0.066	0.81
Independent Care	92.31	92.70	0.39	0.783	0.47
Self-efficacy	88.43	90.29	1.86	0.056	0.66

[a] Two-tailed *p*-value is baseline vs. 6 months.