Psychometric Evaluation of the Chinese Version of the Minnesota Living with Heart Failure Questionnaire

Abstract

Background Health-related quality of life (HRQOL) has emerged as an important outcome in treating and managing patients with heart failure (HF). However, there is no existing instrument for use in Chinese populations.

Objectives To translate the Minnesota Living with Heart Failure Questionnaire (MLHFQ) into a Chinese version and to validate it in the clinical setting.

Methods This was a cross-sectional study. A convenience sample of 247 subjects with NYHA class II to III chronic HF were recruited from a cardiovascular outpatient department in Taiwan.

Results All translation processes followed Brislin's approach. The content validity index was 0.98. Construct validity was supported by exploratory factor analysis, which showed three factors with 20 of 21 items loadings above .50, explaining 71% of the variance. Total scale and subscale scores were highly correlated with reference instruments, indicating satisfactory concurrent and convergent validity. The mean scores of the Chinese version of the MLHFQ were significant higher than those from the non-HF comparison group. The instrument demonstrated a high internal consistency (Cronbach's alpha of .95 for the scale and .93 to .95 for the subscales).

Conclusions The psychometric properties indicate that the Chinese version of the MLHFQ is a valid and reliable instrument for future research. This instrument provides a holistic approach for measuring HRQOL with NYHA class II and III heart failure patients.

Background

Like many developed countries, heart disease is one of the leading causes of morbidity and mortality in Taiwan. Heart failure (HF) is the most common reason for hospital admission and one of leading causes of morbidity and mortality (AHA, 2005). Rapid economic growth in Taiwan is accompanied by changing lifestyles, and the mortality pattern has switched from predominantly infectious diseases to chronic diseases. Heart disease is now the third leading cause of death in Taiwan (Department of Health, Executive Yuan, Taiwan, R. O. C.). Almost 50.93 deaths per 100,000 population and 9.6% of total death were reported in 2003. Heart disease accounted for 3.98% more deaths or made a 0.35% contribution to the annual increase in the numbers of deaths from 2002 to 2003. It has been estimated that heart disease comprised nearly 7% of the total direct medical costs incurred in 2003 in Taiwan. With a large number of persons living with HF, a chronic and progressive disease, health care providers often must address issues related to quality of life.

Health-related quality of life (HRQOL) has emerged an important end point in treating and managing patients with heart failure. Despite the new and effective therapies being developed for these chronically ill patients, their HRQOL remains poor (Bennett, Oldridge, Eckert, Embree, Browning, & Hou, 2002; Bennett, Oldridge, Eckert, Embree, Browning, & Hou, 2003).

One of the widely and commonly used instruments for measuring HRQOL among

patients with HF is the Minnesota Living with Heart Failure Questionnaire (MLHFQ) developed by Rector, Kubo, and Cohn (1987, 1992). This disease-specific, self-administered measure was developed to systemically and comprehensively assess the patient's perceptions of the effects of heart failure as well as its treatment on his/her daily life. It has been proposed that MLHFQ is a valid indicator of the therapeutic benefit of medications for heart failure during randomized controlled clinical trials (Rector & Cohn, 1992; Rector, Kubo, & Cohn, 1987) and has been tested and validated in various study designs (Bennett, Perkins, Lane, Deer, Brater, & Murray, 2001; Heo, Moser, Riegel, Hall, & Christman, 2005a; Rector, Anand, & Cohn, 2006; Riegel, Carlson, Glaser, & Romero, 2003).

Subjects are asked to rate the extent to which their heart failure has prevented them from living as they wanted to during the last month using questions rated on a 6-point scale of 0 (*no impact*) to 5 (*very high impact*). This response format was chosen to be consistent with the concept of HRQOL and allows the individual to weigh each aspect using a common scale. Therefore, one can look at which items had the most effect and the sum of responses reflects the overall effects of heart failure and its treatments on the individual's HRQOL. The questionnaire is scored by summing the responses to all 21 items, thus resulting in a score from 0 to 105 with higher scores reflecting poorer quality of life. Based on a factor analysis performed by the original developer, two subscales have been identified (Rector & Cohn, 1992). The physical

subscale consists of eight items (Q2, Q3, Q4, Q5, Q6, Q7, Q12, and Q13); while the emotional subscale consists of five items (Q17, Q18, Q19, Q20, and Q21). The range of possible scores on the physical subscale is 0 to 40; and 0 to 25 for the emotional subscale. Although the rest of the items (n = 8) were not grouped into any subscales, they provided a more comprehensive assessment of patients' experience of HF (Rector, & Cohn, 1992).

Several studies demonstrated acceptable internal consistency in the overall scale (from .91 to .94) and its subscales (from .71 to .93) (Franzen, Blomqvist, & Saveman, 2006; Heo, et al., 2005a; Rector & Cohn, 1992). The MLHFQ has translated into more than 25 different languages. In those instances when tested by means of factor analysis (Heo, et al., 2005a; Franzen, et al., 2006; Rector & Cohn, 1992), structure equation model (Heo, et al., 2005b; Rector, Anand, & Cohn, 2006) and multitrait-multimethod analysis (Franzen, et al., 2006; Middle, et al, 2001). In studies of the various languages, the investigators have found differing results, such as identifying two to four factors when using factor analysis.

The MLHFQ has not been translated into Chinese. Thus, the purpose of this study was to (1) translate MLHFQ into a Chinese version; and (2) examine the psychometric properties of the Chinese version of MLHFQ.

Methodology

Translation and Equivalence Assessment of the Chinese version

Permission to translate the original MLHFQ into a Chinese version was obtained from the University of Minnesota which holds the copyright for the MLHFQ. All translation processes followed by Brislin's rules of translation for maintaining the equivalence (Brislin, 1970). The steps taken were as follows: (1) Forward and back translation: the MLHFQ was translated into Chinese by the first author and a qualified bilingual expert from the source language (SL, English) to the target language (TL, Traditional Chinese). (2) It was then back-translated by a second blind, qualified bilingual expert from the TL to the SL. (3) Comparisons and corrections of the original version and back-translation version by an expert who is the second author in this article; (4) Validation through a committee panel in which a group of bilinguals translates from the source to the target language. The mistakes of one member can be caught by others on the committee (Brislin, 1970). In addition to comparison between the SL and the TL versions, using a panel of expert works established semantic equivalency and content validity. This committee included one cardiologist, two cardiovascular nurses, one questionnaire expert, and one bilingual expert. To check readability of the Chinese version of the instrument, two sixth-grade students, a boy and a girl, where asked to read and explain individual items. The students encountered no difficulty.

Design and Samples

The design of this study was a cross-sectional survey. The potential subject was someone: (1) with a documented diagnosis of NYHA classification functional II to III heart failure with systolic dysfunction or preserved ejection fraction for longer than 3 months; (2) over 20 years of age; (3) literate in Chinese; and (4) with no reports of mental disorder. Subjects were excluded if they had (1) severe heart failure symptoms or hospitalization; (2) unstable angina; or (3) if they were using a ventilator. The Institutional Review Boards approved all aspects of these studies.

Measurements

Health-Related Quality of Life (HRQOL) HRQOL was measured by means of the Chinese version of the MLHFQ. It was formatted in size 12 font prints and was estimated to take 5-10 minutes to complete.

Generic Quality of Life The SF-36 is one of the best-known and most widely used questionnaires among experts for measuring generic QOL in the general population. The SF-36 questionnaire is a 36-item, self-administered scale, requires approximately 15 minutes to complete, and the questions are designed to be easy to understand and relevant to most people's lives. The SF-36 has two subscales which are physical and mental component scores (PCS and MCS). The composite scores range from 0 to 100 with higher scores meaning better health. The reliability, validity and standardization of SF-36 Taiwan version had already been established (Lu, Tseng, & Tsai, 2002; Tseng, Lu, & Gandek, 2003; Tseng, Lu, & Tsai, 2003).

Depressive Symptoms Depressive symptoms are defined by WHO as "a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low-worth, disturbed sleep or appetite, low energy, and poor concentration." In this study, depressive symptoms were measured by the Chinese version of Center for Epidemiologic Studies Depression Scales (CES-D). The CES-D is a self-report instrument consisting of 20 items of four statements rated on a 0 to 3 scale. Subjects choose one of four statements describing how they felt or behaved during the past week. The CES-D was validated in clinical sample (Williams, Kasl, Heiat, Abramson, Krumholz, & Vaccarino, 2002). A total score was obtained by summing the 20 items; higher scores indicated greater depressive symptoms. In this study, the Cronbach's alpha was .90.

Cardiac Performance Cardiac performance was measured by means of left ventricular ejection fraction (LVEF) and New York Heart Association (NYHA) functional classification in this study. LVEF was measured by 2-D echocardiography and images were acquired in standard views and ejection fraction was calculated using Simpsons's rule. All of the echocardiography studies were performed by the same qualified cardiologist to maintain consistency and reliability in reading and judging the results.

NYHA functional classification is a commonly used measure in practice and research for evaluating the influence of symptoms on the functioning of cardiac patients. It is divided into

four levels of functional ability, and patients were asked to classify themselves in one of the four levels ranging from I (*no limitation*) to IV (*symptoms at rest*). Each subject is classified into a NYHA class based on the subject's symptoms, observed functional capacities, and the information gathered from the medical records. It is recorded using the subject's verbal responses regarding daily activities.

Setting and Procedure

One teaching-hospital in the northern Taiwan was contacted and asked to have their heart failure patients participate in the study. Following approval by the human protection committee of the hospitals and academic institutions, the study was reviewed and approved by the appropriate institutional review board. Patients from the cardiovascular outpatient department who met the inclusion criteria were asked to participate. Subject's participation in this study was voluntary. The study involved no risk or discomfort. All subjects were given an informed consent to sign. Because of cultural concerns, if subjects did not wish to sign the informed consent, implied consent was assumed if they agreed to answer the questionnaires. To assure confidentiality, all answer sheets were locked and stored separately from consent forms.

Data Analysis

All quantitative data were analyzed by use of SPSS 13.0 (Chicago, IL). Exploratory factor analysis (EFA) is used to establish the construct. Because the standard error of a

correlation is a function of the sample size, larger samples will usually lead to clearer indications of the number of factors when the common factor model is appropriate and the number of factors is actually less than the number of variance. Gorsuch (1983) recommend a minimum subject to item ratio of at least 5:1 in EFA, but he also has stringent guidelines for when this ratio is acceptable. There is a widely-cited rule of thumb from Nunnally & Berstein (1994) that the subject to item ratio for exploratory factor analysis should be at least 10:1 to make the results generalizable. In this study, 21 variables were entered into analysis, so a minimum of 210 cases would be required. With a sample size of 247, there were enough subjects for the analysis.

Internal consistency reliability for each scale score was estimated using Cronbach's alpha coefficient. Because higher levels of reliability increase statistical power, a minimum reliability of .80 is the lowest acceptable value for a well-developed psychosocial instrument. For a newly developed psychosocial instrument, a reliability of .70 is considered acceptable (Nunnally & Berstein, 1994).

Results

The psychometric properties of the translated version are presented in terms of subject characteristics, reliability, validity, and the feasibility of the Chinese version of the MLHFQ.

Subject Characteristics

A total of 247 convenience sample of NYHA class II to III chronic HF patients was

recruited from a cardiovascular outpatient department in northern Taiwan. The subject characteristics are described in Table 1. Most subjects had a number of comorbidities, including diabetes, prior myocardial infarction, and liver disease. The rate of missing data and measures of central tendency of the Chinese version of the MLHFQ are shown in Table 2. The item descriptive statistics indicate that the Chinese version of the MLHFQ has a high rate of data completeness. The rates of missing values on the item level were consistently low, ranging from 0 (Q1, Q3, Q7, Q17, Q19, Q20, and Q21) to a high of 2.0% to 2.2% (Q16 and Q14 respectively). This extremely low missing rate is due to the fact that the missing data were treated by the design of the original questionnaires.

Validity

Content Validity Qualitative and quantitative methods were used to measure content validity. Qualitative validity was assessed from a panel of five professionals with content expertise in cardiovascular domain and research experience in instrument development. In response to experts' comments and recommendations, 15 minor semantic errors were reframed and corrected. Quantitative data to determine item validity was established by using the content validity index (CVI). These experts were asked to rate each item of the Chinese version of the MLHFQ based on relevance, clarity, and simplicity on a 4-point rating scale as 1 (*not relevant*), 2 (*somewhat relevant*), 3 (*relevant*), and 4 (*very relevant*). A CVI was computed by the proportion

of experts who are in agreement about item relevance provided a quantitative measure of content validity. The average CVI, or proportion agreement method, based on the experts' rating was 3.92/4 (.98) in the final version. According to Polit and Beck (2004), a CVI higher than .80 is considered indicative of good content validity.

Convergent Validity Convergent validity was tested using correlations between the Chinese version of the MLHFQ scale and subscales and other instruments or measures (Table 4) by using Pearson or Spearman rank correlation depending on the level of measurement. The relationships between the Chinese version of the MLHFQ and other measurements, including NYHA classification, LVEF, the SF-36 (PCS, MCS) and the CES-D, were strongly correlated, ranging from -.71 to .79.

Factor Analysis Construct validity was established by exploratory factor analysis (EFA) of the 21-item on the Chinese version of the MLHFQ. This was the same statistical approach used by the originator of the instrument (Rector & Cohn, 1992). EFA was done using principal axis factoring with direct oblique rotation (Gorsuch, 1983; Loehlin, 2004) (Table 5). The numbers of factors were determined by eigenvalues, scree plot, factor correlation matrix, well-defined loadings of over .40, and the explainable percentage of variance (Kaiser, 1974; Thompson, 2004). The Kaiser-Meyer-Olkin (KMO) measures the sampling adequacy, which should be greater than 0.5 for a satisfactory factor analysis to proceed (Kaiser, 1974). In the current study, the result of

KMO was .92 indicating great sampling adequacy. Bartlett's Test of Sphericity was statistically significant. Three factors were extracted because they had eigenvalues greater than 1 (Gorsuch, 1983). The first factor had an eigenvalue of 10.43, and the second and the third factors were 2.65 and 1.03. The pattern matrix is presented in Table 6. Twenty of the 21 items demonstrated moderate to strong loading (> .50), and only one item (Q15) was failed to load on any factor. Fourteen items had factor loadings > .70 and five items had factor loadings between .50 and .70. Only one item about walking around house difficult had a loading < .50. All nine items in the first factor were related to signs and symptoms of HF, thus this factor was named the physical subscale. The second factor including five items, as same as the original questionnaire, were psychological response to disease, therefore this factor was named the emotional subscale. All items in the third factor were related to the social or personal relationships, this factor was named as social subscale. After the deletion of one item (Q15, discussed below), the MLHFQ was constructed to represent three major dimensions of HRQOL – physical, emotional, and social which accounted for 71% of the total variance of the 20 items included in the analysis in the Chinese version of the MLHFQ scale scores.

Item-to-Subscale Correlation Inter-scale correlation analysis also revealed that the scale constructs for the translated Chinese version were generally distinct. Q1, Q2, Q3, Q6, Q11, Q12, Q13, Q14, and Q16 were highly correlated with Factor I (.77 to .90), but negligibly correlated

with Factors II and III (.32 to .62). Q17, Q18, Q19, Q20 and Q21 were highly correlated with Factor II (.86 to .92), but negligibly correlated with Factor I and III (.25 to .61). Q4, Q5, Q7, Q8, Q9, and Q10 were highly correlated with Factor III (.87 to .90), but negligibly correlated with Factor I and II (.44-.66)(Table 7). These results indicated the adequacy of their placement within the subscales.

Contrasted Group Assessment A contrasted group approach was done. A total of 106 volunteer subjects with no major diseases from a community population answered the translated MLHFQ Chinese version. It was hypothesized that compared with the group with non-HF, scores of the Chinese version of the MLHFQ for those with HF would be lower. There was no significant difference in age or gender between the HF and non-HF groups (p = .31 and .70, respectively). However, as hypothesized, scores for the HF subjects (m = 47, SD = 24) were significantly higher than those of the non-HF subjects (m = 5, SD = 5), $t(351) = -27.24$, $p < .001$. This finding suggests acceptable sensitivity of the Chinese version of MLHFQ in detecting health-related QOL in HF patients.

Reliability

Internal Consistency The Cronbach's alpha coefficients were calculated for each of the subscales and the total scales which are presented on the Table 3. The total scale and subscales of all three questionnaires demonstrated moderate to high internal consistency in this study. The

internal consistency for the Chinese version of the MLHFQ total scale (.95) and subscales (.94 to .95) was good, indicating that the items measure the characteristics relevant to the construct of HRQOL in each dimension. The Cronbach's alpha-if-item-deleted ranged from .94 to .95, indicating that no items were unreliable.

Item-to-total correlations

Except for Q15, correlation coefficients ranging from .55 to .80 were calculated for the corrected item-total correlations, which indicates adequate homogeneity of items. The correlation coefficient of one item, Q15, was .03 which indicated that it did not contribute this questionnaire.

Inter-item Correlations

According to the interitem correlation matrix, few of the items were above .80, indicating a lack of multicollinearity (Tabachnick & Fidell, 2007).

Feasibility of the Chinese Version of the MLHFQ

The average time required to complete the Chinese version of the MLHFQ was 5 minutes. The rate of missing data was extremely low, which reflects that the content of questionnaire is easily to respond to. In general, the subjects did not require assistance to complete the Chinese version of the MLHFQ in this study.

Discussion

The construct validity for the Chinese version of the MLHFQ was examined using factor analysis and item-to-subscale correlations. A sample size of 247 subjects is large enough to process factor analysis and three factors were loaded. Item-to-subscale correlation coefficients showed that all items were highly correlated to their loaded subscale, but they had low correlation to other subscales. This also verified the construct validity of the instrument.

The Chinese version of the MLHFQ shows good internal consistency as reflected by Cronbach's alpha. Cronbach's alphas for the total scale and each subscale far exceed the criteria of .70 for a newly developed instrument. The total scale exceeded the recommended .90 for applied research (Nunnally & Bernstein, 1994). However, few of the inter-item correlations were higher than .80 implying that there may be overlapping or redundant items. For example, Q2 (*rest during the day*) and Q1 (*swelling in ankles, legs*) were highly correlated (r = .84). In heart failure patients, ankle edema or swelling in legs are common reasons to limit their activities or decrease their exercise tolerance. Likewise, Q12 (*shortness of breath*) and Q13 (*tired, fatigue, or low on energy*) were highly correlated (r = .80). It is not unreasonable that difficulty in breathing was associated with heart failure patients being tired and exhausted.

<u>*Item Deletion*</u> Q15, *costing your money for medical care*, was .03 in item-total correlation and it did not load on any factors (see Table 6). According to Tabachnick and Fidell's (2007) recommendation, "as a rule of thumb, only variables with loading of .30 and above are

interpreted". However, with a cut of .30 for inclusion of a variable in interpretation of a factor, 20 of 21 items loaded on these 3 factors. One of the items in the solution, Q15 was complex with low factor loadings. During the data collection, the cost of the National Health Insurance in Taiwan was changing. Further, a single item is insufficient to measure such a complex issue. Therefore, Q15 was deleted. Items measuring medical cost warrant further evaluation.

Factor Loadings According to the results of factor analysis, three factor loadings were demonstrated in this study. The items that loaded on factor I were very similar to the items defined as those constituting the physical subscale of the MLHFQ by Rector and Cohn (1992). Q2, Q3, Q6, Q12, and Q13 were remained in physical subscale as before. Q4 (*working around house difficult*), Q5 (*away from home difficult*) and Q7 (*relating to or doing things with friends or family difficult*) were located to the third factor, social subscale. Q1 (*swelling in ankles, legs*), Q11 (*eating less foods*), Q14 (*hospitalization*) and Q16 (*side effects from medications*) were loaded to physical subscale.

The items that loaded in factor II were the same as those identified as constituting the emotional subscale by the originator (1992). Rector and Cohn (1992) suggested that the MLHFQ measures a physical and emotional dimension and that the rest of the items (8 items) are just for comprehensive assessments. Thus, the results of this study proposed the use of the Chinese version of the MLHFQ as its three dimensions--physical, emotional, and social--reflects the

impact of HRQOL in a broader and more holistic way.

In general, the findings of the current study provide evidence that the concepts embodied in the MLHFQ can be conveyed to the Taiwanese people and their application is feasible to be applied in Taiwan. Most determinations of the psychometric properties of the Chinese version of MLHFQ were satisfactory. Data quality was high. The percentage of missing data was 2.4% or less at an item level. These rates compare favorably with those reported in the original English version (Calvert, Freemantle, & Cleland, 2005) and other language versions (15% - 31%) (Franzen, et al, 2006).

From a methodological perspective, there were two major limitations challenging in this study. First, the generalizability of this study is limited to the subjects who are in northern Taiwan, literate in traditional Chinese, outpatients, experiencing systolic heart failure, and classified as NYHA class II to III. Therefore, these findings cannot be generalized to nor can they be viewed as representative of all chronic heart failure patients. More research is needed to explore the phenomenon in other HF patients who would be candidates for the Chinese version of the MLHFQ. Second, since this is a cross-sectional design, psychological status changes over time could not be assessed.

Conclusion

The factors that may lead to an impaired HRQOL in heart failure are physical symptoms,

psychological problems, adverse effects from treatments and social limitations. The Chinese version of the MLHFQ provides a holistic approach for measuring HRQOL. These findings also indicate that the Chinese version of the MLHFQ is a valid and reliable instrument for future research with NYHA class II to III heart failure patients. Nursing educators or clinicians in Taiwan can also use this instrument to assess HRQOL in patients with chronic HF.

Table 1

Demographic and Medical Characteristics of Subjects (n = 223)

Variables	Mean (*SD*)	*n* (%)
Gender		
Male		138 (56%)
Female		109 (44%)
Age (years)	68(12)	
Marital status		
Single		25 (10%)
Married		171 (69%)
Widowed/divorced/separated/others		51 (21%)
Education		
No formal education		21(13%)
Elementary school		47 (19%)
Junior high school		74 (30%)
High school		54 (22%)
College and above		40 (16%)
NYHA Classification		
II		139 (56%)
III		108 (44%)
Smoking History		
No		115 (47%)
Yes		132 (53%)
Etiology		
Ischemia		202 (82%)
Hypertensive		37 (15%)
Others		8 (3%)

Charlson Comorbidity Index	2.7 (1.3)	
Diabetes		111 (45%)
Prior myocardial infarction		94 (38%)
Liver disease		44 (18%)
Chronic pulmonary disease		47 (19%)
Stroke		35 (14%)
Body Mass Index (BMI)	27.2 (6.1)	
Left Ventricular Ejection Fraction (LVEF)	36 (10)	

Table 2

Central tendency and missing rate of scales in MLHFQ

Items	No. of Missing (%)	Mean (*SD*)
1. Swelling in your ankles, legs	0	2.5 (1.7)
2. Resting during days	3 (1.2%)	2.7 (1.7)
3. Walking or climbing stairs difficult	0	2.8 (1.6)
4. Working around house difficult	1 (.4%)	2.1 (1.6)
5. Being away from home difficult	3 (1.2%)	2.1 (1.6)
6. Sleeping difficult	1 (.4%)	2.6 (1.7)
7. Relating to or doing things with friends or family difficult	0	1.8 (1.5)
8. Working to earn a living difficult	1 (.4%)	1.8 (1.5)
9. Recreational activities difficult	1 (.4%)	1.9 (1.5)
10. Sexual activities difficult	2 (.8%)	1.9 (1.5)
11. Eating less foods I like	4 (1.6%)	2.5 (1.6)
12. Shortness of breath	1 (.4%)	2.9 (1.6)
13. Fatigue	2 (.8%)	2.8 (1.5)
14. Hospitalization	6 (2.4%)	2.5 (1.6)
15. Medical costs	3 (1.2%)	2.4 (1.8)
16. Side effects from medications	5 (2.0%)	2.1 (1.7)
17. Feeling burden to family or friends	0	1.9 (1.5)
18. Feeling like a loss of self-control	2 (.8%)	2.0 (1.67)
19. Being worried	0	2.2 (1.6)
20. Difficulty concentrating or remembering	0	2.0 (1.5)
21. Being depressed	0	2.1 (1.6)

Table 3

The Descriptive Statistics and Cronbach's alpha of Questionnaires

Questionnaires	Mean (*SD*)	Items	Potential range	Actual range	Cronbach's α
MLHFQ	47 (24)	21	0 - 105	01 - 90	.95
Physical	23 (12)	9	0 - 45	0-45	.95
Emotional	10 (7)	5	0 - 25	0-25	.94
Social	12 (8)	6	0 - 30	0-29	.93

Table 4

Correlations between the MLHFQ Total and Subtotal and the SF-36, CES-D

Scales	Reference measures	Results
MLHFQTotal		
Physical	SF-36 (PCS)	-.77***
	NYHA Fc Classification	.79***
	LVEF	-.75***
Mental	SF-36 (MCS)	-.71***
Social	CESD	.74***

Note. *$p < .05$, ** $p < .01$, *** $p < .001$

Table 5

Factor Correlation Matrix

	Factor 1 (physical)	Factor 2 (Emotional)	Factor 3 (Social)
Factor 1 (Physical)	1.000	.394	-.544
Factor 2 (Emotional)	.394	1.000	-.605
Factor 3 (Social)	-.544	-.605	1.000

Table 6

Exploratory Factor analysis (EFA) of Minnesota Living with Heart Failure Questionnaire before and after deletion of item

	Factors			
Items	Factor I	Factor II	Factor III	Communality
Eigenvalue	10.44	2.65	1.03	
1. Swelling in your ankles, legs	.85	.00	-.06	.782
2. Resting during days	.91	-.01	.04	.787
3. Walking or climbing stairs difficult	.75	.15	-.01	.683
4. Working around house difficult	.30	.23	-.47	.686
5. Being away from home difficult	.21	.20	-.55	.676
6. Sleeping difficult	.81	-.04	.08	.564
7. Relating to or doing things with friends or family difficult	.16	.20	-.58	.672
8. Working to earn a living difficult	-.01	.06	-.86	.802
9. Recreational activities difficult	-.03	.08	-.85	.789
10. Sexual activities difficult	.02	-.06	-.84	.659
11. Eating less foods I like	.57	-.04	-.36	.639
12. Shortness of breath	.79	.03	-.07	.711
13. Fatigue	.91	.06	.09	.799
14. Hospitalization	.73	.12	-.02	.634
15. Medical costs	---	---	---	---
16. Side effects from medications	.67	-.14	-.11	.470
17. Feeling burden to family or friends	-.03	.62	-.26	.621
18. Feeling like a loss of self-control	-.08	.82	-.14	.775

19. Being worried	-.01	.95	.06	.825
20. Difficulty concentrating or remembering	-.01	.79	-.12	.737
21. Being depressed	.18	.89	.11	.804
Cumulative % of variance		71 %		

Note. Extraction method: Principal Axis Factoring; Rotation Method: Direct Oblimin with Kaiser Normalization

Table 7

Item-total and Item-Scale correlations of Minnesota Living with Heart Failure Questionnaire

# of item	Item-total correlation	Item-subscale correlation		
		Physical	Mental	Social
Q1	.75	.89	.38	.59
Q2	.71	.89	.33	.54
Q3	.75	.85	.47	.62
Q4	.80	.62	.61	.87
Q5	.77	.57	.60	.88
Q6	.56	.80	.25	.44
Q7	.76	.56	.60	.87
Q8	.73	.47	.60	.89
Q9	.72	.49	.58	.90
Q10	.65	.46	.49	.82
Q11	.74	.80	.39	.66
Q12	.73	.90	.37	.53
Q13	.72	.90	.40	.53
Q14	.72	.82	.40	.55
Q15	.03	--	--	--
Q16	.54	.77	.28	.45
Q17	.63	.33	.86	.60
Q18	.63	.30	.91	.61
Q19	.62	.33	.92	.56
Q20	.65	.32	.91	.61
Q21	.69	.43	.90	.61

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