Utility of the Minnesota Living With Heart Failure Questionnaire for Assessing Quality of Life in Heart Failure Patients

Cèsar Morcillo, Ofelia Aguado, Jordi Delás, and Francesc Rosell

Servicio de Medicina Interna, Hospital Universitari Sagrat Cor, Barcelona, Spain

The Minnesota Living With Heart Failure Questionnaire (MLWHFQ) was used to evaluate the quality of life of patients with heart failure, both before and 6 months after an educational intervention. The study included 99 patients (70 male) with a mean age of 78 years. Significant correlations were found between the MLWHFQ score and the SF-36 score (r=0.41, P=.01), the Barthel Index score (r=–0.23, P=.02), New York Heart Association functional class (r=0.37, P=.01), and the number of readmissions within 6 months (r=0.47, P<.002). Following the intervention, the MLWHFQ score decreased by 34 points (P=.0001). The MLWHFQ score appears to be a useful measure: there were good correlations with functional class and the SF-36 score, and the measure was sensitive to changes in health since there was also a correlation with the patients' prognosis.

Key words: *Congestive heart failure. Quality of life. Questionnaire.*

Utilidad del Minnesota Living With Heart Failure Questionnaire en la evaluación de la calidad de vida en enfermos con insuficiencia cardiaca

Hemos estudiado la utilidad del Minnesota Living With Heart Failure Questionnaire (MLWHFQ) en la calidad de vida de los pacientes con insuficiencia cardiaca, aplicándolo antes y a los 6 meses de una intervención educativa. De los 99 pacientes (70 varones; media de edad, 78 años) hemos encontrado una correlación entre la puntuación del MLWHFQ y las del SF-36 (p = 0,01; r = 0,41), el índice de Barthel (p = 0,02; r = –0,23), la clase funcional (p = 0,01; r = 0,37) y el número de ingresos en 6 meses (p < 0,002; r = 0,47). La intervención disminuye la puntuación del MLWHFQ 34 puntos (p = 0,0001). El MLWHFQ es un instrumento válido, pues se correlaciona con la clase funcional y con el SF-36, y es sensible a los cambios de salud, ya que se correlaciona con el pronóstico de los pacientes.

Palabras clave: *Insuficiencia cardiaca congestiva. Calidad de vida. Cuestionario.*

INTRODUCTION

Quality of life with respect to health (QL) can be defined as the way in which a patient perceives his or her illness.[1]

Four questionnaires exist that specifically investigate QL in patients with heart failure[2]: the Chronic Heart Failure Questionnaire, the Quality of Life Questionnaire in Severe Heart Failure, the Kansas City Cardiomyopathy Questionnaire, and the Minnesota Living with Heart Failure Questionnaire[3] (MLWHFQ). The last 2 are the most complete and widely used.

The aim of the present study was to assess the usefulness of the MLWHFQ in Spain, to evaluate its sensitivity in the detection of changes in QL after an educational intervention, and to compare this questionnaire with a generic instrument, the Short Form-36 Health Survey (SF-36) questionnaire.

METHODS

This study was designed with a cross-sectional component for analyzing the validity of the MLWHFQ via its correlation with the SF-36 questionnaire and patient functional class, and with a prospective component to assess its sensitivity in the detection of changes in QL in the setting of a clinical trial. The main characteristics of this investigation were described in a previous paper.[4] The study was approved by our center's Clinical Research and Ethics Committee. All patient participants gave their signed, informed consent to be included.

The required sample size was established as at least 84 patients; the MLWHFQ contains 21 questions and for sufficient variability in answers to be ensured a number of patients:variables ratio of >4:15 is required. Between July 2001 and June 2003 a total of 99 patients (70 men) were interviewed, all of whom were admitted to hospital due to the worsening of their heart failure. During their stay in hospital they completed the MLWHFQ to determine their initial scores. The degree of help provided was dependent on the capacity of each patient to read, understand, and write a response to each question. After their release a table of random numbers was used to assign them to a control or an educational intervention group. Those in the intervention group received an educational visit by a nurse. All patients were assessed prospectively at 6 months.

Patient social support and associated illness were measured and quantified using the Charlson index,[6] cognitive status using the Spanish version of Pfeiffer's Short Portable Mental Status Questionnaire,[7] and functional capacity using the Barthel index[8] and the New York Heart Association (NYHA) classification. At the end of the study period the patients completed a second MLWHFQ by telephone.

The version of the MLWHFQ[3,9] adapted for use in Spain contains 21 questions with possible answers ranging from 0 (no) to 5 (a lot); the higher the score the worse the QL. The final score is the sum of the points obtained for the 21 questions; it can therefore vary between 0 and 105. It evaluates how heart failure affects patients' physical (8 questions), emotional (5 questions), and socioeconomic (8 questions) dimensions. It is designed for use in face to face interviews, telephone interviews, or by the patient alone.

The Spanish version of the SF-36 generic health questionnaire (version 1.4)[10] contains 36 questions collected into 2 standardized sections: physical and mental. The psychometric validity, sensitivity, and specificity of the SF-36 and MLWHFQ questionnaires have already been evaluated.[3,10]

Statistical Analysis

Questionnaire scores were correlated with other continuous variables by determining the corresponding Spearman correlation coefficient. Discriminatory capacity was analyzed using non parametric methods (the Mann-Whitney and Kruskal-Wallis tests).

Sensitivity in the detection of change in QL was analyzed using tests for the comparison of paired data. The Wilcoxon rank test was used: *a)* to analyze the before-after change in questionnaire score, and *b)* to analyze this change comparing the subgroup whose members improved with the intervention (those who required no hospital visits nor admissions during the 6 month follow-up period) with the subgroup whose members' QL did not improve (those who were admitted to hospital or who

had to visit the emergency department at least once). Significance was set at α=.05. All analyses were performed using SPSS software (version 12.0) for Windows.

RESULTS

The MLWHFQ seemed to be well accepted. This questionnaire is simple to use and it was always fully answered. However, 36 subjects were lost, 13 because they could not respond to the questionnaire by telephone, and 23 due to death (3 in the intervention group and 20 in the control group).

Table 1 shows the sociodemographic and cardiological characteristics of the patients and their differences with respect to baseline QL. A significant correlation (*P*=.02; *r*=−0.23) was found between the initial MLWHFQ score (mean 51) and the Barthel index (mean [standard deviation] 93 [1.7]). This indicates that lower functional capacity is associated with a poorer MLWHFQ score; the MLWHFQ score was also related to the number of medications prescribed (*P*=.04; *r*=0.2). No significant

TABLE 1. **Sociodemographic and Clinical Characteristics of the Study Subjects (n=99) and the MLWHFQ Score Obtained at the Start of the Study**[a]

	Patients, n	Initial MLWHFQ Score	*P*
Social support			
Family	83	51	.95
Paid caregiver	3	59	
Alone	13	48	
Civil status			
Single	11	50	.31
Married	64	49	
Widowed	24	56	
Comorbidity			
High blood pressure	59	50	.45
Diabetes mellitus	37	50	.11
Hypercholesterolemia	32	53	.15
COPD	33	50	.95
Chronic kidney failure	20	50	.38
Chronic liver disease	5	50	.97
CVA	16	50	.95
Smoker	37	50	.41
Etiology of heart failure			
Hypertensive	17	57	.33
Ischemic heart disease	47	52	
Dilated cardiomyopathy	24	54	
Valvular	7	48	
Toxic	4	66	

[a]CV indicates cerebrovascular accident; COPD, chronic obstructive pulmonary disease; MLWHFQ, Minnesota Living With Heart Failure Questionnaire.
Tests used: Spearman, Mann-Whitney, and Kruskal-Wallis tests. The *P* value corresponds to the association between the MLWHFQ score and the different characteristics; significance was set at *P*<.05.
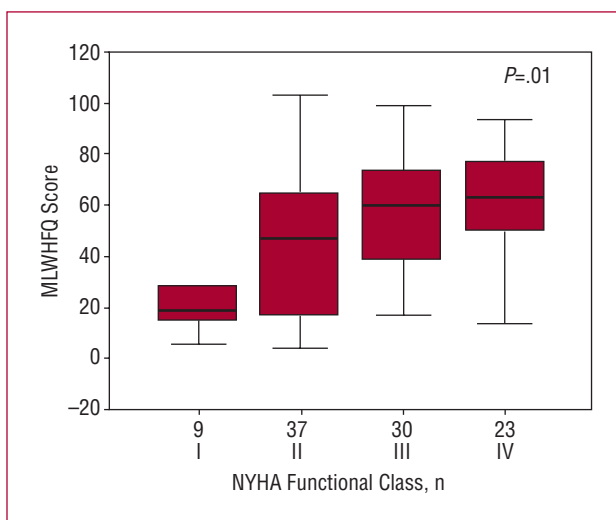
Figure. Box diagram. Distribution of MLWHFQ scores according to the NYHA functional class of the 99 patients with systolic heart failure at the beginning of the study. Graphical representation of the medians, 25th and 75th percentiles, and extreme values for the MLWHFQ scores with respect to each functional class. Class I: patients with no symptoms during ordinary physical activity. Class II: symptoms during ordinary physical activity. Class III: symptoms experienced when undertaking lighter than normal physical activity. Class IV: symptoms experienced even at rest. MLWHFQ indicates Minnesota Living With Heart Failure Questionnaire; NYHA, New York Heart Association.

association was seen between quantified comorbidity and the Charlson index (mean 2.3 [1.7]; P=.12), cognitive deterioration as determined by the Pfeiffer questionnaire (mean 0.5 [1.3]; P=.96), or the left ventricular ejection fraction (mean 35; P=.08).

The MLWHFQ was deemed valid given the correlation between the score obtained and patient functional class (P=.01; r=0.37) (Figure), and on the initial (r=0.41; P=.01) and 6 month concordance (r=0.45; P=.01) between the MLWHFQ and the SF-36 scores.

The capacity of the MLWHFQ to detect change was based on 2 analyses: *a)* the sensitivity of both questionnaires to detect change in QL between the start and end of the study (at 6 months), comparing the intervention group with the control group and assuming that the intervention was efficient (Table 2)[4] (the

intervention reduced the MLWHFQ score by a mean of 34 points for the entire intervention group [P=.0001]), and *b)* the changes in the MLWHFQ scores between the start and end of the study (6 months), comparing the responders (those whose QL improved) with non-responders (those whose QL did not improve). The mean score of the responders changed from an initial 51.6 (28.5) to 26.3 (23.8) at 6 months (a reduction of 25.3 points; P=.0001); interestingly, the mean score of the non-responders was also reduced from 50.6 (26.1) to 37.5 (27.5) (P=.001).

The MLWHFQ appears to predict patient prognosis since a correlation was seen between the initial score and the number of hospital admissions (r=0.92), visits to the emergency room (r=0.47), and mortality (r=0.24) over the 6 month study period. The score at 6 months was also correlated to the number of hospital admissions and visits to the emergency room that had been necessary during the 6 month period (Table 3).

DISCUSSION

The initial mean MLWHFQ score of the present patients (51 [26] points) was worse than that recorded in most other studies,[9] indicating the poor health in which these subjects perceived themselves to be. This may have been due to the advanced age of our subjects, all of whom answered the first questionnaire while in the hospital, and all of whom suffered systolic dysfunction (patients with this problem generally score worse than those with diastolic heart failure)[11].

As reported by Parajón et al,[9] a correlation was found between the MLWHFQ score and functional class, as well as with the number of medications prescribed.

The present results agree with those of other studies in which the MLWHFQ score improved with educational[12] and pharmacological interventions.[13] The results should, however, be interpreted with caution given the limitations of the study. The sample size was small and the majority of the patients were in the advanced stage of disease. In addition they came from a medium-high socioeconomic background and were selected during a hospital stay. These limitations probably mean the results cannot be

TABLE 2. **Sensitivity of the Questionnaires With Respect to Detecting Changes in Quality of Life Between the Start and End of the Study Period**[a]

Intervention	Patients (n)	MLWHFQ			Patients (n)	SF-36 Physical			SF-36 Mental		
		Score, Mean (SD)		P		Score, Mean (SD)		P	Score, Mean (SD)		P
		Initial	Final			Initial	Final		Initial	Final	
Yes	26	52 (27)	18 (17)	.0001	26	35 (9)	52 (5)	.001	37 (13)	53 (8)	.001
No	37	50 (25)	53 (23)	.01	37	40 (12)	39 (11)	.62	36 (14)	32 (17)	.13

[a]SD indicates standard deviation; MLWHFQ, Minnesota Living With Heart Failure Questionnaire; patients, total number analyzed once the null cases had been excluded. Test used: Wilcoxon test. Significance was set at P<.05.

TABLE 3. Relationship Between MLWHFQ Score at 6 Months and Patient Prognosis (Number of Admissions and Visits to the Emergency Room During the 6 Month Study Period)[a]

Intervention	Patients (n)	MLWHFQ Score (Mean [SD])	Admissions (Mean [SD])	r[b]	Visits to ER (Mean [SD])	r[b]
Yes	26	18 (17)	7 (0.6)	0.37	6 (0.6)	0.55
No	37	53 (23)	54 (1.03)	0.47	65 (1.1)	0.54

[a]SD indicates standard deviation; MLWHFQ, Minnesota Living With Heart Failure Questionnaire; ER, emergency room; patients, total number analyzed once the null cases had been excluded; r, Spearman correlation coefficient.
[b]$P<.002$.

extrapolated to the entire population of patients with heart failure. In addition, the reduction in mortality seen in the intervention group raises doubts about comparability. Moreover, the present work suffered the limitations of all studies that try to validate a tool when there is no gold standard against which a comparison can be made. The validity of the results might have been improved had comparisons with other questionnaires or objective tests (such as the Duke or the 6 minute walk test) been made.

Participants in clinical trials of this type nearly always report an improved QL,[14] which might explain why the patients whose QL did not improve with the intervention also scored better at the end of the study period. However, this placebo effect on QL usually disappears when follow-up is for 6 months or longer[14]; this was the case in the control group, in which the QL became gradually lower over time, perhaps due to the progress of disease.

Finally, the possible biases introduced when completing health questionnaires over the phone or by interview should be remembered.

In conclusion, the MLWHFQ appears to be a valid instrument since its scores correlate well with functional class and SF-36 scores. It is also sensitive to changes in health since it correlates with patient prognosis. The QL in patients with heart failure should be measured using specific tools such as the MLWHFQ.

REFERENCES

1. Brotons C, Permanyer M. Métodos de investigación en cardiología clínica (VI). La evaluación de resultados *(outcomes)* y de su relevancia clínica en cardiología: especial referencia a la calidad de vida. Rev Esp Cardiol. 1997;50:192-200.
2. Gordon HG. Measurement of Health-Related Quality of Life in Heart Failure. J Am Coll Cardiol. 1993;22:A185-91.
3. Rector TS, Kubo SH, Cohn JN. Patient's self assessment of their congestive heart failure. Part 2: Content, reliability and validity of a new measure. The Minnesota Living with Heart Failure Questionnaire. Heart Failure. 1987;3:198-209.
4. Morcillo C, Valderas JM, Aguado O, Delás J, Sort D, Pujadas R, et al. Evaluación de una intervención domiciliaria en pacientes con insuficiencia cardiaca. Resultados de un estudio aleatorizado. Rev Esp Cardiol. 2005;58:618-25.
5. Rummel RJ. Applied factor analysis. Evanston: Northwestern University Press; 1970.
6. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chron Dis. 1987;40:373-83.
7. Martínez J, Dueñas R, Onís MC, Aguado C, Albert C, Luque R. Adaptación y validación al castellano del cuestionario de Pfeiffer (SPMSQ) para detectar la existencia de deterioro cognitivo en personas mayores de 65 años. Med Clin (Barc). 2001;117:129-34.
8. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. A simple index of independence useful in scoring improvement in the rehabilitation of the chronically ill. Md State Med J. 1965;14:61-5.
9. Parajón T, Lupón J, González B, Urrutia A, Altimir S, Coll R, et al. Aplicación en España del cuestionario sobre calidad de vida Minnesota Living With Herat Failure para la insuficiencia cardiaca. Rev Esp Cardiol. 2004;57:155-60.
10. Alonso J, Regidor E, Barrio G, Prieto L, Rodríguez C, de la Fuente L. Valores poblacionales de referencia de la versión española del Cuestionario de Salud SF-36. Med Clin (Barc). 1998;111:410-6.
11. Kitzman D, Little W, Brubaker P, Anderson R, Hundley W, Marburger C. Pathophysiological characterization of isolated diastolic heart failure in comparison to systolic heart failure. Arch Intern Med. 2002;288:2144-50.
12. Gwadry-Sridhar FH, Arnold JM, Zhang Y, Brown J, Marchiori G, Guyatt G. Pilot study to determine the impact of a multidisciplinary educational intervention in patients hospitalized with heart failure. Am Heart J. 2005;150:982.
13. Mancini D, Katz S, Lang C, LaManca J, Hudaihed A, Androne AS. Effect of erythropoietin on exercise capacity in patients with moderate to severe chronic heart failure. Circulation. 2003;107:294-9.
14. Badia X, Carné X. La evaluación de la calidad de vida en el contexto del ensayo clínico. Med Clin (Barc). 1998;110:550-6.