

Correlation between Quality of Life and Functional Capacity in Heart Failure

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Abstract

Background: Patients with cardiac failure (CF) present progressive incapacity and decreased quality of life, both related to dyspnea and fatigue. Thus, there is the increasing interest in measuring the quality of life (QL), by generic instrument, such as the 36-item Short-Form Health Survey (SF-36), by specific instrument, such as Minnesota Living with Heart Failure (MLHFQ).

Objective: This study has the objective to correlate the QL surveys, SF-36 and MLHFQ, with the functional capacity of patients with CF, expressed by the cardiopulmonary test and the TC6M.

Methods: Using the SF-36 and MLHFQ surveys for QL evaluation, for the evaluation of the functional capacity, it was used the cardiopulmonary test, being executed using a treadmill with Weber protocol, as well as the distance covered in the walk test of six minutes (TC6M).

Results: Forty-six patients were selected with CF diagnosis (22 men, average age of 52 years old), classes II and III of New York Heart Association. It was observed that the mild correlation between the physical and emotional domains of SF-36 and $VE/VCO_{2,peak}$ ($r=-0.3$; $p<0.05$) and the distance covered in TC6M ($r=0.4$; $p<0.05$), respectively. It was also observed the mild to moderate correlations of MLHFQ total score with $VO_{2,peak}$ ($r=-0.5$; $p<0.05$), the aerobic threshold ($r=-0.4$; $p<0.05$) and the distance covered in TC6M ($r=-0.5$; $p<0.05$).

Conclusion: The data suggest that the application of both evaluation instruments of QL, generic (SF-36) and specific (MLHFQ) in patients with CF, showed mild and moderate correlation with the variable of the cardiopulmonary test with the variables of the cardiopulmonary test and the distance covered in TC6M. (Arq Bras Cardiol 2010; 95(2): 238-243)

Key words: Quality of life; heart failure; dyspnea; fatigue; respiratory function tests.

Introduction

The cardiac failure (CF) is one of the main morbimortality causes all over the world, presenting increased incidence levels and prevalence with aging^{1,2}. In Brazil, CF is the first cause among the hospitalization cardiovascular diseases by Sistema Único de Saúde (SUS, Single Health System) in patients over 65 years old, increasing the costs with hospitalization and medications^{3,4}.

The patients with CF experience several symptoms, many of which are non-specific and frequently result in reduction of the functional capacity and in worsening of the quality of life (QL), both related to dyspnea and fatigue during the daily activities^{5,6}.

Quality of life is a discrepancy between satisfaction or dissatisfaction with certain areas of life, as per the perception of the individual himself, being this perception considered the best indicator of QL. In conventional language, satisfaction with life refers to meeting the needs, expectations, aspirations and desires⁷.

There is an effort of the scientific community in quantifying the impact of the CF in the life of the patients. Despite the existence of determining factors of functional capacity, such as oxygen consumption in the exercise peak ($VO_{2,peak}$), the ventilatory equivalent of carbon dioxide in the effort peak ($V_E/VCO_{2,peak}$), the distance covered in the walk test of six minutes (TC6M), as well as the functional classification of the New York Heart Association (NYHA), the evaluation of the instruments that may indicate the QL of patients with CF is relevant and this way corroborates to the indicators of functional capacity⁸⁻¹⁰.

For the evaluation of QL in CF, the literature presents generic and specific surveys, of which the 36-item Short-Form Health Survey (SF-36) and the Minnesota Living with Heart Failure Questionnaire (MLHFQ) are the most used ones, respectively.

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However, in the generic and specific questionnaires mentioned above, it is not well established which one best presents the functional capacity of the patients with CF.

The objective of the present study was to correlate the QL questionnaires, the generic one (SF-36) and the specific one (MLHFQ), with the functional capacity of the patients with CF, expressed by the cardiopulmonary test and TC6M.

Methods

Patients selection

The patients with cardiac failure diagnosis were recruited in the outpatient clinic specialized in cardiac failure of a high complexity in cardiology hospital.

The cases that presented clinical stability, symptoms (functional class II and III as per the NYHA), ejection fraction $\leq 40\%$, without hospitalization periods for three months before being admitted in the study were considered as eligible. Patients with acute myocardium infarction at least three months before the beginning of the study, non controlled unstable angina with pain for medication treatment or presence of infra or supra unlevelling of the ST segment in rest, inadequate response of the blood pressure or heart rate during the stress test, ventricular arrhythmias induced by the effort in the previous ergometric test, obstructive valvar disease, congenital cardiopathy, several pulmonary hypertension, or other severe pulmonary disease, confusion or dementia, orthopedic limitation and/or cognitive deficit that could difficult the execution of the tests were excluded from the study.

Previously, the patients were informed on the purpose of the study and they agree by signing an informed consent approved by the Ethics Committee of the institution under the number 0897/07;

Study dynamic

In this prospective and transversal study, the selected patients were submitted to a clinical evaluation for admission in the protocol, including the electrocardiogram analysis in rest, ergometric test and echocardiogram.

All the patients performed the cardiopulmonary test (TCP) and the walk test of six minutes (TC6M), in addition to be interviewed for evaluating the quality of life related to the health, by means of questionnaires SF-36 and MLHFQ. The walk tests of six minutes were performed in the maximum period of four days after the cardiopulmonary test.

Echocardiogram

The echocardiogram was performed in parasternal cuts (longitudinal and transversal) and apical (four and two chambers), in an apparatus Ultramark 4 CV, with transducer of 3 megahertz. The ejection fraction of the left ventricle was calculated by the Simpson method.

Cardiopulmonary test

The cardiopulmonary tests were performed in lab with temperature varying from 19° to 24° C and air relative humidity

between 40% and 60%. It was followed the Weber protocol in rolling treadmill with metabolic analysis by the system Medgraphics CPX Ultima System Operating BreezeSuite 6.4.1 Software (Minneapolis, Minn, USA). The oxygen consumption (VO_2) was measured breath by breath, being considered $VO_{2,peak}$ the highest value of VO_2 obtained in the test. The anaerobic threshold was estimated by the V-Slope¹¹ and ventilatory¹².

The following variables were analyzed: oxygen consumption in the effort peak ($VO_{2,peak}$), ventilatory equivalent of the carbon dioxide in the effort peak ($V_E/VCO_{2,peak}$), and anaerobic threshold (AT).

The electrocardiographic monitoring of twelve derivations was obtained in rest, laid down and during stress, continuously (Welch Allyn Cardioperfect - Skaneateles, NY, USA). The blood pressure was measured by sfigmomanometer TycoTM and stethoscope LittmannTM in rest, during stress every three minutes and recovery.

Walk test of six minutes

On the same day, two TC6M were performed with 1-hour interval between them; the first test was presented to the patient aiming at adapting and learning its methodology.

The tests were performed in a 30 meter way, by a single examiner, together with one of the service physician, as per the protocol proposed by the American Thoracic Society (ATS)¹³.

The patients were oriented to walk as per their tolerance to the exercise in the period of six minutes. Encouragement phrases were said during the walk. Before the beginning of each test, the respiratory frequency, the cardiac rate measured by frequency meter POLAR - model FS1 and the blood pressure measured by sfigmomanometer TycoTM and stethoscope LittmannTM were obtained, as well as the effort perception by means of the Borg scale (6-20). At the end of each test, the same parameters were recorded again. The final result of the TC6M was the measurement of the total distance covered in meters during six minutes.

Quality of life evaluation instrument

Generic and specific questionnaires for QL evaluation, SF-36 and MLHFQ, respectively were used.

SF-36 was validated for Portuguese by Ciconelli et al¹⁴. This questionnaire is a tool that can be applied on persons who are 12 years old on and that aims at surveying the physical and mental health status in the clinical practice individually and in the population in general.

The questionnaire is consisted of 35 questions that encompass eight domains (or dimensions) in two large components: the physical component that involves the functional capacity (CF), the pain, the general health status (GHS) and the physical aspect (FA); and the mental component that contemplates the mental health (MH), the emotional aspect (EA), the social aspects (SA) and the vitality (V). The purpose of the questions was to transform subjective measures in objective data, which allow analyses in specific, global and reproducible ways.

Each domain presents a final score from zero to 100, where zero corresponds to the worst health general status and 100,

the best health status.

The MLHFQ questionnaire was validated for Portuguese by Carrara¹⁵ and is consisted of 21 objective questions, which evaluate the physical, socio economical and emotional limitations conditions. Eight questions present a strong relation with the dyspnea and fatigue symptoms and are mentioned as physical dimension measures. Five other questions are strongly related to the emotional dimension and the other questions correspond to the socio economical dimension. For each question, the patient selects a number from 0 to 5. Zero indicates that the cardiac failure does not exercise a limitation and 5 indicates a very high limitation. The final score of MLHFQ varies from 0 to 105. Differently from SF-36, the high score of MLHFQ indicates worse QL.

This QL instrument has been providing valuable information in surveys, allowing that the response to several therapies are quantified.

Both instruments for QL evaluation, SF-36 and MLHFQ, were elaborated to be self-administered instruments, being possible, however, to be applied as interviews. This resource was applied in this study, as the interview detected variability of education level among our patients.

Statistical analysis

The data were analyzed with the statistical software SPSS version 17.0 (SPSS Inc., Chicago, IL, USA). The descriptive analysis was presented as average and standard deviation (SD).

The normality test for the studied variables indicated normal distribution of data by the Kolmogorov-Smirnov test, which allowed the use of the parametric test for the data.

The MLHFQ validity, as well as the domains present in the SF-36 in association with $VO_{2,peak}$, $V_E/VCO_{2,peak}$, AT and distance covered in the TC6M were evaluated by means of the Pearson's correlation coefficient, classifying the correlation as perfect ($r=1$), strong ($r>0.75$), moderate ($r>0.5$), mild ($r<0.5$) and inexistent ($r=0$). The significance level for the test was of 5%.

Results

The clinical characteristics of the sample are in table 1. From the 46 studied patients, 22 (47.8%) were males and 24 (52.2%) were female. The average age of the studied sample was 52 years old (SD 9.0), with ejection fraction of the left ventricle of 30.74% (SD 5.6).

All the patients of our sample were able to conclude the TC6M without stopping the test. It was not seen yet, the presence of arrhythmias that, maybe prevent the performance of the tests.

The patients included in this study presented, however, deteriorated physical capacity ($VO_{2,peak}$ lower than 20 ml/kg/min) and a high MLHFQ score. In this studied sample, 38 patients (82.6%) presented functional class II, as per NYHA (tab. 1 and 2).

When correlating the values obtained in the domains of questionnaire SF-36 and the cardiopulmonary variables, it was observed a mild correlation in all the domains of that

Table 1 - General characteristics of the studied population

Ages (years)	52.26 ± 9.09
Sex	
Male	22 (47.8%)
Female	24 (52.2%)
Weight (kg)	72.00 ± 11.27
Height (m)	1.62 ± 0.07
BMI (kg/m ²)	27.36 ± 4.24
Etiology of cardiac failure	
Ischemic	10 (21.7%)
Chagasic	13 (28.3%)
Alcoholic	3 (6.5%)
Idiopathic	6 (13.0%)
Peripartum	2 (4.3%)
Hypertensive	9 (19.6%)
Viral	2 (4.3%)
Familiar	1 (2.2%)
Functional class (NYHA)	
II	38 (82.6%)
III	8 (17.4%)
Minnesota's quality of life (score)	41.86 ± 18.84
LVEF (%)	30.74 ± 5.65

BMI - body mass index; NYHA - New York Heart Association; LVEF - left ventricular ejection fraction (echocardiogram - Simpson Method).

Table 2 - Description of the average values of the cardiopulmonary test variables and walking test of six minutes

Cardiopulmonary test variables	Average-SD	Minimum-Maximum
$VO_{2,peak}$ (ml/kg/min)	17.27±3.66	9.49 - 25.91
$V_E / VCO_{2,peak}$	33.39±5.56	24.0 - 45.0
AT (ml/kg/min)	12.89±2.59	7.0 - 20.75
Walk test variable of six minutes		
d (m)	524.33±72.70	349.0 - 672.0

$VO_{2,peak}$ - oxygen consumption at the effort peak; $VE/VCO_{2,peak}$ - ventilatory equivalent of carbon dioxide at effort peak; AT - anaerobic threshold; V_E/VCO_{2AT} - ventilatory equivalent of carbon dioxide at the anaerobic threshold; d - distance covered in the walk test of six minutes; LVEF - left ventricular ejection fraction by Simpson method.

questionnaire, as demonstrated in table 3. The correlation was significant only in two of the eight aspects evaluated by the questionnaire SF-36 between the two cardiopulmonary variable, while in the physical aspect, and $V_E/VCO_{2,peak}$, as well as the emotional aspect and the distance covered in the TC6M, as shown in table 3.

Mild to moderate correlations of the total score of MLHFQ with $VO_{2,peak}$, AT and the distance covered in the TC6M were observed, as demonstrated in table 4.

Table 3 - Correlation coefficient in the domain survey SF-36 and the cardiopulmonary variable

SF-36 Domain	Average (SD)	Minimum-Maximum	Cardiopulmonary variables				
			r VO _{2,peak}	r V _E /VCO _{2,peak}	r AT	r d	r LVEF
CF	55.7 ± 23.1	5 - 100	0.2	-0.06	0.2	0.1	0.1
FA	31.5 ± 35.5	0 - 100	0.01	-0.3*	0.05	0.01	0.1
Pain	55.0 ± 24.5	12 - 100	0.2	0.04	0.2	0.1	-0.00
GHS	60.6 ± 19.5	15 - 92	0.2	-0.1	0.2	0.1	-0.1
V	51.9 ± 21.5	10 - 100	0.2	-0.1	0.2	0.2	0.1
SA	71.4 ± 24.9	12.5 - 100	0.2	-0.2	0.2	0.2	-0.06
EA	51.9 ± 38.9	0 - 100	0.08	-0.01	0.07	0.4*	-0.03
MH	62.5 ± 18.9	20 - 96	0.1	0.05	0.1	0.2	0.04

*p < 0.05; CF - functional capacity; FA - physical aspects; GHS - general health status; V - vitality; SA - social aspects; EA - emotional aspects; MH - mental health; r - correlation coefficient; VO_{2,peak} - oxygen consumption in the effort peak; V_E/VCO_{2,peak} - ventilatory equivalent of carbon dioxide in the effort peak; AT - aerobic threshold; d - distance covered in the walk test of six minutes; LVEF - left ventricular ejection fraction.

Discussion

The QL has been considered, under several aspects in the last years as a tool that demonstrates the efficacy of several therapeutical interventions in IC¹⁶.

The majority of the studies that involves the QL evaluation employes generic questionnaires for such, being able to limit, this way, the sensitivity of the study. Thus, we used, in addition to the generic questionnaire, SF-36, the specific questionnaire, MLHFQ, which is the most used questionnaire for the evaluation of the impact of CF on the QL¹⁷⁻¹⁹.

In our study, the QL measured by SF-36 was altered in almost all the domains (FA, EA, CF, Pain, GHS, V), but specifically showed the higher commitment in the physical aspect, which evaluates how the physical health interferes in the work activities, showing, this way, that the functional limitation imposed by the disease is associated to the worsening of QL²⁰. Our findings are similar to those showed in Sneed et al²¹ study, which revealed low scores for all the domains of SF-36, especially regarding the physical aspect of the patients with CF.

We evidenced a high total score for MLHFQ (41.86), which implicates in worsening of QL of our sample. Recent

studies concluded that the variation of the total score of MLHFQ between 27.7 and 42.7 presents association with the functional class II and III proposed by NYHA, respectively²². This fact corroborates our data, in which the functional class (NYHA) varied between II and III.

However, when analyzing both generic (SF-36) and specific (MLHFQ) questionnaires, due to the variable of the cardiopulmonary test, as well as the distance covered in TC6M, we observed that the MLHFQ presented associated values relatively higher with those variables, presenting a mild to moderate correlation with VO_{2,peak} (r=-0.5), AT (r=-0.4) and distance covered in the TC6M (r=-0.5). The other studies also demonstrated association of QL evaluated by MLHFQ with the variables of the cardiovascular test, as well as the distance covered in TC6M^{1,23}.

The MLHFQ was specifically developed for CF, which makes it closer to the reality of this kind of patient, evaluating his/her disease condition. In turn, the generic questionnaire SF-36 was developed to evaluate the health condition in patients with chronic disease¹⁴, which could determine the values found in our study. However, in this study, both questionnaires presented low correlations associated to the studied variables, which can be justified by the sample size.

Regarding the cardiopulmonary variables evaluated in the study, our data suggest a functional limitation when it is evaluated the average values of VO_{2,peak} (17,27 ml/kg/min) and V_E/VCO_{2,peak} (33.39). VO_{2,peak} in addition to be an indicator of functional capacity, it is an index considered as important in the indication of cardiac transplant because it is a strong predictor of morbidity and mortality in patients with advanced CF. A VO₂ lower than 14 ml/kg/min characterizes an important functional limitation, and when associated to other indicators of CF severity, can help in the indication of the cardiac transplant²⁴. Other studies indicate not only VO₂, but also V_E/VCO₂ as being strong independent predictors of the prognosis of patients with IC¹⁰. The latter presents a value superior to 34 for the stratification of the mortality risk for IC²⁵, with increasing risk as the V_E/VCO₂²⁶ value increases.

Table 4 - Correlation coefficient between the total score of MLHFQ and the cardiopulmonary variables

Cardiopulmonary variables	Minnesota survey
	R
VO _{2,peak}	-0.5*
V _E /VCO _{2,peak}	0.1
AT	-0.4*
d	-0.5*
LVEF	0.1

*p < 0.05; r - correlation coefficient; VO_{2,peak} - oxygen consumption in the effort peak; V_E/VCO_{2,peak} - ventilatory equivalent of carbon dioxide at the effort peak; AT - anaerobic threshold; d - distance covered in the walk test of six minutes; LVEF - left ventricular ejection fraction.

In addition to the variables inherent to the cardiopulmonary test, the distance covered in TC6M has been presenting increased interest of the scientific community, concerning the evaluation of the functional capacity²⁷ and the obtaining of prognostic stratification²⁸, most due to its easy methodology, as well as the association to $VO_{2,peak}$ obtained in the cardiopulmonary test²⁹. In our sample, the measurement of the walk distance higher than the one related in the literature can be attributed to the fact that the studied population has presented lower severity (82.6% in CF II - NYHA) and that the test was performed under verbal encouragement (stimulated test). However, recently, Rubim et al³⁰ found results similar to ours, while attributing a cutoff value of 520 meters, as those with higher probability of death.

Conclusion

The data suggest that the application of both QL evaluation

instruments, generic (SF-36) and specific (MLHFQ), in patients with CF, provided the evidences of a correlation mild to moderate with the variables of the cardiopulmonary test and distance covered at TC6M.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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