Six-minute walk test and quality-of-life in heart failure
A correlative study with a Brazilian sample

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Background. Quality-of-life and functional capacity in heart failure are, actually, between the most investigated topics in the scientific community. Patient's self perceptions and exercise capacity can help health professionals with prognosis and decisions in heart failure treatment. Specifically in Brazil, the research on quality-of-life still needs to focus on the differences in the multifactor aspects of heart failure. The aim of this study is to investigate the correlation between quality-of-life and functional capacity in a sample of Brazilian heart failure patients.
Methods. 30 male heart failure patients were included in the study. Quality-of-life was assessed by the Brazilian version of the Minnesota Living with Heart Failure Questionnaire and the functional capacity through the six-minute walk test. Differences in quality-of-life among the functional classes were evaluated through the analysis of variance and the association between the variables was assessed through Pearson's coefficient.
Results. Quality-of-life decreased significantly according to functional class (functional class I= 20±11, class II= 35.9±18 and class III= 58.3±24) and correlated significantly to the distance (r=-0.62, p=0.004).
Conclusions. Longer distances obtained in the six-minute walk test can be interpreted as a better quality-of-life in Brazilian heart failure patients.
Keywords: Heart Failure - Six-minute walk test - Quality-of-life

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Introduction

Heart Failure (HF) is an alteration in the myocardium global state secondary to any pathological state that affects the heart muscle. This reduces the ability of the heart to pump enough amounts of blood to assist the metabolic demands of the organism or make it work with high filling pressures[1].
Prevalence of HF in Brazil is in ascension, due to the increase in the population life expectation and larger effectiveness of new medicines for treatment, prolonging life[2]. In spite of the therapeutic progress that have happened in the last decades, HF is a disease with a bad prognostic, showing an annual mortality from 30 to 50% in more critical patients[3].
Patients with HF have their lives impaired by the disease, and even with optimal treatment it seems to have different impacts on their Quality-of-Life (QOL)[4]. It is marked by fatigue, dyspnea, decrease of functional capacity, adverse cardiac events and the necessity of repeated hospitalizations[5]. The Six-Minute Walk Test (6MWT) has been suggested as a simple, easy to apply (submaximal test) and low cost test designed to objectively evaluate functional limitations[6,7] and the prognosis of HF[8,9].
The aim of the present study was to evaluate the correlation of the 6MWT and QOL in Brazilian HF patient sample.

Methods

From July through September 2006, we studied 30 male patients who had stable chronic HF secondary to ischemic (46%) and hypertensive (54%) heart disease. All patients underwent optimal treatment for stable heart failure for at least 4 weeks. The mean age was 63±11 years. All patients had left ventricular ejection fraction (LVEF) ≤ 0.45, and all were in New York Heart Association (NYHA) functional class I (16%), II (52%) or III (32%) of heart failure. Table 1 summarizes the patients' clinical characteristics.
We excluded from the study patients who had decompensated heart failure, limitation of physical activity due to factors other

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than exertional dyspnea and fatigue (such as orthopedic limitations), psychiatric disorders that could keep the patients from understanding the examination, anemia, and any febrile condition or infectious disease. We also excluded patients who had experienced unstable angina, myocardial infarction, coronary revascularization, or stroke within the previous 2 months.

The study followed the recommendations of the Declaration of Helsinki and the protocol was approved by our local ethics committee. Informed written consent was obtained from all patients before enrollment.

The 6MWT was performed in an indoor corridor 25 m long, according to the recommendations of Guyatt and colleagues[6]. Patients were instructed to walk the corridor from one end to the other, as many times as possible within the permitted time. The test was performed under the control of the physical therapist, which encouraged the patients with remarks such as "you are doing well". At the end of the 6 min, the total distance walked by the patient was measured.

QOL was measured using the Brazilian version of the Minnesota Living with Heart Failure Questionnaire (MLHF), a disease-specific measure that assesses patients' perceptions of the influence of HF on physical, socioeconomic, and psychological aspects of life[10]. Another important consideration about this instrument is that it comprehensive, easy to apply and is validated for Brazilian population[11]. Participants respond to 21 items using a 6-point response scale (0-5). The total summary score (Global Score) can vary from 0 to 105; a lower score reflects better QOL. This instrument is also suitable for older patients[12].

Statistical analysis

The STATISTICA (data analysis software system), version 6 (StatSoft, Inc., 2001) was used for statistical study. Continuous variables are given as mean ± standard deviation, and categorical variables are given as percentages. An Analysis of Variance (ANOVA) was used to differentiate the QOL scores of the three functional classes followed by Tuckey's Test to establish the differences among them. Finally, Pearson's correlation coefficient was performed to analyze the relationship among QOL and the distance achieved in the 6MWT. A value of $P<0.05$ was considered statistically significant.

Results

All patients completed the 6MWT. No clinical complications were recorded during the tests or within the 5-hour period after the tests.

Differences in the QOL of the functional classes could be found through ANOVA. Post test revealed differences between classes I and III, but not in between classes I and II or II and III (Figure 1).

QOL scores had significant negative correlation (r=-0.62, p=0.004) what reveals that the distance achieved in 6MWT is inversely proportional to QOL scores in the MLHF Questionnaire (Figure 2).

Table 1. Baseline characteristics of the subjects

Clinical Characteristics	Values
Number of patients	30
Mean age (years)	63±11
Time since diagnosis (%)	
0-2 years	36
2 yrs and more	64
New York Heart Association Class (%)	
I	16
II	52
III	32
Body mass index (kg/m²)	27±4
6-Minute walk test distance (m)	424.8±105.1
Left ventricle diastolic diameter (mm)	64.24±7.74
Left ventricle systolic diameter (mm)	55.12±6.12
Left atrial diameter (mm)	45.18±10
Minnesota Living with Heart Failure Questionnaire (points)	40±23

Discussion

Even with the advances in the treatment of HF in the last decades, it remains being one of diseases with the highest morbidity and mortality indexes[13]. Specifically in Brazil, it brings a large amount of expenses to the patient and to the public health system[2,14,15] and consequently, strategies for a fast, cheaper and effective assessment are extremely necessary.

In HF as other chronic conditions, small changes in clinical status must be promptly identifiable to monitor patients' progress and to modify the treatment program, if necessary[16,17]. Numerous clinical indicators are employed to monitor HF patients' health status over time, including physician assessments (e.g., NYHA classification system), exercise capacity (e.g., six-minute walk test, peak oxygen test), body weight changes, and biomarkers[18]. Often, however, patients' own perceptions of their health status may not be clearly apparent to the health professionals or may not be manifested
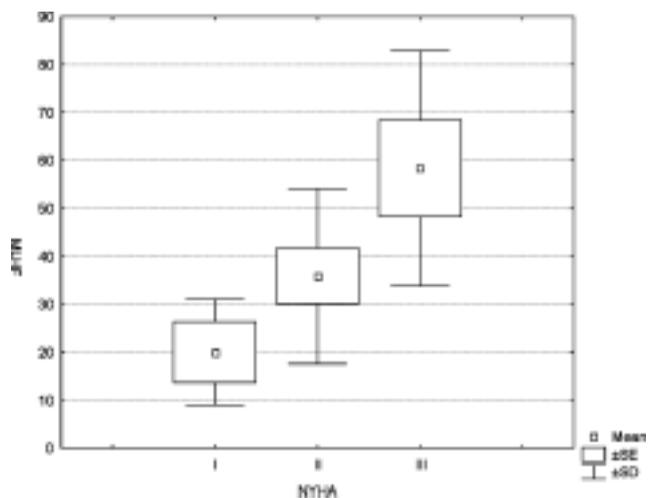

Figure 2. Correlation between the Six-minute walk test and quality-of-life scores.
6MWT= Distance in the six-minute walk test; MLHF= Minnesota Living with Heart Failure Questionnaire score.
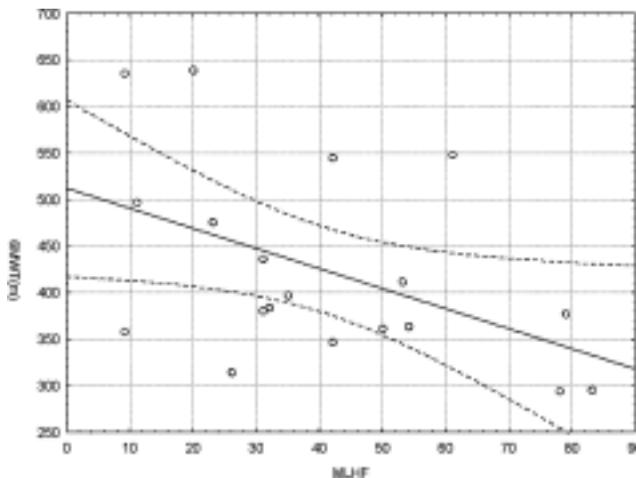
Figure 1. Quality-of-life and functional classes.
SE= Standard Error; SD= Standard Deviation; NYHA= New York Heart Association Class; MLHF= Minnesota Living with Heart Failure Questionnaire score.

in a manner that easily lends itself to these assessments. As a result, QOL measures are increasingly being used to provide complementary and additional insight into the patient's health status[19,20].

The MLHF Questionnaire's capacity to evaluate QOL has been demonstrated in several studies[12,21-25]. This article showed moderate compromising level in QOL (40±23) as other previous studies[26-29]. Few studies with the Brazilian population have been made. Scatollin and colleagues (2007) showed similar scores for overall measure of QOL in Brazilian population (41.3±17.8)[30], another Brazilian study, showed basal values of QOL ranging about 31±20.6[31].

Six minute walking test is also a well established instrument for functional capability in HF[6]. Nowadays, it is used not only for assessing functionality but also for prognosis purposes[8,9,32,33]. Zugck et al.[33] demonstrated that the prognostic power of the distance walked in 6MWT in HF is similar to the peak oxygen uptake of the ergospirometry, although, it demands more expensive methods and when the seriate evaluation is accomplished, the cost elevates even more, placing this test out of Brazilian daily reality. 6MWT doesn't substitute the information that the ergospirometry supplies; however, it becomes important where it is impracticable.

Other investigators demonstrated correlation between QOL and functional, movement or daily activity measures. In the studies by Davies et al. (1992)[34] and Houghton et al. (2002)[35], significant correlations ($r=-0.49$, $P=0.006$) with a movement monitor on ankle and ($r=-0.47$, $P=0.04$) with a pedometer on hip were found between the level of movement related everyday activity and quality of life in people with CHF.

This study elucidates that 6MWT can explain the QOL of HF patients and this correlation was not yet well demonstrated in a Brazilian HF patient sample, considering that QOL is also influenced by emotional and social aspects that differ in distinct populations[36].

Demmers et al. (2001) showed significant correlation (r=-0.26) between MLHF questionnaire and 6MWT with a Canadian sample.

Juenger et al. (2002) using a generic instrument for QOL measure Questionnaire (SF-36) evaluated 205 HF patients and found significant correlation in all instrument domains (mental, physical function, role- physical, bodily pain, general health, vitality, social function, role-emotional, mental health). This association could be explained by the fact that the 6MWT reflects most of the daily activity efforts[37]. In contrast to the 6MWT (submaximal), peak oxygen consumption test do not seem to be related to QOL scores when it is evaluated by the SF-36[38].

Conclusion

In conclusion, this investigation suggests that the distance in 6MWT is related to the QOL scores assessed by the MLHF instrument in a sample of Brazilian patients with HF showing the 6MWT as a safe and inexpensive tool to measure functional status in HF.

One limitation of this study was the reduced size of the sample. Other studies involving differences among etiologies, race, and sex are necessary to increase the knowledge in Brazilian HF patients.

Resumo

Teste de caminhada de seis minutes e qualidade de vida na insuficiência cardíaca
Um estudo correlativo com uma amostra brasileira

Fundamentação. Qualidade-de-vida e capacidade funcional na insuficiência cardíaca estão, atualmente, entre os tópicos mais investigados na comunidade científica. As auto-percepções e a capacidade de exercício dos pacientes podem ajudar as profissionais de saúde com o prognóstico e as decisões no tratamento da insuficiência cardíaca. Especificamente no Brasil, a pesquisa em qualidade-de-vida ainda precisa focar nas diferenças nos aspectos multifatoriais da insuficiência cardíaca. O objetivo deste estudo foi investigar a correlação entre qualidade-de-vida e capacidade funcional em uma amostra brasileira de pacientes com insuficiência cardíaca.

Métodos. Foram incluídos no estudo trinta pacientes masculinos com insuficiência cardíaca. A qualidade-de-vida foi avaliada pela versão brasileira do Questionário Minnesota Living With Heart Failure e a capacidade funcional pelo teste de caminhada de seis minutos. Foram avaliadas diferenças em qualidade-de-vida entre as classes funcionais pela análise de variância, e a associação entre as variáveis foi avaliada pelo coeficiente de Pearson.

Resultados. A qualidade-de-vida diminuiu significativamente de acordo com classe funcional (classe funcional I=20±11, classe II=35,9±18 e classe III=58,3±24) e correlacionou-se significativamente com a distância (r=0,62, p=0,004).

Conclusões. Distâncias mais longas obtidas no Teste de caminhada de seis minutos podem ser interpretadas como uma qualidade-de-vida melhor em pacientes de parada cardíaca brasileiros.

References

1. Zipes DP, Libby P, Bonow RO, Braunwald E. Tratado de doenças cardiovasculares. São Paulo: Roca, 2003.
2. Araujo DV, Tavares LR, Verissimo R, Ferraz MB, Mesquita ET. [Cost of heart failure in the Unified Health System]. Arq Bras Cardiol 2005;84:422-7.
3. Muntwyler J, Abetel G, Gruner C, Follath F. One-year mortality among unselected outpatients with heart failure. Eur Heart J 2002;23:1861-6.
4. Remme WJ, Swedberg K. Guidelines for the diagnosis and treatment of chronic heart failure. Eur Heart J 2001;22:1527-60.
5. Lee DT, Yu DS, Woo J, Thompson DR. Health-related quality of life in patients with congestive heart failure. Eur J Heart Fail 2005;7:419-22.
6. Guyatt GH, Sullivan MJ, Thompson PJ, et al. The 6-minute walk: a new measure of exercise capacity in patients with chronic heart failure. Can Med Assoc J 1985;132:919-23.
7. Sullivan MJ, Hawthorne MH. Exercise intolerance in patients with chronic heart failure. Prog Cardiovasc Dis 1995;38:1-22.
8. Arslan S, Erol MK, Gundogdu F, et al. Prognostic value of 6-minute walk test in stable outpatients with heart failure. Tex Heart Inst J 2007;34:166-9.
9. Curtis JP, Rathore SS, Wang Y, Krumholz HM. The association of 6-minute walk performance and outcomes in stable outpatients with heart failure. J Card Fail 2004;10:9-14.
10. Rector TS, Francis GS, Cohn JN. Patient's self-assessment of their congestive heart failure. Part 1: content, reliability and validity of a new measure, The Minnesota Living with Heart Failure Questionnaire. Heart Failure 1987;3:192-196.
11. Carrara D. Avaliação prospectiva da qualidade de vida em pacientes com miocardiopatia dilatada submetidos a ventriculectomia parcial esquerda. São Paulo: Universidade de São Paulo, 2001.
12. Saccomann IC, Cintra FA, Gallani MC. Psychometric properties of the Minnesota Living with Heart Failure—Brazilian version—in the elderly. Qual Life Res 2007;16:997-1005.
13. Association AH. Understanding Heart Failure. Dallas, 2007.
14. Albanesi Filho FM. [What is the current scenario for heart failure in Brazil?]. Arq Bras Cardiol 2005;85:155-6.
15. Araujo DV, Tavares LR, Veríssimo R, Ferraz MB, Mesquita ET. Custo da insuficiência cardíaca no Sistema Único de Saúde. Arq Bras Cardiol 2005;84:422-427.
16. Hunt SA, Abraham WT, Chin MH, et al. ACC/AHA 2005 Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2001 Guidelines for the Evaluation and Management of Heart Failure): developed in collaboration with the American College of Chest Physicians and the International Society for Heart and Lung Transplantation: endorsed by the Heart Rhythm Society. Circulation 2005;112:e154-235.
17. Hunt SA, Baker DW, Chin MH, et al. ACC/AHA Guidelines for the Evaluation and Management of Chronic Heart Failure in the Adult: Executive Summary A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1995 Guidelines for the Evaluation and Management of Heart Failure): Developed in Collaboration With the International Society for Heart and Lung Transplantation; Endorsed by the Heart Failure Society of America. Circulation 2001;104:2996-3007.
18. Spertus J, Peterson E, Conard MW, et al. Monitoring clinical changes in patients with heart failure: a comparison of methods. Am Heart J 2005;150:707-15.
19. Detmar SB, Muller MJ, Schornagel JH, Wever LD, Aaronson NK. Health-related quality-of-life assessments and patient-physician communication: a randomized controlled trial. Jama 2002;288:3027-34.
20. Fihn SD, McDonell MB, Diehr P, et al. Effects of sustained audit/feedback on self-reported health status of primary care patients. Am J Med 2004;116:241-8.
21. Morcillo C, Aguado O, Delas J, Rosell F. [Utility of the Minnesota Living With Heart Failure Questionnaire for assessing quality of life in heart failure patients]. Rev Esp Cardiol 2007;60:1093-6.
22. Parajon T, Lupon J, Gonzalez B, et al. [Use of the Minnesota Living With Heart Failure Quality of Life Questionnaire in Spain]. Rev Esp Cardiol 2004;57:155-60.
23. Rector TS. A conceptual model of quality of life in relation to heart failure. J Card Fail 2005;11:173-6.
24. Rector TS, Kubo SH, Cohn JN. Validity of the Minnesota Living with Heart Failure questionnaire as a measure of therapeutic response to enalapril or placebo. Am J Cardiol 1993;71:1106-7.
25. Rector TS, Tschumperlin LK, Kubo SH, et al. Use of the Living With Heart Failure questionnaire to ascertain patients' perspectives on improvement in quality of life versus risk of drug-induced death. J Card Fail 1995;1:201-6.
26. Bennet SJ, Oldridge NB, Eckert GJ, et al. Discriminant properties of commonly used quality of life measures in heart failure. Qual Life Res 2002;11:349-59.
27. Calvert MJ, Freemantle N, Cleland JG. The impact of chronic heart failure on health-related quality of life data acquired in the baseline phase of the CARE-HF study. Eur J Heart Fail 2005;7:243-51.
28. Heo S, Moser DK, Riegel B, Hall LA, Christman N. Testing the psychometric properties of the Minnesota Living with Heart Failure questionnaire. Nurs Res 2005;54:265-72.
29. Riegel B, Moser DK, Glaser D, et al. The Minnesota Living With Heart Failure Questionnaire: sensitivity to differences and responsiveness to intervention intensity in a clinical population. Nurs Res 2002;51:209-18.
30. Scattolin FAdA, Diogo MJDE, Colombo RCR. Correlação entre instrumentos de qualidade de vida relacionada à saúde e independência funcional em idosos com insuficiência cardíaca. Cadernos de Saúde Pública 2007;23:2705-2715.
31. Issa VS, Guimaraes GV, Rezende MV, et al. Effects of bisoprolol on cardiac function and exercise in patients with heart failure. Arq Bras Cardiol 2007;88:340-5.
32. Rostagno C, Galanti G, Romano M, Chiostri G, Gensini GF. Prognostic value of 6-minute walk corridor testing in women with mild to moderate heart failure. Ital Heart J 2002;3:109-13.
33. Zugck C, Kruger C, Durr S, et al. Is the 6-minute walk test a reliable substitute for peak oxygen uptake in patients with dilated cardiomyopathy? Eur Heart J 2000;21:540-9.
34. Davies SW, Jordan SL, Lipkin DP. Use of limb movement sensors as indicators of the level of everyday physical activity in chronic congestive heart failure. Am J Cardiol 1992;69:1581-6.
35. Houghton AR, Harrison M, Cowley AJ, Hampton JR. Assessing exercise capacity, quality of life and haemodynamics in heart failure: do the tests tell us the same thing? Eur J Heart Fail 2002;4:289-95.
36. Garratt A, Schmidt L, Mackintosh A, Fitzpatrick R. Quality of life measurement: bibliographic study of patient assessed health outcome measures. Bmj 2002;324:1417.
37. Juenger J, Schellberg D, Kraemer S, et al. Health related quality of life in patients with congestive heart failure: comparison with other chronic diseases and relation to functional variables. Heart 2002;87:235-41.
38. Steptoe A, Mohabir A, Mahon NG, McKenna WJ. Health related quality of life and psychological wellbeing in patients with dilated cardiomyopathy. Heart 2000;83:645-50.