Quality of life in patients with chronic respiratory disease: the Spanish version of the Chronic Respiratory Questionnaire (CRQ)

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Quality of life in patients with chronic respiratory disease: the Spanish version of the Chronic Respiratory Questionnaire (CRQ). R. Güell, P. Casan, M. Sangenís, F. Morante, J. Belda, G.H. Guyatt. ©ERS Journals Ltd 1998.

ABSTRACT: The aim of this study was to translate the Chronic Respiratory Questionnaire (CRQ) into Spanish and to test its measurement properties.

The study was performed in 60 patients with chronic obstructive pulmonary disease (forced expiratory volume in one second (FEV1) mean±SD 35±14% of reference value). A rigorous process of forward and back translation and review produced an easily comprehensible questionnaire, which was administered together with measures of pulmonary function and exercise capacity. The patients were randomly allocated to one of two groups: 30 received respiratory rehabilitation and the other 30 received standard community care only.

Weak to moderate statistically significant correlations (0.2–0.38) were found between the domains of the CRQ and pulmonary function and exercise measures. For the three CRQ domains that measure differences between patients at a point in time, Crohnbach's alpha and intraclass correlation coefficients were: fatigue 0.80 and 0.80; emotional function 0.86 and 0.68; and mastery domains 0.84 and 0.67, respectively. Scores remained stable in patients who were deemed clinically stable, and showed large statistically significant improvement (p<0.0001) in patients in the rehabilitation programme. Only low correlations were found between the changes in CRQ and the changes in pulmonary function and exercise capacity. The index of responsiveness was 0.92 for fatigue, and 0.91 for dyspnoea, emotional function and mastery.

In conclusion, the Spanish translation of the Chronic Respiratory Questionnaire is likely to be useful for measuring differences between patients, and particularly for measuring the effects of intervention on quality of life in chronic respiratory disease.

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In recent years, the concept of "health-related quality of life" has gained importance in the assessment of healthcare interventions. Health-related quality of life allows assessment of multiple domains in the experience of chronic illness [1, 2]. Different questionnaires have been developed, some with a general application [3–5] and others focusing on specific illnesses [6, 7], but almost all have been produced originally in English. In order to use these questionnaires in other cultures, they must be translated and adapted to the social and cultural circumstances in which they are used, or new material must be developed. A variety of recommendations have been published in recent years in relation to the translation, adaptation and validation of questionnaires in different languages and cultures [8–11].

The Spanish language is spoken by more than 300 million people throughout the world. It is the main language in Spain and most of South America, and an important second language in the USA. Three generic

questionnaires have been translated and validated in Spanish so far: the Nottingham Health Profile (NHP) [12], the Sickness Impact Profile (SIP) [13], and the Short Form (SF)-36 [14], the applicability of which has been demonstrated in numerous studies. Some of these questionnaires have also been translated and adapted to other languages spoken in Spain, such as Catalan [15]. With respect to targeted or specific instruments validated in Spanish, only one questionnaire, the St George's Respiratory Questionnaire (SGRQ) [16], has been translated into Spanish.

The "Chronic Respiratory Questionnaire" (CRQ) [6, 17] was developed for application in patients with chronic obstructive pulmonary disease (COPD) and designed to evaluate the impact of interventions, including respiratory rehabilitation. This instrument, when used in English, has proved useful in a variety of studies [18– 23]. In res-ponse to the need for a Spanish language specific health-related quality-of-life measure for assessing interventions in COPD, we translated the CRQ and assessed the measurement properties of the new questionnaire.

Materials and methods

The Chronic Respiratory Questionnaire

The CRQ [6, 17] includes 20 items divided into four domains: dyspnoea (five items); fatigue (four items); emotional function (seven items); and mastery, a domain which explores how patients cope with their chronic illness (four items). In the dyspnoea domain, items are "individualized": patients are asked to choose the five day-to-day activities that are most important to them and in which they experience exertional dyspnoea, and also to specify the degree of dyspnoea in these items. To aid in their selection, patients are offered a list of 26 activities. The structure of the other domains is conventional, each patient being asked identical questions.

Respondents are asked to grade their function in each item using a seven-point scale. The total score for each domain is divided by the number of items, yielding a potential score of one to seven, with higher numbers representing better function. The questionnaire has been validated [6, 24] and proved useful in assessing a variety of medical interventions in COPD, including pharmacological [20–22] and rehabilitational [18, 19, 23] interventions.

Spanish translation of the CRQ

The first translation from English to Spanish was a collaborative effort by a group of Spanish chest physicians with varying fluency in English and a professional translator whose first language is English. A Spanish physician fully fluent in English conducted the independent back-translation. The complete panel, aided by consultation with the investigator who led the original development of the CRQ (GHG), then reviewed the original forward- and the back-translation, and modified the initial translation to create a definitive Spanish questionnaire, which was subsequently tested. To ensure adequate comprehension, the definitive CRQ was pretested in five COPD patients not otherwise involved in this study.

Patient population

The translated questionnaire was administered to a total of 65 male out-patients from the Pneumology Department of a General Hospital in Barcelona, Spain. The inclusion criteria were: age ≤ 75 yrs; clinical diagnosis of COPD in stable condition (defined as at least 1 month since the most recent hospitalization); forced expiratory volume in one second (FEV_1) $\leq 50\%$ of predicted value; arterial oxygen tension (Pa,O_2) ≥ 8.0 kPa (60 mmHg) and arterial carbon dioxide tension (Pa,CO_2) ≤ 7 kPa (50 mmHg); and free of associated illnesses.

Of the 65 patients, five participated only in the comprehension test in the questionnaire. The remaining 60 patients were randomly allocated to one of two groups of 30: half received respiratory rehabilitation and the other half received standard community care only.

Testing protocol

In addition to the CRQ, which was administered according to published criteria by an interviewer [6, 17], patients underwent a number of other tests. These included: spirometry (forced vital capacity (FVC) and FEV_1); static pulmonary volumes using a dilution technique with helium (functional residual capacity (FRC), residual volume (RV), total lung capacity (TLC)); transfer factor of the lungs for carbon monoxide (T_L,CO), and carbon monoxide transfer coefficient (K_CO); arterial gas values at rest (pH, Pa,O_2, Pa,CO_2); maximum static respiratory pressures (maximum inspiratory pressure (PI,max) and maximum expiratory pressure (PE,max)); and maximum voluntary ventilation (MVV).

All of the patients also carried out two exercise tests: the 6 min walking test (6MWT) following the method described by McGAVIN et al. [25] and modified by BUTLAND et al. [26], including measurement of oxygen saturation at the completion of the test; and a test of increasing effort limited by symptoms on the cycle ergometer (100 kilopondimeters (kpm)·min^{-1}) using the method described by JONES and CAMPBELL [27], with continuous monitoring of oxygen output ($V'O_2$), production of carbon dioxide ($V'CO_2$), cardiac frequency (fC); minute ventilation ($V'E$); tidal volume (VT); respiratory frequency (fR), arterial oxyhaemoglobin saturation (Sa,O_2), and the patients' symptoms (thoracic discomfort, dyspnoea and leg pain) evaluated according to the scale proposed by BORG [28].

Sixty patients, judged to be clinically stable and not undergoing any changes in treatment, completed the CRQ twice with an interval of 3 months. Of these patients, 30 were randomly selected for participation in a programme of respiratory rehabilitation consisting of 3 months of conventional physiotherapy in three weekly sessions, and 3 months of muscular training with a cycle ergometer in five sessions of 30 min each week. The CRQ was completed at baseline, and at 3 and 6 months. In this study, only the results of the first 3 months have been analysed.

Approach to instrument testing

The goals of measuring health-related quality of life include differentiating between people who have a better or worse quality of life (a discriminative instrument), and measuring the degree to which the quality of life has changed over time (an evaluative instrument).

A satisfactory discriminative instrument will have a high ratio of signal (variability between patients) to noise (variability within patients) quantified by reliability. It will also be valid in that it will demonstrate appropriate strength of correlation with related measures. The validity of a discriminative instrument may be further strengthened by a demonstration of a high degree of internal consistency within domains that are designed to measure a single aspect of health-related quality of life. Because the dyspnoea domain of the CRQ uses individualized items, it is not appropriate for discriminating between COPD patients according to their underlying quality of life.

A satisfactory evaluative instrument will have a high ratio of signal (variability over time due to true change) to noise (variability within patients unrelated to true change). The smaller the ratio of the within-person standard deviation in stable subjects to the mean, the greater the responsiveness. A satisfactory evaluative instrument will also be valid in that it will demonstrate appropriate strength of correlation between changes in the questionnaire being tested and changes in related measures.

Statistical analysis

The description of the variables under study was performed by using the average value and its standard deviation, accompanied by maximum and minimum values of distribution. The Wilcoxon test was used to evaluate the difference between average values, and for the correlation between variables, due to their non-Gaussian distribution, Spearman's rank correlation was used. In the reliability study, Crohnbach's alpha [29] was used to measure the internal consistency of the CRQ, and the intraclass correlation coefficient for the test-retest reliability. The data for Crohnbach's alpha came from all 60 patients studied at baseline. Because reliability is best calculated in patients who have not changed, data for the test-retest reliability came from the 30 patients receiving community care at baseline and for 3 months. A value of 0.7 was considered acceptable both for Crohnbach's alpha and the intraclass correlation coefficient.

The index of responsiveness was measured [30], which relates the minimal important difference (MID) [31] to the variability in stable subjects, as estimated by the between-subject variability of the difference in the score between baseline and three monthly visits. This estimate is represented by the square root of twice the mean square error, $\sqrt{(2 \times MSE)}$. For calculating the required sample size, we used standard formulae setting $\alpha = 0.05$, $\beta = 0.10$, $\Delta = MID$ (0.5), variability (δ) and $\sqrt{(2 \times MSE)}$ of the change from baseline to 3 months. The MID for the CRQ was estimated as a change in score of 0.5 per item. The null hypothesis that change over time was due to the play of chance was tested by paired t-tests. All analyses were conducted using a Statistical Package for the Social Sciences (SPSS) software package for personal computers.

Results

The mean±SD age of the 60 patients (excluding the five patients who participated only in the comprehension test) was 65±7 yrs (46–74 yrs). All were males and diagnosed as having COPD with a severe obstructive disease: FVC mean±SD 63±15 (range 33–94) % pred; FEV1 35±14 (range 15–50) % pred; RV 179±45 (range 95–278) % pred; TLC 112± 20 (range 82–190) % pred. However, they were without respiratory insufficiency: Pa,O$_2$ 9.3±1.2 (8.1–10.7) kPa (70±9 (61–80) mmHg); Pa,CO$_2$ 5.9±0.7 (5.1–6.5) kPa (44±5 (38–49) mmHg).

In the process of forward- and back-translation, differences in conceptualization arose. The panel which reviewed the forward- and back-translation addressed these issues and constructed a list of alternative wording of items. The initial agreement on optimal wording was as follows: 100% in the domain of dyspnoea; 75% in the domain of fatigue; 86% in the emotional area; and 50% in the area of mastery of the illness. The panel reviewed the items in which disagreement remained, and ultimately attained a consensus. For example, the panel initially disagreed on the optimal translation for the concept of "energy" which was finally translated by "strength"; "breathing problems" for "respiratory problems"; "illness" for "respiratory problems"; "mopping" for "sweeping".

The five patients who participated only in the pretest found no difficulty in comprehending any item in the questionnaire. Following the suggestion of one patient, "lovemaking" was added to the list of activities provided to help patients assess dyspnoea. The original administration of the questionnaire consistently took less than 30 min, and the follow-up consistently less than 20 min. Both the comprehensibility of the CRQ and the duration of administration were confirmed in later patients in the study.

With respect to the validity of the CRQ as a discriminative measure, the mean and standard deviation of fatigue, emotional function and mastery domains of the questionnaire were 4.47±1.22, 4.79±1.26 and 5.05± 1.49, respectively. Table 1 shows the correlation of the three domains with the pulmonary function and effort variables. A number of the pulmonary function variables, as well as the exercise tests, showed statistically significant weak-to-moderate correlations with the domains of the CRQ. The average values obtained for both groups at baseline and at 3 months are presented in table 2. Crohnbach's alpha for fatigue, emotional function and mastery domains were 0.80, 0.86 and 0.84, respectively. The intraclass correlations over the 3 months were 0.80, 0.68 and 0.67, respectively.

With respect to the properties of the CRQ in their evaluative function, the responsiveness of the questionnaire was very good. In the stable patients, none of the four domains showed statistically significant differences

Table 1. – Spearman's rank correlation between the Chronic Respiratory Questionnaire (CRQ) and pulmonary function and exercise variables (n=60)

	Fatigue	Emotional function	Mastery
FVC	0.12	0.12	0.22*
FEV1	0.26**	0.23*	0.27**
RV	-0.31**	-0.38***	-0.31**
TLC	-0.18	-0.20	-0.14
PI,max	0.01	-0.21*	-0.04
PE,max	0.14	-0.17	0.02
Pa,O$_2$	-0.09	0.26**	-0.07
6MWT	0.23*	0.07	0.21*
Wmax	0.23**	0.08	0.37***
V'O$_2$,max	0.21*	0.05	0.31**
V'E,max	0.17	0.01	0.22*
Borg scale	-0.14	-0.14	0.29**

FVC: forced vital capacity; FEV1: forced expiratory volume in one second; RV: residual volume; TLC: total lung capacity; PI,max: maximum inspiratory pressure; PE,max: maximum expiratory pressure; Pa,O$_2$: arterial oxygen tension; 6MWT: 6 min walking test; Wmax: maximum workload on the cycle ergometer; V'O$_2$,max: maximum oxygen output; V'E,max: maximum ventilation; Borg Scale: Borg's dyspnoea scale. *: p<0.05; **: p<0.01; ***: p<0.001.

Table 2. – Pulmonary function variables (at rest and during exercise) and Chronic Respiratory Questionnaire (CRQ) in two groups of patients in basal conditions and at 3 months

	Control group (n=30)			Rehabilitation group (n=30)		
	Baseline	3 months	p-value[#]	Baseline	3 months	p-value[#]
Pulmonary function						
FVC % pred	64 (15)	66 (16)	0.130	62 (15)	69 (12)	0.021
FEV1 % pred	38 (15)	39 (14)	0.786	31 (12)	33 (12)	0.065
RV % pred	168 (46)	162 (45)	0.336	191 (42)	186 (35)	0.392
TLC % pred	108 (18)	109 (24)	0.629	117 (21)	117 (13)	0.954
Respiratory muscles						
$P_{I,max}$ cmH$_2$O	69 (19)	72 (20)	0.206	81 (23)	79 (22)	0.42
Exercise						
6MWT m	305 (54)	320 (61)	0.118	308 (60)	393 (52)	0.0001
W_{max} % pred	54 (19)	56 (19)	0.260	61 (23)	61 (23)	0.972
CRQ						
Dyspnoea	3.2 (1.0)	3.2 (0.9)	0.860	3.1 (0.9)	4.1 (1.1)	0.00001
Fatigue	4.5 (1.4)	4.5 (1.2)	0.738	4.4 (0.9)	5.2 (0.9)	0.0001
Emotional function	5.1 (1.2)	5.2 (1.2)	0.492	4.5 (1.3)	5.3 (1.3)	0.0001
Mastery	5.2 (1.4)	5.3 (1.3)	0.327	4.9 (1.6)	5.8 (1.1)	0.00001

Values are presented as mean, and SD in parenthesis. [#]: Wilcoxon test. % pred: percentage of predicted value. For further definitions see legend to table 1.

between baseline and follow-up 3 months later. In contrast, the 30 patients who followed a programme of 3 months of respiratory rehabilitation showed a significant improvement in the four domains of the questionnaire (p<0.0001 for each) (table 2). In table 2, we present the magnitude of change in the CRQ in the patients undergoing the rehabilitation programme. We found no changes in pulmonary function, except for FVC % pred; but there were some changes in the effort variables. The CRQ proved as responsive or more responsive than the traditional measures (ventilatory and exercise capacity variables). The magnitude of the change in the quality-of-life questionnaire represents a moderate treatment effect in agreement with previous work [19, 23]. The index of responsiveness was 0.91 for dyspnoea, emotional function and mastery and 0.92 for fatigue.

The correlations between changes in CRQ and pulmonary function and effort variables were examined. The only statistically significant correlations found were between change in TLC (L) and fatigue (r=0.37; p=0.043) and between change in W_{max} (% pred) and mastery (r= 0.39; p=0.035).

Discussion

The results of this study suggest a satisfactory adaptation of the CRQ to our population. With respect to the ability of the questionnaire to obtain the same results in independent repeated trials under the same conditions in COPD patients, the reliability was high and the internal consistency was strong. The three domains that are appropriate to use for the discriminative function of the questionnaire showed weak but statistically significant correlations with measures of respiratory function and exercise. The CRQ proved very responsive with respect to measuring change over time, the function for which it was developed, showing a very strong response to a rehabilitation intervention while demonstrating no change in the control group.

A good translation is indispensable to obtain a quality-of-life questionnaire that works well in a culture different from that for which the instrument was originally designed. It is important to remember that, as happens in other languages, Spanish as used in Spain can be slightly different from that used in other Spanish-speaking countries. Consequently, each questionnaire should be adapted to the local culture. The rigorous process of forward-translation/back-translation that we conducted increased the likelihood that our questionnaire would work well in the new setting. The comprehension study, carried out on a group of patients not included in other parts of the study, confirmed (as was later observed in the remaining patients) that there were no difficulties in the understanding of words or concepts. Finally, our empirical testing of the measurement properties of the CRQ in Spanish suggests that its function is similar to that of the original English version.

WIJKSTRA et al. [24] recently translated the CRQ into Dutch, and evaluated some of the measurement properties of their translation. Their results are very similar to those of the present study. In both studies the correlation coefficients were 0.2–0.45, which is very close to the original study [6]. Furthermore, in the paper by WIJKSTRA et al. [24], the internal consistency in the areas of fatigue, emotional function and mastery was virtually identical to those of the present study. These findings suggest that the CRQ can be adapted to a number of European cultures. However, looking at the discriminative use of the CRQ, we anticipated a higher correlation between pulmonary function (at rest and during exercise) and dyspnoea and fatigue areas, but found a higher correlation between pulmonary function and emotional function and mastery areas. This raises questions about the usefulness or validity of separation of physical and emotional function in the Spanish version of CRQ. We also found lower correlation of change in CRQ domains with change in other measures than we had anticipated. These issues will require further exploration in subsequent studies.

The CRQ examines the functional and psychological aspects of chronic respiratory disease. COPD patients have high levels of anxiety and depression that have an important influence on their behaviour and on the way

they live with the illness [32–34]. The area of emotional function of the CRQ permits the examination of anxiety, frustration and irritability [6] that are closely linked with the intensity of the dyspnoea. The Dutch translation of WIJKSTRA *et al*. [24] showed that the fatigue, emotional function and mastery domains of the CRQ demonstrated moderate associations with areas of anxiety, depression and somatization from a Symptoms Check List questionnaire (SCL-90) [35].

Perhaps the most important use of the CRQ, the one for which it was originally designed, is evaluating response to treatment. To detect change an instrument must show only small changes in stable patients, and improved scores in patients who respond to treatment. The CRQ performed very well in this regard. The lack of change in stable subjects contrasts markedly with the large improvements seen in patients undergoing respiratory rehabilitation. These improvements were not as large as those found in the original study [17], perhaps because the baseline condition of our patients was worse. Nevertheless our results show a minimal important difference in accordance with previous studies [30, 31]. The index of responsiveness makes it possible to establish the minimum number of patients needed to detect the MID in a statistically meaningful way. Previously published calculations [30] and the values observed for the index of responsiveness in the present study indicate the minimum number of patients to be between 19 and 29, below the number of patients actually included in our study groups.

In conclusion, we have found that our Spanish translation of the Chronic Respiratory Questionnaire is highly acceptable to patients, easily and efficiently administered, and functions well in the study of the quality-of-life of chronic obstructive pulmonary disease patients in our environment [36]. The only concern is the low level of correlation between change in the Chronic Respiratory Questionnaire and change in other measures. This raises questions about the validity of the translation for measuring change, and further study will be required before we can be confident that we are measuring changes in health-related quality of life. At the same time, the process followed in the translation and testing of the Chronic Respiratory Questionnaire has made it possible to obtain an instrument which, in other regards, functions similarly to the original English language version.

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