ORIGINAL ARTICLES

Quality of Life With Chronic Obstructive Pulmonary Disease: the Influence of Level of Patient Care

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Objective: The aim of the study was to determine the factors related to the health-related quality of life (HRQL) of patients with stable chronic obstructive pulmonary disease (COPD) and to assess the degree of influence of level of patient care (primary or specialized).

Material and method: An observational descriptive, cross-sectional, multicenter study was carried out. The study sample was a randomized selection taken from a stratified sample of patients treated by primary care physicians and pneumologists from each Spanish region. Only those patients whose level of health care was indicated and whose diagnosis of COPD was confirmed by spirometry were enrolled in the study.

Results: Five hundred sixty patients were assessed, 100 from primary health care and 460 from pneumology practices. No significant differences between the 2 levels of care were found in the scores on the HRQL questionnaire (Spanish version of the St George's Respiratory Questionnaire). There was a weak correlation between patients' perception of health and lung function parameters. Factors related to HRQL in the multivariate analysis were dyspnea, the presence of COPD exacerbations in the previous year, consequent visits to the emergency department, age, and degree of airflow restriction, but not level of patient care.

Conclusions: Stable COPD patients' HRQL is not related to their level of care, be it primary or specialized, but is related to other factors such as dyspnea, presence of exacerbations or consequent visits to the emergency department, age, and degree of airflow restriction.

Key words: *COPD. Quality of life. Level of care. Primary health care. Pneumology.*

Calidad de vida en la enfermedad pulmonar obstructiva crónica. Influencia del nivel de asistencia de los pacientes

Objetivo: El estudio se realizó con el propósito de determinar los factores que se relacionan con la calidad de vida relacionada con la salud (CVRS) de los pacientes con enfermedad pulmonar obstructiva crónica (EPOC) estable y evaluar si existen diferencias según el nivel de asistencia de los pacientes (neumología o atención primaria).

Material y método: Se trata de un estudio observacional, descriptivo, transversal y multicéntrico. La selección de la muestra se realizó mediante un muestreo aleatorizado estratificado por población regional entre médicos de familia y neumólogos de todo el territorio nacional. Para este trabajo se seleccionó a aquellos en los que se registró el nivel de asistencia y en los que el diagnóstico de EPOC se confirmó por espirometría.

Resultados: Se evaluó a 560 pacientes, 100 en atención primaria y 460 en neumología. No se detectaron diferencias significativas en las puntuaciones obtenidas en el cuestionario de calidad de vida (versión española del Cuestionario Respiratorio St. George) en ambos niveles asistenciales. La correlación entre el estado de salud percibido por los pacientes y los parámetros de función pulmonar fue débil. Los factores que se relacionaron con la CVRS en el análisis multivariante fueron la disnea, la existencia de reagudizaciones de la EPOC en el año previo, las visitas a urgencias por este motivo, la edad y el grado de limitación al flujo respiratorio, pero no el ámbito de asistencia de los pacientes.

Conclusiones: La CVRS de los pacientes con EPOC estable no se relaciona con el nivel de atención, ya sea asistencia primaria o neumología, pero sí con otros factores como la disnea, la existencia de agudizaciones o visitas a urgencias por este motivo, la edad y el grado de obstrucción al flujo respiratorio.

Palabras clave: *EPOC. Calidad de vida. Nivel de asistencia. Atención primaria. Neumología.*

Introduction

Chronic obstructive pulmonary disease (COPD) is characterized by chronic, poorly reversible airflow obstruction, principally caused by an anomalous

inflammatory response to tobacco smoke.[1] As the disease develops, COPD patients experience a corresponding reduction in health-related quality of life (HRQL) which includes reduced ability to work and to participate in physical and social activities.[2] However, the evaluation of COPD severity alone, defined as the degree of reduction in forced expiratory volume in 1 second (FEV_1), does not provide enough information to assess patients' self-perceived health status. This finding could be attributable to the fact that HRQL is the result of the interaction of many physical, psychological, and social factors unique to each individual.[3]

In recent years specific questionnaires have been developed to measure HRQL in COPD patients. The St George's Respiratory Questionnaire, designed by Jones et al[4] in 1992 for patients with obstructive airway diseases has been widely used. The questionnaire was later adapted for use in Spain by Ferrer et al.[5] Studies have found strong correlations between total scores on this questionnaire and several clinical and functional variables,[4] but the influence of the level of patient care on a patient's HRQL has not been assessed. While it must be considered that more severely affected patients would be attended by specialists it is also true that many patients demand specialist attention for their health problems and the quality of life of COPD patients may be better if they have been evaluated by a pneumologist than if they are under the care of a primary care physician.

The objective of this study was to determine the factors related to quality of life of stable COPD patients and to assess, in particular, the influence of level of care.

Material and Methods

Study Design and Population

The study formed part of the IDENTEPOC study,[6,7] an observational, descriptive, cross-sectional, multicenter project, the main objective of which was to assess the prevalence and characteristics of patients diagnosed with COPD in Spain at 2 levels of patient care: primary and specialist.

Patient enrollment and sample size corresponded to those undertaken for the IDENTEPOC study. Although the details have been described before, we will summarize them briefly.[6,7] Sample size was estimated according to the expected percentage of COPD patients attended at primary health care centers and pneumology practices (10% and 30% respectively). Patients were randomly selected by primary care physicians and pneumologists from all over Spain. The doctors involved were also randomly selected from the data bases of scientific societies related to primary health care and respiratory medicine combined with data bases from the pharmaceutical sector to avoid selection bias. Data was collected between January 1 and June 30, 2000.

The IDENTEPOC project enrolled 898 patients but in the present study we only included patients who had indicated their level of patient care and whose clinical diagnosis of presumed COPD had been confirmed by spirometry. Finally, 560 patients were included in the analysis. The sample size was large enough to guarantee the objectives proposed in this study.

Patients gave their informed consent to participate in the study.

Patient Assessment

Demographic, social, and occupational data, personal history of the disease, clinical characteristics, and treatments undergone were collected. All patients were given the St George's quality-of-life questionnaire, spirometry was performed, and basal arterial blood gases were analyzed.

Dyspnea was graded from 0 (absence of dyspnea except during intense exercise) to 4 (dyspnea at rest) according to an adapted version of the scale proposed by the Medical Research Council.[8] HRQL was assessed using the Spanish version of the St George's Respiratory Questionnaire, with 76 items in 3 subscales: symptoms, activities (circumstances that cause or are limited by dyspnea) and impacts (social functioning and psychological disorders caused by the respiratory disease). Total scores and scores of each subscale ranged from 0 to 100, higher scores indicating worse quality of life.[4,5]

Spirometry was performed according to the international standard.[9] COPD diagnosis was considered correct when spirometry revealed an airflow obstruction with a ratio of FEV_1 to forced vital capacity (FVC) (FEV_1/FVC) of less than 70% and an FEV_1 less than 80% of predicted. Basal arterial blood gases were analyzed with the patient at rest and breathing ambient air. Samples were processed in a gas analyzer according to SEPAR recommendations.[10]

Statistical Analysis

Data analysis was performed using the SPSS statistical package, version 9.0 for Windows. Quantitative variables were expressed as means (SD) and qualitative variables as percentages. The χ^2 test was used to analyze the relation between 2 qualitative variables. For nonnormally distributed data or when group size was small the Kruskal-Wallis test was used to compare more than 2 groups and the Mann-Whitney U test to compare 2 groups. Pearson correlation coefficients were used to assess the correlation between scores obtained on the quality-of-life questionnaire and clinical and functional parameters. Finally, multiple linear regression analysis was performed using backward selection of variables based on their conditional elimination. The dependent variable was quality of life (the total score of the Spanish version of the St George's Respiratory Questionnaire) and the independent variables were the following: level of health care, age, sex, body mass index (BMI), comorbidity, cough, expectoration, dyspnea, degree of dyspnea, FEV_1, FVC, PaO_2, $PaCO_2$, medical visits caused by COPD, exacerbations, visits to emergency departments caused by exacerbations, and hospital and intensive care admissions caused by exacerbations over the previous year. A *P* value less than .05 was considered significant.

Results

Five hundred sixty COPD patients were studied, 100 from primary health care and 460 from pneumology practices. Table 1 shows the clinical characteristics of the patients. Significant differences were found in the

TABLE 1
Patients' Clinical Characteristics*

	Level of Health Care	
	Primary	**Specialist**
No. of patients	100	460
Age, years[†]	68.3(10.3)	67.8(8.7)
	range, 42-97	range, 35-96
Sex		
Men	91 (91%)	441 (95.9%)
Women	9 (9%)	19 (4.1%)
BMI, kg/m[2†]	26.4(4.7)	27.5(4.6)
	Range, 18.0-44.7	16.0-43.4[$]
Smoker		
No	18 (18%)	28 (6.1%)
Yes	20 (20%)	88 (19.1%)
Ex smoker	62 (62%)	344 (74.8%)
Place of residence		
Rural (<15 000)	23 (23%)	196 (42.6%)
Urban (>15 000)	77 (77%)	264 (57.4%)
Occupational situation		
Active	12 (12%)	57 (12.4%)
Sick leave due to COPD	15 (15%)	62 (13.5%)
Sick leave due to other disease	1 (1%)	13 (2.8%)
Retired	67 (67%)	320 (69.6%)
Other	5 (5%)	8 (1.7%)
Level of studies		
None	12 (12%)	113 (24.6%)
Primary	78 (78%)	286 (62.2%)
Secondary	7 (7%)	49 (10.7%)
University	2 (2%)	12 (2.6%)
Unknown	1 (1%)	0
Dyspnea		
Grade 1	26 (26%)	118 (25.6%)
Grade 2	33 (33%)	185 (40.2%)
Grade 3	25 (25%)	124 (26.9%)
Grade 4	8 (8%)	6 (1.3%)
Unknown	8 (8%)	27 (5.9%)
Comorbidity	73 (73%)[$]	269 (58.5%)
Cough	97 (97%)	452 (98.3%)
Expectoration	96 (96%)	449 (97.6%)
COPD visits[‡]	4 (6)	2 (3)
Emergency visits[‡]	1 (2)	0 (1)
COPD hospitalizations[‡]	0 (1)	0 (1)
ICU admissions[‡]	0 (0)	0 (0)

*COPD indicates chronic obstructive pulmonary disease; BMI, body mass index; ICU, intensive care unit.
[†]Data expressed as means (SD) and ranges.
[‡]Data expressed as medians (interquartile range).
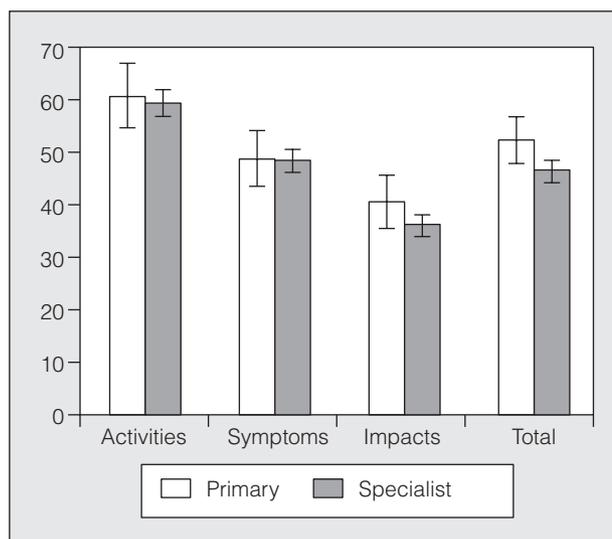[$]Differences significant at $P<.05$.

Figure 1. Mean scores of the St George's Respiratory Questionnaire by level of patient care. The error bars represent 2 standard errors of the mean.

Pharmacological treatment received by the patients did not differ significantly between the levels of care with the exception of ipratropium bromide, which was prescribed more by pneumologists as has been described before.[6] The number of patients receiving more than 3 drugs for COPD was similar for both levels of care. The proportion of patients receiving oxygen therapy, however, was greater for specialist care (27.6% compared with 14%; $P<.05$).

Figure 1 shows the mean total scores and the mean scores on each of the subscales (symptoms, activities, and impacts) obtained from the St George's Respiratory Questionnaire. No significant differences were found between the levels of patient care for these scores. The correlation between quality of life and FEV_1, although weak, was higher in patients attended by primary care physicians ($r^2=0.11$) than in those attended by pneumologists ($r^2=0.06$) (Figure 2). The relation between HRQL and the degree of dyspnea was more consistent (Table 3).

Level of patient care was not among the factors related to HRQL and so the multiple linear regression model only included the influence of dyspnea, exacerbations of COPD in the previous year, emergency

proportion of women and of nonsmokers attended at the 2 levels of health care, more being cared for by primary care physicians than specialists. Primary care physicians also saw a significantly higher proportion of patients with higher degrees of dyspnea. Differences were also found for BMI, comorbidity, and the number of medical visits provoked by COPD in the previous year.

Regarding severity of disease, mean FEV_1 was greater in patients seen in primary care centers than in specialist care (48.7% [15.5%] compared with 43.4% [4.8%]; $P<.05$). Significant differences were also found for the mean FVC, which was also greater for patients in primary health care centers (70.5% [16.9%] compared with 65.0% [18.9%]; $P<.05$). Differences were not found, however, for arterial blood gases (Table 2).

TABLE 2
Lung Function Parameters*

	Health Care Center	
	Primary	**Specialist**
PaO_2	63.5(13.1); range, 7-94	63.1(12.1); range, 7-106
$PaCO_2$	41.3(7.9); range, 27-69	43.0(7.2); range, 28-96
$FEV_1\%$	48.6(15.5); range, 25-80	43.5(14.8); range, 15-80[†]
FVC%	70.5(16.9); range, 32-109	65.0(18.9); range, 23-140[†]

*Data are expressed as means (SD) and ranges. $FEV_1\%$ indicates forced expiratory volume in 1 second, expressed as a percentage; FVC%, forced vital capacity expressed as a percentage.
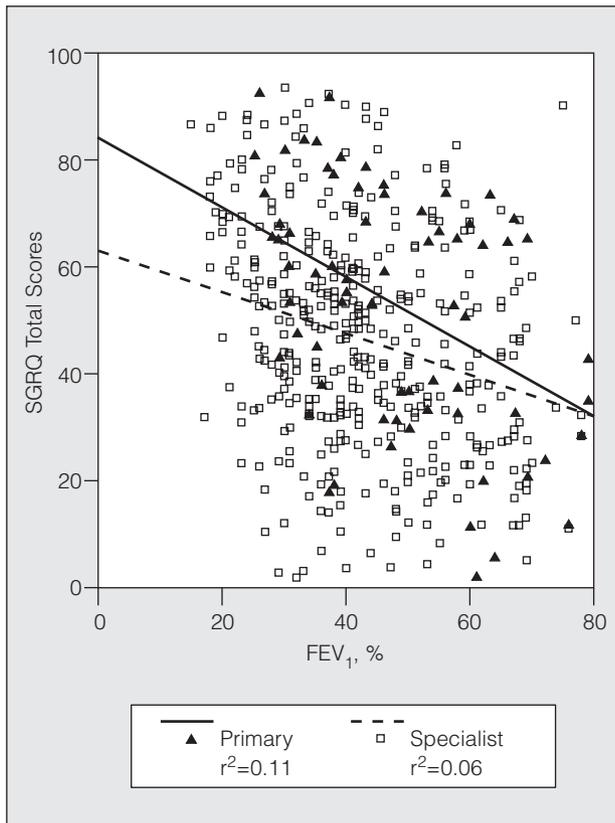[†]Differences were significant at $P<.05$

Figure 2. Correlation between quality of life and pulmonary function in primary and specialist care. FEV_1 indicates forced respiratory volume in 1 second; SGRQ, St George's Respiratory Questionnaire.

TABLE 3
Study of the Correlation (r) Between the St George's Respiratory Questionnaire Scores and Patients' Main Clinical and Lung Function Parameters*

	Symptoms	Activities	Impacts	Total
Age, years				
Primary care	−0.05	0.02	−0.06	−0.03
Specialist care	−0.08	0.04	−0.06	−0.03
Degree of dyspnea				
Primary care	0.23[†]	0.36[†]	0.49[†]	0.47[†]
Specialist care	0.34[†]	0.39[†]	0.40[†]	0.43[†]
No. of exacerbations in the previous year				
Primary care	0.27[†]	0.16[†]	0.27[†]	0.25[†]
Specialist care	0.38[†]	0.28[†]	0.37[†]	0.38[†]
No. of emergency visits in the previous year				
Primary care	0.31[†]	0.16	0.21[†]	0.23[†]
Specialist care	0.39[†]	0.29[†]	0.38[†]	0.38[†]
No. of hospitalizations in the previous year				
Primary care	0.32[†]	0.26[†]	0.40[†]	0.38[†]
Specialist care	0.28[†]	0.20[†]	0.29[†]	0.29[†]
BMI				
Primary care	0.05	0.17	0.08	0.11
Specialist care	0.08	0.08	0.03	0.07
$FEV_1\%$				
Primary care	−0.19	−0.31[†]	−0.36[†]	−0.33[†]
Specialist care	−0.16[†]	−0.24[†]	−0.23[†]	−0.24[†]
PaO_2				
Primary care	−0.18	−0.2	−0.15	−0.19
Specialist care	−0.04	−0.16[†]	−0.12[†]	−0.14

*$FEV_1\%$ indicates forced expiratory volume in 1 second expressed as a percentage; BMI, body mass index.
[†]Differences were significant at $P<.05$.

TABLE 4
Multiple Regression Analysis for Quality of Life ($r^2=0.33$)*

Variable	b	SE of b	β	t	P
Constant	40.3	7.72		5.23	.000
Dyspnea	10.0	1.16	0.40	8.68	.000
Emergency visits	7.2	2.03	0.17	3.54	.001
Exacerbations in previous year	7.9	2.45	0.16	3.24	.001
Age, years	0.25	0.10	−0.11	−2.50	.013
$FEV_1\%$	−0.15	0.06	−0.11	−2.44	.015

*b indicates sample regression coefficient; SE, standard error; $FEV_1\%$, forced expiratory volume in 1 second expressed as a percentage. Variables included in the model that were not significant: level of patient care, cough, expectoration, comorbidity, medical visits, hospitalizations and intensive care admissions in the previous year, sex, body mass index, PaO_2, and $PaCO_2$.

visits caused by exacerbations, age, and finally, to a lesser degree, FEV_1 expressed as a percentage. Other factors such as sex, the presence of associated comorbidity, cough or expectoration, BMI, and gasometric parameters did not reach significance in the model obtained (Table 4).

Table 5 shows the distribution of the St George's Respiratory Questionnaire scores (both subscale and total scores) according to the factors found to affect HRQL by the multiple regression analysis.

Discussion

To our knowledge, this is the first study that describes the HRQL of stable COPD patients at 2 different levels of patient care: primary and specialist. The study shows that the level of care does not significantly influence patients' self-perceived health status. The factors shown to influence HRQL are, in order of importance, dyspnea, presence of exacerbations, emergency visits caused by exacerbations, age, and degree of airflow impairment. These findings are representative of an unselected population attended by primary care physicians and pneumologists. For this reason the findings have not been influenced by clinical trial enrollment criteria as has occurred in studies that used patients from clinical trials as references.

Dyspnea is one of the main determinants of HRQL in COPD patients, as previous studies have found moderate to high correlation between the 2 parameters.[4,11,12] Accordingly, patients with low degrees of dyspnea have fewer restrictions on activities of daily living, and the disease has less impact on their daily life. In clinical practice, then, stratification according to the degree of dyspnea could be more useful than spirometry in determining COPD patients' self-perceived health status.[13] Our study also found a strong

TABLE 5
Distribution of St George's Respiratory Questionnaire Scores in Function of the Parameters Determining Quality of Life*

	Number	Symptoms	Activities	Impacts	Total
Degree of dyspnea					
Grade 1	144	39.2(22.9)	49.5 (25.8)	27.9(20.0)	37.1(19.0)
Grade 2	218	48.0(23.9)	58.0(24.1)	34.0(20.2)	46.4(16.5)
Grade 3	149	57.2(23.1)	74.4(24.4)	49.4(21.8)	59.9(17.7)
Grade 4	14	71.5(17.6)	86.7(25.7)	66.5(21.1)	74.2(15.4)
P		<.001	<.001	<.001	<.001
Emergency visits					
Number	281	39.6(22.4)	53.4(27.1)	30.0(20.7)	38.6(20.8)
≥1	279	56.4(23.3)	65.4(26.7)	43.3(23.3)	52.1(21.8)
P		<.001	<.001	<.001	<.001
Exacerbations in previous year					
Number	112	34.7(20.8)	51.7(26.0)	26.8(20.17)	35.5(19.5)
≥1	456	51.4(24.0)	61.3(27.6)	39.0(23.0)	47.8(22.3)
P		<.001	<.001	<.001	<.001
Age, years					
<65	190	51.1(25.8)	60.2(28.8)	40.3(25.7)	50.5(22.5)
65-69	99	46.6(26.4)	53.5(27.9)	33.9(23.4)	43.9(20.8)
70-74	135	47.9(22.8)	61.3(24.3)	35.0(20.6)	45.4(19.6)
≥75	136	46.1(22.0)	61.3(28.4)	35.8(21.1)	47.3(19.1)
P		.253	.118	.07	.049
FEV$_1$					
60%-80%	102	42.2(24.2)	49.4(28.9)	29.5(21.2)	38.0(20.0)
40%-60%	214	48.7(23.8)	59.5(26.6)	36.3(22.2)	46.8(20.0)
<40%	244	51.4(24.8)	64.3(27.7)	40.8(24.3)	52.0(21.3)
P		.01	<.001	<.001	<.001

*Data are expressed as means (SD). FEV$_1$ indicates forced expiratory volume in 1 second.

correlation between dyspnea and HRQL, independent of the level of patient care, despite the paradoxical finding that a larger number of patients with severe dyspnea were attended at primary health care centers. This strong correlation could have a clinical application: although quality of life questionnaires are increasingly administered in clinical research, systematic administration in daily practice has been questioned, partly because they take a long time to administer. The advantage of assessing dyspnea is that, unlike quality of life questionnaires,[2] very little time is needed to ask the patients what daily life activities cause breathlessness and the information is easily obtained while taking the patient's medical history.[13]

Exacerbations are a frequent setback for COPD patients and are the most common cause of visits to doctors, hospitalizations, and death.[14] Despite this fact there is little evidence of the impact of exacerbations on the state of health of COPD patients. Earlier studies have shown that patients who present more than 3 episodes of exacerbations annually have greater deterioration in quality of life than patients who suffer fewer exacerbations.[15] In our study we also found that exacerbations and emergency visits in the previous year significantly affected the quality of life of COPD patients.

There is inconclusive evidence of the influence of age on the HRQL of COPD patients. Some authors have found no relation between the 2 variables[16] while others have found age to be an independent determining

factor,[17] as we did. The fact that elderly patients often present chronic comorbidity could explain this finding. However, unlike other studies,[17] we did not find that comorbidity had a significant influence on COPD patients' HRQL. These differing results could be related to differences in the impact of each associated disease. In a recent primary health care study, certain conditions such as diabetes mellitus or heart disease were found to have little impact on COPD patients' self-perceived health status while others such as depression or osteoarthrosis had greater impact.[18]

The association between HRQL and the degree of airflow obstruction has been weak or moderate in most earlier studies.[16,17,19-23] In the present study we also found a weak correlation in patients attended by pneumologists and a slightly stronger one for patients attended at primary care centers. The reason for the weakness of the association is that there are patients with poor quality of life despite having mild spirometric impairment and other patients with severe airflow impairment whose daily activities are hardly affected.[3] Self-perceived health status has been shown to correlate better with distance walked in the 6-minute walking test than with FEV$_1$ expressed as a percentage.[4]

The influence of hypoxemia and oxygen therapy on COPD patients' quality of life has been assessed in earlier studies.[24] Although some studies found a significant deterioration in most activities of hypoxic patients and found a relation between the deterioration of neuropsychological functions and self-perceived

health status, no association was found between PaO_2 and quality of life.[25,26] We not only found the correlation between the various dimensions of quality of life and PaO_2 scores to be weak, but also that this parameter was not an independent predictor of self-perceived health status. However, there is disagreement over this question and other studies have found contrary results.[17,27-29]

The lack of relation between level of patient care and HRQL could be attributed to the existence of good coordination between the 2 levels of patient care. This study found few differences between the COPD treatment protocols employed in primary and specialist centers.[6] Another possible factor, not assessed in this study, is that a large proportion of patients attended at primary care centers had been visited at least once by a specialist. Pneumologists play an important role in the control and treatment of COPD patients, particularly the more severe cases, although these same patients may be monitored by a primary care physician and enrolled in the study at that level.

We did not find an association between HRQL and other parameters such as BMI, unlike earlier studies that did find such a relation,[21,30] although in some the correlation was weak and only appeared in some domains of the quality-of-life questionnaire.[30] A relation was found, however, between BMI and COPD mortality, independent of the FEV_1 score, such that for each subgroup of patients with similar airflow impairment, mortality increased as weight decreased.[31,32]

In conclusion, the HRQL of stable COPD patients was unrelated to level of patient care but was associated with other factors such as dyspnea, exacerbations or emergency visits caused by exacerbations in the previous year, age, and FEV_1 expressed as a percentage. Nevertheless these factors cannot completely predict HRQL with all its variability. In the near future, standardization of quality-of-life measurement will allow the most incapacitated patients to be identified independently of their level of patient care.

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