

# Quality of Life in Patients With Chronic Obstructive Pulmonary Disease and Comorbid Anxiety or Depression

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*The authors examined 179 veterans with chronic obstructive pulmonary disease (COPD) to determine the relative contribution of clinical depression and/or anxiety (Beck Depression and Beck Anxiety Inventories) to their quality of life (Chronic Respiratory Questionnaire and Medical Outcomes Survey Short Form). Multiple-regression procedures found that both depression and anxiety were significantly related to negative quality-of-life outcomes (anxiety with both mental and physical health quality-of-life outcomes, and depression primarily with mental health). When comorbid with COPD, mental health symptoms of depression and anxiety are some of the most salient factors associated with quality-of-life outcomes. (Psychosomatics 2006; 47:312–319)*

Mental health conditions, such as depression and anxiety, are present in nearly one-half of all chronic obstructive pulmonary disease (COPD) patients,<sup>1–4</sup> yet the specific impact of these disorders on quality of life remains poorly understood. Because of the intractable nature of COPD, current medical treatments are generally restricted to focusing on minimization of symptoms, maintenance of functional abilities, and, ultimately, on improved health-related quality of life.<sup>5</sup> Despite the frequency of depression and anxiety in chronically ill patients, little attention has been given to the specific role of these conditions in health-related quality of life for patients with COPD.

Of particular importance are the relative contributions of COPD severity, medical comorbidity, depression, and

anxiety on patient functioning and quality of life. Previous research has found a moderate association between COPD and multiple health-related indicators, even in milder forms of the disease.<sup>6,7</sup> Evidence also exists to suggest that comorbid medical conditions may be associated with unique impact above and beyond COPD severity. Impairments in physical functioning, vitality, and general health appear to be related to COPD severity, whereas difficulties in social and emotional functioning appear to be related to comorbid medical conditions.<sup>7</sup>

Two previous studies have focused on the general contributions of mental health conditions and COPD severity to quality of life. Using a large sample of veterans with COPD and controlling for demographic variables, smoking history, and comorbid medical conditions, Felker et al.<sup>8</sup> found that depression added significant variance to both general and disease-specific quality-of-life indicators. Regression models were generated for individual quality-of-life subscales, with full models accounting for 15%–61% of the variance and measures of depression exhibiting the highest adjusted R<sup>2</sup> values. However, Felker et al.<sup>8</sup> did not examine the relative contribution of COPD severity, nor did they investigate the role of anxiety.

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Another study examined the relative contribution of both anxiety and depression to quality of life in COPD. Using a small sample of 43 veteran participants, Kim *et al.*<sup>9</sup> found that anxiety and depression together contributed significantly to the overall variance in functional status, beyond medical burden and COPD severity. Although the relative separate contributions of anxiety and depression were not examined, the results provided evidence that mental health conditions accounted for a significant amount of variance in quality of life. In addition to the small sample, a notable limitation of this study was the lack of inclusion of measures for objective physical functioning and disease-specific quality of life.

To understand physical and mental health-related quality of life in patients with COPD more fully, additional studies are needed to assess the contributions of depression and anxiety. Extensions in methodology are also needed to address past weaknesses in sample size and to extend outcome variables to include measures of objective physical functioning and disease-specific quality of life.

The present study provides the first large-scale examination of the relative contributions of depression and anxiety to quality of life for patients with COPD and comorbid depression and/or anxiety. Pilot investigations<sup>9</sup> found that mental-health symptoms accounted for more variance in quality of life than COPD severity and medical comorbidity. Hence, both depression and anxiety were expected to contribute significantly to decreased quality of life. Furthermore, we hypothesized that anxiety would account for more variance than depression, because of the fear-invoking nature of the breathing distress common to patients with COPD.<sup>10</sup>

## METHOD

This study was conducted with a subsample of 179 patients from a randomized, controlled trial of the use of cognitive-behavioral therapy in persons with COPD and comorbid anxiety and/or depression. All research subjects participated in informed-consent procedures approved by the Baylor College of Medicine Institutional Review Board.

### Participants

Using the Veterans Affairs outpatient and inpatient treatment files, all persons who received care at the Michael E. DeBakey Veterans Affairs Medical Center in the previous year (2002–2003) and had an ICD-9 diagnosis of a chronic breathing disorder were targeted for recruitment

(466: acute bronchitis and bronchitis; 490: bronchitis, not specified as acute or chronic; 491: chronic bronchitis; 492: emphysema; 493: asthma; 494: bronchiectasis; 496: chronic airway obstruction, not elsewhere classified; and 508: respiratory conditions due to other and unspecified external agent);  $N = 9,664$ . Because of the frequent symptom and diagnostic overlap of these conditions, the inclusion of a broad range of diagnostic codes was believed to improve the quality of the sampling pool of patients experiencing chronic breathing disorders. Of this group, 1,573 were contacted and screened by telephone for breathing difficulties. Patients who acknowledged having breathing difficulties were screened with the five depression and anxiety questions from the PRIME–MD patient questionnaire.<sup>11,12</sup> Those who responded positively to at least one PRIME–MD anxiety or depression item were recruited for a baseline assessment.

At the baseline appointment ( $N = 557$ ), depression and anxiety were assessed with the Beck Depression Inventory–II (BDI) and the Beck Anxiety Inventory (BAI). If clinically significant levels of depression or anxiety were present ( $BDI > 19$  or  $BAI > 15$ ), then portable spirometry was administered to confirm expiratory airflow limitation ( $FEV_1/FVC < 75\%$  and  $FEV_1 < 70\%$ ). Equivocal spirometric examinations were reviewed and confirmed by a pulmonologist (AS). A Mini-Mental State Exam (MMSE)<sup>13</sup> was also administered to ensure adequate cognitive functioning ( $MMSE \geq 24$ ).

From the 557 baseline appointments, 353 participants were excluded for the following reasons: no spirometric indication of COPD ( $N = 194$ ), no anxiety or depression according to the BDI or BAI ( $N = 128$ ), severely depressed and/or suicidal ( $N = 12$ ), active psychosis ( $N = 9$ ), cognitive impairment ( $N = 8$ ), active substance use disorders ( $N = 9$ ), and other reasons ( $N = 8$ ).

The final sample of 179 patients (95% men;  $N = 170$ ) had a mean age of 65.75 years (standard deviation [SD]: 10.53) and a mean education of 12.69 years (SD: 2.85). Ethnic distribution was the following: white, 80.4% ( $N = 144$ ); African American, 15.1% ( $N = 27$ ); Hispanic, 2.8% ( $N = 5$ ); and Native American, 1.7% ( $N = 3$ ); marital status: 55.3% ( $N = 99$ ) married; 28.5% ( $N = 51$ ), divorced/separated; 9.5% ( $N = 17$ ), widowed; 3.9% ( $N = 7$ ), never married; and 2.8% ( $N = 5$ ), unknown.

### Measures

**Depression** The 21-item Beck Depression Inventory, 2nd Edition (BDI)<sup>14</sup> was used to assess severity of depression.

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The BDI is a highly reliable and valid instrument for medical patients, with excellent internal consistency and factorial and convergent validity.<sup>15</sup> Total scores ranging from 0 to 13 are indicative of minimal depression, 14–19 of mild depression, 20–28 of moderate depression, and 29–63, severe depression.<sup>14</sup> For the purposes of this study, clinically significant depression was defined as a BDI score  $\geq 20$ .

*Anxiety* The Beck Anxiety Inventory (BAI),<sup>16</sup> a 21-item, self-report measure of anxiety, was used to assess anxiety severity. The BAI possesses strong psychometric properties related to internal consistency, test-retest reliability, and validity.<sup>17</sup> The BAI is particularly effective for identifying anxiety symptoms in clinical populations and has been validated for use with older psychiatric patients<sup>18</sup> and older medical patients.<sup>19</sup> Research on this instrument<sup>17</sup> suggests the following ranges for interpretation: 0–7: minimal anxiety; 8–15: mild anxiety; 16–25: moderate anxiety; and 26–63: severe anxiety. For the purposes of this study, clinically significant anxiety was defined as a BAI score  $\geq 16$ .

*COPD severity* The Forced Expiratory Volume in 1 second (FEV<sub>1</sub>), that is, the expired volume over the first second of spirometry, was chosen as the best available indication of symptom severity, as addressed by the Global Initiative for Obstructive Lung Disease (GOLD) guidelines.<sup>5</sup> Each participant completed portable spirometry, administered by study staff trained in the use of this technology. Equivocal results were reviewed by the study pulmonologist. The FEV<sub>1</sub> was used as a measure of COPD severity (higher FEV<sub>1</sub> values represent better lung functioning).

*Medical comorbidity* Medical comorbidity was assessed from participant self-report. The self-reported conditions were itemized according to their associated major ICD-9 categories, and the total number of ICD-9 categories reported was used to represent a numeric value for medical comorbidity. Mental health disorders were excluded from the comorbidity analysis. This assessment gave a possible score range of 0–11.

*Disease-specific quality of life* The Chronic Respiratory Questionnaire (CRQ)<sup>20</sup> is a reliable quality-of-life (QOL) instrument developed specifically for use with COPD patients. The CRQ items are aggregated into four subscales (Dyspnea, Fatigue, Emotional Functioning, and Mastery), and the instrument provides incremental validity on

changes in QOL, as compared with less specific measures.<sup>20,21</sup>

*Quality of life* The Medical Outcomes Survey Short Form (SF-36)<sup>22</sup> has been validated for use in patients with COPD<sup>23,24</sup> and is widely used to measure QOL in other medical populations. Since patients with COPD commonly have coexisting illnesses, this scale was included to allow for the measurement of broader effects on participants' well-being that may not be detected by a disease-specific quality-of-life instrument.

*Objective physical functioning* The 6-minute walking test, using total distance in feet, was used as an objective measurement of physical functioning.<sup>25</sup> During the test, subjects are asked, with standardized encouragement, to cover as much distance as possible.<sup>26</sup>

### Statistical Analysis

To determine the contribution of depression and anxiety to disease-specific and general quality of life, we used multiple-regression procedures. Individual regression models were generated for the total distance traveled in the 6-minute walk, the four CRQ subscales, and all eight SF-36 subscales (total of 13 models). A two-step process was used, where demographic variables (age, years of education, gender, and ethnicity: white/non-white) were entered stepwise during Step 1, and four clinical severity indicators (BAI total, BDI total, FEV<sub>1</sub>, and medical comorbidities) were entered in a similar fashion during Step 2. The two-step process allowed the relative contributions of the clinical severity indicators to be assessed while controlling for demographic variables. Because of the homogenous nature of this sample, cognitive impairment, which was used as an inclusion variable, was not included in the regression analyses. Bonferroni corrections were used for interpretative guidelines, where a significance cutoff (0.05 divided by 13 models) was set at  $<0.004$ . Before interpretation, regression diagnostics were examined for each model to ensure compliance with the following assumptions: variable types, non-zero variance, independence of residual errors, multicollinearity, normally distributed errors, homoscedasticity, and linearity.

### RESULTS

Of the 179 participants, 69 were classified as having moderate-to-severe symptoms of anxiety; 20 were classified as

having moderate-to-severe symptoms of depression; and 90 were classified as having moderate-to-severe symptoms of both depression and anxiety. Mean scores for COPD severity, depression severity, anxiety severity, and the number of medical comorbidity ICD-9 categories were the following: spirometry FEV<sub>1</sub>: 45.47 (SD: 17.49; range: 15–80); FEV<sub>1</sub>/FVC: 56.84 (SD: 13.68; range: 15–80); BAI total: 24.60 (SD: 9.33; range: 6–62); BDI total: 22.47 (SD: 9.41; range: 1–50), and number of medical comorbidities: 2.35 (SD: 1.60; range: 0–6). Patients' mean score on the MMSE was 28.42 (SD: 1.59; range: 24–30).

### Bivariate Correlational Analyses

Table 1 provides Pearson correlations for the primary variables in the study. Notably, the BAI was significantly correlated with three of the four CRQ subscales and seven of the eight SF-36 subscales. Similarly, the BDI was significantly correlated with two of the four CRQ subscales and six of the eight SF-36 subscales, but was not significantly related to the BAI. Follow-up analyses on the BAI/BDI relationship suggest that the low correlation may be attributable to the truncated range of BAI and BDI scores within this sample. Surprisingly, FEV<sub>1</sub> was significantly correlated with only two outcomes, CRQ Dyspnea and SF-36 Physical Functioning, and FEV<sub>1</sub> was not significantly

associated with depression or anxiety. Medical comorbidity was significantly correlated with two SF-36 subscales: Physical Functioning and Role-Emotional.

### Multiple-Regression Procedures

We used multiple-regression procedures to examine the relative contribution of anxiety, depression, COPD severity, and medical comorbidity on multiple outcome measures (6-minute walk, CRQ subscales, and SF-36 subscales). A total of 13 regression models were attempted.

*Total Distance in the 6-Minute Walk* Using Total Distance in the 6-Minute Walk as the outcome variable, the final regression model retained three variables: age, BAI, and FEV<sub>1</sub>. After controlling for demographic factors, the BAI total score explained the most variance, whereas COPD Severity added significant additional explanatory information (see Table 2 [A]).

*The Chronic Respiratory Questionnaire* Three significant regression models were generated (Dyspnea, Emotion, Mastery), with no significant model formed for the CRQ Fatigue subscale. After controlling for demographic factors, the BAI total score entered all three models as the most significant and explanatory variable. Also, the BDI

**TABLE 1. Pearson Correlations for Primary Study Measures**

Measure	BDI	BAI	FEV <sub>1</sub>	Comorbidity
BDI				
BAI	0.077			
FEV <sub>1</sub>	0.136	−0.001		
Medical Comorbidity	0.024	0.113	0.113	
6-Minute Walk	−0.047	−0.174*	0.175*	−0.118
CRQ				
Dyspnea	−0.091	−0.326***	0.236**	−0.023
Fatigue	−0.050	−0.052	0.068	−0.064
Emotion	−0.241***	−0.416***	0.070	0.001
Mastery	−0.254***	−0.427***	0.000	0.064
SF-36				
Physical Functioning	0.053	0.266***	−0.252***	0.153*
Role-Physical	0.206**	0.104	0.000	0.093
Bodily Pain	0.124	0.317***	0.095	0.118
General Health	0.164*	0.252***	−0.125	0.049
Vitality	0.292***	0.258***	−0.007	0.049
Social Functioning	0.189*	0.434***	−0.033	0.069
Role-Emotional	0.204**	0.289***	0.077	0.160*
Mental Health	0.264***	0.279***	0.075	0.020

BDI: Beck Depression Inventory-II total score; BAI: Beck Anxiety Inventory total score; FEV<sub>1</sub>: Forced Expiratory Volume in 1 second, a measure of COPD severity; Comorbidity: the number of medical ICD-9 categories with an associated self-reported medical condition; CRQ: Chronic Respiratory Questionnaire, a disease-specific quality-of-life measure; SF-36: Short-Form 36, a general quality-of-life measure.

On the BDI, BAI, Comorbidity, and SF-36: higher scores mean greater impairment; on the FEV<sub>1</sub> and CRQ: lower scores mean greater impairment.

\* p ≤ 0.05; \*\* p ≤ 0.01; \*\*\* p ≤ 0.001.

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total score was significantly associated with the CRQ subscales of Emotion and Mastery, beyond the variance accounted for by the BAI total score. The FEV<sub>1</sub> was significantly associated with the CRQ Dyspnea subscale. The number of medical-comorbidity categories did not enter any of the CRQ models (see Table 2 [B–E]).

**SF-36** All outcome measures except the SF-36 Role-Physical subscale generated significant regression models. The BAI total score was significantly associated with all seven outcome measures and entered all seven models. As with the CRQ, the BDI total score added explanatory information for four psychologically-based models (Vitality, Social Functioning, Role-Emotional, and Mental Health), whereas the FEV<sub>1</sub> added explanatory information for two physically-oriented models (Physical Functioning and General Health). The number of medical comorbidity categories added explanatory information to only one model (Physical Functioning; see Table 3.)

### DISCUSSION

Mental health distress, as indicated by symptoms of anxiety and depression, accounts for a significant amount of variance in quality of life, above and beyond the contributions of COPD severity, medical comorbidity, and patient demographic factors. The results of this study parallel and

extend previous findings, which indicate that comorbid conditions and COPD severity only partly influence health-related quality of life.<sup>6,9</sup> Furthermore, the impact of anxiety on quality of life was not restricted to mental health and emotional outcomes, but also included associations with pain, physical functioning, general health, and disease-specific outcomes, such as mastery of the illness and symptoms of dyspnea.

Although not as significant as anxiety, depression accounted for a moderate amount of variance across multiple outcome models, above and beyond the contribution of anxiety, COPD, and medical comorbidity. However, unlike anxiety, depression was primarily restricted to associations with mental-health-related quality of life and was not associated with pain, physical functioning, general health, or symptoms of dyspnea.

The possibility that anxiety is a more salient condition for patients with COPD (relative to depression and other medical factors) is not altogether unexpected. Although sustained and persistent feelings of frustration, hopelessness, and helplessness are likely causes for the frequency of depression in many chronic health conditions, patients with COPD are faced with the additional burden of coping with the unpredictable and fear-invoking symptoms of breathing distress.<sup>10</sup> This investigation suggests that anxiety (as measured by the BAI) is a key factor associated with decreased quality of life for patients with COPD. Al-

**TABLE 2. Stepwise Multiple Regressions for Total Distance Walked in 6 Minutes and CRQ Subscales**

Variables Retained	F[df]	Standardized $\beta$	Cumulative	
			p	R <sup>2</sup>
<b>A. TD6MW</b>	F[3, 128] = 5.180		0.002	0.108
Step 1	Age	–0.197	.022	
Step 2.1	BAI	–0.233	0.007	
Step 2.2	FEV <sub>1</sub>	0.172	0.044	
<b>B. CRQ Dyspnea</b>	F[2, 165] = 16.099		<0.001	0.163
Step 2.1	BAI	–0.321	<0.001	
Step 2.2	FEV <sub>1</sub>	0.254	<0.001	
<b>C. CRQ Fatigue</b>	No model found			
<b>D. CRQ Emotion</b>	F[2, 165] = 22.416		<0.001	0.214
Step 2.1	BAI	–0.396	<0.001	
Step 2.2	BDI	–0.214	0.002	
<b>E. CRQ Mastery</b>	F[3, 166] = 17.474		<0.001	0.240
Step 1	Age	0.132	0.065	
Step 2.1	BAI	–0.387	<0.001	
Step 2.2	BDI	–0.190	0.008	

CRQ: Chronic Respiratory Questionnaire. Higher scores represent better status; BDI: Beck Depression Inventory–II total score; BAI: Beck Anxiety Inventory total score; FEV<sub>1</sub>: Forced Expiratory Volume in 1 second, a measure of COPD severity.  
 Step 1: Age, Years of Education, Gender, and Ethnicity entered as stepwise variables.  
 Step 2: FEV<sub>1</sub>, BAI, BDI, and medical comorbidity entered as stepwise variables.  
 TD6MW: Total Distance in the 6-Minute Walk, measured in feet.

though further studies are needed, it appears that the alleviation of anxiety symptoms may hold the potential for improving COPD patients' functioning across both mental and physical health dimensions.

Several limitations of the present investigation should be noted. First, because of the methodological design of the investigation, assumptions of causality between mental health distress and quality of life are not warranted. Data indicate that both anxiety and depression are significant factors associated with quality of life; however, further studies are needed to determine whether mental health distress is a cause of reduced quality of life or if such conditions are simply a product of reduced quality of life. Second, the enlisted sample of patients consisted of veterans who were primarily male, limiting the generalizability of the results, with further studies needed for non-veterans and women with COPD. The specific recruitment of pa-

tients with COPD and comorbid clinical depression and/or anxiety may also limit the generalizability of the results to similar patient populations. Specifically, the sample consisted of patients identified with COPD by chart diagnosis who subsequently tested positive for depression, anxiety, or both, and results may not apply in the case of subclinical mental health symptoms.

In conclusion, the impact of depression and anxiety on patients with COPD is of high importance. Although further studies are needed to clarify this relationship, early detection and treatment of psychological difficulties may play a critical role in improving quality of life for COPD patients with comorbid psychological symptoms. Because the physical symptoms associated with COPD are often irreversible, clinicians are forced to focus on management issues that improve quality of life for their patients. Results from this investigation indicate that psychological distress,

**TABLE 3. Stepwise Multiple-Regression Models for SF-36 Subscales**

Variables Retained	F[df]	Standardized $\beta$	Cumulative	
			p	R <sup>2</sup>
<b>A. Physical Functioning</b>	F[4, 161] = 9.201		<0.001	0.186
Step 1	Age	0.133	0.073	
Step 2.1	BAI	0.274	<0.001	
Step 2.2	FEV <sub>1</sub>	-0.267	<0.001	
Step 2.3	Comorbidity	0.170	0.021	
<b>B. Role Physical</b>	F[1, 165] = 7.508		NS	0.044
Step 2	BDI	0.209	0.007	
<b>C. Bodily Pain</b>	F[1, 167] = 21.167		<0.001	0.112
Step 2.1	BAI	0.335	<0.001	
<b>D. General Health</b>	F[3, 165] = 9.077		<0.001	0.142
Step 1	Age	-0.241	0.001	
Step 2.1	BAI	0.229	0.002	
Step 2.2	FEV <sub>1</sub>	-0.174	0.018	
<b>E. Vitality</b>	F[4, 163] = 8.291		<0.001	0.169
Step 1.1	Age	-0.088	0.249	
Step 1.2	Ethnicity	-0.150	0.040	
Step 2.1	BDI	0.250	0.001	
Step 2.2	BAI	0.231	0.002	
<b>F. Social Functioning</b>	F[2, 166] = 24.153		<0.001	0.225
Step 2.1	BAI	0.435	<0.001	
Step 2.2	BDI	0.158	0.022	
<b>G. Role-Emotional</b>	F[2, 163] = 11.378		<0.001	0.123
Step 2.1	BAI	0.291	<0.001	
Step 2.2	BDI	0.171	0.022	
<b>H. Mental Health</b>	F[4, 163] = 9.660		<0.001	0.192
Step 1.1	Age	-0.206	0.007	
Step 1.2	Gender	-0.192	0.009	
Step 2.1	BAI	0.236	0.001	
Step 2.2	BDI	0.202	0.006	

SF-36: Medical Outcomes Survey Short Form; note that lower scores represent better status.  
 BDI: Beck Depression Inventory-II total score; BAI: Beck Anxiety Inventory total score; FEV<sub>1</sub>: Forced Expiratory Volume in 1 second, a measure of COPD severity.  
 Step 1: Age, Years of Education, Gender, and Ethnicity entered as stepwise variables.  
 Step 2: FEV<sub>1</sub>, BAI, BDI, and Medical Comorbidity entered as stepwise variables.

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and anxiety, especially, are associated with poor quality of life related to mental- and physical-health outcomes. Despite the potential efficacy of mental health treatment for patients with COPD,<sup>27</sup> depression and anxiety are often overlooked by the current treatment guidelines, including the recent Global Initiative for Chronic Obstructive Lung Disease (GOLD) Standards.<sup>5</sup>

With their high prevalence and documented impact on quality of life, routine assessment for both depression and anxiety may be useful as part of standard medical practice for the management of COPD. Furthermore, treatment or mental health referrals for those patients who display signs of anxiety and/or depression appear warranted. Interventions for depression and anxiety in COPD include pharmacological and non-pharmacological options. Pharma-

cologically, controlled trials and recent reviews provide empirical support for the use of tricyclic antidepressants and SSRIs for depression; and, because of the potential for respiratory depression with benzodiazepines, SSRIs and buspirone are recommended for anxiety. For non-pharmacological interventions, psychotherapy is efficacious for both depression and anxiety.<sup>27-29</sup>

Future research initiatives are needed. In real-world settings, where the primary driver is medical rather than psychiatric care, a particular need exists for studies designed to improve the recognition, treatment, and engagement of patients with depression and anxiety. Implementation efforts related to routine screening, referral, and treatment practices have the potential to directly affect quality of care and patients' quality of life.

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