Prevalence and Risk Factors for Depressive Symptoms in Persons with Chronic Obstructive Pulmonary Disease

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BACKGROUND: Although depression is a risk factor for adverse outcomes in chronic illness, little is known about the prevalence or risk factors for depressive symptoms in chronic obstructive pulmonary disease (COPD).

OBJECTIVE: To determine the prevalence of depressive symptoms in COPD as compared to other chronic illnesses and to identify risk factors for depressive symptoms in COPD.

DESIGN AND PATIENTS: Cross-sectional study of 18,588 persons (1,736 subjects with self-reported COPD), representing a sample of the US population aged ≥50 years who participated in the 2004 Health and Retirement Survey.

MEASUREMENTS: Presence of COPD and other chronic conditions was defined by self-report. Presence of depressive symptoms was assessed using the CES-D8 scale. Participants with a score ≥3 on CES-D8 were classified as having clinically significant depressive symptoms.

MAIN RESULTS: Of 1,736 participants with COPD, 40% had ≥3 depressive symptoms. Depressive symptoms were more common in COPD than in coronary heart disease, stroke, diabetes, arthritis, hypertension, and cancer. Risk factors for ≥3 depressive symptoms in COPD: younger age (OR 1.02/per year younger, 95% CI [1.02–1.03]), female gender (1.2 [1.1–1.3]), current smoking (1.5 [1.3–1.7]), marital status [divorced/separated (1.8 [1.6–2.1]), widowed (1.8 [1.6–2]), never married (1.4 [1.1–1.8]), ≤high school degree (1.6 [1.5–1.8]), dyspnea (2.3 [2.1–2.6]), difficulty walking (2.8 [2.5–3.2]), and co-morbid diabetes (1.2 [1.1–1.4]), arthritis (1.3 [1.2–1.5]) or cancer (1.2 [1.1–1.4]).

CONCLUSIONS: Depressive symptoms are common in COPD and are more likely to occur in COPD than in other common chronic illnesses. The risk factors identified may be used for targeted depression screening in COPD patients.

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a chronic illness that is increasing in prevalence and is a significant cause of morbidity and mortality. Chronic obstructive pulmonary disease is characterized by airflow obstruction leading to slowly progressive symptoms of persistent cough, exertional dyspnea, wheezing, and eventual functional impairment. COPD is often brought to attention when patients suffer from activity limitations as a result of their respiratory complaints. Given that COPD is the fourth leading cause of death and the fifth leading cause of disability in the United States,[1–4] identification of risk factors that contribute to functional and physical impairment, such as concomitant depressive symptoms, is paramount.

Depression is another example of a chronic illness that causes significant morbidity and mortality. Depression is a leading cause of disability worldwide and an increasing cause of physical and psychological impairment in persons with COPD.[5–7] A number of studies have shown that depressive symptoms in persons with COPD can have adverse effects on functional mobility, symptom burden, the ability to tend to daily tasks, and mortality.[8–11] These studies, however, have primarily been conducted in the setting of an acute COPD exacerbation, where the frequency of depressive symptoms is higher.[8,12,13] The association of depressive symptoms and health outcomes in persons with stable COPD has not been well evaluated.

Despite the observations that depressive symptoms are associated with poor outcomes in persons with COPD, the prevalence of depressive symptoms in COPD remains uncertain. Current estimates of the prevalence of depressive symptoms in COPD using a large, nationally representative sample of the United States population are presently unavailable. Furthermore, how rates of depressive symptoms in COPD compare to rates of depressive symptoms in other chronic illnesses is unclear. Prior studies of persons with COPD report

a prevalence of depressive symptoms that range broadly with some studies estimating the prevalence as low as 6% and other studies estimating the prevalence as high as 56%.[14,15] This wide variability has been due to small sample sizes, the narrow spectrum of the population studied (e.g., severe COPD), and to differences in the definition of depression employed.[16–19]

The current standard for diagnosis of depression is based on criteria set forth in the DSM-IVTR, which includes guidelines that account for vegetative symptom assessment in the setting of a psychiatric interview. Given the detailed nature of this diagnostic system, numerous instruments have been developed *as reliable and rapid* alternatives to screen for depression. While these instruments have been created to increase the ease with which clinicians can screen for depressive symptoms, no individual instrument has been found to provide superior objective measurements. The choice of a screening instrument is often a function of accessibility, time, and comfort level on the part of the administrator. Among the list of actual instruments available, the Center for Epidemiologic Studies Depression eight-item scale (CES-D8) is one example of a well-validated instrument designed to measure depressive symptoms;[20] the brevity of the test, the relative ease of administration, and an external validation of its performance allow for its use in a large sample population-based study of US adults such as the Health and Retirement Survey.

Because COPD is slowly advancing, leading to physical wasting, a loss of mobility, and eventual death over years, we hypothesized that depressive symptoms may be a common complicating factor among patients with COPD. Therefore, the aims of our study were (1) to determine the prevalence of depressive symptoms in COPD using a depressive symptom complex inventory, the CES-D8, in a large nationally representative sample population of US adults over age 50, (2) to determine if the prevalence of depressive symptoms identified in our sample is higher in patients with COPD when compared to other chronic conditions and, (3) to identify risk factors associated with depressive symptoms in persons with COPD so that these patients may be targeted for early screening and treatment.

METHODS

Subjects

We studied subjects interviewed in the 2004 wave of the Health and Retirement Survey (HRS), a nationally representative population-based study of subjects age 50 and older. With an overall response rate of 86.2%, subjects included 18,588 adults who participated in interviews conducted either in person or by phone. Prior studies of the HRS have not observed any difference in responses when interviews were conducted in person or by phone.[21] The HRS study design employs a multiple stage sample with over-sampling of Blacks, Latinos, and Florida residents. When analyzed using sampling weights, the HRS provides a nationally representative sample of persons age 50 and older who were not institutionalized at the time of recruitment.

We defined our measure of COPD as answering "yes" to the question: "Has a doctor ever told you that you have lung disease, such as chronic bronchitis or emphysema?" Interviewers were instructed to exclude subjects with asthma. Of the total sample (N=18,588), 1,736 reported having COPD after accounting for sample weights and multiple imputation.

Outcome Variables

The outcome of interest was depressive symptoms. Depressive symptoms were assessed by the eight-item CES-D8 scale, an abridged version of the CES-D20. Scores of ≥ 3 on the CES-D8 have been shown to correspond with the traditional cut-off of 16 points on the CES-D20 which indicates a clinical diagnosis of depression.[20,22,23] We used a dichotomized (yes/no) score as our outcome measure. The CES-D8 asks whether persons have the following symptoms in the week prior: depression, lack of happiness, loneliness, sadness, that everything was an effort, sleep was restless, inability to get going, and lack of energy. Each question is assigned one point for a maximum of eight.

Risk Factors for Depressive Symptoms

Additional variables that, based upon prior literature, had potential to confound the association between COPD and depressive symptoms included the subject's demographic characteristics (age, gender, race/ethnicity, and marital status), education, body mass index (measured by self-report of weight and height), alcohol consumption (defined as "do you ever drink alcohol?"), tobacco use (defined as "do you currently smoke and/or did you ever smoke?"), socioeconomic status (income), respiratory symptoms (dyspnea and difficulty with walking several blocks) and self-report of co-morbid diseases.

Chronic conditions, such as heart disease, stroke, diabetes, arthritis, hypertension, congestive heart failure, and cancer were similarly assessed by self-report in the standardized questionnaire. Prior studies have found a strong correlation between self-report of chronic conditions and the medical record.[24,25] For each chronic condition, patients were asked if their doctor has ever told them that they had heart disease, stroke, hypertension, congestive heart failure, cancer, diabetes or arthritis. For example, a patient was considered to have arthritis if they answered "yes" to the following question: "Has a doctor ever told you that you have arthritis?"

Statistical Analysis

Sample-weighted prevalence of depressive symptoms was measured in persons with COPD and in persons with other chronic diseases. The prevalence of depressive symptoms across these chronic diseases was compared using weighted logistic regression controlling for age and sex. Analyses of the association between depressive symptoms and individual factors in patients with COPD were performed using weighted logistic regressions.

To minimize analytic biases introduced by missing data, we employed multiple imputation and combined results[26,27] in STATA 9.2 using the ice package[28,29] to create five data sets for analysis. Reported confidence intervals thus account for variation introduced by missing data. All variables included in the analyses were employed in the imputation; each variable was modeled as continuous, multinomial, or binomial as appropriate. For most variables, data were missing at a rate of <1%, excepting all items of the CES-D8 (ranging from 7.8% to 8.1% of the eight-item questionnaire), BMI (1.7%), and difficulty walking several blocks (2.6%).

Because our analyses employ multiple simultaneous tests, we control the false discovery rate using the method described by Benjamini and Yekutieli to adjust our reported p-values for multiple comparisons using the p.adjust() function in the R statistical platform.[30] The Committee for Human Research at the University of California, San Francisco approved this study.

RESULTS

Characteristics of the Study Population

The mean age of the 18,588 participants in the HRS was 67 years (range 50 to 107); 57% were female and 81% were white. The participants (N=1,736) with self-reported COPD had a mean age of 67 years (range 50–96); 57% were female and 88% were white (Table 1). Persons with COPD were more likely to be white, single, and current smokers than persons without COPD. Persons with COPD were also more likely to be at extremes of weight: 5% were underweight (BMI<19) and 13% were obese (BMI>35). Persons with COPD were overall more likely to have co-morbid conditions of heart disease, stroke, hypertension, congestive heart failure, diabetes, arthritis, and cancer than persons without COPD. As expected, persons with COPD were also more likely to report respiratory symptoms. 58% of persons with COPD complained of dyspnea, compared to 13% of subjects without COPD; 57% of persons with COPD reported difficulty ambulating several blocks, compared to 24% without COPD (Table 1).

Prevalence of Depressive Symptoms in COPD and Other Chronic Diseases

Of participants with COPD (N=1,736) 40% had CES-D8 scores ≥3 compared to 19% of participants without COPD (N=16,852) (Table 2). Participants with COPD had more than twice the odds of having CES-D8 scores ≥3 than persons without COPD and were more likely to have depressive symptoms than persons with stroke, hypertension, diabetes, coronary heart disease, arthritis, or cancer (Table 2). Persons with COPD scored worse on every question of the CES-D8, including somatic symptoms (e.g., "everything was an effort") as well as mood (e.g., "feeling happy or sad"). Persons with COPD had a similar risk for depressive symptoms as persons with congestive heart failure.

Risk Factors for Depressive Symptoms in COPD

Multiple logistic regression analyses identified several independent risk factors for having CES-D8 scores ≥3 among patients with COPD (Table 3). Respiratory symptoms remained the most powerful predictors of depressive symptoms even after adjustment for all factors in Table 3. Among persons with COPD who reported dyspnea or difficulty walking several blocks, over 50% had CES-D8 scores ≥3 (Table 3). Even after adjustment, dyspnea continued to be associated with more than twice the odds of having ≥3 depressive symptoms (OR 2.3, 95% CI [2.1–2.6]). Difficulty ambulating several blocks continued to be associated with nearly three times the odds of having ≥3 depressive symptoms (OR 2.8, 95% CI [2.5–3.2]). Dyspnea and difficulty walking were major mediators of the association between COPD and depressive symptoms (the association between COPD and depressive symptoms decreased from OR 2.71, 95% CI [2.39–3.07] to OR 1.28, 95% CI [1.11–1.48] after adjustment for age, sex, difficulty walking and dyspnea).

Other independent risk factors for depressive symptoms in COPD patients included younger age, female gender, smoking, single marital status, ≤high school degree, and co-morbid diagnoses of diabetes, arthritis or cancer. The prevalence of depressive symptoms among persons with COPD and any one of these aforementioned risk factors ranged from 33% (never married) to 51% (≤high school education) (Table 3).

DISCUSSION

This population-based study of adults aged 50 years and older found that depressive symptoms are very common in patients with COPD, with 40% of patients having CES-D8 scores ≥3. Depressive symptoms are significantly more common in patients with COPD than in patients with other chronic illnesses, including coronary heart disease, stroke, hyperten-

Table 1. Characteristics of Subjects With and Without COPD (N=18,588)[a]

Characteristic for subjects	Without COPD (N=16,852)	With COPD (N=1,736)
Age in years, mean	64.3	67.1*
Sex, No. (%)		
Female	9,058 (53.8)	993 (57.2)
Male	7,794 (46.2)	743 (42.8)
Race/ethnicity, No. (%[b])		
White	14,382 (85.3)	1,530 (88.1)*
Black	1,641 (9.7)	143 (8.2)*
Other	829 (4.9)	63 (3.7)
Education, No. (%)		
No HS diploma or equivalent	2,946 (17.5)	483 (27.8)
HS diplomat or equivalent	13,906 (82.5)	1,253 (72.2)
Marital status, No. (%[b])		
Married	11,431 (67.8)	955 (55.0)*
Separated	2,105 (12.5)	310 (17.9)*
Widowed	2,669 (15.8)	406 (23.4)*
Never been married	647 (3.8)	65 (3.8)
Body mass index (kg/meters), mean	27.5	27.9
Body mass index groups, No. (%[b])		
<19	360 (2.1)	89 (5.1)*
19–35	14,999 (89.0)	1,418 (81.7)*
>35	1,493 (8.9)	229 (13.2)*
Consumes alcohol, No. (%[b])	9,309 (55.2)	765 (44.1)*
Respiratory symptoms, No. (%[b])		
Dyspnea	2,099 (12.5)	1,006 (58.0)*
Difficulty walking several blocks	3,994 (23.7)	989 (57.0)*
Chronic conditions, No. (%[b])		
Stroke	1,031 (6.1)	248 (14.3)*
Diabetes	2,694 (16.0)	375 (21.6)*
Coronary heart disease	3,425 (20.3)	711 (41.0)*
Arthritis	8,862 (52.6)	1,300 (74.9)*
Cancer	1,941 (11.5)	344 (19.8)*
Congestive heart failure	415 (2.5)	850 (10.0)*
Hypertension	8,255 (49.0)	1,052 (60.6)*
Current smoker, No. (%[b])	2,538 (15.1)	505 (29.1)*

[a]*Both counts and percentages are based upon weighted imputed values*
[b]*Numbers do not sum to exactly 100% due to round-off error*
**p-value<0.05 for difference by COPD between mean (ordinary least squares regression) or prevalence rate (logistic regression) as appropriate*

Table 2. Prevalence (%) of Depressive Symptoms (CES-D8 ≥3), and Odds Ratios (OR) for Depressive Symptoms Predicted by Each Chronic Condition While Adjusting for Age and Sex

Chronic disease	Prevalence of depressive symptoms	Prediction of depressive symptoms
	No. (%)[a]	OR [b] (95% CI)[c]
COPD	701 (40.4)	2.71 (2.39, 3.07)
Stroke	459 (35.9)	2.13 (1.86, 2.45)
Diabetes	959 (31.2)	1.87 (1.68, 2.07)
Coronary heart disease	1,271 (30.7)	1.96 (1.78, 2.15)
Arthritis	2,742 (27.0)	2.00 (1.81, 2.20)
Cancer	593 (26.0)	1.26 (1.13, 1.42)
Congestive heart failure	257 (43.7)	2.85 (2.29, 3.54)
Hypertension	2,593 (25.6)	1.57 (1.43, 1.72)

[a]*Both counts and percentages are based upon weighted imputed values*
[b]*OR is based on a series of weighted multiple logistic regression models of depressive symptoms predicted by each chronic condition while adjusting for age and sex. The reference category is the all subjects without the chronic disease of mention*
[c]*CIs are unadjusted for multiple comparisons*

sion, diabetes, arthritis or cancer. COPD patients with difficulty ambulating or dyspnea are at exceptionally high risk for depressive symptoms with over one-half scoring ≥3 on the CES-D8. Our results highlight the importance of evaluating patients with COPD for depressive symptoms and for considering the implications of depressive symptoms on health outcomes in these patients.

This study adds to the literature by providing estimates of depressive symptoms in a large population-based sample of persons with COPD. To our knowledge, ours is the first large population-based study to compare rates of depressive symptoms in subjects with COPD to the general population and to those with other chronic illnesses. One concern about the measurement of depressive symptoms in persons with COPD is that depression scales include somatic symptoms that may be the result of COPD, rather than depression, such as "feeling that everything was an effort." To determine if somatic symptoms were the main reason for high CES-D8 scores in our population, we evaluated individual answers to the eight-item questionnaire by looking at both responses to mood and physical limitation. We found that patients with COPD scored worse than persons with other chronic diseases on each of the 8 depressive items of the CES-D8, including more likely to "feel depressed" and less likely to "feel happy" or "enjoy life." Therefore, it is likely that our findings from our symptom scale reflect depressive symptoms rather than somatic complaints due to COPD.[31,32]

Several factors may contribute to a higher rate of depressive symptoms in COPD when compared to heart disease, stroke, diabetes, arthritis, and cancer. COPD is a slowly debilitating disease in which difficulty breathing is a progressive symptom that is distressing to patients.[1,3,33] Furthermore, treatment of dyspnea is less effective in COPD than treatment of relevant symptoms in arthritis or cardiac disease.[34] In fact, side effects of bronchodilators can often contribute to increased anxiety, and steroids have several psychiatric side effects.[35–37] In addition, oxygen therapy can be associated with social stigma.[33,38] Finally, cigarette smoking most commonly causes COPD, and patients might view their COPD as a self-inflicted condition.[1] Given the large number of persons with COPD who have depressive symptoms and the association of depression with worse outcomes in chronic diseases, it is possible that better identification and treatment of depressive symptoms in patients with COPD would offer an effective option to improve outcomes in this population.

Our analyses also identified a number of factors that further stratify patients with COPD into groups at very high risk for depressive symptoms: respiratory symptoms, physical limitation, younger age, and current smoking status. Even after adjusting for multiple factors, including other medical diagnoses, dyspnea and difficulty walking several blocks still remained the strongest

Table 3. Prevalence and Risk Factors for Depressive Symptoms (CES-D8 ≥3) in Persons with COPD (N=1,736)

Predictor	CES-D8 ≥3	Prediction of depressive symptoms
	Prevalence of depressive symptoms (CES-D8 ≥3) among those with COPD (N) (%)[a]	Adjusted OR[b] (95% CI)[c]
Sex		
Male	267 (35.9%)	1.00
Female	434 (43.7%)	1.21 (1.09,1.34)*
Age (years) per year younger		1.02 (1.02,1.03)*
Education		
High school degree or equivalent	455 (36.3%)	1.00
No high school degree or equivalent	246 (50.9%)	1.63 (1.46,1.82)*
Does not smoke	458 (37.2%)	1.00
Currently smokes	243 (48.2%)	1.46 (1.29, 1.66)*
Body mass index (kg/meter)		
BMI<19	49 (55.3%)	1.38 (1.05, 1.83)
19≤BMI≤35	525 (37.0%)	1.00
BMI>35	127 (55.5%)	1.01 (0.87, 1.19)
Marital status		
Married	342 (35.9%)	1.00
Separated/Divorced	157 (50.8%)	1.82 (1.59, 2.09)*
Widowed	180 (44.2%)	1.78 (1.57, 2.02)*
Never married	22 (33.4%)	1.42 (1.1, 1.83)*
Race/ethnicity		
White	593 (38.8%)	1.00
African American	75 (52.4%)	1.09 (0.96, 1.24)
Other	33 (52.5%)	1.41 (1.13, 1.75)*
Respiratory symptoms		
No respiratory symptoms	94 (19.6%)	1.00
Difficulty walking	531 (53.7%)	2.82 (2.52, 3.16)*
Experiences dyspnea	516 (51.3%)	2.32 (2.05, 2.62)*
Co-morbid conditions		
No co-morbidities	43 (36.5%)	1.00
Stroke	122 (49.0%)	1.18 (1.01, 1.38)
Diabetes	182 (48.4%)	1.21 (1.07, 1.37)*
Coronary heart disease	338 (47.6%)	1.15 (1.03, 1.28)
Arthritis	574 (44.2%)	1.31 (1.18, 1.46)*
Cancer	148 (42.9%)	1.19 (1.05, 1.35)*
Congestive heart failure	99 (57.0%)	0.93 (0.72, 1.22)
Hypertension	472 (43.6%)	1.13 (1.02, 1.26)

**p<0.05 after accounting for multiple comparisons using the false discovery rate*
[a]*Percentages are based upon weighted imputed values*
[b]*Adjusted for all variables in Table 3*
[c]*CIs are unadjusted for multiple comparisons*

predictors of depressive symptoms in COPD (Adjusted OR=2.3 for dyspnea; Adjusted OR=2.8 for difficulty walking several blocks). While we do not know if dyspnea and difficulty walking several blocks were due directly to COPD, these are common problems seen in this patient population.[1] Nevertheless, our study suggests that dyspnea and difficulty walking several blocks are red flags that increase the likelihood that patients with COPD may have depressive symptoms.

Another striking finding was that as persons with COPD aged, they were less likely to have depressive symptoms. This relationship held until approximately 65 years after which advancing age was no longer associated with a lower risk of depressive symptoms. As to what places younger COPD patients at greater risk for depressive symptoms when compared to older COPD patients, we speculate that older patients eventually adapt over time. Since COPD is commonly detected in the 6th and 7th decades, the initial diagnosis in patients less than 65 may signal the onset of significant future physical limitations and precipitate depressive symptoms during years that would otherwise have been characterized by relatively good functional status.

Of importance, our analyses support an association between COPD, smoking, and depressive symptoms. Current smokers with COPD were more likely to have depressive symptoms. The connection between COPD and smoking is well recognized, and there is a clear link between depressive symptoms and smoking. Acutely, depression can trigger patients to start smoking, and chronic smoking can be considered an outward manifestation of depressive symptoms.[39,40] COPD patients who had quit smoking were less likely to have depressive symptoms. These results should encourage clinicians to think more about screening for depressive symptoms among patients with COPD who are actively smoking.

Some limitations in our study warrant further comment. First, our definition of COPD relied upon self-report without confirmation from spirometry or medical record review. Self-report of COPD has been shown to be relatively accurate in prior studies. In the Nurse's Health Study, 78% of a random sample of women who reported physician-diagnosed COPD were confirmed to have COPD based on review of the medical record, use of spirometry, or radiographic imaging.[41] While we agree that self-report of COPD could significantly influence our prevalence estimate of depressive symptoms in our sample population, self-report was used across all chronic conditions assessed. As such, we would not expect that this systematic bias would influence our finding that depressive symptoms are more common in COPD than other conditions. Furthermore, it is reassuring that the prevalence of COPD identified in our sample is 10%, a value that is consistent with current estimated prevalence of self-reported COPD observed among individuals over age 55 reported in the United States National Health Interview Survey: individuals aged 55–64: 8%, 65–74: 9.6% and >75 years of age: 10.6%.[42]

In addition, while we used questionnaire data to classify subjects as having significant depressive symptoms, further psychiatric evaluation should be considered to obtain a formal diagnosis of clinical depression before initiating treatment. Unfortunately, little data exist on outcomes in COPD patients with co-morbid depressive symptoms who undergo either pharmacological treatment or psychiatric counseling.[4,43–45] Moreover, the HRS does not provide specific information on pharmacologic treatment for depressive symptoms in patients who carry the diagnosis of clinical depression. Lastly, our study is a cross-sectional design, which allows us to describe associations but not causal relationships. Regardless, we identified risk factors that were strongly and independently associated with depressive symptoms in COPD patients.

In summary, this is the largest study to measure rates of depressive symptoms in COPD using a representative sample of the US population age 50 years and older. We found that depressive symptoms are very common in COPD and are more common than in other chronic diseases, including conditions in which depression has received significant attention and been shown to adversely influence outcomes, such as in heart disease.[7] Our research further identified that physical symptoms and functional limitations are major risk factors for depressive symptoms in COPD and that younger patients are at greater risk than older patients. The high rates of depressive symptoms found in this study raise the issue that clinicians should consider screening COPD patients for depression, especially in younger patients with physical symptoms and functional limitations, since treating depressive symptoms is one intervention that could improve outcomes in this growing group of patients.

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REFERENCES

1. **Mannino DM.** COPD: epidemiology, prevalence, morbidity and mortality, and disease heterogeneity. Chest. 2002;121(5 Suppl):121S–6S, May.
2. Report TWH. Mental Health: New Understanding, New Hope. Geneva, Switzerland: World Health Organization 2001.
3. World Health Organization. Burden of COPD. http://www.who.int/respiratory/copd/burden/en/. Accessed July 9, 2008.
4. **Borson S, Claypoole K, McDonald GJ.** Depression and chronic obstructive pulmonary disease: treatment trials. Semin Clin Neuropsychiatry. 1998;3(2):115–30, Apr.

5. **Cully JA, Graham DP, Stanley MA, et al.** Quality of life in patients with chronic obstructive pulmonary disease and comorbid anxiety or depression. Psychosomatics. 2006;47(4):312–9, Jul–Aug.
6. **Gift AG, McCrone SH.** Depression in patients with COPD. Heart Lung. 1993;22(4):289–97, Jul–Aug.
7. **Whooley MA, Browner WS.** Association between depressive symptoms and mortality in older women. Study of Osteoporotic Fractures Research Group. Arch Intern Med. 1998;158(19):2129–35, Oct 26.
8. **Ng TP, Niti M, Tan WC, Cao Z, Ong KC, Eng P.** Depressive symptoms and chronic obstructive pulmonary disease: effect on mortality, hospital readmission, symptom burden, functional status, and quality of life. Arch Intern Med. 2007;167(1):60–67, Jan 8.
9. **Gudmundsson G, Gislason T, Janson C, et al.** Risk factors for rehospitalisation in COPD: role of health status, anxiety and depression. Eur Respir J. 2005;26(3):414–9, Sep.
10. **McCathie HC, Spence SH, Tate RL.** Adjustment to chronic obstructive pulmonary disease: the importance of psychological factors. Eur Respir J. 2002;19(1):47–53, Jan.
11. **Stein MB, Cox BJ, Afifi TO, Belik SL, Sareen J.** Does co-morbid depressive illness magnify the impact of chronic physical illness? A population-based perspective. Psychol Med. 2006;36(5):587–96, May.
12. **Yohannes AM, Baldwin RC, Connolly MJ.** Predictors of 1-year mortality in patients discharged from hospital following acute exacerbation of chronic obstructive pulmonary disease. Age Ageing. 2005;34(5):491–6, Sep.
13. **Cao Z, Ong KC, Eng P, Tan WC, Ng TP.** Frequent hospital readmissions for acute exacerbation of COPD and their associated factors. Respirology. 2006;11(2):188–95, Mar.
14. **Norwood R.** Prevalence and impact of depression in chronic obstructive pulmonary disease patients. Curr Opin Pulm Med. 2006;12(2):113–7, Mar.
15. **van Ede L, Yzermans CJ, Brouwer HJ.** Prevalence of depression in patients with chronic obstructive pulmonary disease: a systematic review. Thorax. 1999;54(8):688–92, Aug.
16. **Wong SY, Woo J, Lynn HS, Leung J, Tang YN, Leung PC.** Risk of depression in patients with chronic respiratory diseases: results from two large cohort studies in Chinese elderly from Hong Kong. Int J Geriatr Psychiatry. 2006;21(3):233–8, Mar.
17. **Crockett AJ, Cranston JM, Moss JR, Alpers JH.** The impact of anxiety, depression and living alone in chronic obstructive pulmonary disease. Qual Life Res. 2002;11(4):309–16, Jun.
18. **Di Marco F, Verga M, Reggente M, et al.** Anxiety and depression in COPD patients: The roles of gender and disease severity. Respir Med. 2006;100(10):1767–74, Oct.
19. **van Manen JG, Bindels PJ, Dekker FW, Ijzermans CJ, van der Zee JS, Schade E.** Risk of depression in patients with chronic obstructive pulmonary disease and its determinants. Thorax. 2002;57(5):412–6, May.
20. **Radloff L.** The CES-D Scale: A self-report depression scale for research in the general population. Appl Psychol Meas. 1977;1:385–401.
21. **Steffick DE, Wallace RB, Herzog AR, Ofstedal MB, Fonda S, Langa K.** Documentation of Affective Functioning Measures in the Health and Retirement Survey. Ann Arbor: University of Michigan; 2000.
22. **Andresen EM, Malmgren JA, Carter WB, Patrick DL.** Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). Am J Prev Med. 1994;10(2):77–84, Mar–Apr.
23. **Blazer D, Burchett B, Service C, George LK.** The association of age and depression among the elderly: an epidemiologic exploration. J Gerontol. 1991;46(6):M210–15, Nov.
24. **Bush TL, Miller SR, Golden AL, Hale WE.** Self-report and medical record report agreement of selected medical conditions in the elderly. Am J Public Health. 1989;79(11):1554–6, Nov.
25. **Simpson CF, Boyd CM, Carlson MC, Griswold ME, Guralnik JM, Fried LP.** Agreement between self-report of disease diagnoses and medical record validation in disabled older women: factors that modify agreement. J Am Geriatr Soc. 2004;52(1):123–7, Jan.
26. **Rubin D.** Multiple Imputation After 18+ Years. J Am Stat Assoc. 1996;91 (434):473–89.
27. **Schafer J.** Multiple imputation: a primer. Stat Methods Med Res. 1999;8 (1):3–15.
28. **Royson P.** Multiple Imputation of missing values. Stata J. 2004;4 (3):227–41.
29. **Royson P.** Multiple Imputation of missing values: update. Stata J. 2005;5(2):118–201.
30. **Benjamini Y, Hochberg Y.** Controlling the false discovery rate: a practical and powerful approach to multiple testing. J R Stat Soc. Ser B (Methodological). 1995;57(1):289–300.
31. **de Jonge P, Ormel J, van den Brink RH, et al.** Symptom dimensions of depression following myocardial infarction and their relationship with somatic health status and cardiovascular prognosis. Am J Psychiatry. 2006;163(1):138–44. Jan.
32. **Skotzko CE.** Symptom perception in CHF: (why mind matters). Heart Fail Rev. Dec 11 2007.
33. **Rabe KF, Beghe B, Luppi F, Fabbri LM.** Update in chronic obstructive pulmonary disease 2006. Am J Respir Crit Care Med. 2007;175 (12):1222–32. Jun 15.
34. **Tashkin DP, Cooper CB.** The role of long-acting bronchodilators in the management of stable COPD. Chest. 2004;125(1):249–59, Jan.
35. **Kelly HW.** Risk versus benefit considerations for the beta(2)-agonists. Pharmacotherapy. 2006;26(9 Pt 2):164S–74S, Sep.
36. **Walters JA, Walters EH, Woodbaker R.** Oral corticosteroids for stable chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2005(3):CD005374.
37. **DeBellis RJ.** Mechanism of action of long- acting bronchodilators. Clin Pulmon Med. 2005;12(Supplement 1):S10–S12, July.
38. **Cullen DL.** Long term oxygen therapy adherence and COPD: what we don' know. Chron Respir Dis. 2006;3(4):217–22.
39. **Wilhelm K, Arnold K, Niven H, Richmond R.** Grey lungs and blue moods: smoking cessation in the context of lifetime depression history. Aust N Z J Psychiatry. 2004;38(11–12):896–905, Nov–Dec.
40. **Glassman AH.** Cigarette smoking: implications for psychiatric illness. Am J Psychiatry. 1993;150(4):546–53, Apr.
41. **Barr RG, Herbstman J, Speizer FE, Camargo CA Jr.** Validation of self-reported chronic obstructive pulmonary disease in a cohort study of nurses. Am J Epidemiol. 2002;155(10):965–71, May 15.
42. **Mannino DM, Homa DM, Akinbami LJ, Ford ES, Redd SC.** Chronic obstructive pulmonary disease surveillance-United States, 1971–2000. MMWR Surveill Summ. 2002;51(6):1–16, Aug 2.
43. **Pirraglia PA, Charbonneau A, Kader B, Berlowitz DR.** Adequate initial antidepressant treatment among patients with chronic obstructive pulmonary disease in a cohort of depressed veterans. Prim Care Companion J Clin Psychiatry. 2006;8(2):71–6.
44. **Yohannes AM, Connolly MJ, Baldwin RC. A** feasibility study of antidepressant drug therapy in depressed elderly patients with chronic obstructive pulmonary disease. Int J Geriatr Psychiatry. 2001;16 (5):451–54, May.
45. **Eiser N, West C, Evans S, Jeffers A, Quirk F.** Effects of psychotherapy in moderately severe COPD: a pilot study. Eur Respir J. 1997;10 (7):1581–4, Jul.