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Depression in Individuals with Chronic Obstructive Pulmonary Disease and their Informal Caregivers

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Abstract

Objective—Individuals with chronic obstructive pulmonary disease (COPD) and their caregivers are at high risk for developing depression. Depression can adversely affect the quality of life of patients and caregivers; however, studies in COPD have largely examined predictors of patient and caregiver depression in isolation. This dyadic study examined individual-level predictors of patient and caregiver depression in COPD (i.e., actor effects) as well as how dyad members effect each other's depression (i.e., partner effects).

Methods—Survey data was collected from 89 patient-caregiver dyads that were enrolled in a multi-site cohort study.

Results—Participants were predominantly women (61% of patients and 76% of caregivers) and racial/ethnic minorities (65% of patients and 63% of caregivers). Based on PHQ9 cutoffs, 30% of patients and 20% of caregivers had mild depression; 30% of patients and 8% of caregivers had moderate to severe depression. Multilevel models with the dyad as the unit of analysis showed that less frequent patient self-management, higher levels of caregiver burden, and being in poorer health were associated with higher levels of depression for both dyad members. Higher levels of depression in a partner were also associated with higher levels of depression for women, regardless of whether women were patients or caregivers.

Conclusion—Findings suggest that similar factors predict patient and caregiver depression in COPD and that women are at increased risk for developing depression when their partners are depressed. Dyadic psychosocial interventions that target patients and their caregivers may thus be beneficial in terms of addressing depression in this this vulnerable population.

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Keywords

COPD; depression; patient-caregiver dyads; caregivers

Background

Improved medical care and prevention efforts have contributed to dramatic increases in global life expectancy as well as an epidemiological transition in the leading causes of death, from infectious disease and acute illness to chronic and degenerative illness (Prince et al., 2015). In the United States, 70% of adults age 65 and over require some type of long-term care due to chronic illness (U.S. Department of Health and Human Services, 2015). Although long-term care is often equated with institutionalization, almost 60% of chronically ill persons live at home and receive assistance from informal (i.e., unpaid family members and friends) caregivers (U.S. Department of Health and Human Services, 2015). These individuals often take an active role in medical decisions and provide emotional support (Levesque et al., 2015; Rosland, Heisler, & Piette, 2011). As the primary setting for chronic care has shifted from hospital to home, many have also replaced skilled healthcare workers in the delivery of care (McCorkle & Pasacreta, 2001). Despite this, health care delivery models primarily focus on patients and often fail to properly engage, educate, or support informal caregivers (Gillick, 2013; Wolff & Roter, 2008). Recent reviews have demonstrated that caregivers are more likely to experience depressive symptoms and have poorer health outcomes relative to non-caregivers (Pinquart & Sörensen, 2003; Schulz & Sherwood, 2008; Vitaliano, Zhang, & Scanlan, 2003). From a healthcare perspective, this is highly problematic because impaired caregiver mental health is directly related to adverse patient outcomes (Graneheim, Johansson, & Lindgren, 2014; Liu et al., 2015; Rohrbaugh, Shoham, Cleary, Berman, & Ewy, 2009) and may result in caregivers relinquishing their role and seeking out costly institutional care despite a strong desire to keep the patient at home.

To date, most of the caregiving literature has focused on specific chronic conditions such as cancer, dementia, or heart failure (Buck et al., 2014; Li, Cooper, Bradley, Shulman, & Livingston, 2012; Northouse, Williams, Given, & McCorkle, 2012). Despite the fact that chronic obstructive pulmonary disease (COPD) is the third leading cause of death worldwide (World Health Organisation, 2015), few psychosocial support services are available for patients and the experiences of their caregivers have only been superficially examined. COPD is a progressive disorder that is characterized by cough, shortness of breath, and acute exacerbations that are associated with decrements in physical, cognitive, social, and psychological functioning (Decramer & Janssens, 2013; Miravittles et al., 2006). In fact, rates of psychological distress (i.e., depression and anxiety symptoms) in individuals with COPD have been reported to be as high as 80% (Hynninen, Breitve, Wiborg, Pallesen, & Nordhus, 2005; Kunik et al., 2005; Lacasse, Rousseau, & Maltais, 2001). Over the past decade, quality of life (QOL) has received increased attention in COPD, with studies finding that distress is a better predictor of COPD-related QOL than lung function (Cully et al., 2006; Kim et al., 2000). Other studies have found that depressive symptoms predict 1-year mortality in COPD patients following an acute exacerbation (Yohannes, Baldwin, & Connolly, 2005). Factors that are associated with elevated depression among those with

COPD include: female gender, younger age, increased severity of respiratory symptoms, greater physical impairment, higher income, and living alone (Coultais, Edwards, Barnett, & Wludyka, 2007; Hanania et al., 2011; Laurin et al., 2007; Lin, Chen, & McDowell, 2005; van Manen et al., 2002). Although engaging in chronic disease self-management may help to alleviate depression (Kroenke et al., 2009), COPD patients often experience physical symptoms (e.g., uncontrolled cough, lack of mobility, fatigue) that severely restrict their self-care capacity (Decramer & Janssens, 2013; Rodriguez Gonzalez-Moro et al., 2009), and cause them to rely heavily on family members for care and support (Figueiredo, Gabriel, Jácome, Cruz, & Marques, 2014).

Growing evidence suggests that COPD imposes increasing physical and emotional burden on informal caregivers (Figueiredo et al., 2014; Grant, Cavanagh, & Yorke, 2012). The prevalence of depressive symptoms in this population ranges from 29%–46% (Figueiredo et al., 2014; Keele-Card, Foxall, & Barron, 1993; Miravittles, Peña-Longobardo, Oliva-Moreno, & Hidalgo-Vega, 2015; Washio et al., 2003). Greater patient illness severity and activity limitations, older age, female gender, and greater subjective burden of the caregiver have been identified as predictors of caregiver depression in COPD (Figueiredo et al., 2014). Studies in other chronic diseases have also shown that patients' lack of disease self-management, caregiver health problems, and lower caregiver income contribute significantly to caregiver depression (Haley, LaMonde, Han, Burton, & Schonwetter, 2003; Nijboer, Triemstra, Tempelaar, Sanderman, & van den Bos, 1999; Porter, Keefe, Garst, McBride, & Baucom, 2008); however, such factors have yet to be examined as predictors of depression in the context of COPD.

Most research in COPD has focused either on patients or on caregivers. Examining patients and caregivers in isolation misses key information about the adjustment process because both the stress of the illness and the factors that affect each person's depression occur within a larger interpersonal context (Lyons, Sullivan, Ritvo, & Coyne, 1995). For example, one meta-analysis found moderate correlations between the distress levels of cancer patients and their caregivers, suggesting that dyad members respond to illness as an emotional system (Hagedoorn, Sanderman, Bolks, Tuinstra, & Coyne, 2008). Social cognitive theory further posits that because patients and caregivers live in a shared environment, they observe one another's experiences and responses to illness and learn from and are affected by one another (Locke & Sadler, 2007). Supporting this, research on couples coping with heart failure has shown that spouses' distress at baseline predicted an unfavorable course of patients' physical symptoms and general health over a 6 month period, independently of patients' baseline distress (Rohrbaugh et al., 2009). Thus, it is important to consider the effects that individuals and their caregivers have on their own outcomes (i.e., actor effects) as well as how each member of the dyad influences the outcomes of the other dyad member (i.e., partner effects) (Kenney, Kashy, & Cook, 2006; Van Lange & Rusbult, 2011).

The consequences of untreated depression in COPD can be severe, affecting patient and caregiver QOL as well as patient mortality (Cully et al., 2006; Grant et al., 2012; Yohannes et al., 2005), yet few psychosocial interventions targeting depression in COPD patients exist (Hynninen, Bjerke, Pallesen, Bakke, & Nordhus, 2010)(Baraniak & Sheffield, 2011); and interventions that target or include their caregivers have yet to be developed. This study

simultaneously evaluated predictors of depression in COPD patients and their caregivers as a first step toward developing such interventions. We expected that patient and caregiver depression levels would be significantly correlated. We also expected that each dyad member's depression would be associated with that person's own sociodemographic and health-related factors (actor effects) and that person's partner's depression (partner effect) in addition to individual-level patient (i.e., COPD severity, self-management behaviors, and social support) and caregiver (i.e., caregiver burden) factors that have been previously identified as predictors of depression in the COPD literature (Coultais et al., 2007; Figueiredo et al., 2014; Hanania et al., 2011; Pinto, Holanda, Medeiros, Mota, & Pereira, 2007).

Methods

Design

The study is a secondary analysis of data collected from COPD patients and their caregivers who were enrolled in a prospective multi-site cohort study (Kale et al., 2015). Participants were recruited from two socioeconomically and racially diverse inner-city outpatient clinics in New York City, NY and Chicago, IL between December 2011 and June 2013. The study was approved by the Institutional Review Boards of the Icahn School of Medicine at Mount Sinai and the Northwestern University Feinberg School of Medicine.

Participants

Eligible patients were ≥ 55 years of age, speakers of English or Spanish, community-dwelling, and had a physician's diagnosis of COPD. Patients were ineligible if they had a history of asthma or neurological or psychological conditions that profoundly affected their cognition. Potentially eligible patients were identified based on reviews of the electronic medical records and clinic registration systems of participating clinics. Trained, bilingual research assistants contacted patients by telephone to verify eligibility. Eligible patients were scheduled for an in-person interview in English or Spanish, at which time written informed consent was obtained. Patients who consented and completed the study questionnaire were asked permission to contact their primary caregiver for participation. Eligible caregivers were ≥ 18 years of age, spoke English or Spanish, identified as the primary informal caregiver of the patient, and had served in that capacity for > 6 months at the time of recruitment.

Measures

Patient and caregiver depression—The 9-item Patient Health Questionnaire (PHQ-9) depression scale (Kroenke & Spitzer, 2002) is half the length of many other depression measures, has comparable sensitivity and specificity, and consists of the actual nine criteria on which the diagnosis of DSM depressive disorders is based (Kroenke, Spitzer, & Williams, 2001). Scores range from 0 to 27 with scores of 5, 10, 15, and 20 representing cut-points for mild, moderate, moderately severe, and severe depression, respectively (Kroenke & Spitzer, 2002). In this study, Cronbach's alpha was .83 for patients and .77 for caregivers.

Patient and caregiver socio-demographics—Patients and caregivers were asked to report on their age, gender, race, marital status, income, and educational history.

Patient and caregiver health measures—Patients completed the COPD Severity Index, a validated self-report measure that uses information on respiratory symptoms, use of systemic corticosteroids and other COPD medications, previous hospitalization for COPD, history of mechanical ventilation, and home oxygen use (Eisner et al., 2005). The index correlates well with physiologic measures of COPD severity and health-related QOL; scores range from 0–25 with higher values indicating greater disease severity.

Using a checklist created for this study, patients reported (1=yes, 0=no) on whether they had any of the following comorbidities: arthritis, coronary artery disease, congestive heart failure, stroke, diabetes, high blood pressure or hypertension, and hyperlipidemia or hypercholesterolemia. Caregivers similarly reported on whether they had arthritis, congestive heart failure, diabetes, high blood pressure or hypertension, hyperlipidemia or hypercholesterolemia, seasonal or nasal allergies, eczema, chronic sinusitis, acid reflux/GERD, or osteoporosis.

Patients and caregivers rated their own general health using a single item on a 5-point Likert-type scale (1 = excellent to 5 = poor) and completed the 6-item Katz Activities of Daily Living (ADL) scale in reference to their own ADLs. The scale is a widely used graded instrument that assesses six primary functions: bathing, dressing, going to toilet, transferring, feeding, and continence (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963). Items are rated on a Likert-type scale (1 = no difficulty to 5 = unable to do it). Summary scores were calculated by summing the number of items in which the person indicated at least some difficulty. Smoking pack years were assessed for patients and caregivers. Smoking status (current, former, or never smoker) was only assessed for caregivers.

Patient self-management—Patients reported on medication use including whether or not they were on reliever medications, used an inhaler, nebulizer, or controller, or were prescribed long-acting beta agonists (LABA) or ipratropium. They also indicated whether they engaged in 8 self-management behaviors (1 = yes, 0 = no). Examples are: having a doctor or nurse in charge of COPD care, going for routine check-ups, even when they do not have difficulty breathing, having at least one routine checkup for COPD in the past year, having a flu shot in the past year, and having ever had a pneumonia shot.

Patient social support—The Lubben Social Network Scale (Lubben, 1988) is a brief instrument that measures social support received from family and friends. Scores range from 0 to 30, with higher scores indicating greater social network support. In this study, Cronbach's alpha was .84.

Caregiver subjective appraisals of caregiving—The 22-item Zarit Burden Interview (Zarit, Reever, & Bach-Peterson, 1980) measures subjective demands and perceived strain of the caregiving role on a 5-point Likert scale of 0 (never) to 4 (nearly always). Scores range from 0 to 88, with higher scores reflecting greater burden. Scores > 60 indicate severe burden, scores 41 to 60 indicate moderate to severe burden, and scores < 40 indicate mild to

no burden. In addition, caregivers reported on how many hours they spent caregiving in a typical week.

Data Analysis

Descriptive statistics (means, standard deviations, Pearson's correlations) were computed separately for patients and caregivers. Partial correlations and paired samples t-tests were additionally calculated for measures that both dyad members completed (e.g., PHQ-9). Given the non-independence of dyadic data, we used a multilevel modeling approach whereby patient and caregiver data were treated as nested scores within the same group (i.e., the dyad; Kenny et al., 2006). Using this approach, we were able to examine actor and partner effects in addition to individual-level patient and caregiver factors associated with depression. We were also able to explore whether actor and partner effects differed depending on the individual's gender (man or woman) and their role as patient or caregiver (Kenny et al., 2006). To test our hypothesis, we ran a linear mixed model in which all of the grand-mean centered predictor variables were simultaneously entered along with gender (1 = man, -1 = woman) and role (1 = patient, -1 = caregiver). All possible interactions between the predictor variables, gender, and role were also examined. Significant interactions were graphed using 1 *SD* above and below the grand mean as high and low values. Effect sizes were calculated using the formula $r = \sqrt{t^2 / (t^2 + df)}$ (Snijders & Bosker, 1999).

Results

Recruitment

We reviewed 939 consecutive electronic medical records of patients with a diagnosis of COPD. One-hundred thirty-six patients were ineligible. Of the 403 who were eligible and provided informed consent; 393 (98%) ultimately completed the study questionnaire. All the caregivers (paid and informal) of patients who completed the study questionnaire were approached by the research team to participate. One-hundred four (26%) caregivers were eligible, provided informed consent, and completed the study questionnaire. However, 15 caregivers (14%) were paid caregivers and were excluded from further analysis based on the fact that their relationship with the patient would be vastly different from informal caregivers who are often family members or close friends. Therefore, the final sample comprised 89 patient-caregiver dyads.

Sample Characteristics

As Table 1 shows, most patients and caregivers who agreed to participate were female, minority (Black or Hispanic), and had completed some college level credits or less. Fifteen patients (17%) and 8 caregivers (9%) described their English proficiency as fair to very poor. Most caregivers were either the spouses/partners or the adult children (son/daughter) of the patient. Length of time spent caregiving ranged from 1 to 7 years ($\bar{X} = 5.10$, $SD = 1.6$); the average amount of time that caregivers spent providing caregiving in a typical week ranged from 1 to 6 hours ($\bar{X} = 5.26$, $SD = 1.4$).

Only 25% of patients and 47% of caregivers described their health as excellent or very good. Approximately 79% of patients reported at least one comorbidity; the most common were

high blood pressure or hypertension (60%), hyperlipidemia or hypercholesterolemia (37%), and diabetes (25%). Caregivers reported an average of 2.70 chronic health conditions out of 10 ($SD = 2.20$), with the most common being high blood pressure or hypertension (46%), arthritis (38%), and diabetes (21%). With regard to smoking, 21 (24%) caregivers were current smokers, 29 (33%) were former smokers, and 39 (44%) had never smoked. The average smoking pack years reported by patients was 41.55 ($SD = 30.54$) and the average smoking pack years reported by caregivers was 15.12 ($SD = 27.06$). Caregivers who were current smokers were more depressed ($\bar{X} = 5.44$, $SD = 4.46$) than caregivers who were former or never smokers ($\bar{X} = 3.20$, $SD = 3.69$; $t(82) = 2.19$, $p = .03$).

In terms of COPD severity, the average score was 7 ($SD = 3.92$; scores can range from 0 to 25), indicating relatively mild disease severity. Eighty-three percent of patients were on reliever medications (in 39%, one or more reliever medications was taken as a nebulizer). Sixty-five percent were prescribed an ICS, 65% were prescribed ipratropium, and 7% were prescribed a LABA. This distribution is consistent with the presence of mild COPD. Patients reported less than 1 ADL on average, indicating good functional status; however, 25% also reported one or more visits to an emergency room in the past year, and 32% reported one or more hospital admissions in the past year. In terms of self-management, 84% said they had a doctor or nurse in charge of COPD care, 55% indicated they had routine medical check-ups and 65% had at least one routine checkup for COPD in the past year. Sixty percent indicated receiving annual flu shots and 64% had received a pneumonia shot.

As Table 2 shows, patients were significantly more depressed than caregivers ($p < .01$). Based on the established cut-points for the PHQ-9, 27 patients had mild depression (30%), 18 had moderate depression (20%), and 9 (10%) had moderately severe to severe depression. The remainder scored below the PHQ-9 cut-off for mild depression. In addition, 18 caregivers had mild depression (20%), 5 had moderate depression (6%), and 2 had moderately severe to severe depression (2%). The partial correlation for depression between patients and caregivers was $r = 0.28$, $p = .01$.

Hypothesis Testing

We ran a linear mixed model to estimate a person's depression levels as a function of: 1) his or her own sociodemographic and health-related factors (actor effects); 2) his or her partner's depression (partner effect); and, 3) individual-level patient (i.e., COPD severity, self-management behaviors, and social support) and caregiver (i.e., caregiver burden) factors that have previously been identified as predictors of depression in the COPD literature (Coultais et al., 2007; Figueiredo et al., 2014; Hanania et al., 2011; Pinto et al., 2007). Only the predictor variables of interest that were significantly associated with the outcome (actor's depression) were included in the mixed model. The contributions of gender and role and their interactions with our predictors of interest were also examined. However, none of the two- or three-way interactions with role were significant, so, for simplicity, they were removed from the final model.

As Table 2 shows, significant main effects ($p .05$) were found for actor's gender, role, and general health, as well as for the patient's self-management (going for routine medical visits) and caregiver burden with effect sizes ranging from $r = .15$ to $.20$. There was also a

significant gender \times partner's depression interaction ($t = -2.442$, $p = .02$). As Figure 1 illustrates, tests of the simple slopes showed that women's depression increased as a function of their partners' depression ($b_1 = 1.24$; $t = 2.97$, $p = .004$). Men's depression decreased slightly as a function of their partner's depression; however, the slope was not significant ($b_1 = -.91$; $t = -1.17$, $p = .25$).

Discussion

This study examined the association between patient and caregiver depression in the context of COPD and evaluated individual-level predictors of depression in a matched sample of patient-caregiver dyads. We found that the depression levels of patients and caregivers were significantly correlated. Using multilevel models with the dyad as unit of analysis, we also found that lack of patient self-management (i.e., not going for routine medical visits), higher levels of caregiver burden, and being in poorer general health were all associated with higher levels of depression for both dyad members. These findings lend partial support to our hypothesis that similar individual-level factors predict patient and caregiver depression in the context of COPD and suggest that the target of psychosocial intervention should be the dyad. Given that research in other chronic diseases has shown that patient self-management and caregiver burden are amenable to intervention (Nolte & Osborne, 2013; Revenson et al., 2016), future research in COPD may benefit from focusing on these variables as future intervention targets.

With regard to our findings for patient general health, it is possible that even though patients had mild COPD, it was not well-managed; 28% of patients visited the ER, 36% were hospitalized in the past year, and only 55% reported going for routine medical check-ups. It is unknown whether these hospital visits/admissions were directly related to a lack of adherence or management of COPD symptoms or whether they were due to other health problems. It is also unclear the degree to which caregiver depression may have contributed to patient symptom management and self-care. With regard to our findings for caregiver general health, over half of the caregivers in our sample reported being in less than optimal health, and caregivers reported an average of 2.7 chronic health conditions. While the severity of caregiver comorbidities is unknown, those who reported poorer health had higher levels of depression. Ironically, the only patient self-management behavior that was predictive of caregiver depression was the patient going for routine medical checkups. Thus, it is possible that caregivers were more focused on the patient's health more than on their own health. Another noteworthy finding related to caregiver health was that 24% of caregivers were current smokers, and those who smoked were more depressed. Preventing or managing depression in caregivers who are smokers is not only important for the caregiver's health and well-being, but also because the caregiver's smoking can interfere with cessation and abstinence in the patient (Gritz et al., 2006). Taken together, our findings underscore the need for greater attention to both patient and caregiver general health in the context of COPD. For example, programs that encourage patients to take a more proactive role in their disease management by going for routine check-ups and taking prescribed medications, and that seek to minimize caregiver burden by encouraging them to engage in self-care and healthy lifestyle behaviors (e.g., smoking abstinence) may help to alleviate both dyad members' depression and improve their QOL.

An interesting finding that emerged based on our exploration of gender and role effects was that higher levels of depression in a partner were associated with higher levels of depression for women, regardless of whether women were patients or caregivers. Thus, in the context of COPD, women may be at increased risk for developing depression when their partners are depressed. This notion is consistent with research suggesting that women carry a larger part of the burden of chronic illness, regardless of whether they are in the role of the patient or the caregiver (Baider & Bengel, 2001; Coyne & Fiske, 1992; Hagedoorn, Buunk, Kuijer, Wobbles, & Sanderman, 2000). Our finding is also partially consistent with theories of emotional contagion which posit that when individuals in close relationships are faced with a common threat, the depression of one partner can spill over and contribute to depression in the other partner (Gump & Kulik, 1997; Hatfield, Cacioppo, & Rapson, 1994). Given that the majority of patients and caregivers in this study were female, more research to disentangle the effects of gender and role on depression in COPD is needed.

Although the depression levels of COPD patients who were enrolled in this study were comparable to those reported in previous studies (Doyle et al., 2013; Hynninen et al., 2005), caregiver depression levels were lower than those reported in previous studies (de Miranda et al., 2011; Nordtug, Krokstad, & Holen, 2011; Washio et al., 2003). Comparisons are difficult given the different measures used to assess depression across studies and the possible influence of sociodemographic/medical characteristics of the various samples (e.g., age, gender composition, COPD severity, and patient functional disability). However, two unique aspects of this study may account for our findings for caregivers. First, we used the PHQ-9, which is a clinical screening measure for major depressive disorder, whereas previous studies have used general measures of mental health or depressive symptomatology. Second, most patients in this study had mild COPD and demands on caregivers were less extensive compared to other samples. Nationally, informal caregivers spend an average of 24.4 hours per week providing care (National Alliance for Caregiving and AARP, 2015) and between 13%–23% of family caregivers provide 40 hours of care a week or more (Evercare and the National Alliance for Caregiving). Our sample provided far fewer hours of caregiving per week, which may have contributed to the lower levels of caregiver burden and depression we observed. Future research may thus benefit from comparing the demands experienced by individuals caring for patients with mild versus severe COPD and how differences in the demands of these different contexts contributes to patient and caregiver depression.

This study had some limitations. Despite the fact that we enrolled a relatively large cohort of inner-city adults with predominant representation of racial/ethnic minorities, our results may not be generalizable to non-urban communities. However, we believe our attention to this population is warranted given the high risk of poor outcomes among ethnic minority COPD patients. In addition, the sample size was small and the participation rate may have affected generalizability. Although spirometric data was not available, all patients had a verified diagnosis of COPD based on their medical record and the self-report measure of COPD severity that we used is a commonly used and well-validated measure. In addition, although we examined individual-level predictors of patient and caregiver depression, we did not collect data on possible relationship factors that could influence the association between dyad members' depression. In a study of couples coping with lung cancer, Carmack Taylor

and colleagues (2008) found that relationship satisfaction moderated the association between patient and partner depression, suggesting that relationship level factors may be important to consider. To explain their findings, the authors posited that couples with good relationship functioning may be better able to engage in positive supportive dyadic coping whereby one partner recognizes the other's distress and the need to assist him or her in coping (Bodenmann, 2005). In such cases, one partner may actively manage his or her own distress for the sake of the other partner and/or their relationship. Finally, the analyses in this study were cross-sectional, so we could not demonstrate a causal relationship between the variables examined. Future studies should thus examine how patient and caregiver depression changes as a function of COPD progression and/or increasing patient physical disability over time.

This study also had strengths. The sample was heterogeneous with regard to race/ethnicity. Moreover, to our knowledge, this is the first study in COPD to examine factors associated with depression in a matched sample of patient-caregiver dyads using appropriate methodologies. We employed multilevel modeling to control for interdependencies in the data and analyzed reciprocal interactions between patients and caregivers in order to understand the impact of dyad members on each other's depression. We found similar patterns of prediction for patient and caregiver depression, which supports expanding research on the psychological sequelae of COPD beyond the individual to examine how partner factors influence depression. Future research can extend these findings by examining the mechanisms by which dyad members affect each other's depression as well as relationship or dyad-level factors that may buffer patients and caregivers from the adverse effects of their partners' depression on their well-being.

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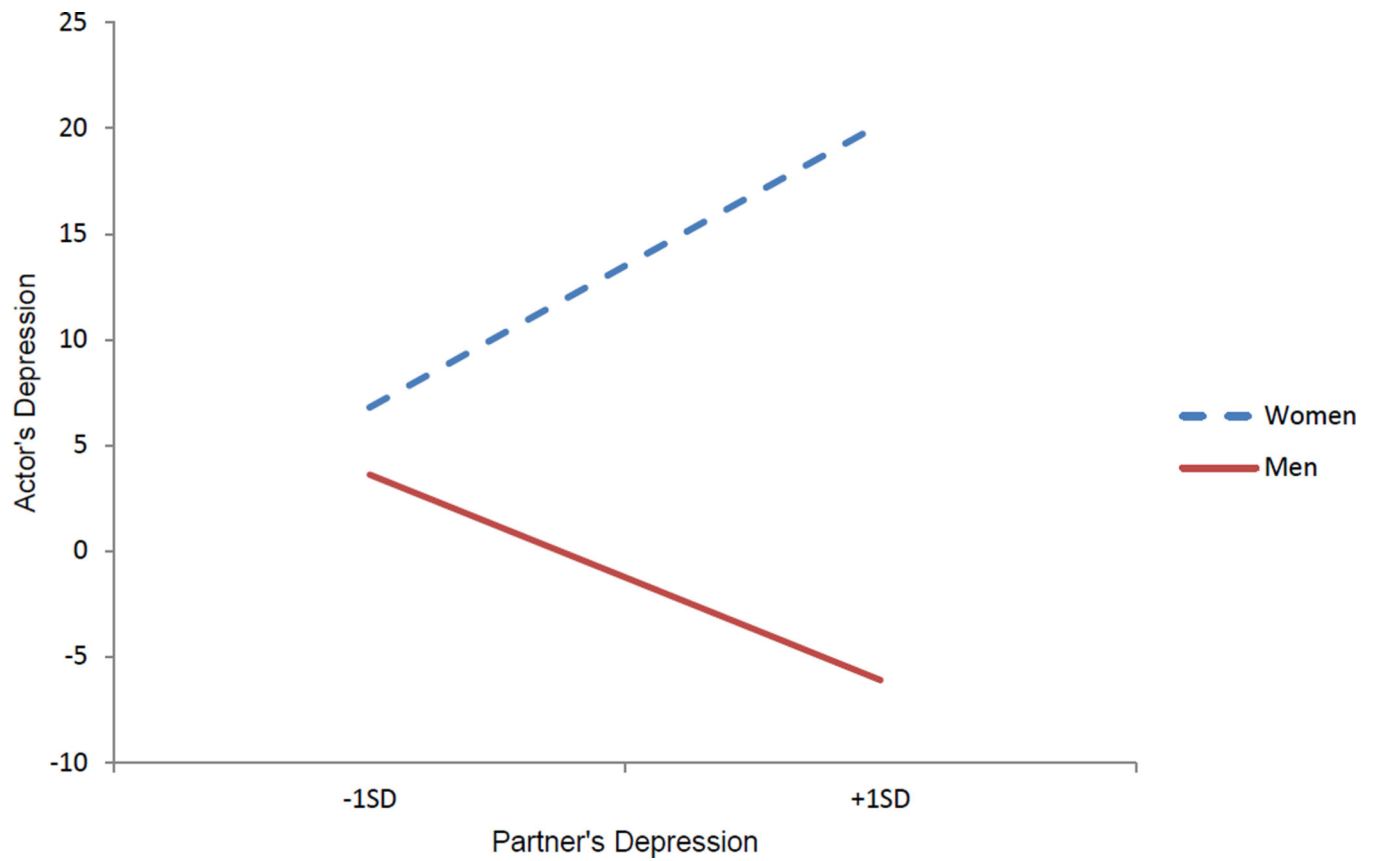


Figure 1.
Results of multi-level modeling analysis showing actor's depression as a function of partner's depression and actor's gender

Table 1

Demographic and Medical Characteristics of the Sample (N = 89 patient-caregiver dyads)

	COPD Patients	Caregivers
Age	\bar{X} = 67.6 years (SD = 8.2)	\bar{X} = 54.8 years (SD = 16.0)
Gender (%)		
Male	35 (39.3)	21 (23.6)
Female	54 (60.7)	68 (76.4)
Marital Status (%) ^I		
Married or living with partner	45 (50.6)	--
Divorced, widowed, never married	42 (47.2)	--
Missing	2 (2.2)	--
Income (%)		
Less than \$750/month	13 (14.6)	19 (21.3)
\$751 to \$1350/month	26 (29.2)	16 (18.0)
\$1351 to \$3000/month	22 (24.7)	25 (28.1)
> \$3000/month	24 (27.0)	29 (32.6)
Missing	4 (4.5)	
Race (%)		
White	29 (32.6)	30 (33.7)
Black	36 (40.4)	34 (38.2)
Hispanic	22 (24.7)	21 (23.6)
Other minority	--	1 (1.1)
Missing	2 (2.2)	3 (3.4)
Education (%)		
Did not graduate high school	20 (22.5)	15 (16.9)
High school graduate	27 (30.3)	17 (19.1)
Some college	21 (23.6)	31 (34.8)
Graduate school	19 (21.3)	23 (25.8)
Missing	2 (2.2)	3 (3.4)
Relationship of Caregiver to Patient (%)		
Spouse/Partner		35 (39.3)
Son/Daughter		25 (28.1)
Another family member		6 (6.7)
A close friend		3 (3.4)
Did not specify		20 (22.5)

Note: \bar{X} = Mean, SD = standard deviation^I Data not collected for caregivers

Table 2

Descriptive results for COPD patients and caregivers (N = 89 patients and 89 caregivers)

	1	2	3	4	5	6	7	8	9	10	Patients \bar{X} (SD)	Caregivers \bar{X} (SD)	Paired t-test
1. Age	.38**	.52**	-.17	.12	-.29*	.12	-.06	-.24*	.25*	.23*	67.67 (8.2)	54.84 (16.0)	8.05**
2. Income ¹	.35**	.34**	-.43**	-.04	-.16	.24*	.28*	-.28*	.21*	-.01	2.67 (1.1)	2.72 (1.1)	-.33
3. General Health ²	-.16	-.26*	-.10	.14	.41**	-.25*	-.16	.07	.29**	.29**	3.20 (1.03)	2.60 (1.0)	4.18**
4. Activities of Daily Living ³	-.29**	-.32**	.30**	-.07	.09	-.10	-.04	-.12	.08	.06	.84 (1.5)	.10 (.5)	4.17**
5. Depression ⁴	-.32**	-.46**	.40**	.54**	.28**	-.14	-.24	.05	.31**	.36**	7.44 (5.9)	3.68 (3.9)	5.67**
6. Pt Network Support ⁵	.10	.31**	-.07	-.12	-.30**	--	.30*	-.23*	.18	-.28**	16.36 (6.7)	--	--
7. Pt Self-Management ⁶	.10	.15	.05	-.16	-.15	.30*	--	-.30*	-.02	-.04	.78 (.4)	--	--
8. PT COPD Severity ⁷	-.30*	-.33**	.45**	.37**	.40**	-.23	-.30*	--	-.16	.16	7.15 (3.9)	--	--
9. Comorbidities ⁸	-.11	-.19	.25*	.17	.25*	-.19	-.06	.22*	--	.24*	1.83 (1.4)	2.70 (2.2)	--
10. Caregiver Burden ⁹	-.27*	-.04	.12	.25*	.34**	-.28**	-.04	.16	.24*	--	--	21.0 (13.6)	--

Note. PT = Patient; CG = Caregiver; \bar{X} = Mean, SD = standard deviation, t = paired samples t-test; correlations for patients are on the lower diagonal, correlations for caregivers are on the upper diagonal and partial correlations between patients and caregivers are in bold on the diagonal.

** p .01,
* p .05

² Single item. "Would you say your health in general is:" 1 = excellent; 2 = very good; 3 = good; 4 = fair; 5 = poor.

³ Katz ADL scale (Katz et al., 1963). Scores can range from 0 to 6 – higher scores indicate greater impairment.

⁴ PHQ-9 (Kroenke & Spitzer, 2002). Scores can range from 0–27; higher scores indicate greater depressive symptomatology.

⁵ Lubben Social Network Scale (Lubben, 1988). Scores range from 0 to 30, with higher scores indicating greater social network support.

⁶ Patient has routine checkups, even when not experiencing difficulty breathing: 1 = yes, 0 = no.

⁷ COPD Severity Index (Eisner et al., 2005). Scores can range from 0 to 25; higher scores indicate greater COPD severity.

⁸ Different comorbidities were assessed for patients and caregivers. For patients, scores could range from 0 to 7 with higher scores indicating more comorbidities. For caregivers, scores could range from 0 to 10 with higher scores indicating more comorbidities.

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Zarit Burden Interview (Zarit et al., 1980). Scores range from 0 to 88, with higher scores reflecting greater burden. Scores 0-9 indicate mild to no burden, and scores 10-40 indicate mild to no burden, scores 41 to 60 indicate moderate to severe burden, and scores 61 to 88 indicate severe burden.

Table 3

Actor, Partner, Patient, and Caregiver Variables Associated with Depression in COPD

	Actor's Depression			
	B	SE	t	Effect size (r)
Intercept	5.17	.41	–	–
Actor's Gender ¹	–1.33	.40	–3.31**	.30
Actor's Role ²	1.72	.42	4.09**	.37
Actor's General Health ³	1.31	.45	2.90**	.27
Partner's Depression ⁴	.17	.46	.37	–
Patient's Self-Management ⁵	–.88	.39	–2.25*	.23
Caregiver's Burden ⁶	1.36	.42	3.21**	.30
Actor's Gender × Actor's General Health	–.01	.43	–.02	–
Actor's Gender × Partner's Depression	–1.07	.44	–2.44*	.26
Actor's Gender × Patient Self-Management	.28	.39	.71	–
Actor's Gender × Caregiver Burden	–.55	.42	–1.29	–

Note: B=raw coefficient, SE=standard error; effect size $r = \sqrt{t^2 / (t^2 + df)}$

*
p<.05,

**
p<.01

¹Effect coding was used for gender such that 1 = man and –1 = woman

²Effect coding was used for role such that 1= patient and –1 = caregiver

³Single item. "Would you say your health in general is:" 1 = excellent; 2 = very good; 3 = good; 4 = fair; 5 = poor.

⁴Patient has routine checkups, even when not experiencing difficulty breathing; 1 = yes, 0 = no.

⁵PHQ-9 (Kroenke & Spitzer, 2002). Scores can range from 0–27; higher scores indicate greater depressive symptomatology.