Respiratory and Bronchitic Symptoms Predict Intention to Quit Smoking among Current Smokers with, and at Risk for, Chronic Obstructive Pulmonary Disease

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Abstract

Rationale: Smoking cessation is the most important intervention for patients with chronic obstructive pulmonary disease (COPD). What leads smokers with COPD to quit smoking remains unknown.

Objectives: We sought to examine the association between respiratory symptoms and other markers of COPD severity with intention to quit smoking among a cohort of patients with probable COPD.

Methods: We conducted a cross-sectional study of subjects with COPD or fixed airflow obstruction clinically diagnosed on the basis of pulmonary function testing. The subjects were identified in the COPD Outcomes-based Network for Clinical Effectiveness and Research Translation multicenter registry. The primary outcome was the intention to quit smoking within the next 30 days (yes or no), which was examined using model building with multivariable logistic regression, clustered by study site.

Measurements and Main Results: We identified 338 current smokers with COPD via the registry. Of these subjects, 57.4% (n = 194) had confirmed airflow obstruction based on pulmonary function testing. Nearly one-third (29.2%; n = 99) intended to quit smoking in the next 30 days. In adjusted analyses, compared with subjects without airflow obstruction based on pulmonary function testing, subjects with Global Initiative for Chronic Obstructive Lung Disease stage I/II COPD were more likely to be motivated to quit (odds ratio [OR], 1.85; 95% confidence interval [CI], 1.37–2.49), with no association found for subjects with Global Initiative for Chronic Obstructive Lung Disease stage III/IV disease. Among the entire cohort, frequent phlegm (OR, 2.10; 95% CI, 1.22–3.64), cough (OR, 1.74; 95% CI, 1.01–2.99), wheeze (OR, 1.73; 95% CI, 1.09–3.18), and higher modified Medical Research Council dyspnea score (OR, 1.26 per point; 95% CI, 1.13–1.41) were associated with increased odds of intending to quit smoking. Low self-reported health was associated with decreased odds of intending to quit (OR, 0.75; 95% CI, 0.62–0.92).

Conclusions: Frequent cough, phlegm, wheeze, and shortness of breath were associated with intention to quit smoking in the next 30 days, with a less clear relationship for severity of illness graded by pulmonary function testing and self-rated health. These findings can be used to inform the content of tobacco cessation interventions to provide a more tailored approach for patients with respiratory diseases such as COPD.

Keywords: tobacco; cessation; chronic obstructive pulmonary disease

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Tobacco use remains a major contributor to poor health, particularly among older smokers and smokers with chronic obstructive pulmonary disease (COPD) (1). After decades of successful tobacco control policies, the rate of decline in the prevalence of smoking in the United States has slowed (2). One possible explanation is that tobacco use is increasingly concentrated among patients who are less motivated to quit or are less able to do so with conventional cessation support, making new insights into the factors that prompt a quit attempt a priority.

In previous studies, researchers reported that health concerns play a significant role in the intention and motivation to quit smoking (3, 4), with some indication that respiratory symptoms are particularly important (5). Diagnosis of a smoking-related condition can prompt individuals to make a quit attempt (6). Patients with COPD, one of the smoking-related conditions most directly attributable to tobacco use, are at very high risk for poor health due to ongoing tobacco abuse, including increased risk for lung cancer, worsening lung function, cardiovascular disease (7), and progressive respiratory symptoms. This population has been shown to benefit greatly from smoking cessation (8, 9). Unfortunately, the prevalence of smoking among individuals with COPD remains about twice as high as in the population as a whole (10). However, smokers with COPD have similar quit rates with treatment and a similar number of quit attempts when compared with smokers in general (11).

Despite the importance of cessation among patients with tobacco-related respiratory diseases, factors associated with the intention to quit smoking among patients with COPD are poorly understood. The primary goal of this study was to examine the association of respiratory symptoms, severity of airflow obstruction (AFO), and other markers of COPD disease severity with the intention to quit smoking in a cohort of patients with clinically diagnosed COPD and a subset of patients with confirmed fixed AFO. The Health Belief Model suggests that cues to action are an important part of making a change in health behavior. Therefore, we hypothesized that respiratory symptoms would predict the intention to quit smoking in the near term. Some of the results of this study were reported previously in the form of an abstract (12).

Methods

Design, Participants, and Data Source

We conducted a cross-sectional study of patients who were identified as having probable COPD. The complete methods for the identification of the study population have previously been published (13). In brief, potential subjects were selected via probability-based sampling from the COPD Outcomes-based Network for Clinical Effectiveness and Research Translation (CONCERT) DataHub (14). The DataHub comprised 220,000 patients 40 years of age or older identified using a comprehensive electronic health record database from 2006–2010, drawn from seven sites representing academic, private, and integrated healthcare organizations. Patients were identified for inclusion in the database via one of three methods: (*1*) identification of COPD-related codes in the International Classification of Diseases, Ninth Revision; (*2*) a medication list that included one or more respiratory-related treatments (short- or long-acting β-agonists, short- or long-acting anticholinergics, inhaled corticosteroids, or formulations containing a combination of these medications); or (*3*) spirometry demonstrating fixed AFO.

A stratified sample of patients was invited to complete an in-person study visit, and they provided written informed consent to participate. Of those who were contacted and eligible (n = 3,350), a total of 1,206 patients (36%) agreed to participate and completed data collection procedures. Trained study personnel administered a questionnaire to collect information on demographics, self-reported comorbid conditions, symptoms, tobacco history, and intention to quit smoking. Patients completed several validated scales for assessment of dyspnea, functional status, and health-related quality of life.

Post-bronchodilator spirometry was performed and interpreted per the American Thoracic Society standards (15), with measurements of height and weight taken at the visit. The presence and frequency of phlegm, cough, and wheeze were assessed by subject report using standardized instruments by asking whether subjects often or usually experienced a given symptom. The instrument was adapted from previously described epidemiologic tools for the purposes of this study (16). Subjects were limited to patients who identified smoking in the past 30 days ("smokers"). All smokers who completed the study visit were included in the primary analysis, with secondary analysis restricted to subjects with fixed AFO based on post-bronchodilator FEV_1/FVC less than or equal to 0.7. All subjects completed and submitted informed consent forms (VA Puget Sound IRB 00207).

Predictors

The exposures included severity of AFO as measured by Global Initiative for Chronic Obstructive Lung Disease (GOLD) stage (17); respiratory symptoms; exacerbation of COPD within the past 3 months; use of home oxygen; and measures of dyspnea, functional status, and self-reported health. We used GOLD stage based on spirometry, rather than the new GOLD classification, because we lacked a full year of history to categorize subjects according to the new GOLD classification and because we wanted to examine exacerbation history and symptoms independently. Our primary measurement of shortness of breath was done using the modified Medical Research Council (mMRC) dyspnea scale (18). The mMRC dyspnea scale is a simple 5-point scale corresponding to activities that provoke dyspnea, with scores ranging from 0 (short of breath only with heavy exertion) to 4 (shortness of breath with dressing or minor activities). Assessment of phlegm, cough, and wheeze was performed using standardized questionnaires as described above.

We measured health status using the self-reported health measure of the EuroQol (EQ)-5D-5L (19), which asks subjects to assign a number to their health, ranging from 0 (worst) to 100 (best). We measured functional limitation using the Patient Reported Outcomes Measurement Information System (PROMIS)-43 scale (20, 21). The PROMIS functional limitation scale is normalized against the general population, with a score of 50 corresponding to average and a lower score corresponding to lower physical function. Our final assessment of dyspnea was done using the Functional Assessment of Chronic Illness Therapy (FACIT) scale (22, 23). The FACIT scale for dyspnea is normalized against a population of subjects with self-reported COPD, with a score of 50 corresponding to average and a higher score corresponding to more dyspnea.

Scores were categorized in tertiles, with the less symptomatic subjects serving as the referent group.

Outcome

We were interested in capturing all smokers who expressed interest in quitting within the next 30 days. Therefore, we assessed intention to quit smoking with a single question, "Are you seriously considering quitting smoking?," with a response of "yes, within 30 days" considered positive. This query is very similar to the assessment of the preparation stage of tobacco cessation that has been used in a number of studies (24, 25), though our assessment was purposefully more inclusive to better mirror the assessment performed in clinical practice. A statement of intention to quit within the next 30 days has been found to correlate with other markers of motivation and self-efficacy for tobacco cessation (26). While intention and motivation are conceptually different measures, an intention to change is a necessary step in the process of changing a behavior.

Confounders

We selected confounders *a priori*, and these included age, race, sex, educational attainment, current smoking intensity, and time spent with other smokers in the home. Because comorbid conditions may influence intention to quit smoking, both independently and through worsening symptoms and frequency of healthcare contacts, we assessed a number of self-reported comorbidities (listed in Table 1) as potential confounders.

Statistical Analysis

We used Stata 13 software (StataCorp, College Station, TX) for statistical analysis. We used chi-square tests and *t* tests to assess unadjusted associations. We performed logistic regression modeling. We built individual models for each symptom and marker of disease severity, adjusted for the confounders listed above, with GOLD stage excluded as a confounder from the model in which it was the primary predictor. Analyses were clustered by site using robust standard errors with a Huber-White sandwich estimator. We assessed each comorbidity for association with the outcome in an individual model, with those attaining a value of $P \leq 0.15$ in bivariate models considered for inclusion in the final models. Model building was repeated for the subjects with fixed AFO on spirometry. An α value less than or equal to 0.05 was considered significant. No adjustment was made for multiple comparisons. Model fit was assessed with the Hosmer-Lemeshow goodness-of-fit test and the area under the curve, which ranged from 0.71 to 0.74 for all the models.

Table 1. Characteristics of current smokers in two motivational stages among a cohort of patients with clinically diagnosed chronic obstructive pulmonary disease

	Smokers, Intending to Quit within 30 d?		
Variable	Yes (*n* = *99*)	No (*n* = *239*)	*P* Value
Age, yr	60.3 (7.4, 44–85)	61.0 (8.25, 42–85)	0.496
Male sex	57 (57.6)	132 (55.7)	0.769
Race			
White	61 (61.6)	171 (71.3)	0.213
Black	30 (30.3)	56 (23.3)	
Other	8 (8.1)	13 (5.4)	
Education			0.436
Less than high school	16 (16.2)	41 (17.3)	
High school	21 (21.2)	65 (27.4)	
Above high school	62 (62.6)	131 (55.3)	
Smoking behavior			
Current smoking, cigarettes/d	10.2 (9.1, 1–40)	15.5 (10.7, 1–70)	<0.001
Pack-years	45.3 (32.0, 0.3–171)	49.3 (28.7, 2.6–182)	0.868
Hours with other smokers in the home	2.3 (4.8, 0–24)	3.3 (6.6, 0–24)	0.164
Symptoms and disease severity			
Phlegm most days	56 (56.6)	102 (42.5)	0.018
Cough most days	68 (68.7)	143 (60.4)	0.152
Wheeze often	68 (68.7)	135 (56.3)	0.034
mMRC dyspnea scale*	1.55 (1.06, 0–4)	1.39 (1.05, 0–4)	0.222
Prescribed medications for breathing	74 (74.7)	169 (70.4)	0.421
Ever prescribed home oxygen	24 (24.2)	37 (15.4)	0.054
COPD exacerbation in the past 3 mo	13 (13.1)	30 (12.5)	0.874
FACIT dyspnea	46.4 (9.32, 27.7–72.2)	45.2 (8.4, 27.7–72.2)	0.245
EQ-5D-5L: self-reported health†	70.9 (18.2, 20–100)	60.0 (20.1, 10–100)	0.037
PROMIS physical function	40.0 (6.4, 26.5–57.8)	40.1 (7.2, 26.5–57.8)	0.931
Self-report of COPD‡	72 (72.7)	174 (73.4)	0.909
GOLD stage			0.433
No fixed airflow obstruction	40 (40.4)	105 (44.3)	
I/II	43 (43.4)	85 (35.9)	
III/IV	16 (16.2)	47 (19.8)	
Comorbid conditions			
Lung cancer	3 (3.0)	9 (3.8)	
Diabetes	17 (17.2)	64 (26.7)	0.062
CHF	18 (18.2)	41 (17.1)	0.808
Stroke	14 (14.1)	38 (15.8)	0.094
Depression	57 (57.6)	127 (52.9)	0.434
CAD	35 (35.4)	89 (37.6)	0.710
Kidney disease	14 (14.1)	47 (19.8)	0.177
OSA	32 (32.3)	51 (21.5)	0.031

Definition of abbreviations: CAD = coronary artery disease; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; EQ = EuroQol; FACIT = Functional Assessment of Chronic Illness Therapy; GOLD = Global Initiative for Chronic Obstructive Lung Disease; mMRC = modified Medical Research Council; OSA = obstructive sleep apnea; PROMIS = Patient Reported Outcomes Measurement Information System.
Values presented are mean (SD, range) or number (percent). Missingness was less than 2% for all variables. *P* values were calculated using chi-square *t* tests.
*Missing for four subjects.
†Reported on 0–100 scale, worst to best.
‡Includes COPD, chronic bronchitis, and emphysema.

Results

Of 3,350 potential subjects, 1,206 (36%) subjects completed the study visit. Of these 1,206 participants, 338 (28%) identified as current smokers and were included in our analysis (Figure 1). Overall, 29.2% (n = 99) of identified smokers indicated an intention

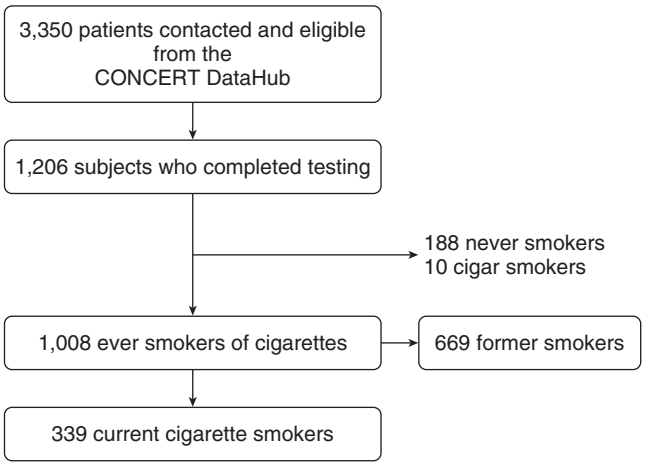

Figure 1. Results of patient selection from the COPD Outcomes-based Network for Clinical Effectiveness and Research Translation (CONCERT) DataHub.

to quit smoking in the next 30 days. In unadjusted analyses, subjects who intended to quit smoking in the next 30 days smoked fewer cigarettes daily, reported more respiratory symptoms, and were more likely to experience sleep apnea. There were no observed differences in dyspnea or physical function, though smokers who intended to quit reported higher self-rated health on the EQ-5D-5L (Table 1).

Association of Symptoms and Disease Severity

In adjusted analyses, GOLD stage demonstrated a U-shaped association with intention to quit smoking. In comparison with smokers without fixed AFO on spirometry, subjects with GOLD stage I/II COPD were more likely to intend to quit smoking in the next 30 days (odds ratio [OR], 1.85; 95% confidence interval [CI], 1.37–2.49), whereas subjects with GOLD stage III/IV disease were not (OR, 1.11; 95% CI, 0.66–1.87). Several respiratory symptoms were associated with almost double the odds of intending to quit smoking within the next 30 days: phlegm on most days (OR, 2.10; 95% CI, 1.22–3.64), cough (OR, 1.74; 95% CI, 1.01–2.99), and frequent wheeze (OR, 1.73; 95% CI, 1.09–3.18).

For each point higher on the mMRC dyspnea scale, corresponding to more dyspnea, we found higher odds of intending to quit smoking in the next 30 days (OR, 1.26; 95% CI, 1.13–1.41). Subjects with the lowest self-rated health on the EQ-5D-5L were less likely to intend to quit smoking in both groups (OR, 0.75; 95% CI, 0.62–0.92; and OR, 0.67; 95% CI, 0.49–0.92) (Table 2). These same relationships were observed among subjects with fixed AFO based on pulmonary function testing, though wheeze was not statistically significant.

Shortness of breath as measured by the FACIT dyspnea scale was not associated with intention to quit smoking, though there was a non–statistically significant trend for an association between intending to quit and more dyspnea (OR, 1.84; 95% CI, 0.92–3.70). Other markers of disease severity were not associated with intention to quit smoking in the next 30 days among the overall cohort, including physical function as measured by the PROMIS physical function scale, exacerbation of COPD within the past 3 months, the use of respiratory medications, and having been prescribed home oxygen at any time. However, among subjects with fixed AFO, use of home oxygen (OR, 1.79; 95% CI, 1.04–3.09) and a moderate but not severe amount of physical limitation based on the PROMIS scale (OR, 2.05; 95% CI, 1.06–3.97) were both associated with increased odds of intending to quit smoking in the next 30 days (Table 2).

Discussion

Within this cohort of current smokers, comprising both those with probable COPD and those with confirmed COPD, near-term intention to quit smoking was associated with symptoms suggestive of chronic bronchitis and shortness of breath, but it was less clearly associated with other measures reflective of COPD severity. These results were found among the overall cohort with a clinical diagnosis of COPD as well as among the subjects with fixed AFO based on pulmonary function testing. These findings suggest that symptom burden is more highly associated with the intention to quit smoking than with other measures of COPD severity, such as a history of exacerbations, more severe lung disease based on spirometry, or use of home oxygen. More than hospitalizations or the use of medication, frequent symptoms may be socially disruptive and difficult to conceal or ignore.

In previous studies (27–29), patients with bronchitic symptoms such as phlegm, cough, and wheeze realized significant improvements in these symptoms if they were successful at smoking cessation. Patients who are motivated to quit smoking in the setting of these symptoms may therefore be counseled regarding the likelihood of improvement if they are successful.

Typical physician-based tobacco counseling is focused on the "dangers of tobacco use" (30), such as the increased risks for cancer, worsening lung function, oxygen dependence, and death. The Health Belief Model suggests that the motivation to change a potentially dangerous behavior depends on a number of factors, including the patient's belief regarding susceptibility to a particular health concern (31). While physicians are well aware of the potential long-term risks for their patients, patients may not fully perceive their risk for these future complications. Misinformation on the risks of tobacco use is common among smokers, and it is detrimental to quit attempts (32, 33). However, symptoms that are readily apparent on a daily basis are harder to deny and may therefore lead to more quit attempts.

These data support the use of a tailored approach to tobacco cessation among older smokers with and at risk for COPD, an approach focused on more immediately tangible rewards, and suggest that the most opportune time for providers to discuss smoking cessation may be when patients report cough, phlegm, wheeze, or shortness of breath. Although it is a necessary first step, intention to quit smoking does not necessarily translate into a successful attempt to do so (34). Focusing on symptoms as a motivating factor for a cessation attempt may be beneficial by

Table 2. Adjusted odds ratios of endorsing intention to quit smoking within next 30 days among current smokers with or without fixed airflow obstruction, by symptoms and markers of disease severity

Variable	All Smokers (*n* = 338)			Subjects with COPD Based on PFT (*n* = 194)		
	OR	95% CI	*P* Value	OR	95% CI	*P* Value
GOLD stage						
0 (no COPD)	Reference			—	—	
I–II (mild to moderate)	**1.85**	**1.37–2.49**	<0.001	Reference		
III–IV (severe to very severe)	1.11	0.66–1.87	0.694	0.67	0.38–1.17	0.157
Phlegm most days	**2.10**	**1.22–3.64**	0.007	**2.41**	**1.37–4.24**	0.034
Cough most days	**1.74**	**1.01–2.99**	0.045	**2.15**	**1.06–4.36**	0.034
Wheeze frequently	**1.73**	**1.09–3.18**	0.023	1.98	0.94–4.18	0.071
mMRC dyspnea scale, per point higher*	**1.26**	**1.13–1.41**	<0.001	**1.22**	**1.05–1.42**	0.008
Exacerbation in past 3 mo	0.92	0.63–1.33	0.645	1.62	0.64–4.08	0.308
Prescribed home oxygen	1.85	0.90–3.76	0.090	**1.79**	**1.04–3.09**	0.036
Reported physician-diagnosed COPD, emphysema, or chronic bronchitis	0.97	0.69–1.38	0.874	1.34	0.73–2.44	0.348
FACIT dyspnea score†						
⩽40	Reference			Reference		
40–49	1.35	0.80–2.28	0.264	1.42	0.57–3.53	0.453
⩾50	1.84	0.92–3.70	0.087	2.00	0.86–4.68	0.105
PROMIS score, physical function‡						
⩾42	Reference			Reference		
35–42	1.47	0.85–2.55	0.168	**2.05**	**1.06–3.97**	0.033
⩽35	1.12	0.52–2.42	0.775	1.06	0.51–2.19	0.881
EQ-5D-5L, self-reported health, 0–100 from worst to best						
⩾80	Reference			Reference		
60–80	1.35	0.80–2.26	0.257	1.00	0.70–1.44	0.984
⩽60	**0.75**	**0.62–0.92**	0.005	**0.67**	**0.49–0.92**	0.012

Definition of abbreviations: CI = confidence interval; COPD = chronic obstructive pulmonary disease; EQ = EuroQol; FACIT = Functional Assessment of Chronic Illness Therapy; GOLD = Global Initiative for Chronic Obstructive Lung Disease; mMRC = modified Medical Research Council; OR = odds ratio; PFT = pulmonary function testing; PROMIS = Patient Reported Outcomes Measurement Information System.

Models are adjusted for age, race, education, cigarettes smoked daily, GOLD stage, hours spent with another smoker, and comorbidities, clustered by site. Bold type indicates statistically significant values.

*n = 333 and n = 191 for all smokers and subjects with COPD, respectively, due to missingness.

†Normalized against an average of 50, with higher score meaning more dyspnea.

‡Normalized against an average of 50, with lower score meaning worse physical function.

providing a more immediate, concrete, and positive reason for a behavior change (35). This fits within the framework of the "five R's" of motivational interviewing (relevance, risks, rewards, roadblocks, and repeat), an evidence-based method designed to help motivate the unmotivated smoker or aid the motivated smoker struggling with turning thought into action (36). Recent data indicate that providers are already much more likely to provide counseling and assistance to smokers with COPD, with undiagnosed or asymptomatic smokers assisted at a much lower rate (37). Although symptoms may provide an excellent opportunity for a clinician to initiate a discussion of smoking cessation, an absence of symptoms does not relieve the clinician from recommending or providing smoking cessation therapies.

We also observed that patients with GOLD stage I/II disease were more likely to intend to quit in the near term than were those with GOLD stage III/IV disease, and that subjects with the lowest self-reported health were less likely to endorse an intention to quit smoking in the next 30 days. The finding that subjects with mild to moderate COPD were more likely than those without AFO to intend to quit smoking was unsurprising.

However, it is concerning that smokers with more severe COPD and subjects with worse self-reported health were less likely to intend to quit smoking. These data are consistent with those in prior studies which showed that older smokers and smokers with COPD were less likely to recognize and endorse the benefits of cessation, and believed that they themselves would find quitting too hard (38–40). We may have identified a subgroup of smokers with COPD at the highest risk of ongoing danger due to tobacco use. Our findings persist despite adjustment for heaviness of tobacco use, time spent with other smokers, and other markers of socioeconomic status. Therefore, the subgroup of smokers with heavy tobacco use, other smokers in the home, and low socioeconomic status in addition to COPD and respiratory symptoms may represent the highest-risk group for ongoing tobacco abuse and warrant further investigation.

An alternative explanation for our findings is that smokers who were more motivated to quit may have stopped smoking at an earlier disease stage, leaving a population of "hard-core" smokers at higher GOLD stages. Again, this underscores the need for tailored treatments for smokers with significant pulmonary disease, aimed at getting them to quit earlier in the disease process. In previous studies examining interventions tailored to older smokers, researchers found improved cessation rates (41). Such personalized materials may be beneficial for patients with lung diseases.

Strengths and Limitations

Our study has several limitations. Inference is limited due to the cross-sectional nature of the data. Smoking status was determined by self-report and was not biochemically confirmed. While information on the number of cigarettes smoked daily was available, additional testing of level of addiction was not performed. The stated intent to quit smoking was measured at a single time point, with the possibility of overreporting due to social desirability. However, recent data suggest that subjects do not frequently overreport a desire to quit smoking, regardless of the modality of measurement (42). Measures of recent exacerbations, comorbidities, and use of oxygen were based on patient report, which may have introduced recall bias by severity of disease. The recall period was within accepted time periods for more accurate recall, and we would anticipate this bias to be nondifferential to our outcome.

Although the subjects who completed the study visit appeared to be representative of the DataHub as a whole, we had a relatively low response rate, which may have introduced selection bias. Subjects who agree to participate in research may differ from the population with and at risk for COPD overall. We would anticipate that these subjects might be more engaged in healthcare and therefore more likely to report an intention to quit smoking in the next 30 days. However, the proportion of our subjects (28.2%) who indicated an intention to quit smoking in the next 30 days was nearly identical to that found in a national population-based study of subjects with self-reported COPD (37). Finally, we were able to assess only intent to quit smoking, not whether those intentions led to success.

Our study has a number of strengths. We selected patients from a large database across multiple sites and cities, improving the generalizability of the results to the population of smokers with and at risk for COPD. We had access to spirometry, the gold standard for the diagnosis of COPD, as well as to detailed demographic data. Last, we had access to a number of highly validated measures of symptom burden and physical limitation.

Conclusions

Respiratory symptoms consistent with chronic bronchitis were significantly associated with the intention to quit smoking. This suggests that a focus on the daily experience of smokers—more than on the other downstream complications—may be helpful when encouraging quit attempts for all smokers. This information can particularly be used to help tailor cessation support materials and counseling for symptomatic smokers and smokers with COPD. Addressing tobacco use when respiratory symptoms are present may improve quit rates among a population of chronically ill and potentially recalcitrant smokers. ■

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