American Thoracic Society Documents

An Official American Thoracic Society Systematic Review: Influence of Psychosocial Characteristics on Workplace Disability among Workers with Respiratory Impairment

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THIS OFFICIAL SYSTEMATIC REVIEW OF THE AMERICAN THORACIC SOCIETY (ATS) WAS APPROVED BY THE ATS BOARD OF DIRECTORS, JULY 2013

CONTENTS

***Rationale*: Psychosocial characteristics likely play an important role in the severity of workplace disability for workers with a respiratory impairment.**

***Objectives*: We performed a systematic review of the available literature to examine the impact of psychosocial characteristics on workplace disability among workers with a respiratory impairment.**

***Methods*: Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses recommendations, we searched Medline and other published and unpublished sources using the PubMed and Cochrane Central Register of Controlled Clinical Trials (CENTRAL) search engines from January 1, 1990 through March 8, 2013 for quantitative studies that examined the association of psychosocial characteristics with workplace disability among workers with a respiratory impairment. We also searched related citations and the bibliographies of selected studies and relevant review articles. One investigator abstracted data about study design and quality, psychosocial characteristics, and outcome measures.**

***Measurements and Main Results*: Of 5,746 potentially relevant studies, 20 met eligibility criteria and were included. Studies reported heterogeneous outcomes among heterogeneous samples of workers that precluded a quantitative synthesis. In general, mental illness was associated with increased workplace disability among workers with respiratory impairments. Few studies adjusted for disease severity, so the independent association of psychosocial characteristics and workplace disability is unclear. Most studies were cross-sectional, so the direction of the association could not be determined. We found only one trial of targeted therapy for the psychosocial condition, which was not effective at reducing disability.**

***Conclusions*: Psychosocial characteristics likely influence workplace disability in workers with respiratory impairments. The impact of targeted therapies is unclear and warrants further study.**

OVERVIEW

Respiratory impairment and psychosocial characteristics impact workplace disability, but the interactions between these conditions are likely complicated and multidirectional. Furthermore, it is not clear if targeted interventions for the psychosocial characteristics decrease workplace disability among workers with a respiratory impairment. In order to better understand the influence of psychosocial characteristics on workplace disability among workers with a respiratory impairment, we performed a systematic review to address three questions: (*1*) Do psychosocial characteristics (mental illness, occupational stressors, etc.) influence workplace disability among workers with a respiratory disability? (*2*) Do targeted interventions decrease workplace disability among workers with a respiratory disability and concomitant adverse psychosocial characteristics? (*3*) Do specific mental health assessment instruments have better test characteristics among workers with a respiratory disability?

- Our systematic review identified 5,746 potentially relevant studies. Twenty studies met eligibility criteria and were included in our analysis.
- *Question 1*: Mental illness was associated with increased workplace disability among workers with respiratory illness. Studies of mental health were mostly conducted among patients with asthma and chronic obstructive pulmonary disease (COPD) and suggested that depression and distress had stronger associations with workplace disability than the underlying respiratory disease itself. More severe mental illness was associated with increased disability. However, an independent association between psychosocial characteristics and workplace disability could not be evaluated because few

This study was sponsored by the American Thoracic Society (ATS). C.G.S. is supported by a VA Health Services Research and Development Career Development Award and resources from the Portland VA Medical Center, Portland, Oregon. The Department of Veterans Affairs did not have a role in the conduct of the study, in the collection, management, analysis, interpretation of data, or in the preparation of the manuscript. The sponsor provided documents review processes and, after satisfactory revision, forwarded to the ATS Board of Directors for final approval. The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs or the U.S. Government.

Am J Respir Crit Care Med Vol 188, Iss. 9, pp 1147–1160, Nov 1, 2013

DOI: 10.1164/rccm.201309-1656ST
Internet address: www.atsjournals.org

studies adjusted for disease severity, and the direction of the association could not be determined because most studies were cross-sectional.

- *Question 2*: Only one study was identified that examined the effect of treating comorbid mental illness on workplace disability in workers with a respiratory impairment. It found no effect from a stress management intervention.
- *Question 3*: None of the studies identified addressed the third question.
- In conclusion, psychosocial characteristics likely play a role in workplace disability among patients with respiratory impairment, and there is evidence that they impact the disability more than the actual respiratory impairment. There is insufficient evidence to guide interventions, and there is no evidence about the performance of mental health instruments in workers with respiratory impairment. Additional research into these questions, as well as the complex relationships between psychosocial characteristics and respiratory impairment, is warranted.

INTRODUCTION

Pulmonary and occupational medicine clinicians are frequently required to evaluate the cause and severity of a worker's respiratory impairment and its impact on workplace disability. Although the terms impairment and disability are often used synonymously, there are important differences. According to the World Health Organization (WHO), impairment is "any loss or abnormality of psychological, physiological, or anatomical structure or function," whereas disability means "activity limitation that creates a difficulty in the performance, accomplishment, or completion of an activity in the manner or within the range considered normal for a human being" (Figure 1) (1).

Notably, many workers have more than one impairment that may contribute to disability. For instance, respiratory impairments and adverse psychosocial characteristics, including but not limited to mental illness and negative workplace attitudes and behaviors, commonly impact workplace disability, both individually and as concomitant conditions (2, 3). The relationships between respiratory impairments, psychosocial characteristics, and workplace disability are likely complex and multidirectional. Patients with respiratory illnesses have a greater risk for depressive symptoms (4–7) and suffer worse outcomes than those without mental illness (8). In particular, comorbid mental illness has been shown to potentiate the impact of physical illness on general functional disability (9–11). It is less clear how mental illness and other psychosocial characteristics impact the association between respiratory impairment and workplace disability.

Objectively determining the severity of respiratory impairment that leads to a particular degree of workplace disability is difficult at least in part because workers often have more than one condition that affects their ability. Some aspects of the severity of respiratory disease can be relatively objectively and easily measured, such as the FEV_1, bronchoprovocation testing, and maximum oxygen consumption ($V_{O_2}max$) (12–14). Ideally, clinicians would be able to evaluate the independent contribution of each component causing workplace disability, including mental illness. Although the severity of mental illness is more difficult to measure than respiratory impairment, evaluating its contribution to workplace disability is recommended when assessing a worker's ability to work (15). Solely focusing on objective measures of respiratory impairment may lead to underestimations of the degree of disability (16). Importantly, better understanding of the interplay between physical and mental comorbid illnesses and their effect on work outcomes may lead to improved treatment strategies (17).

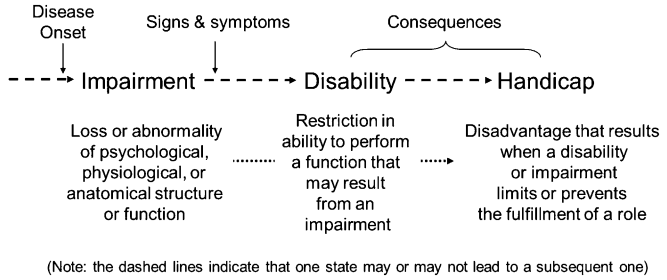

Figure 1. Relationship between workplace impairment and disability.

Using the WHO's theoretical model of disability to evaluate workers with multiple impairments, we performed a systematic review of available evidence regarding the association of psychosocial characteristics ("predictor") with workplace disability ("outcome") among patients with respiratory illnesses. Specifically, we had three questions, framed in the Patient Intervention Comparator Outcome (PICO) format. (*1*) Among workers with a respiratory disability, do psychosocial characteristics (mental illness, occupational stressors, etc.), compared with not having these characteristics, influence workplace disability? (*2*) Among workers with a respiratory disability and concomitant adverse psychosocial characteristics, do targeted interventions, compared with placebo or usual care, decrease workplace disability? (*3*) Among workers with a respiratory disability, do specific mental health assessment instruments, compared with other instruments, have better test characteristics?

METHODS

Study Identification

Two authors (C.G.S. and M.C.H.) conducted the search using PubMed focusing on text words to find the maximal number of relevant studies after consultation with a medical librarian. We combined the terms "occupational diseases," "occupational asthma," "workplace related asthma," "work related asthma," "asthma in the workplace," "respiratory tract diseases," "pulmonary disease," "asthma," or "chronic lung disease" with "behavioral disciplines and activities," "psychology," "psychosocial," "depression," or "anxiety," and "disability evaluation," "activities of daily living," "employment," "work," "work disability," or "employment status." Publications were searched from January 1, 1990, through March 8, 2013, and limited to human studies published in English, because we believed studies published before this date would be less likely to be relevant to current clinical practices. One author (C.G.S.) also searched the Cochrane Central Register of Controlled Clinical Trials (CENTRAL), which includes trials indexed in EMBASE, for the same dates using the text search terms "respiratory" or "pulmonary" and "work" and "disability." Figure 2 shows the results of the searches. We followed the recommendations from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement for reporting the results of this systematic review (18) and summarize our methodology in Table 1.

The references of all included papers and pertinent review articles plus the "related citations" section in PubMed were reviewed. If two or more of the included papers had a common primary or senior author, we searched for that author's other work in PubMed. Reviews, letters, and case series/reports were not included, but references were reviewed for possible inclusion.

TABLE 1. METHODS CHECKLIST

	Yes	No
Panel assembly		
Included experts from relevant clinical and nonclinical disciplines	✓	
Included individuals who represent views of patients and society at large		✓
Included methodologist with appropriate expertise (documented expertise in development of conducting systematic reviews to identify the evidence base and development of evidence-based recommendations)	✓	
Literature review		
Performed in collaboration with librarian	✓	
Searched multiple electronic databases	✓	
Reviewed reference lists of retrieved articles	✓	
Evidence synthesis		
Applied prespecified inclusion and exclusion criteria	✓	
Evaluated included studies for sources of bias	✓	
Explicitly summarized benefits and harms	✓	
Used PRISMA1 to report systematic review	✓	
Used GRADE to describe quality of evidence		✓
Generation of recommendations		
Used GRADE to rate the strength of recommendations	NA	NA

Definition of abbreviations: GRADE = Grading of Recommendations Assessment, Development, and Evaluation; NA = not applicable; PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Study Eligibility

We *a priori* decided to include all randomized controlled trials and observational studies that evaluated the combined association of respiratory disease and psychosocial determinants (hereafter categorized as: mental health, workplace attitudes and beliefs, demographic, and disease knowledge/management characteristics) with work-related outcomes. Studies had to include workers with respiratory illnesses as the majority (>85%) of total workers, or this number was evaluated separately. We made no exclusions based on the country of origin. We included all studies that reported a relevant measure of workplace activity, including employment status, sick leave/absenteeism, hours worked, etc., as the outcome. We did not include studies that reported other activities, such as exercise or activities of daily living. All studies included a psychosocial characteristic as the predictor (Question 1), or the intervention was based on changing a psychosocial characteristic (Question 2). One author (C.G.S.) reviewed the full-text papers for these eligibility criteria.

Data Abstraction

We abstracted data about demographic characteristics, the psychosocial characteristic or intervention, specific workplace activity and/or disability outcome, statistical tests and significance, and adjustment for important confounders. We also collected data about how the predictors and outcomes were measured.

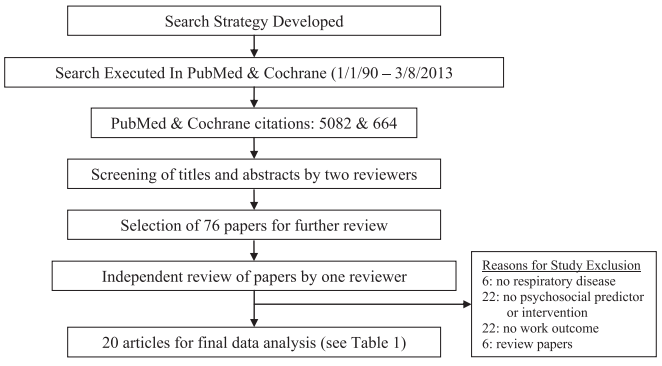

Figure 2. Flow chart of the process that was used to select the relevant studies.

Analyses

Values and ranges for summary statistics are reported based on information provided by each of the study authors. We did not attempt to pool data across studies because there was substantial heterogeneity in the cohorts that were evaluated as well as predictor and outcome measures.

Quality Review

To measure study quality, we used a 16-item inventory (19). These items included measures of cohort assembly, predictor measurement, outcome measurement, adjustment for confounding, and statistical analysis. Each question was graded either "Yes," "No," "Unsure," or "Not applicable" by one investigator (C.G.S.). Individual questions are listed in Figure 3, and quality was graded as the total number of "Yes" responses over the possible number. Many studies were cross-sectional, so the question regarding appropriate follow-up was not relevant. Also, most of the studies used a survey design, and it was unclear if investigators and/or participants were blinded; these studies were not included in the denominator for those criteria.

Role of the Sponsor

This study was sponsored by the American Thoracic Society (ATS). The sponsor provided documents review processes and, after satisfactory revision, forwarded to the ATS Board of Directors for final approval.

RESULTS

We identified 5,082 and 664 potentially relevant citations from the PubMed and Cochrane searches, respectively. After reviewing the title and abstract, and secondarily reviewing the references and citing papers of the included studies and review articles, we identified 76 papers for full-text review (Figure 2). Of these 76 papers, 20 were eligible based on our inclusion and exclusion criteria: 6 did not evaluate a respiratory disease, 22 did not include a psychosocial predictor or intervention, 22 did not include a work outcome, and 6 were review papers. Table 2 lists the characteristics of the studies. No study quantitatively addressed the third question, so this aspect was not addressed. Most of the studies included workers with asthma and/or COPD. None of the studies that included workers with asthma were limited to workers with work-related asthma, but one separately categorized this group. Table 3 lists the studies, the psychosocial predictor or intervention, work outcomes measured, and results from each study. Representative studies are discussed below.

Study Quality

In general, study quality was good (Figure 3). Seventeen studies were cross-sectional, and most used survey data, with two prospective cohorts and one randomized intervention trial. All but one of the studies met at least 75% of the applicable quality criteria. Few studies (20%) addressed the potential problem of multiple comparisons or reported potential conflicts of interest (15%).

QUESTION 1

Mental Health

In general, mental health was found to be associated with workplace disability among workers with asthma and COPD (Tables 1 and 2). The studies included multiple aspects of mental health, including anxiety, depression, and distress, that were measured with many instruments or methodologies. For example, Kessler and

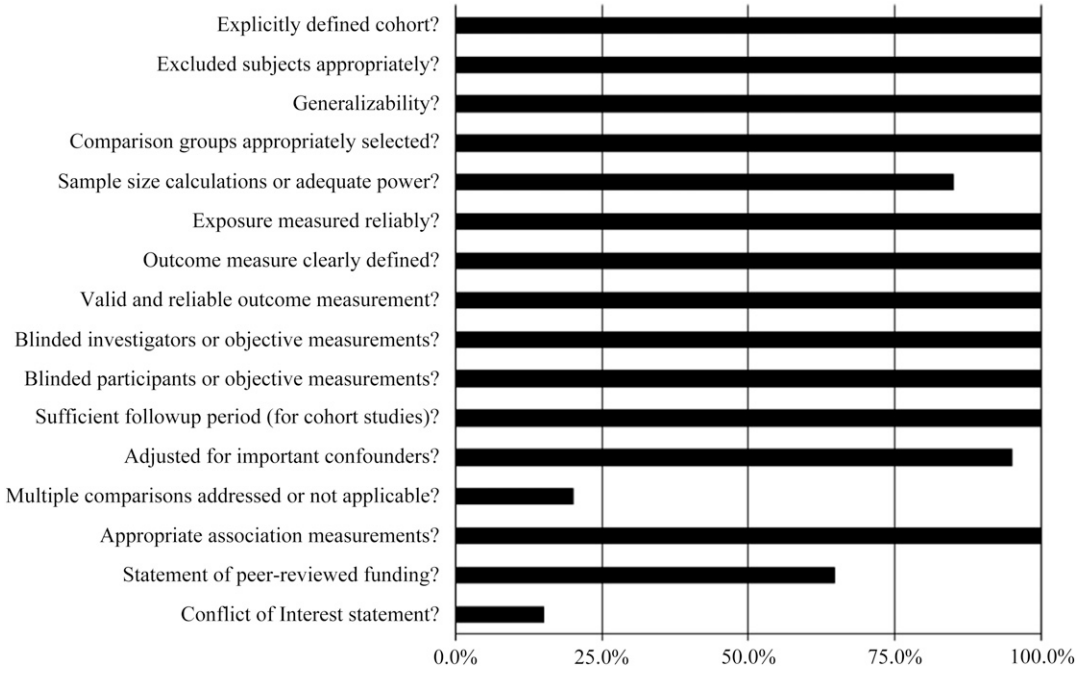

Figure 3. Percentage of studies meeting each quality measurement. Studies were categorized as deficient if they did not report on the measure. Most studies were cross-sectional, so the question regarding follow-up was not applicable, and these studies were not included in the numerator or denominator.

colleagues examined the impact of depression relative to other health problems using the WHO Health and Workplace Questionnaire, a self-report of work absenteeism and job performance, among workers in a large U.S. firm (20). Respiratory problems were one of nine medical problems included on the Health and Workplace Questionnaire checklist. They found that depressive symptoms were associated with poor work performance, whereas asthma was not. They did not observe an interaction between asthma and depression, implying that poor work performance was associated with depression alone, rather than acting as an effect modifier.

Few studies adjusted for respiratory disease severity. However, in a cross-sectional study of Health Maintenance Organization enrollees in California with a previous hospitalization for asthma, Eisner and colleagues showed that poor mental health, as measured with the Short Form Health Survey (SF)-12, was associated with higher odds ratios (ORs) for partial and complete disability as well as receipt of disability payments that persisted after adjustment for a self-reported asthma severity score (21). In a study that adjusted for pulmonary function and other potential confounders, among Dutch workers enrolled in an asthma treatment trial, measures of anxiety and asthma-related stigma were associated with absence from work in the previous 3 months (22).

Stein and colleagues used a large cross-sectional study from Canada (the Canadian Community Health Survey) to examine the impact of a major depressive disorder on work disability among workers with chronic illnesses, including asthma and COPD (23). Participants with a respiratory disorder with concomitant major depressive disorder had a higher adjusted risk of missing work for asthma (OR, 2.38; 95% confidence interval [CI], 1.04–5.43) and COPD (OR, 2.58; 95% CI, 1.11–5.99), respectively. These ORs were adjusted for sociodemographic characteristics and chronic physical illness burden but not markers of disease severity.

Schmitz and colleagues also used data from a portion of the Canadian Community Health Survey to determine the functional disability of individuals with asthma and psychological distress (24). They examined disability days in the previous 2 weeks for 6 subgroups: subjects without asthma with low, moderate, or high psychological distress and subjects with asthma with low, moderate, or high psychological distress. For subjects with asthma and low psychological distress, the OR for having 1 or more disability days in the previous 2 weeks was 1.40 (95% CI, 1.19–1.64) versus 11.73 (95% CI, 8.30–16.57) for those with asthma and high psychological distress (both using subjects without asthma and having low psychological distress as the referent). Using the same cross-sectional survey, Goodwin and colleagues found that self-reported asthma and a lifetime history of a mental health disorder were associated with adjusted higher risks for workplace disability due to physical health and work limitation compared with asthma alone (OR, 2.03; 95% CI, 1.57–2.63 and OR, 2.08; 95% CI, 1.59–2.97), respectively (25). Neither study adjusted for markers of asthma severity.

One study evaluated patients with work-related asthma. Mazurek and colleagues used the U.S. Behavioral Risk Factor Surveillance System survey to identify workers with self-reported asthma. They defined subjects with work-related asthma (WRA) as those who answered "yes" to a question regarding being told by a clinician their asthma was "related to any job you ever had" (26). They found an association of WRA and depression (based on the Patient Health Questionnaire-8) with an inability to work 14 or more days in the last year (adjusted prevalence ratio, 4.20; 95% CI, 2.43–7.25) compared with a prevalence ratio of 2.78 (95% CI, 1.64–4.68) for WRA alone.

Three studies included patients with cystic fibrosis who also showed an association between mental health and workplace disability. As an example, Burker and colleagues, using a survey of patients with cystic fibrosis referred to a transplant clinic in North Carolina, found that people who were not working had higher Beck Depression Index scores (27). In addition, they found higher depression scores and higher optimism scores (measured on the Life Orientation Test) were associated with less and more hours worked per week, respectively. Notably, FEV_1 was not associated with hours worked per week.

Workplace Attitudes/Beliefs

Several studies from the Netherlands used cross-sectional surveys of patients with asthma and COPD. Boot and colleagues found

TABLE 2. OVERVIEW OF INCLUDED STUDIES

Study (Reference)	Methodology Study Design (Source[s] of Data)	Subjects			Predictor or Intervention	Outcome(s)
		Disease	Number	Age (*yr*)		
Question 1: Among workers with a respiratory disability, do adverse psychosocial characteristics (mental illness, occupational stressors, etc.), compared to not having these characteristics, influence workplace disability?						
Kaptein et al., 1993 (22)	Cross-sectional survey (Adults in the Netherlands enrolled in an asthma treatment trial)	Asthma	274	18–60	Stigma Anxiety	Absence from work
Gillen et al., 1995 (59)	Cross-sectional survey (Patients attending two outpatient clinics in San Francisco)	Cystic fibrosis	48	32*	Marital status	Workplace disability
Blanc et al., 1996 (33)	Cross-sectional survey (Adults in Northern California)	Asthma	601	18–50	Multiple (*see* Table 3)	Asthma-attributed work disability Complete cessation of work Partial disability
Erickson and Kirking, 2002 (34)	Cross-sectional survey (Adults in a managed care organization in Michigan)	Asthma	369	>18	Multiple (*see* Table 3)	Work performance scale Days missed
Boot et al., 2004 (28)	Cross-sectional survey (Workers in the Netherlands)	COPD and asthma	189	18–65	Multiple (*see* Table 3)	Sick leave
Burker et al, 2004 (27)	Cross-sectional survey (Adult clinic, referred for lung transplant, in North Carolina)	Cystic fibrosis	183	Not reported	Depression Education Optimism State anxiety Trait anxiety	Working/not working Hours worked per week
Boot et al, 2005 (29)	Cross-sectional survey (Workers in the Netherlands)	COPD and asthma	165	18–65	Knowledge about disease	Sick leave
Boot et al, 2005 (30)	Prospective cohort (Workers in the Netherlands)	Asthma	111	18–65	Multiple (*see* Table 3)	Sick leave
Boot et al, 2005 (31)	Cross-sectional survey (Workers in the Netherlands)	COPD and asthma	189	18–65	Multiple (*see* Table 3)	Sick leave
Boot et al, 2005 (32)	Cross-sectional survey (Workers in the Netherlands)	COPD and asthma	165	18–65	Attitudes Social norms toward sick leave Control	Sick leave
Eisner et al., 2006 (21)	Cross-sectional survey (Northern California Kaiser-Permanente)	Severe asthma	465	18–65	Mental health	Complete work disability Partial work disability Disability payments
Joshi et al., 2006 (60)	Cross-sectional survey (State workers with health benefits)	Asthma	385	18–64	Self-reported medication adherence	Productivity dollars
Stein et al, 2006 (23)	Cross-sectional survey (Canadian Community Health Survey)	Asthma and COPD	130,880	≥12	Major depressive disorder	2-wk disability Work absence
Hogg et al., 2007 (61)	Cross-sectional survey (Outpatients from a university teaching hospital in Australia)	Cystic fibrosis	50	28*	Disease mastery Emotional function Quality of life	Disability index Hours worked per wk
Kessler et al., 2008 (20)	Cross sectional survey (Large [20,000 employees] information technology firm in United States)	Respiratory disease (asthma, allergic rhinitis, chronic bronchitis, emphysema)	7,320	18–55+	Depression	Work performance (Health and Work Performance Questionnaire)
Schmitz et al., 2009 (24)	Cross-sectional survey (Canadian Community Health Survey)	Asthma	62,425	≥12	Psychological distress	Disability days (≥1) in last 14 d
Goodwin et al., 2010 (25)	Cross-sectional survey (Canadian Community Health Survey)	Asthma	36,980	≥15	Mental disorder (self-report, lifetime)	2-wk disability due to physical health Work limitation
Hakola et al., 2011 (62)	Prospective survey linked with administrative data (Finnish Public Sector Study)	Asthma	2,332	45*	Depression (medication prescriptions)	Long-term sickness absence (≥90 d) Disability pension

(Continued)

TABLE 2. (CONTINUED)

Study (Reference)	Methodology Study Design (Source[s] of Data)	Subjects			Predictor or Intervention	Outcome(s)
		Disease	Number	Age (*yr*)		
Mazurek et al., 2012 (26)	Cross-sectional survey (Behavioral Risk Factor Surveillance System)	Asthma	7,494	⩾18	Depression	Change/quit job due to asthma Days unable to work because of asthma in past year
Question 2: Among workers with a respiratory disability and concomitant adverse psychosocial characteristics, do targeted interventions, compared to placebo or usual care, decrease workplace disability?						
Blake et al., 1990 (35)	Randomized, nonblinded, controlled trial (Veterans in Missouri with chronic lung disease)	Chronic lung disease	94	63*	Psychosocial intervention	Restricted activity days

Definition of abbreviation: COPD = chronic obstructive pulmonary disease.
*Mean.

associations of several workplace attitudes and beliefs with sick leave (28–32) (Table 2). For example, among subjects with asthma, more control over fatigue at work was associated with less sick leave (32). Among patients with COPD, more unpleasantness of negative work consequences (example: "if my colleagues will have to do more work when I am taking sick leave …") was associated with a higher risk of sick leave (32). They also found that less often spending all one's energy at work was associated with decreased sick leave, whereas pulmonary function and pulmonary-aggravating work factors were not (30). Finally, they found that several factors, including high job satisfaction, were associated with sick leave (31) (Table 3).

Demographics

Several studies, including those by Boot and associates, found that socioeconomic and other demographic characteristics were associated with disability (Table 2). As an example of this type of study, Blanc and colleagues, using a survey of patients with asthma from California, reported that higher levels of education were associated with lower rates of asthma-attributed complete cessation of work after adjustment for self-reported asthma severity (33).

Disease Knowledge/Management

Several studies found an association of disease knowledge and management characteristics with workplace disability (Table 2). Erickson and Kirking used a cross-sectional survey of workers with asthma in Michigan to evaluate several factors that were associated with work disability (34). For example, avoidant health beliefs (for example: "I do my best to avoid situations that trigger my asthma") were associated with more missed workdays, whereas access to a health-care provider was associated with fewer.

QUESTION 2

We found one report of a psychosocial intervention designed to affect work and other activities (35). The intervention was a randomized controlled trial focused on stress management education among 94 patients with chronic lung disease. There was no effect of the intervention on restricted activity workdays.

DISCUSSION

The most consistent finding was that mental illness was associated with increased workplace disability among workers with respiratory illness. However, few of the studies adjusted their analyses for objective pulmonary function variables or other markers of disease severity, so the independent effect of mental illness is uncertain. The studies of mental health were mostly conducted among patients with asthma and COPD and suggested that depression and distress had stronger associations with workplace disability than the underlying respiratory disease itself. These studies also suggested that more severe mental illness was associated with increased disability. It is difficult to draw generalizable conclusions about the influence of other potentially modifiable psychosocial characteristics other than mental illness, because there were few studies, and several involved the same cohort. In terms of potential therapies, there was only one study that examined the effect of treating comorbid mental illness among workers with a respiratory impairment with workplace disability. Thus, it is unclear if targeted interventions of psychosocial characteristics are useful. Finally, there is no evidence to guide the choice of mental health assessment instrument among workers with a respiratory impairment.

Respiratory illnesses and psychosocial characteristics commonly impact workplace disability (3, 36–39), but the interactions between these conditions are complicated. Many of the studies included in our review are cross-sectional, so whether coexisting mental illness leads to more disability among workers with respiratory illness versus disability from respiratory impairment leads to worse mental illness cannot be determined. Based on other conditions, these relationships are likely multidirectional (15). Substantiating the hypothesis that mental illness leads to disability, depression in preretirement adults has been associated with increased risk of disability for activities of daily living (40). In addition, respiratory impairment, such as poor control of asthma symptoms, is associated with higher rates of incident depression (41). There is also evidence that not working leads to increased mental illness, as underemployment is a risk factor for incident mental illness (42). Given these complex mechanisms between respiratory impairment, psychosocial characteristics, and workplace disability, future studies will need prospective, longitudinal designs with adequate adjustments for relevant confounders. In lieu of treatment effectiveness evidence, these types of studies may help address where and when to focus targeted therapies.

Several studies in this review reported that workplace attitudes and beliefs are associated with disability among workers with respiratory impairments. Other studies have reported that these beliefs can impact mental health as well. For instance, in a longitudinal study of workers with arthritis, lower workplace support and greater workplace activity limitations were significantly associated with future depressive symptoms (43). In systematic reviews, factors

TABLE 3. OUTCOMES OF INCLUDED STUDIES

Study (Reference)	Predictor	Outcome	Measure	Adjusted for/Notes
Question 1: Among workers with a respiratory disability, do adverse psychosocial characteristics (mental illness, occupational stressors, etc.), compared to not having these characteristics, influence workplace disability?				
Mental health characteristics				
Kaptein et al., 1993 (22)	Stigma (Respiratory Illness Opinion Survey) Anxiety (SCL-90)	Absence from work in the last 3 mo	**OR (95% CI)** Stigma (1-point change in score): 1.10 (1.05–1.16) Anxiety (1-point change in score): 1.09 (1.03–1.15)	AGE, sex, smoking status, FEV_1 % predicted, FEV_1/IVC % predicted, PC_{20}, depression, optimism, sleep disorders
Burker et al., 2004 (27)	Depression (BDI)	Work/not working	**Working score (SD) vs. not working score (SD)** BDI (lower score = less depression): 7.8 (6.2) vs. 12.2 (8.3)	FEV_1, state anxiety, trait anxiety, and optimism not significantly different between working and not working
Burker et al., 2004 (27)	Depression (BDI) Optimism (Life Orientation Test) State anxiety Trait anxiety (Spielberger State-Trait Anxiety Inventory for both) Education	Hours worked per wk	**Analysis of variance (*r value*) (*P* value)** Depression: −0.28 ($P = 0.001$) Optimism: 0.23 ($P = 0.009$) Trait anxiety: −0.15 ($P = 0.07$) State anxiety: −0.03 ($P = 0.76$) FEV_1: 0.02 ($P = 0.82$) Education: 0.23 ($P = 0.001$) Sex: 10.2 ($P = 0.002$)	Note: depression, sex, and education accounted for 14% of the variance in hours worked per week in a regression model
Eisner et al., 2006 (21)	Mental health	Complete disability	**OR (95% CI)** SF-12 Mental Health (per 1/2 SD): 1.45 (1.23–1.67)	Asthma severity (self-reported score) and others
Eisner et al., 2006 (21)	Mental health	Partial disability	**OR (95% CI)** SF-12 Mental Health (per 1/2 SD): 1.24 (1.03–1.48)	Asthma severity (self-reported score) and others
Eisner et al., 2006 (21)	Mental health	Disability payments	**OR (95% CI)** SF-12 Mental Health (per 1/2 SD): 1.35 (1.26–1.71)	Asthma severity (self-reported score) and others
Stein et al., 2006 (23)	MDD (CIDI-SF)	2-wk disability from asthma	**OR (95% CI)** Neither MDD nor PC: referent MDD alone: 2.33 (2.08–2.60) PC alone: 0.83 (0.73–0.94) MDD + PC: 1.98 (1.54–2.55)	Age, sex, education, income, alcohol dependence, and no. of chronic physical conditions
Stein et al., 2006 (23)	MDD (CIDI-SF)	2-wk disability from COPD	**OR (95% CI)** Neither MDD nor PC: referent MDD alone: 2.39 (2.15–2.66) PC alone: 1.14 (0.95–1.37) MDD + PC: 2.02 (1.42–2.89)	Age, sex, education, income, alcohol dependence, and no. of chronic physical conditions
Stein et al., 2006 (23)	MDD (CIDI-SF)	Work absence from asthma	**OR (95% CI)** Neither MDD nor PC: referent MDD alone: 3.29 (2.33–4.64) PC alone: 0.71 (0.43–1.16) MDD + PC: 2.38 (1.04–5.43)	Age, sex, education, income, alcohol dependence, and no. of chronic physical conditions
Stein et al., 2006 (23)	MDD (CIDI-SF)	Work absence from COPD	**OR (95% CI)** Neither MDD nor PC: referent MDD alone: 3.38 (2.41–4.73) PC alone: 0.96 (0.51–1.84) MDD + PC: 2.58 (1.11–5.99)	Age, sex, education, income, alcohol dependence, and no. of chronic physical conditions Note: Analyses did not observe an interaction between MDD and the PC, meaning the two are independent and that depression independently contributed to disability rather than modified the effect of the respiratory condition.
Hogg et al., 2007 (61)	Disease Mastery, Emotional Function, and Quality of Life (CRDQ)	Disability Index (0–4 point scale, higher scores = more disability; created for study)	**Correlation (*r*) (*P* value)** Emotional Function (1-point change in score): 0.52 (0.001) Disease Mastery (1-point change in score): 0.56 (0.001) Quality of Life (1-point change in score): 0.54 (0.001)	None
Hogg et al., 2007 (61)	Disease Mastery, Emotional Function, and Quality of Life (CRDQ)	Work hours per wk	**Correlation (*r*) (*P* value)** Disease Mastery (1-point change in score): 0.46 (0.005) Emotional Function (1-point change in score): 0.07 (0.64) Quality of Life (1-point change in score): 0.15 (0.31)	None

(Continued)

TABLE 3. (CONTINUED)

Study (Reference)	Predictor	Outcome	Measure	Adjusted for/Notes
Kessler et al., 2008 (20)	Depression (from checklist, U.S. National Health Interview Survey)	Work performance (Health and Work Performance Questionnaire)	**β (SE)** Depression (survey; similar to U.S. National Health Interview Survey) Depression: −3.2 (0.8) Asthma: 0.0 (0.7) NS Interaction: 1.5 (2.1) NS Effect of depression with asthma: −1.8 (1.9) NS Effect of depression without asthma: 1.5 (2.0) NS	Age, age-squared, sex, education, occupation, no. of children, eligibility of a spouse, CCI, inpatient stay in prior 6 mo, disability leave in prior 6 mo, and family member with CCI > 1.0 Note: implies depression itself is driving change in work performance rather than interaction with asthma
Schmitz et al., 2009 (24)	Psychological Distress (K10)	Disability days (≥1) in last 14 d	**Prevalence** Without asthma/low psychological distress: 11.6% Without asthma/moderate psychological distress: 21.8% Without asthma/high psychological distress: 45.2% With asthma/low psychological distress: 17.0% With asthma/moderate psychological distress: 35.4% With asthma/high psychological distress: 69.4%	Note: weighted prevalence
Schmitz et al., 2009 (24)	Psychological Distress (K10)	Disability days (≥1) in last 14 d	**OR (95% CI)** Without asthma/low psychological distress: referent Without asthma/moderate psychological distress: 1.88 (1.75–2.03) Without asthma/high psychological distress: 4.71 (3.94–5.62) With asthma/low psychological distress: 1.40 (1.19–1.64) With asthma/moderate psychological distress: 3.31 (2.81–3.88) With asthma/high psychological distress: 11.73 (8.30–16.57)	Sex, age, marital status, education, chronic conditions, smoking, and alcohol consumption
Goodwin et al., 2010 (25)	Mental disorder (self-report, lifetime)	2-wk disability due to physical health	**OR (95% CI)** Asthma alone: referent Asthma + mental disorder: 2.03 (1.57–2.63)	Sex, age, education, income, marital status, and comorbidity of physical health conditions (dichotomous, ≤1 disorder vs. ≥2 disorders).
Goodwin et al., 2010 (25)	Mental disorder (self-report, lifetime)	Work limitation	**OR (95% CI)** Asthma alone: referent Asthma + mental disorder: 2.08 (1.59–2.97)	Sex, age, education, income, marital status, and comorbidity of physical health conditions (dichotomous ≤1 disorder vs. ≥2 disorders).
Hakola et al., 2011 (62)	Depression (>30 daily doses of an antidepressant medication recorded in national pharmacy register)	Long-term sickness absence (≥90 d), disability pension	**HR (95% CI)** No asthma, no depression: referent Asthma, no depression: 1.82 (1.61–2.06) No asthma, depression: 2.45 (2.22–2.71) Asthma and depression: 3.58 (2.59–4.96)	Sex, age, socioeconomic status, smoking, obesity, and for the presence of comorbidities (ischemic heart disease, diabetes, rheumatic disease, cancer, hypertension)
Hakola et al., 2011 (62)	Depression (>30 daily doses of an antidepressant medication recorded in national pharmacy register)	Disability pension	**HR (95% CI)** No asthma, no depression: referent Asthma, no depression: 1.91 (1.56–2.33) No asthma, depression: 3.24 (2.79–3.74) Asthma and depression: 6.83 (4.60–10.15)	Sex, age, socioeconomic status, smoking, obesity, and for the presence of comorbidities (ischemic heart disease, diabetes, rheumatic disease, cancer, hypertension)
Mazurek et al., 2012 (26)	Depression (Patient Health Questionnaire-8), WRA (BRFSS)	Unable to work 1–13 d in past yr	**Prevalence ratio (95% CI)** No depression, no WRA: referent Depression, no WRA: 0.99 (0.72–1.35)	Age, sex, race/ethnicity, education, employment, annual household income, smoking status

(Continued)

TABLE 3. (CONTINUED)

Study (Reference)	Predictor	Outcome	Measure	Adjusted for/Notes
			No depression, WRA: 1.20 (0.86–1.68) Depression, WRA: 1.71 (1.11–2.63)	
Mazurek et al., 2012 (26)	Depression (Patient Health Questionnaire-8), WRA (BRFSS)	Unable to work ⩾14 d in past yr	**Prevalence ratio (95% CI)** No depression, no WRA: referent Depression, no WRA: 2.95 (2.10–4.13) No depression, WRA: 2.78 (1.64–4.68) Depression, WRA: 4.20 (2.43–7.25)	Age, sex, race/ethnicity, education, employment, annual household income, smoking status
Mazurek et al., 2012 (26)	Depression (Patient Health Questionnaire-8), WRA)(BRFSS)	Change/quit job due to asthma	**Prevalence ratio (95% CI)** No depression, no WRA: referent Depression, no WRA: 2.42 (1.50–3.91) No depression, WRA: 6.04 (4.10–8.91) Depression, WRA: 6.28 (3.70–10.67)	Age, sex, race/ethnicity, education, employment, annual household income, smoking status
Workplace attitude/belief				
Boot et al., 2004 (28)	Multiple (subjects with asthma)	2 d of sick leave in past 12 mo (OR > 1 = sick leave)	**OR (95% CI)** Higher frequency of dyspnea: 0.4 (0.2–0.9) Lower quality of life regarding breathing problems: 1.1 (1.0–1.1) Spending all energy at work: 0.7 (0.4–0.9)	Lung function, health complaints and limitations, work characteristics, demography, psychosocial variables, and adaptation
Boot et al., 2004 (28)	Age (subjects with COPD)	2 d of sick leave in past 12 mo (OR > 1 = sick leave)	**OR (95% CI)** Age: 0.9 (0.8–1.0)	Lung function, health complaints and limitations, work characteristics, demography, psychosocial variables, and adaptation
Boot et al., 2005 (30)	Multiple	Decreased sick leave over 1 yr (OR > 1 = decreased sick leave; OR < 1 = stable high sick leave)	**Partially adjusted model: OR (95% CI)** More comorbidity: 0.09 (0.01–1.47) Lower FEV_1/FVC: 0.88 (0.75–1.02) More pulmonary aggravating work factors: 0.41 (0.05–3.13) More overall satisfaction: 0.95 (0.73–1.23) Spending all energy at work less often: 1.56 (0.87–2.80) Fewer health complaints in social activities: 1.37 (1.07–1.74) **Final model: OR (95% CI)** Spending all energy at work less often: 2.12 (1.25–3.61) Fewer health complaints in social activities: 1.32 (1.07–1.62)	Age, sex, smoking status
Boot et al., 2005 (30)	Multiple	Increased sick leave over 1 yr (OR > 1 = increased sick leave; OR < 1 = stable low sick leave)	**Partially adjusted model: OR (95% CI)** Higher education: 0.03 (0.01–0.89) More functional limitations in ADLs: 1.49 (1.07–2.08) More fatigue: 1.34 (0.97–1.86) More job satisfaction: 0.27 (0.02–3.86) More overall satisfaction: 0.75 (0.49–1.13) More relationship satisfaction: 1.15 (0.12–10.7) Spending all energy at work less often: 0.42 (0.13–1.34) **Final model: OR (95% CI)** Higher education: 0.11 (0.01–0.92)	Age, sex, smoking status

(Continued)

TABLE 3. (CONTINUED)

Study (Reference)	Predictor	Outcome	Measure	Adjusted for/Notes
			More functional limitations in ADLs: 1.35 (1.09–1.67)	
Boot et al., 2005 (30)	Multiple	Stable high sick leave over 1 yr (OR > 1 = stable high sick leave; OR < 1 = stable low sick leave)	**Partially adjusted model: OR (95% CI)** More comorbidity: 2.75 (0.08–93.2) Higher level of reversibility: 0.88 (0.73–1.06) More bothered by dyspnea-related emotions: 0.93 (0.81–1.61) More functional limitations in ADLs: 1.18 (0.86–1.61) Higher physical workload: 0.20 (0.02–2.20) More job satisfaction: 0.04 (0.01–0.63) More support by employer: 1.57 (0.80–2.81) More overall satisfaction: 0.94 (0.68–1.30) More relationship satisfaction: 4.74 (0.43–52.7) Spending all energy at work less often: 0.68 (0.32–1.42) Fewer health complaints in social activities: 0.76 (0.57–1.03) **Final model: OR (95% CI)** More job satisfaction: 0.09 (0.02–0.44) More support by employer: 1.63 (1.03–2.59) Fewer health complaints in social activities: 0.75 (0.62–0.90)	Age, sex, smoking status
Boot et al., 2005 (31)	Multiple (subjects with asthma)	High sick leave (>2 episodes in last yr and/or > 1 mo of sick leave in last yr) (OR > 1 = high sick leave)	**OR (95% CI)** Emotionally difficult job: 0.2 (0.1–0.7) High job satisfaction: 0.2 (0.1–0.6) Change of employer: 4.8 (1.3–17) Use of job control: 4.1 (1.6–10.8) Pulmonary aggravating factors (>3) at work: 2.7 (1.0–7.2)	Age, sex, education level, lung function variables. Note that depression was not significant in the final model.
Boot et al., 2005 (31)	Multiple (subjects with COPD)	High sick leave (>2 episodes in last yr and/or > 1 mo of sick leave in last yr) (OR > 1 = high sick leave)	**OR (95% CI)** Employer/colleagues informed: 12 (1.9–77) Difficult tasks at work: 0.2 (0.0–0.9) Not hiding dyspnea/limitations: 2.6 (1.5–4.5) Little general fatigue: 0.8 (0.7–1.0)	Age, sex, education level, lung function variables. Note: depression was not significant in the final model.
Boot et al., 2005 (32)	Multiple (subjects with asthma)	High sick leave (>2 episodes/yr each yr for last 2) (OR > 1 = high sick leave)	**OR (95% CI)** Finding negative consequences more unpleasant: 1.05 (0.95–1.15) More adherence to norms of others at work: 1.08 (0.93–1.26) More control over sick leave: 1.01 (0.95–1.08) More control over fatigue at work: 0.81 (0.69.–0.97)	None. Note: analyses evaluated multiple potential confounders (including spirometry), and those that were confounders are reported here
Boot et al., 2005 (32)	Multiple (subjects with COPD)	High sick leave (>2 episodes/yr each yr for last 2) (OR > 1 = high sick leave)	**OR (95% CI)** Finding negative consequences more unpleasant: 1.24 (1.03–1.51) More adherence to norms of others at work: 1.25 (0.95–1.66) More control over sick leave: 0.86 (0.77–1.01) More control over fatigue at work: 0.88 (0.70.–1.07)	Age, sex. Note: analyses evaluated multiple potential confounders (including spirometry), and those that were confounders are reported here
Demographic characteristics				
Gillen et al., 1995 (59)	Marital status	Workplace disability (complete cessation of employment)	**OR (*P* value)**	Age, cystic fibrosis diagnosed as an adult, sex, hospitalization,

(Continued)

TABLE 3. (CONTINUED)

Study (Reference)	Predictor	Outcome	Measure	Adjusted for/Notes
			Single, not cohabitating: 17.1 (0.048)	Shwachman-Kulczycki score, FEV_1
Blanc et al., 1996 (33)	Multiple	Asthma-attributed complete cessation of work	**OR (95% CI)** Education <High school: referent Some college: 0.4 (0.2–1.1) College graduate: 0.3 (0.1–0.9) Cigarette smoking status Never smoked: referent Former smoker: 1.7 (0.8–3.7) Current smoker: 1.0 (0.2–5.7) Atopic history: 2.1 (0.8–5.5) General health status decrement: 1.6 (1.3–2.0) Increased severity of asthma (per 10-point change in a self-reported scale): 4.0 (1.9–8.2)	Age, sex, race/ethnicity, childhood asthma onset, general health status (from SF-36) plus those listed in the comparison cell
Blanc et al., 1996 (33)	Multiple	Asthma-attributed partial disability	**OR (95% CI)** Education <High school: referent Some college: 1.4 (0.7–2.8) College graduate: 1.1 (0.5–2.3) Cigarette smoking status Never smoked: referent Former smoker: 1.0 (0.5–1.9) Current smoker: 0.3 (0.1–1.1) Atopic history: 2.4 (1.2–4.9) General health status decrement: 1.1 (0.96–1.2) Increased severity of asthma (per 10-point change in scale): 2.4 (1.4–4.2)	Age, sex, race/ethnicity, childhood asthma onset, general health status (from SF-36) plus those listed in the comparison cell
Disease knowledge/management characteristics				
Erickson and Kirking, 2002 (34)	Multiple	Work Performance Scale (best = 100) (negative numbers indicate the characteristic is associated with lower work performance scale)	**β** Race (nonwhite): −9.1 * No. of other illnesses: −2.8 * Barrier health belief: 6.4 * Avoidance health belief: −2.8 * Income: 1.9 * Accessibility to health-care provider: NS Symptom-derived severity: −2.6 * Perceived severity: −2.7 *	Note: adjusted for measures noted in the "Measure" cell
Erickson and Kirking, 2002 (34)	Multiple	Days missed (positive numbers indicate the characteristic is associated with more missed days)	**β** Race (nonwhite): 1.86 No. of other illnesses: 0.83 * Barrier health belief: −0.68 * Avoidance health belief: 0.75 * Income: −0.42 * Accessibility to health-care provider: −0.40 * Symptom-derived severity: 0.54 * Perceived severity: NS	Note: adjusted for measures noted in the "Measure" cell
Boot et al., 2005 (29)	Knowledge about disease (asthma management)	High sick leave (>2 episodes/yr each yr for last 2)	**OR (95% CI)** Knowledge Attitude Self-efficacy Asthma Questionnaire (dichotomized at 50th percentile): 2.03 (0.75–5.47)	Sex, level of education, smoking. Note: multiple potential confounders were evaluated (including spirometry) and those that were confounders are reported here.
Boot et al., 2005 (29)	Knowledge about disease (asthma diagnosis)	High sick leave (>2 episodes/yr each yr for last 2)	**OR (95% CI)** Knowledge Attitude Self-efficacy Asthma Questionnaire (dichotomized at 50th percentile): 1.80 (0.71–4.60)	No confounders. Note: multiple potential confounders were evaluated (including spirometry) and those that were confounders are reported here.
Boot et al., 2005 (29)	Knowledge about disease (COPD management)	High sick leave (>2 episodes/yr each yr for last 2)	**OR (95% CI)** Knowledge Attitude Self-efficacy COPD Questionnaire (dichotomized at 50th percentile): 1.12 (0.23–5.47)	Level of education, time since diagnosis. Note: multiple potential confounders were evaluated (including spirometry)

(Continued)

TABLE 3. (CONTINUED)

Study (Reference)	Predictor	Outcome	Measure	Adjusted for/Notes
				and those that were confounders are reported here.
Boot et al., 2005 (29)	Knowledge about disease (COPD diagnosis)	High sick leave (>2 episodes/yr each yr for last 2)	**OR (95% CI)** Knowledge Attitude Self-efficacy COPD Questionnaire (dichotomized at 50th percentile): 0.55 (0.10–2.88)	FEV_1 % predicted, smoking status. Note: multiple potential confounders were evaluated (including spirometry), and those that were confounders are reported here.
Joshi et al., 2006 (60)	Medication adherence (Morisky Score)	Productivity dollars	**Log-β (*P* value)** High adherence: referent Medium adherence: 0.015 (0.941) Low adherence: 0.184 (0.492)	Age, sex, education, health status, chronic medication score, total medication score, asthma severity
Question 2: Among workers with a respiratory disability and concomitant adverse psychosocial characteristics, do targeted interventions, compared to placebo or usual care, decrease workplace disability?				
Blake et al., 1990 (35)	Psychosocial Intervention 1–3 sessions focused on stress management	Restricted-activity days	**Days (at 6 mo postintervention)** Intervention: 7.67 Control: 9.06 (NS) **Days (at 12 mo postintervention)** Intervention: 9.67 Control: 8.96 (NS)	Randomized, nonblinded, controlled trial

Definition of abbreviations: ADL = activity of daily living; BDI = Beck Depression Index; BRFSS = U.S. Behavioral Risk Factor Surveillance System; CCI = Charlson Comorbidity Index; CID-SF = Composite International Diagnostic Interview–Short Form; COPD = chronic obstructive pulmonary disease; CRDQ = Chronic Respiratory Disease Index Questionnaire; IVC = inspiratory vital capacity; K10 = Kessler scale; MDD = Major Depressive Disorder; NS = not significant; PC = physical condition; PC_{20} = provocative concentration of histamine producing a 20% fall in FEV_1; SF = Short Form Health Survey; WRA = work-related asthma.
* $P < 0.05$.

such as job strain, low decision latitude, low social support, high psychological demands, effort–reward imbalance, and high job insecurity are associated with incident mental illness (44, 45). Boot and colleagues described four types of adaptations to respiratory impairment in a qualitative analysis of workers in the Netherlands with asthma and COPD: the eager, the adjusted, the cautious, and the worried workers (46). Despite similarities in impairment severity, these coping mechanisms were related to different levels of disability. The authors propose that better understanding of an individual's coping strategies can lead to decreased disability, a theory that deserves further investigation.

We were particularly interested in how psychosocial characteristics influenced disability among those with work-related asthma. We found one systematic review on this topic (47), and, like those authors, we only found one relevant paper (48) that had been published at that time. That paper was not included in our systematic review because it did not quantitatively report the association of psychosocial characteristics with work disability. We identified one paper published after the previous systematic review that indicated the combination of depression and WRA was more strongly associated with workplace disability than either alone (26). Guidelines and reviews on caring for workers with a disability caused by work-related respiratory impairment are mostly silent on this issue (49–52). However, studying this issue was listed as one of 100 key questions in occupational asthma research (53), and we concur that this association deservers further evaluation.

We identified only one trial that investigated the effect of treating psychosocial attributes on work outcomes among people with respiratory illness (35). There is a high prevalence of depression and it has a significant negative impact on work outcomes in other settings. However, treatment is underused (54), despite evidence that treatment improves workplace outcomes (55). In a Cochrane review of treating depression among people with back pain, the authors reported conflicting evidence that intensive interventions improved work outcomes (56). Thus, because there appears to be a detrimental association between mental illness and work outcomes among people with respiratory illnesses, improving outcomes will likely require the use of intensive interventions. Our review focused on interventions directed at the individual worker, but it may be useful to also examine worksite interventions.

It is recommended that clinicians screen patients for depression using one of several instruments (15), and it may be worthwhile for clinicians to consider evaluating other psychosocial characteristics as well. We found no studies that directly compared different instruments for detecting psychosocial comorbidities among workers with respiratory disability. However, the U.S. Preventive Services Task Force recommends measures to be used in primary care settings that may be useful (57).

It is possible our strategy did not identify relevant studies. We followed the PRISMA guidelines, but searched only two databases from 1990 onward. Only one author reviewed the Cochrane Register results and abstracted the data. However, given our *a priori* plan to construct the search using broad terms, the very large number of abstracts we reviewed, our review of related citations, our finding that only 4 of 19 papers were from before 2000, and obtaining similar results from related reviews (47, 58), we believe it is unlikely we missed papers that would alter our conclusions.

Conclusions

We found that psychosocial characteristics are associated with workplace disability among workers with respiratory impairments, chiefly that mental illness is associated with decreased workplace ability. Because most studies were cross-sectional and did not adjust for respiratory impairment severity, the direction and independent effect of these psychosocial characteristics on workplace disability is not clear. Furthermore, there is no evidence to guide directed interventions. Although more research into these complex relationships and treatments is needed, there is evidence from other settings that treating these conditions in isolation is beneficial. However, these cofactors appear to be common and undertreated. They likely play a role in the disability, and there is some evidence that they impact the disability more than the actual respiratory impairment. As these characteristics often warrant treatment regardless, occupational medicine and

pulmonary clinicians should consider an evaluation for these conditions among workers with disability from a suspected respiratory impairment.

This official statement was prepared by an *ad hoc* subcommittee on the workplace effects of respiratory impairment.

Members of the subcommittee:

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PHILIP HARBER, M.D., M.P.H.
MARGARET C. HAGGERTY, A.P.R.N., A.E.-C.

Author Disclosures: P.H. reported consulting and/or serving as an expert witness for several law firms, insurers, and unions as part of occupational respiratory disease and occupational-preventive medicine practice ($5,000–24,999). C.G.S. and M.C.H. reported that they had no relevant commercial interests.

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