Journal of Psychosomatic Research 71 (2011) 45–49

Contents lists available at ScienceDirect

Journal of Psychosomatic Research

Association of change in depression and anxiety symptoms with functional outcomes in pulmonary rehabilitation patients

Paul A. Pirraglia [a,b,*], Brian Casserly [b,c], Robert Velasco [b], Matthew L. Borgia [a,d], Linda Nici [b,e]

[a] Primary Care Service and the Systems Outcomes and Quality in Chronic disease and Rehabilitation (SOQCR) Research Enhancement Award Program, Providence Veterans Affairs Medical Center, Providence, RI, USA
[b] Alpert Medical School of Brown University, Providence, RI, USA
[c] Memorial Hospital, Pawtucket, RI, USA
[d] Brown University, Providence, RI, USA
[e] Medical Service Providence Veterans Affairs Medical Center, Providence, RI, USA

ARTICLE INFO

Article history:
Received 5 February 2010
Received in revised form 23 December 2010
Accepted 4 January 2011

Keywords:
Pulmonary disease
Chronic obstructive
Rehabilitation
Depression
Anxiety

ABSTRACT

Objective: Pulmonary rehabilitation (PR) has emerged over the last decade as an essential component of an integrated approach to managing patients with chronic respiratory diseases such as chronic obstructive pulmonary disease (COPD). We sought to examine how depression and anxiety symptom changes relate to disease-specific quality of life outcomes following PR.

Methods: We performed a cohort study of 81 patients with COPD who completed PR at a Veterans Administration Medical Center. Pulmonary rehabilitation consisted of supervised exercise training and education twice weekly for 8 weeks. Beck Depression and Anxiety Inventories (BDI and BAI) assessed symptom burden at baseline and completion of PR. We measured change in disease-specific quality of life using the dyspnea, mastery, emotion and fatigue domains of the Chronic Respiratory Questionnaire Self-Reported (CRQ-SR) from baseline to completion of PR.

Results: Participants were 69.8±9.1 years old and all male. Forced expiratory volume in 1 s (FEV1) was 1.23± 0.39 L. The CRQ-SR scores improved significantly: dyspnea ($P<.0001$), mastery ($P=.015$) and fatigue ($P=.017$). The BDI scores improved significantly (13.1±10.5 to 10.8±9.9, $P=.003$; BAI: 13.1±10.1 to 12.1± 11.7). Multivariate regression models controlling for age, FEV1, depression treatment and anxiety treatment showed that improvement in depressive symptoms were associated with improvement in fatigue ($P=.003$), emotion ($P=.003$) and mastery ($P=.01$). Anxiety symptom change was not significantly associated with change in disease-specific quality of life domains.

Conclusion: Addressing anxiety symptoms in PR patients may be indicated because disease-specific quality of life improvement appears to be associated with mood.

Published by Elsevier Inc.

Introduction

An estimated 10 million adults in the US have physician-diagnosed chronic obstructive pulmonary disease (COPD) [1]. Chronic obstructive pulmonary disease was the fourth leading cause of death in the US in 2001 [2] and was the fourth most common discharge diagnosis from Veterans Affairs Medical Centers (VAMCs) in 2003 [3]. Estimates vary, but approximately 40% of COPD patients have clinical depression [4], and 10%–30% have generalized anxiety disorder [5]. Research at the Michael DeBakey VAMC in Houston, TX, showed that 80% of veterans with COPD screened positive for depression and/or anxiety, and that 65% of these were found to have a clinical diagnosis of depression and/or anxiety [6]. Depressive or anxiety symptoms in COPD patients that do not meet diagnostic criteria are even more common [7].

The impact of the overlap of COPD with depression/anxiety is becoming increasingly clear with respect to quality of life, self-efficacy and self-management, COPD exacerbations and mortality. The combination is synergistic, resulting in lower health-related quality of life [8–10]. Higher levels of depression and anxiety are associated with lower self-efficacy of COPD symptom management [10,11]. Among patients who present to the emergency department with an asthma or COPD exacerbation, those with depression/anxiety have a significantly higher rate of treatment failure or relapse [12]. One study showed that among women with severe COPD, poor emotional functioning was associated with increased mortality [13].

Pulmonary rehabilitation has emerged over the last decade as an essential component of an integrated approach to managing patients with chronic respiratory diseases such as COPD [14]. This comprehensive intervention has been demonstrated to reduce dyspnea,

* Corresponding author at: Providence VA Medical Center, 830 Chalkstone Ave., Bldg 32, Providence, RI 02908, USA. Tel.: +1 401 273 7100x6239; fax: +1 401 457 3311.
E-mail address: paul.pirraglia@va.gov (P.A. Pirraglia).

0022-3999/$ – see front matter. Published by Elsevier Inc.
doi:10.1016/j.jpsychores.2011.01.002

increase exercise performance and improve health-related quality of life [15]. Emerging data indicate that pulmonary rehabilitation has a salutary effect on depression and anxiety [16,17]. The interaction of pulmonary rehabilitation and depression and/or anxiety has also been studied from the standpoint of the effect of depression and/or anxiety on pulmonary outcomes. A study of 81 COPD patients who participated in an outpatient pulmonary rehabilitation program did not find that depression or anxiety had an appreciable impact on the effects of rehabilitation [18]. However, whether changes in depression and anxiety burden impact the effectiveness of pulmonary rehabilitation is unknown. We sought to determine whether changes in depression and anxiety symptom burden are associated with quality of life outcomes following pulmonary rehabilitation.

Method

We performed a retrospective observational cohort study of a consecutive series of all patients who participated in our pulmonary rehabilitation program at a VAMC between October 2006 and March 2010. We extracted data through review of the patient's electronic medical record starting with the most recent primary care visit prior to the time of enrollment in pulmonary rehabilitation. In addition, we obtained the responses to questionnaires used for tracking success of the rehabilitation program that were completed by patients before and after pulmonary rehabilitation. The study was approved by our Institutional Review Board.

Pulmonary rehabilitation program

The pulmonary rehabilitation program at our VAMC aims to stabilize or reverse systemic manifestations of respiratory diseases. It has a multidisciplinary staff that includes a pulmonologist, nurse practitioner, physical therapist, respiratory therapist, dietician and social worker. The program lasts for 8 weeks with two sessions per week. In each cycle of pulmonary rehabilitation, there are 8–12 patients. The program starts with the development of an individualized treatment plan and an exercise prescription. Patient-directed goals around function and exercise are assessed. The patient then participates in rehabilitation sessions twice a week for 8 weeks. Each session lasts 2 h in total and involves aerobic exercises, strength training exercises and education. The educational component takes about 1 h a week for each of the 8 weeks of the pulmonary rehabilitation program, and each topic is presented by an expert in that area. The educational topics are as follows: normal lung function and pathophysiology of lung disease, proper use of medications and inhalation technique, oxygen therapy, nutrition, coping and relaxation techniques, benefits of exercise and maintaining physical activities, breathing strategies and end-of-life planning.

Patients are referred to the pulmonary rehabilitation program from primary care, the inpatient medical service and pulmonology. To be included in the pulmonary rehabilitation program, a patient must meet at least one of the following criteria: lack of improvement in dyspnea or fatigue with maximal pharmacological treatment, difficulty performing activities of daily life or poor self-reported quality of life. Before entering pulmonary rehabilitation, a patient undergoes a medical interview, a physical exam, an evaluation of symptoms and exercise tolerance and a review of comorbidities. Patients may be excluded from pulmonary rehabilitation if they have unstable comorbidities, cognitive impairment or a psychiatric illness that would preclude participation in a group setting. Active smoking, recent respiratory disease exacerbation and poor motivation are not exclusion criteria. Our center strives to provide pulmonary rehabilitation to as many individuals as possible who could benefit from the intervention.

Data collection

We obtained age and gender from the medical record. Forced expiratory volume in 1 s (FEV1) was obtained from spirometry testing done nearest to the start of pulmonary rehabilitation. We recorded all active medications at the time of enrollment as well as all current medical problems on the patient's problem list. We determined whether the patient was receiving treatment for depression or anxiety by use of medications or having mental health visits in the previous 6 months, as well as during pulmonary rehabilitation. The medications we used to classify as depression or anxiety treatment were serotonin selective reuptake inhibitors (sertraline, paroxetine, citalopram, fluoxetine or fluvoxamine), tricyclics (amitriptyline, desipramine, doxepin, imipramine, nortriptyline, protriptyline, trimipramine or clomipramine) and atypical agents (trazodone, bupropion, phenelzine, tranylcypromine, maprotiline, nefazodone, venlafaxine, mirtazapine and amoxapine), benzodiazepines (diazepam, clonazepam, chlordiazepoxide, alprazolam, oxazepam, or lorazepam) and buspirone. Note that we did not consider low-dose tricyclics antidepressants (less than 150 mg daily) or low-dose trazodone (less than 150 mg daily) as treatment for depression.

Our primary measures of interest were the Beck Depression Inventory-II (BDI) [19] and the Beck Anxiety Inventory (BAI) [20], which were administered at time of entry into pulmonary rehabilitation and again at completion (i.e., immediately following the final session). The BDI is a 21-question survey that asks respondents to rate how they have felt over the preceding week. Scores range from 0 to 63, with a higher score reflecting a greater burden and severity of symptoms. The BDI has been widely used, and its internal consistency and content validity are high [21]. Those with a BDI score of less than 10 are unlikely to have clinically diagnosed depression [22]. The BAI, like the BDI, is a 21-question survey with a score range of 0 to 63, with a higher score reflecting a greater burden and severity of symptoms. The BAI has high internal consistency, test–retest reliability and content validity [20].

Our outcome measurement was change in domains of disease-specific quality of life as measured by the Chronic Respiratory Questionnaire Self-Reported (CRQ-SR). The CRQ-SR has demonstrated reproducibility and reliability [23]. It is divided into four dimensions of dyspnea, fatigue, emotional function and mastery, with a 7-point Likert scale response for each question. Dyspnea relates to a patient's symptoms of shortness of breath and difficulty breathing. Mastery relates to a patient's sense of having control over his or her disease and symptoms. Emotion relates to a patient's general mood. Fatigue relates to a patient's energy level. Patients generally report that they feel better with an average improvement of 0.5 per dimension. Changes between 0.75 and 1.25 represent important changes of moderate magnitude, and changes greater than 1.5 represent important changes of large magnitude. We measured CRQ-SR domain scores at the time of entry into pulmonary rehabilitation and again at completion (i.e., immediately following the final session).

Statistical analysis

We used paired *t* tests to compare scores (BDI, BAI and CRQ-SR domains) from before to after pulmonary rehabilitation. We used multivariate regression models to evaluate change in each CRQ-SR domain by change in BDI and in BAI. Given the small number of subjects, we chose to control for age, FEV1, depression treatment and anxiety treatment. Analyses were performed in SAS (V9.2, Cary, NC, USA), and the *P* value for significance was set at .05.

Results

In total, 154 veterans were enrolled in our pulmonary rehabilitation program in our observation period, of whom 113 (73%) completed the program. Of these, we report on 81 veterans who completed our pulmonary rehabilitation program and had complete