CHEST

Original Research

DYSPNEA

Validity and Responsiveness of the Self-Administered Computerized Versions of the Baseline and Transition Dyspnea Indexes*

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Background: **Numerous instruments have been developed to examine the impact of activities on breathlessness. The primary purpose of this study was to examine the validity and responsiveness of the self-administered computerized (SAC) versions of the multidimensional baseline dyspnea index (BDI) and the transition dyspnea index (TDI).**

Methods: **Sixty-five patients with COPD who complained of exertional breathlessness were evaluated at an initial visit and after receiving standard therapy at two academic medical centers. Dyspnea scores from the SAC versions were compared with those obtained with the Medical Research Council (MRC) scale and with the original interview versions of the BDI and TDI.**

Results: **At the initial visit, all three dyspnea instruments showed similar correlations among themselves and with lung function. At the follow-up visit (mean [± SD] time after initial visit, 48 ± 16 days), breathlessness scores were improved on all three instruments. Correlations were consistently higher for both versions of the TDI, and changes in lung function compared with corresponding values for ΔMRC scale. Although 55% of patients reported no change in breathlessness on the MRC scale following treatment, the mean SAC and interview TDI scores were increased by 1.0 ± 2.4 and 1.4 ± 2.5, respectively, in these same patients.**

Conclusions: **Both versions of the BDI and the MRC scale showed concurrent validity at the initial visit. The SAC TDI demonstrated responsiveness to standard therapy that was comparable with the findings of the interview TDI, but was better than that recorded with the MRC scale. The advantages of the SAC TDI include a patient-reported score on a continuous scale using computer technology.** ***(CHEST 2007; 132:1283–1290)***

Key words: COPD; lung function; Medical Research Council scale; patient-reported breathlessness

Abbreviations: BDI = baseline dyspnea index; CRQ = chronic respiratory questionnaire; DHMC = Dartmouth-Hitchcock Medical Center; IC = inspiratory capacity; MRC = Medical Research Council; SAC = self-administered computerized; SFMC = Saint Francis Medical Center; TDI = transition dyspnea index

Breathlessness with daily activities is the major complaint of patients with chronic respiratory disease and is the key symptom for which they seek medical attention. The ability to measure or quantify breathlessness is important for the following two reasons: (1) to determine which patients have more breathlessness compared with those who have less breathlessness (discriminative purpose); and (2) to assess the response to therapy (evaluative purpose).[1,2] Numerous questionnaires have been developed over the past 50 years to evaluate the impact of activities of daily living on breathlessness. For example, the patient is asked to select one of five grades on the Medical Research Council (MRC) scale that most closely matches daily tasks (*eg*, walking) that provoke breathlessness.[3] Over the past several years, the MRC scale has been used to predict mortality in patients with COPD[4,5] and to assess the efficacy of treatment in patients with COPD.[6–9]

As a unidimensional instrument, the MRC scale depends exclusively on an individual's activity level. However, patients typically reduce or avoid physical activities in order to minimize breathing difficulty; thus, the MRC scale may not accurately

reflect the extent of a patient's breathlessness. Multidimensional instruments have been developed to provide a more comprehensive measure of the severity of breathlessness and to capture changes over time.[2] For example, the baseline dyspnea index (BDI) and the transition dyspnea index (TDI) contain the following three components that contribute to breathlessness as part of activities of daily living: functional impairment; magnitude of task; and magnitude of effort.[10] The psychometric properties of the interviewer-administered BDI and TDI have been established, and these instruments have been used widely in clinical trials evaluating a variety of treatments in patients with COPD.[11–24] In 2004, we converted the original interview BDI and TDI[25] into self-administered computerized (SAC) versions so that the patient reported the intensity of breathlessness with daily activities. In a preliminary investigation,[25] scores on the SAC versions yielded data that were similar to those obtained with the interview BDI and TDI instruments in 25 patients with COPD.[25]

The primary purpose of the present study was to investigate the psychometric properties of the multidimensional SAC versions of the BDI and TDI in a large number of patients with COPD. The specific aims were as follows: (1) to examine concurrent validity by comparing dyspnea scores from the SAC version of the BDI with the interview method and the MRC scale; and (2) to examine responsiveness to therapy by comparing dyspnea scores from the SAC and interview versions of the TDI along with changes in the MRC scale following therapy. The two hypotheses were as follows: (1) at the initial visit, the scores from the three instruments were moderately correlated; and (2) the SAC TDI demonstrated comparable responsiveness with the interview version, but better responsiveness than the MRC scale.

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Materials and Methods

Subjects

Sixty-five patients were enrolled from the out-patient clinics at Dartmouth-Hitchcock Medical Center (DHMC; Lebanon, NH) [n = 54] and at Saint Francis Medical Center (SFMC; Hartford, CT) [n = 11]. The diagnosis was based on standard criteria.[26] Inclusion criteria were as follows: primary complaint of exertional breathlessness; ability to read and understand English; and ability to use the computer display to render judgments. Exclusion criteria were as follows: a comorbidity that interfered with participation in the study; and unwillingness to return for follow-up testing.

Procedures

Each institutional review board approved the study. The study design consisted of two visits. At visit 1, baseline (pretreatment) data were collected. After each patient gave verbal consent, the three dyspnea instruments were administered in random order, and pulmonary function testing (spirometry and inspiratory capacity [IC] measures) was performed. Each patient returned 4 to 8 weeks later for visit 2 (posttreatment). Testing was performed for each patient in the same order as at visit 1.

MRC Scale

Patients were instructed to read the 5-point MRC scale (higher scores represent more breathlessness) that was presented on a piece of paper and to circle the grade that most closely matched their breathlessness.[3]

Interview-Administered BDI and TDI

The patient was questioned individually by the same two experienced interviewers at each site at both the initial and follow-up visits, and then selected grades for dyspnea on the BDI and for the TDI as previously described.[10] Lower scores on the BDI represent more breathlessness. In order to compare the interview and SAC TDI scores as representing changes in breathlessness with treatment from the same baseline state, the interviewer used the scores for each component of the SAC BDI as the initial severity of breathlessness.

SAC Versions of the BDI and TDI

The SAC versions were presented on a desktop computer. The patient was seated in front of the computer, and all instructions were given on the screen. At each visit, the patient completed a practice session by rating tiredness on a typical day in order to gain familiarity with the computer method. To do this, the patient positioned the cursor in a box next to the grade and then clicked on the mouse to place an "X" in the box. Then, the grades and descriptors for the three components of the SAC BDI appeared sequentially, and the subject selected one of five choices for each of the three components.[25]

At follow-up, the patient rated changes in tiredness (for practice) and then changes in breathlessness (higher scores on