ATS CLINICAL PRACTICE GUIDELINE: SUMMARY FOR CLINICIANS

Senior Editors: Carey C. Thomson and Kevin C. Wilson

Field Walking Tests in Chronic Respiratory Disease

Chris Garvey[1], Alice M. Boylan[2], David L. Miller[3], Ann E. Holland[4], Sally J. Singh[5], Martijn A. Spruit[6,7], Kevin C. Wilson[8], and Carey C. Thomson[3]; for the American Thoracic Society Implementation Task Force

[1]Pulmonary and Cardiac Rehabilitation, Seton Medical Center, and Sleep Disorders Center, University of California, San Francisco, San Francisco, California; [2]Division of Pulmonary and Critical Care, Medical University of South Carolina, Charleston, South Carolina; [3]Mt. Auburn Hospital, Harvard Medical School, Boston, Massachusetts; [4]Alfred Health Clinical School, La Trobe University, Melbourne, Australia; [5]Centre for Exercise and Rehabilitation Science and Institute for Lung Health, University Hospitals of Leicester National Health Service Trust, Leicester, United Kingdom; [6]Department of Research and Education, CIRO+ Centre of Expertise for Chronic Organ Failure, Horn, The Netherlands; [7]Rehabilitation Research Center, Biomedical Research Institute, Faculty of Medicine and Life Sciences, Hasselt University, Diepenbeek, Belgium; and [8]Boston University School of Medicine, Boston, Massachusetts

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Field walking tests are simple, low-cost, accurate methods to assess exercise capacity and response to treatment in persons with chronic lung disease. To improve the understanding of field walking tests in patients with chronic respiratory disease, the American Thoracic Society and European Respiratory Society developed Technical Standards for Field Walking Tests in Chronic Respiratory Disease (1). This summary is prepared for practicing clinicians.

Background

The 6-minute-walk test (6MWT), incremental shuttle walk test (ISWT), and endurance shuttle walk test (ESWT) are valid, reliable, and responsive to change (1). Regardless of the test used, all variables should be held constant for initial and repeat tests, including test location, track layout and length, staffing, time of day, oxygen (flow rate, system, and transport), medications, use of the patient's usual walking aides, encouragement, and indications for test cessation. In addition, testing should always follow the protocol, including patient instruction, scripts, and standardized encouragement (1).

Field walking tests have an excellent safety profile when conducted according to standard protocols, including test cessation if the oxygen saturation (Sp_{O2}) decreases to less than 80%. The safety profiles of protocols where greater desaturation is permitted are unknown, as no literature is available. Contraindications and precautions for field walking tests are the same as cardiopulmonary exercise testing (CPET). For a list of absolute and relative contraindications, *see* Table 4 in Reference 1.

Six-Minute-Walk Test

The 6MWT is a self-paced test of walking capacity; the distance walked is the primary test outcome. Patients are asked to walk as far as possible in 6 minutes along a flat corridor (2). The Sp_{O2} and heart rate are measured continuously during testing to ensure that the Sp_{O2} nadir and the end-test heart rate are observed. Sp_{O2} measurements during 6MWT are reliable, provided that an adequate pulse signal is obtained (1). Dyspnea and subjective fatigue are measured before and after the 6MWT using validated measurement scales, such as the Borg scale. The 6MWT report should include the distance walked, number of stops during the test, total time stopped, Sp_{O2} nadir, and end-test pulse rate. The 6MWT is associated with considerable learning effect. Therefore, two tests should be performed, with the greatest distance of the two tests reported.

The 6MWT is a reliable measure of exercise performance and functional capacity across various lung diseases (1). The 6MWT appears responsive to treatment effects in chronic obstructive pulmonary disease (COPD), interstitial lung disease, and pulmonary arterial hypertension, although the majority of 6MWT evaluation has occurred in pulmonary rehabilitation (PR) trials. The minimal important difference (MID) for the 6MWT in adults with chronic respiratory disease is between 25 and 33 m, with a median value across trials of 30 m. The distance walked is inversely related to risk of hospitalization in chronic respiratory disease and mortality in COPD. Desaturation during a 6MWT is associated with increased disease severity and progression, more rapid decline in FEV_1, and worse prognosis.

The 6MWT is more sensitive for identifying exercise-induced desaturation than

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Correspondence and requests for reprints should be addressed to Chris Garvey, F.N.P., M.S.N., M.P.A., Seton Medical Center, Pulmonary and Cardiac Rehabilitation, 1900 Sullivan Avenue, Daly City, CA 94015. E-mail: chrisgarvey@dochs.org

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cycle testing. The CPET and 6MWT have similar peak exercise responses, including peak oxygen uptake ($\dot{V}O_2$peak); however, the 6MWT has substantially lower ventilatory requirements (peak $\dot{V}CO_2$, peak $\dot{V}E$, and respiratory exchange ratio), potentially contributing to the test's tolerability in chronic respiratory disease.

Incremental Shuttle Walk Test

The ISWT is a test of maximal exercise capacity. A patient is required to walk a 10-m course around two cones that are spaced 9 m apart. Walking starts at a slow pace and then increases incrementally when the patient hears an audio signal (a prerecorded beep) at 1-minute intervals. Before the test, standardized recorded instructions are provided to the patient to ensure consistency. Encouragement is limited to one standard verbal cue. Walking continues until one or more of the following occur: the patient is unable to continue (determined by either the patient or operator), the patient reaches a cone before the beep sounding, or the Sp_{O2} falls to less than 80%.

The distance walked is the most important test outcome; only completed 10-m shuttles are recorded. The Sp_{O2}, heart rate response, dyspnea, fatigue, and reason for terminating the test are generally also reported. The test has a significant learning effect, and a practice walk is recommended. As with any exercise test, repeat testing should occur at the same time of day to minimize intraday variability.

The validity and reliability of the ISWT have been established exclusively in patients with COPD (3), with the MID associated with feeling better after PR being an increase of 47.5 m. The ISWT is strongly correlated with the work rate ($\dot{V}O_2$) and linear response in $\dot{V}O_2$peak measured by CPET. There is weak to moderate correlation of the ISWT with age, sex, lung function, quadriceps muscle strength, and objective measures of physical activity in daily life. Improvement in the ISWT may follow PR and long-acting bronchodilators, whereas poor performance on the ISWT is associated with worse survival and increased readmissions in patients with COPD.

Endurance Shuttle Walk Test

The ESWT is performed by walking for as long as possible (to a maximum of 20 min) at a predetermined percentage of the maximal walking performance as measured by the ISWT. Therefore, an ISWT must be performed before an ESWT. The primary outcome measure of the ESWT is the time (in seconds) walked at the predetermined speed, based on either a predefined percentage of peak ISWT performance (e.g., 70–85% estimated $\dot{V}O_2$peak) or a percentage of the peak speed achieved (e.g., 85% of peak speed). The test is performed using audio cues and, therefore, is not self-paced. The ESWT has only been studied in patients with COPD. The MID after bronchodilators has been suggested to be between 65 and 85 seconds. There is not an established MID post PR.

Comparing the Field Walking Tests

All three field walking tests measure the exercise capacity, limits to exercise performance, and response to an intervention. The 6MWT and ISWT can be used to predict survival and risk of hospitalization (1). These outcomes have not been evaluated using the ESWT; however, the ESWT has greater sensitivity to detect changes in exercise performance after an intervention than the ISWT or 6MWT, including bronchodilators, PR, and exercise interventions in COPD.

The ESWT and ISWT require a 10-m course, whereas the 6MWT course length is 30 m or longer. The 6MWT and ISWT require that two tests be performed before an intervention (1). The ESWT does not require repeat testing but must be preceded by two ISWTs to calculate ESWT speed. The 6MWT is self-paced, whereas the ISWT and ESWT are externally paced.

The peak oxygen uptake ($\dot{V}O_2$) is similar in all three tests and comparable to a CPET. The ISWT elicits an incremental increase in $\dot{V}O_2$ because it offers an incremental protocol similar to a CPET; this facilitates prescribing an exercise regimen as a percentage of peak performance on a field walking test. The ESWT causes a significantly more rapid rise in $\dot{V}O_2$ and ventilation than during the 6MWT, yet end-test values are similar. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

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