Getting the most out of the six-minute walk test

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BACKGROUND

The six-minute walk test (6MWT) was introduced into clinical practice almost half a century ago. Gradually, it became the most widely used field exercise test in chronic respiratory disease. Despite advances in standardization,[1,2] there are some aspects of test performance and interpretation that should be carefully tempered by individual clinical judgment (Chart 1).

OVERVIEW

A 49-year-old woman presenting with a BMI of 34.2 kg/m^2, antiphospholipid syndrome, and two episodes of submassive pulmonary embolism developed chronic thromboembolic pulmonary hypertension . The six-minute walk distance (6MWD) increased from 198 m to 336 m after administration of riociguat. Over the next 6 months, she reported a decrease in exercise tolerance: her DL_{CO}, a ventilation-perfusion scan, and a transthoracic echocardiogram did not suggest disease progression. However, the 6MWD decreased by 72 m, i.e., approximately twice the recently estimated minimal clinically important difference of 33 m.[3] Given the conflicting results, she was referred for right heart catheterization, which confirmed hemodynamic stability. A review of the results of the latest 6MWT showed the following: a) a pronounced increase in the body weight (BMI, 41.2 kg/m^2); b) a shift from dyspnea to limiting "leg fatigue" associated with palpitations, lightheadedness, and limb paresthesia; and c) an SpO_2 of 99-100% on room air. Cardiopulmonary exercise testing revealed the negative effects of obesity, physical deconditioning, and dysfunctional breathing/hyperventilation. After aggressive weight loss (BMI, 30.7 kg/m^2), physical reconditioning, anxiety control, and breathing exercises, the 6MWD increased to 389 m, with marked symptom improvement.

Chart 1. Challenges to performing/interpreting the six-minute walk test: current recommendations and additional practical recommendations for clinical settings.

Points of concern	Standard recommendations	Practical recommendations
Test performance		
Less distance is walked a) up an inclined surface; b) to cover a short and tortuous track, because of slowing down to turn around and because of curves; c) on a treadmill.	The 6MWT should be performed along a flat, straight indoor course of at least 30 m (ideally 50 m) in length with a hard surface and little pedestrian traffic.	A long, unimpeded corridor might not be available in all settings. If a shorter track is used, this should be clearly stated. Track length should not change between interventions. Free-walking and treadmill tests are not interchangeable.
Large variability in walking speed depending on pre-test instructions. Given the maximal, all-out nature of many PFTs, patients may interpret it as a maximal test.	Patients should cover the longest possible distance in 6 min, walking along the hallway between markers. They are allowed to slow down, stop, and rest, but should resume walking as soon as possible.	It is critical that the patient understands the purpose of the test. Avoid walking alongside the patient. If clinically required (in order to improve safety or because of an unstable gait, for example), walk behind the patient.
Distance may increase across sequential tests as efficiency and pacing strategy improve, turning "positive" an ineffective intervention.	When the 6MWT is used in order to evaluate response to treatment or change over time, two baseline tests should be performed, with the longest distance being recorded.	Test repetition is usually not feasible in clinical settings: record whether/when the patient had previous experience with the 6MWT. Test repetition is less critical in patients repeatedly exposed to the test, such as those undergoing cardiac or pulmonary rehabilitation.
Longer distance when the patient is continuously and actively encouraged; conversely, shorter distance with little/no encouragement.	Standardized phrases of encouragement. If the patients stops during the test, they should be reminded every 30 s to resume walking when possible.	Ensure tone consistency across examiners; avoid conversation with the patient; adhere strictly to standardized phrases.

Continue...▶

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Chart 1. Challenges to performing/interpreting the six-minute walk test: current recommendations and additional practical recommendations for clinical settings. (Continued...)

Points of concern	Standard recommendations	Practical recommendations
Test performance		
The patient may lose the ability to self-pace if he/she is unaware of the time left for walking.	Every minute is signaled to the patients with standardized phrases of encouragement.	Keep a written description of the standard operating procedures for routine application by the assessors.
SaO_2 is critically dependent on metabolic demands: SpO_2 may vary widely in tandem with changes in pace, increasing rapidly upon exercise cessation.	Continuous monitoring of pulse oximetry is recommended. Plotting SpO_2 against time might provide patterns of desaturation (early vs. late exercise, stable vs. progressive).	Increased costs. More frequent detection of "severe" desaturation. Depending on the clinical context, it may trigger unnecessary interruption, artificially decreasing the 6MWD.
Hypoxemia increases ventilation and reduces O_2 delivery to leg muscles, both leading to high symptom burden and lower 6MWT	O_2 should be given at the standard rate when the patient is on long-term O_2 therapy. O_2 supplementation using the patient's carrier device leads to 12-59 m longer 6MWD.	The provision of supplemental O_2 and the carrying method should be kept constant across sequential assessments. If not, this should be clearly stated.
Many patients require walking aids for safety and/or to lessen exertional dyspnea.	Walking aids should be used when the patient regularly uses these devices. A wheeled aid increases the 6MWD by 2-46 m in comparison with no aid.	The walking aid should be kept constant on longitudinal assessments. If not, this should be clearly stated.
Exercise tolerance—particularly walking capacity—is influenced by a multitude of symptoms.	Dyspnea and subjective fatigue should be measured at the beginning and end of the 6MWT using the 0-10 Borg scale.	Record *all* reported symptoms and barriers to walking, as well as the number and duration of stops (if any), together with the reasons for the stops (and their severity).
Test interpretation		
Given the known effects of sex, age, and body dimensions on exercise capacity, there is a large between-subject variability in the 6MWD.	Use prediction equations representative of the local population. Prefer reference values generated from large samples of men and women, showing a wide age and height ranges.	Relatively large confidence intervals decrease the accuracy of equations at the extremes of age and height, particularly in elderly and short women. Apply a Bayesian approach to values close to the lower limit of normal.
Akin to bronchodilator "reversibility," the higher the pre-intervention 6MWD, the easier a given absolute threshold (in m) is reached. The opposite is true for relative changes (in %).[5]	Available evidence suggests an MCID of ~30-35 m for the 6MWD in adults with chronic respiratory disease. There is a relatively small amount of variability across patient groups.	MCIDs were established in moderate-to-severe lung disease patients exposed to selected interventions. The mean baseline distance ranged from 343 m to 403 m. Care should be taken when interpreting the 6MWT in different scenarios.
Less room for improvement after interventions when the patient walks close to the fastest possible walking speed.[5]	Despite this caveat, jogging is not allowed, because of the abrupt increase in metabolic/ventilatory demands and due to safety concerns.	The 6MWT may lose sensitivity to functional improvement after interventions in those who are already walking at the fastest allowed speed.
More work is performed when a larger body mass is displaced against gravity; conversely, obesity is known to decrease exercise tolerance.	The six-minute walk work is the product of distance and body weight, which may provide a better estimate of the total work required to perform the 6MWT than distance alone.	Additional studies are needed to better characterize the utility of the six-minute walk work in adults with chronic respiratory disease and its sensitivity to change over time.
The nature and severity of the symptoms limiting walking capacity may vary over time.	The symptoms reported in previous tests should be available for longitudinal comparison.	Special attention should be given to the locus of symptom limitation/concurrent symptoms in longitudinal assessments.

6MWT: six-minute walk test; PFT: pulmonary function test; 6MWD: six-minute walk distance; and MCID: minimal clinically important difference.

The 6MWT is a self-paced test of functional walking capacity that neither provides a metric of physical performance/fitness nor gives the causes of exercise limitation.[1,2] These considerations should not prevent the reader from seeking information beyond the 6MWD. For instance, in the case reported here, a more careful consideration of the ancillary findings (obesity progression, patient symptoms, and supra-normal SpO_2 on room air suggesting deconditioning and hyperventilation) in light of other data indicating disease stability might have avoided a futile invasive procedure (right heart catheterization). Continuous monitoring of SpO_2 improves the yield of oximetry in predicting mortality and hospitalization in patients with COPD.[4] Paradoxically, however, it can have undesirable consequences, such as early exercise interruption and slowing down at a "critically low" SpO_2 that could be faced in daily life without major implications. Patients experiencing the long-term consequences of disabling dyspnea and self-restraint are less likely to walk faster after an effective intervention; that is, they "can," but "won't." In fact, the test is notoriously more sensitive to interventions in (usually younger) patients with pulmonary arterial hypertension than in older patients with COPD.[2,3]

CLINICAL MESSAGE

Although the 6MWT provides limited information regarding the underlying mechanisms of exercise intolerance, it can be clinically useful to assess (a) functional capacity; (b) the severity of walking-induced hypoxemia, including the need for exertional O_2 supplementation; (c) the symptoms contributing to impaired exercise tolerance; and (d) potentially meaningful changes in walking capacity over time, either spontaneous changes or changes secondary to interventions. Akin to exercise-based evaluations that are more elaborate, all subjective and objective data should be interpreted in light of the clinical context and the limitations of the method (Chart 1).

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