

**OPTN Lung Transplantation Committee  
Six-Minute Walk Workgroup  
Meeting Summary  
April 27, 2023  
Conference Call  
Marie Budev, DO, Chair  
Matthew Hartwig, MD, Vice Chair**

## **Introduction**

The Six-Minute Walk Workgroup (the Workgroup) met via Citrix GoTo teleconference on 4/27/2023 to discuss the following agenda items:

1. Welcome and agenda
2. Recap and background: Six-Minute Walk in Lung Allocation
3. Review current standards
4. Examples: Transplant program protocols
5. Discussion
6. Next Steps and Closing Comments

The following is a summary of the Workgroup's discussions.

### **1. Welcome and agenda**

The Chair welcomed Workgroup members.

#### Summary of discussion:

There was no further discussion by the Workgroup.

### **2. Recap and background: Six-Minute Walk in Lung Allocation**

The Chair provided a recap of the previous meeting, explaining the Workgroup discussed whether the purpose of the six-minute walk is to assess functional status or disease severity. The Workgroup agreed to focus on standardizing it first. She stated the Workgroup has an interest in understanding how other programs are conducting their walk now.

The Chair gave a background on how the six-minute walk has been included in lung allocation. When the lung allocation score (LAS) was implemented in 2005, the six-minute walk distance (6MWD) was included only in the waitlist mortality model. It was incorporated as a dichotomous variable due to data quality and was identified as a measurement of "severity of illness" in the document describing data to be pulled from candidate medical records. The LAS was updated in 2015 and changed the 6MWD to a continuous variable in the waitlist mortality model. The 6MWD was added to the post-transplant survival model for distances up to 1,200 feet. This update assessed "change in six-minute walk distance" as a separate variable but was not found to be significant in either the waitlist or post-transplant survival models. In 2021, the LAS was updated, but there was no change to how the 6MWD was incorporated in either the waitlist mortality or post-transplant survival model. In 2023, the lung composite allocation score (CAS) was implemented, and this modified how the 6MWD is included in the post-transplant outcomes calculation. This placed more weight on the post-transplant survival score relative to the LAS.

#### Summary of discussion:

A member stated stopping the six-minute walk test (6MWT) to give oxygen is not productive. He noted performing an oxygen titration test first is helpful and allows for a practice walk. The Chair asked how feasible this is for pulmonary function test (PFT) labs. He responded it is a burden to perform two tests, and that stopping to allow for oxygen defeats the purpose of the test. He explained that he put candidates on two liters of oxygen to prevent the need for stopping, and this works for chronic obstructive pulmonary disease (COPD) candidates, but not interstitial lung disease (ILD) candidates.

A member agreed with performing an oxygen titration test prior to the 6MWT. A member explained that when a candidate falls below 80% of oxygen, the candidate can pause the test to rest and resume when saturation levels return to 80%.

### 3. Review current standards

The Chair provided an overview of current standards. She explained the 2002 American Thoracic Society (ATS) guidelines state if supplemental oxygen is needed during the walk and serial tests are planned, oxygen should be delivered in the same way with the same flow. If flow must be increased during subsequent tests, the test administrator should note this on their worksheet and consider it in interpretation of the results. The reason for this is for patients with COPD or ILD, supplemental oxygen increases the 6MWD. The Chair noted the 2002 guidelines state a practice walk is not needed in most clinical settings but should be considered. This is because the 6MWD is only slightly higher for a 6MWT performed a day later. The Chair noted there is no specific guidance on titration walks or severely impaired candidates.

The Chair explained that the 2014 ATS and European Respiratory Society (ERS) technical standard<sup>1</sup> regarding practice walks state, “Effect of learning on 6MWD is large enough to be clinically important when the 6MWT is used to evaluate response to treatment or change over time. In these situations, two 6MWTs should be performed and the best 6MWD recorded.” The ATS/ERS standard also states, “Where the 6MWD is used as a one-off measure to stage disease or assess risk (e.g. likelihood of hospitalization or mortality, the magnitude of the learning effect may be less important and one test may be sufficient.” They concluded that, “One test may also be sufficient for patients who have recently performed the test.”

The Chair highlighted sources of variability identified by ATS, including:

- Factors reducing the 6MWD
  - Shorter height
  - Older age
  - Higher body weight
  - Female sex
  - Impaired cognition
  - A shorter corridor (more turns)
  - Pulmonary disease (COPD, asthma, cystic fibrosis, interstitial lung disease)
  - Cardiovascular disease (angina, MI, CHF, stroke, TIA, PVD, AAI)
  - Musculoskeletal disorders (arthritis, ankle, knee, or hip injuries, muscle wasting, etc.)
- Factors increasing the 6MWD
  - Taller height (longer legs)

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<sup>1</sup> Anne E Holland, Martijn A. Spruit, Thierry Troosters, et al., “An official European Respiratory Society/American Thoracic Society technical standard: field walking tests in chronic respiratory disease,” *European Respiratory Journal* 44 (2014): 1428-1446, DOI: 10.1183/09031936.00150314.

- Male sex
- High motivation
- A patient who has previously performed the test
- Medication for a disabling disease taken just before the test
- Oxygen supplementation in patients with exercise-induced hypoxemia

The factors affecting performance of the 6MWT identified by AST and ERS are:

- Encouragement
- Provision of supplemental oxygen
- Method for carrying the supplemental oxygen
- Use of wheeled walkers
- Track layout and length
- Use of treadmill (not recommended for 6MWT)

Summary of discussion:

There was no further discussion by the Workgroup.

**4. Examples: Transplant program protocols**

University of Michigan:

A Workgroup member from the University of Michigan discussed their protocol. They use two types of tests, the 6MWT and an “O2 Assessment.” If a candidate has not had a recent titration walk and no recent exercise history (e.g Pulmonary Rehabilitation), they perform O2 Assessment first, then the 6MWT. For most candidates, during the 6MWT, they use a setting already prescribed for exercise.

He explained if a candidate had a recent titration walk or is attending pulmonary rehabilitation those supplemental oxygen levels are used for the 6MWT. He emphasized there is no use of titration during the walk. If a candidate drops below 80% of oxygen saturation levels, the test stops until the candidate recovers to 85%.

Duke University:

A member explained his protocol for assessing oxygen needs ahead of the 6MWT is based on the 6MWT. Pulse oximetry readings (oxygen saturation) are monitored, and supplemental oxygen is added in 2 L/min increments to keep oxygen saturation at greater than 88%. This continues for at least six minutes of walking with the oxygen saturation remaining greater than 88% for at least three minutes. This is the ERS/ATS standard. It is based on a widely accepted measurement of functional capabilities, and it provides a stable final oxygen dose for greater than or equal to three minutes of walking in most candidates.

Cincinnati Children’s:

A member provided an overview of her approach at Cincinnati Children’s Hospital. She confirms with the ordering physician if patient should use oxygen/if oxygen titration procedure is needed ahead of the 6MWT. Oxygen titration performed on a treadmill. This goes for four minutes while titration half a liter according to saturations. During the 6MWT she monitors and records oxygen saturation and heart rate. She noted they do not perform a practice test walk due to difficulties in having pediatric candidates perform just one test alone.

### Summary of discussion:

The Chair asked how University of Michigan titrates oxygen. A member responded they do a resting assessment at 89 saturation or higher for 2 L/min increments. They then walk candidates, stop them, and titrate them until they reach 92% of oxygen saturation levels. They then restart the timer and wait until they can go again. Oxygen assessments can take up to 25 minutes. Members stated they perform a similar approach.

A member commented his program first adjudicates the baseline oxygen requirement of a candidate, and then continues to titrate as they walk. The goal is to maximize walk distance to see what they can do physically. A member commented that additional data is needed to detect frailty, lung disease, etc. The classic 6MWT does not do this. The member stated his program does a resting titration to see what candidates require at rest. He commented it is unknown if the titration candidates receive is truly what they need. Candidates self-report their oxygen needs because of how vague the OPTN description is of what this walk should be. He commented his program tries to make it reproducible.

The Chair asked the member from Cincinnati Children's Hospital if she uses self-reported oxygen for allocation. She responded no and that they know all their candidate's oxygen levels because of how often they see them.

## **5. Discussion**

The Chair asked the Workgroup for feedback on:

- Does your program do something different than the protocols discussed?
- What is the goal of providing oxygen during the test?
  - Patient safety/prevent oxygen desaturation?
  - Maximize performance?
  - Patient comfort?
- What is the best way to assess how much oxygen should be provided?
  - Oxygen titration test ahead of 6MWT?
  - Practice walk ahead of 6MWT?
  - Provide oxygen as needed during the test?
  - All patients provided standard amount of oxygen?

### Summary of discussion:

A member stated an oxygen titration test must be performed ahead of the 6MWT. A member responded it may impact performance of the 6MWT if they are performed simultaneously, and this may exhaust the candidate. The Chair agreed. A member commented an oxygen titration test is a good idea but should be conducted early enough that the candidate has time to rest. It should not be done on the same day. A member responded that the 6MWT increases candidates' heart rate and dyspnea score, so logically it makes sense to let the candidate rest until this is normal and proceed with the 6MWT. A member said that this is ideal, but often candidates desaturate and cannot walk any further because the test is administered too soon after the oxygen titration test.

A member commented the comfort and safety of the candidate is important. He stated that oxygen titration prior to the test is not always feasible, and many times programs know what the candidate needs. He stated two tests for severely sick candidates will be difficult and cannot be a required standard. The Chair said that it seems like two walks are necessary and noted the idea that candidates

should receive a standard amount of oxygen will not lend itself to maximizing performance. Members agreed.

A member stated that candidates will have to be scheduled to be at the hospital for multiple days to perform two tests. This is a change but allows for the most equitable situation. He asked what information is provided from the test and oxygen levels. He asked if it is related to severity of lung disease, frailty, etc. A member responded providing oxygen during the test eliminates the mechanism of exercise intolerance. An alternative is to remove oxygen and follow the 80% threshold to perform a 6MWT. This will lower scores and recognize that desaturation will reduce the 6MWD. The Chair said that threatens patient safety. The member responded going down to 80% does not have any additional patient safety risk associated with it.

A member stated that his program does oxygen titration before the 6MWT. He stated he does this for three minutes with a candidate walking at their normal pace and then pushing themselves. He explained this is reflective of candidates' normal activities. He noted the higher level of oxygen was used for their 6MWT. He said that when oxygen saturation levels fell to below 80% there was no detrimental effect. He stated eliminating oxygen completely will disadvantage certain candidates and not suit the current allocation score. He explained a challenge will be standardizing the equipment used to provide oxygen.

A member stated starting at self-reported baseline oxygen levels and then titrating as needed throughout the test may be a compromise and avoid the need for two tests. Members said that titration during six-minute walks makes the results operator dependent and results in greater inconsistencies. A member agreed and added that the threshold of 80% for oxygen saturation mitigates safety concerns.

A member commented requiring oxygen use for the 6MWT will not work for congenital heart defect candidates that cannot receive oxygen.

## **6. Next steps and closing comments**

The Chair thanked the Workgroup for the discussion.

### Summary of discussion:

There was no further discussion by the Workgroup.

### **Upcoming Meetings**

- May 25, 2023, teleconference, 5pm EST

## Attendance

- **Workgroup Members**
  - Marie Budev
  - Abigail Motz
  - Aleksander Tomas
  - Brian Armstrong
  - Dennis Lyu
  - John Reynolds
  - Julia Klesney-Tait
  - Kevin McCarthy
  - Nirmal Sharma
  - Neil McIntyre
- **HRSA Representatives**
  - Jim Bowman
- **SRTR Staff**
  - Nicholas Wood
  - David Schladt
- **UNOS Staff**
  - Kaitlin Swanner
  - Taylor Livelli
  - Tatenda Mupfudze
  - Samantha Weiss
  - Susan Tlusty
  - Chelsea Weibel