

Public Comment Proposal

Standardize Six-Minute Walk for Lung Allocation

OPTN Lung Transplantation Committee

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Standardize Six-Minute Walk for Lung Allocation

<i>Affected Policies:</i>	10.1.A.1 <i>Waitlist Survival Points for Candidates at least 12 Years Old</i>
	10.1.B.1 <i>Post-Transplant Outcomes Points for Candidates at least 12 Years Old</i>
	10.3 <i>Clinical Values and Update Schedule</i>
	10.3.B <i>Lung Clinical Values That Must Be Updated Every Six Months</i>
	21.2.A <i>Values Used in the Calculation of Lung Waiting List Survival</i>
	21.2.B.1 <i>Coefficients Used in Calculating Lung Post-Transplant Outcomes</i>
<i>Affected Data Collection:</i>	<i>OPTN Waiting List</i>
<i>Sponsoring Committee:</i>	<i>Lung Transplantation</i>
<i>Public Comment Period:</i>	<i>January 23, 2024 – March 19, 2024</i>

Executive Summary

Six-minute walk distance is a variable in the lung composite allocation score (CAS). The distance (measured in feet) that a lung candidate can walk in six minutes factors into both the medical urgency and post-transplant outcome portions of the lung CAS for candidates age 12 and older. Lung candidates who cannot walk far during the six-minute walk test generally have more medical urgency for transplant, and these candidates receive a higher medical urgency score and a lower post-transplant outcomes score. Lung candidates who walk farther during the six-minute walk test do not receive as many points for this variable in their medical urgency score but receive more points in their post-transplant outcomes score.

Existing clinical standards provide guidance for performing the six-minute walk test but do not provide details on conducting the walk with severely impaired patients, which is particularly relevant for the lung transplant candidate population. Additionally, OPTN policy regarding the six-minute walk distance is not well aligned with the clinical standards. Due to these gaps, lung transplant program representatives report that performance of the six-minute walk test is not consistent across transplant programs. Provision of supplemental oxygen during the test is one of the main sources of variability.

Given the importance of the six-minute walk test in the lung CAS, this proposal would require lung transplant programs to perform an oxygen titration test ahead of the initial six-minute walk test for lung candidates at least 12 years old to standardize how supplemental oxygen needs are determined for conducting the six-minute walk test. This proposal also includes guidance to supplement the existing clinical standards with recommendations specifically for lung transplant programs, and data definition changes to align with the policy changes and guidance.

The Lung Transplantation Committee is requesting public comment feedback including input on the following questions:

- Do you support the proposed policy requirement to perform an oxygen titration test ahead of the initial six-minute walk test for candidates at least 12 years old, and for candidates approaching 12 years of age?
- Should policy specify a timeframe within which the oxygen titration test must be completed ahead of the six-minute walk test?

- If the policy change were to be approved by the OPTN Board of Directors in June 2024 and implemented on September 5, 2024, would that give lung transplant programs adequate time to prepare for implementation?
- Are the data definition changes clear, and would you recommend any changes?
- Is the guidance clear, and would you recommend any changes?
- Does this proposal strike the right balance between promoting data quality for the six-minute walk distance and managing burden on lung candidates and lung transplant programs?
- What, if any, consideration should be given for altitude for candidates who live at a significantly different altitude compared to the transplant hospital where they are registered?

Purpose

The purpose of this proposal is to standardize how transplant programs perform the six-minute walk test when reporting the walk distance for use in the lung composite allocation score (CAS). This proposal would:

- Add a new policy requirement to complete an oxygen titration test ahead of the initial six-minute walk test conducted for lung candidates at least 12 years old, and for the six-minute walk test conducted just before candidates turn 12 years old
- Provide guidance specifically for lung transplant programs to supplement existing clinical standards
- Update the six-minute walk distance data definition to align with the policy changes and guidance

Background

The six-minute walk test is a simple walking test used to assess a patient's cardiopulmonary function.¹ The patient is asked to walk as far as they can over a six-minute interval, and the distance that the patient walks is measured.² Clinically, the test is used for several purposes, including assessing how patients with cardiac or pulmonary disease are responding to treatment; stratifying preoperative risk; and measuring exercise tolerance and prognosis.³

Six-minute walk distance (measured in feet) has been incorporated into lung allocation since the implementation of the lung allocation score (LAS) in 2005.⁴ The LAS calculation was derived from two models: a waiting list survival model and a post-transplant survival model. The models estimate the degree to which various clinical factors are predictive of survival and are used to determine the coefficients for each variable in the LAS. When LAS was first implemented by the OPTN in 2005, six-minute walk distance was a variable in the waiting list survival model but not in the post-transplant survival model. The six-minute walk distance variable was dichotomous and only impacted the score if the candidate's walk distance was less than 150 feet. In 2015, the LAS was updated to incorporate six-minute walk distance as a continuous variable in the waiting list survival model, as recommended concurrently in clinical literature,⁵ and to add six-minute walk distance to the post-transplant survival model.⁶ In 2021, the LAS was updated based on analysis of a more current cohort of lung candidates.⁷ As part of that change, the coefficients for six-minute walk distance were updated in both the waiting list survival and post-transplant survival models. Finally, with the implementation of continuous distribution

¹ Harold A. Matos Casano and Fatima Anjum, "Six-Minute Walk Test," StatPearls, accessed October 10, 2023, available <https://www.ncbi.nlm.nih.gov/books/NBK576420/>.

² "Guidelines for the Six-Minute Walk Test," American Thoracic Society, March 2002, accessed October 9, 2023, available <https://www.atsjournals.org/doi/10.1164/ajrccm.166.1.at1102>.

³ Casano and Anjum, "Six-Minute Walk Test."

⁴ T.M. Egan, S. Murray, R.T. Bustami, et al., "Development of the New Lung Allocation System in the United States," *American Journal of Transplantation* 6 no. 5 (May 2006): 1212 – 1227, <https://doi.org/10.1111/j.1600-6143.2006.01276.x>.

⁵ A.W. Castleberry, B.R. Englum, L.D. Snyder, et al., "Utility of Six-Minute Walk Distance in Predicting Outcomes After Lung Transplant: A Nationwide Survival Analysis," *The Journal of Heart and Lung Transplantation* 32 no. 4 (April 2013): S147, <https://doi.org/10.1016/j.healun.2013.01.332>.

⁶ "Proposal to Revise the Lung Allocation Score (LAS) System," OPTN, Briefing Paper, 2012. This proposal was approved by the OPTN Board of Directors in 2012 and implemented in 2015. See "Changes to the lung allocation system," OPTN, February 17, 2015, accessed October 9, 2023, available <https://optn.transplant.hrsa.gov/news/changes-to-the-lung-allocation-system/>.

⁷ "Updated Cohort for Calculation of the Lung Allocation Score (LAS)," OPTN, Policy Notice, accessed October 9, 2023, available <https://optn.transplant.hrsa.gov/media/4244/updated-cohort-for-calculation-of-the-las.pdf>.

of lungs on March 9, 2023, the lung composite allocation score (CAS) replaced the LAS.⁸ While the lung CAS includes additional factors in the score compared to the LAS, the medical urgency and post-transplant outcomes portions of the lung CAS are based on the modeling approach used for LAS. With the shift from LAS to the lung CAS, there were no changes to the coefficients for the variables in the waiting list survival model, including six-minute walk distance. However, the post-transplant outcomes component of the lung CAS is based on a model of five-year-post-transplant survival rather than the one-year post-transplant survival model used for LAS. This altered how the six-minute walk distance factors into the post-transplant outcomes component of the allocation score. The differences between LAS and lung CAS are summarized in **Table 1**.

Table 1: Comparison of the LAS (2005 – 2023) and the Lung CAS (2023 – Present)

Attribute	LAS	CAS
Waiting list survival	1 year	1 year
Post-transplant survival	1 year	5 year
Candidate biology	Not included	Blood type, CPRA, height
Patient access	Not included	Pediatric, Prior Living Donor
Placement efficiency	Not included	Travel, Proximity Efficiency

Other differences	LAS	CAS
Total points for waiting list survival & post-transplant survival	100 out of 100	50 out of 100
Ratio of waiting list survival to post-transplant survival	2:1	1:1
Waiting list survival rating scale	Linear	Nonlinear

The changes to how six-minute walk distance has factored into lung allocation since the 2005 implementation of LAS are summarized in **Table 2**.

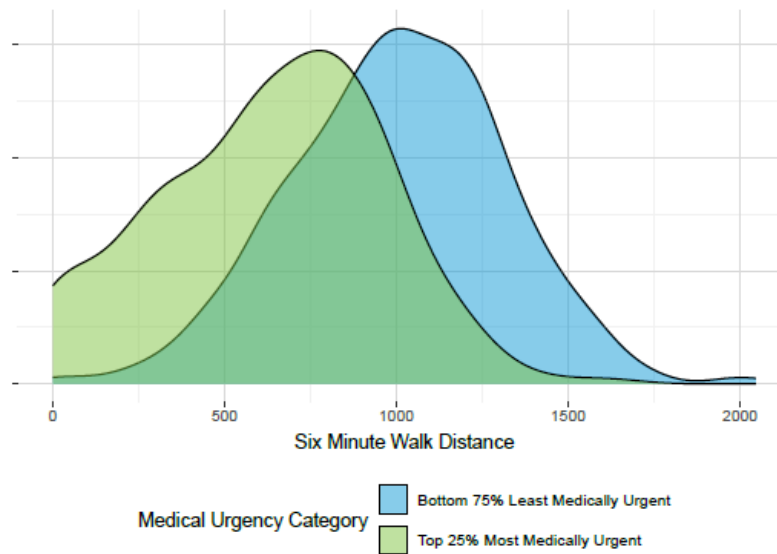
⁸ "Establish Continuous Distribution of Lungs," OPTN, Policy Notice, accessed November 13, 2023, https://optn.transplant.hrsa.gov/media/b13dlep2/policy-notice_lung_continuous-distribution.pdf.

Table 2: Incorporation of the Six-Minute Walk Distance in Lung Allocation

Lung Allocation	Waitlist Survival Model	Post-transplant Survival Model
2005 LAS	0.33075226458318394 if six-minute walk distance < 150 feet 0 if six-minute walk distance \geq 150 feet	Not incorporated
2015 LAS update	-0.0844896372724000 * six-minute walk distance/100	0.0004594953809594 * (1200 – six-minute walk distance) 0 if six-minute walk distance is at least 1200 feet
2021 LAS update	-0.09937981549564 * six-minute walk distance/100	0.0001943695814883 * (1200 – six-minute walk distance) 0 if six-minute walk distance is at least 1200 feet
2023 Lung CAS	-0.09937981549564 * six-minute walk distance/100	Less than 200 feet: -0.0002535116049789 x (200 - Six-minute-walk distance) + 0.11168755 At least 200 feet and less than 600 feet: -0.0002841805913329 x (Six-minute-walk distance - 200) + 0.11168755 At least 600 feet and less than 800 feet: -0.0000049617083362 x (Six-minute-walk distance - 600) - 0.00198468 At least 800 feet and less than 1,200 feet: -0.0001950464256370 x (Six-minute-walk distance - 800) - 0.00297703 At least 1,200 feet and less than 1,600 feet: -0.0007428583659073 x (Six-minute-walk distance - 1200) - 0.08099560 At least 1,600 feet: 0.0035374143842919 x (Six-minute-walk distance - 1600) - 0.37813894

In the current allocation score (the lung CAS), the six-minute walk distance has opposing effects in the medical urgency and post-transplant outcome scores. Candidates with a shorter six-minute walk distance have higher medical urgency scores and lower post-transplant outcome scores, whereas candidates with a longer six-minute walk distance receive fewer points for this variable in their medical urgency score and more points in their post-transplant outcome scores. This effect is shown in **Figure 1**, where the distribution of six-minute walk distance for the candidates with medical urgency scores in the top 25% skewed lower compared to the distribution of six-minute walk distance for candidates with medical urgency scores in the bottom 75%.

Figure 1: Distribution of Six Minute Walk Distance (feet) by Medical Urgency Category⁹



Professional medical organizations have issued clinical guidelines and standards for conducting the six-minute walk test. In 2002, the American Thoracic Society released guidelines for the six-minute walk test.¹⁰ The guidelines include indications and limitations, contraindications, safety issues, technical aspects, and quality assurance considerations, among other topics. In 2014, the European Respiratory Society and American Thoracic Society released a technical standard for field walking tests in chronic respiratory disease which included the six-minute walk test.¹¹ This standard included further guidance for performing the six-minute walk test based on clinical literature published following release of the 2002 guidelines. While detailed, these standards do not delineate a specific approach for determining oxygen requirements ahead of the six-minute walk test or provide guidance on how to conduct the walk with severely impaired patients, which is particularly relevant for the lung transplant candidate population. Furthermore, OPTN policy regarding the six-minute walk distance is not well aligned with the clinical standards as it leaves broad discretion to transplant programs on increasing supplemental oxygen during the six-minute walk test. Due to these gaps, lung transplant program representatives report that performance of the six-minute walk test is not consistent across transplant programs and have expressed concerns that the variation may result in inequities in allocation priority.

The OPTN Lung Transplantation Committee (Committee) established the Six-Minute Walk Workgroup (Workgroup) to discuss approaches for standardizing performance of the six-minute walk test for lung transplant candidates and supplementing the existing clinical standards with guidance specifically for lung transplant programs. The Workgroup included pulmonologists and patient representatives from the Committee as well as respiratory therapists. Their recommendations were presented to the Committee to inform the development of this proposal.

⁹ Samantha Weiss and Chelsea Weibel, "Medical Urgency Data Request: Distributions of Characteristics of Most Medically Urgent Lung Candidates," OPTN Descriptive Data Request for the National Lung Review Board, October 5, 2023. Analysis includes all lung-alone candidates on the OPTN waiting list as of July 31, 2023 and their data at that time. The top 25% of medically urgent candidates are those with at least 0.6350 medical urgency points, excluding exceptions.

¹⁰ "Guidelines for the Six-Minute Walk Test," American Thoracic Society.

¹¹ 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.

Overview of Proposal

The Committee proposes policy and data definition changes as well as guidance to promote standardization of the six-minute walk test for the purposes of lung allocation.

New Policy Requirement for Oxygen Titration Test

The Committee proposes adding a new requirement in policy for lung transplant programs to perform an oxygen titration test ahead of the initial six-minute walk test for lung candidates at least 12 years old, and for lung candidates approaching 12 years of age. The final amount of supplemental oxygen from the oxygen titration test would be the amount of supplemental oxygen provided to the candidate at the start of the six-minute walk test and would need to be documented in the candidate's medical record.

Following discussion of practices at their own hospitals and review of six-minute walk test and oxygen titration protocols submitted by several transplant programs, the Workgroup identified provision of supplemental oxygen as the main source of variability in how the six-minute walk test is administered to lung transplant candidates. Many transplant programs reported using the 2002 and 2014 standards to guide how they perform the test, though transplant programs also reported titrating up supplemental oxygen during the six-minute walk test if the candidate desaturated. The 2014 technical standard states, "Oxygen is not to be titrated during any of the tests where distance is a measured outcome. If oxygen titration is desired, this should be done during a separate test."¹² However, the current OPTN policy language suggests that oxygen titration during the six-minute walk test is acceptable since it states that "Increase in supplemental oxygen during this test is at the discretion of the center performing the test." The Workgroup noted that transplant programs aim to support their lung candidates in walking as far as they can during the test since that often results in a higher overall allocation score.

The Workgroup discussed extensively how to balance consistent administration of the six-minute walk test with the goal of providing appropriate access to transplant for lung candidates, as determined in part by their six-minute walk distance. The Workgroup determined that the optimal approach is for transplant programs to perform a separate oxygen titration test ahead of the six-minute walk test, as advised by the 2014 technical standard,¹³ to determine how much supplemental oxygen the candidate should receive during the six-minute walk test and to avoid titrating up supplemental oxygen during the six-minute walk test. The intent is for candidates to receive adequate supplemental oxygen to complete the six-minute walk test without providing excessive supplemental oxygen that would impact the candidate's performance.

The Workgroup considered whether an oxygen titration test should be recommended in guidance or required by policy. The Workgroup noted that completing an oxygen titration test and a six-minute walk test in the same day may be physically taxing for a candidate and logistically challenging for both the candidate and the transplant program, as the candidate may need time (up to a few hours) to rest and recover in between the two tests. The oxygen titration test may not be necessary prior to every six-minute walk test if the candidate's supplemental oxygen needs with exertion are well-established and stable. Workgroup members noted that administering the six-minute walk test to pediatric candidates can be challenging and respiratory therapists may need to make the test seem like a game to get the candidate to adhere to the instructions, so administering two separate tests may be particularly challenging for these candidates. Their supplemental oxygen needs may also be well-established due to frequent inpatient care. The Workgroup also noted that each transplant program's pulmonary function

¹² Holland et al., "Field walking tests," 1438.

¹³ Ibid.

testing laboratory may not always have the capacity to conduct an oxygen titration test every time that a candidate does a six-minute walk test. However, since guidance is not binding, members of the Workgroup and the Committee decided that a minimum requirement should be added to policy to promote standardization of the six-minute walk test across lung transplant programs. Accordingly, the Committee determined that requiring an oxygen titration test ahead of the candidate's initial six-minute walk test would be an appropriate compromise, with supplementary guidance recommending that additional oxygen titration tests be completed at least once in every 6-month period, or more frequently as needed as a candidate's condition changes.

Candidates less than 12 years old are assigned waitlist survival and post-transplant outcomes points based on their pediatric priority. Their scores are not impacted by changes to their six-minute walk distance up until they turn 12 years old, at which point their waitlist survival and post-transplant outcomes points are calculated based on the clinical values entered, including six-minute walk distance. Accordingly, the Committee determined that only candidates ages 12 and older should be required to complete the oxygen titration test ahead of the six-minute walk test. However, since six-minute walk distance impacts the allocation score as soon as a candidate turns 12 years old, the policy would also require transplant programs to perform an oxygen titration test as the candidate's 12th birthday approaches. Specifically, the policy would require transplant programs to conduct the oxygen titration test before reporting six-minute walk distance within six months of a candidate's 12th birthday. This would ensure that as soon as the six-minute walk distance factors into a candidate's score upon turning 12, the value entered will be based on the same standardized approach for determining supplemental oxygen needs as for other candidates at least 12 years old.

The Committee also proposes removing some of the existing policy language regarding the six-minute walk distance. Lung allocation policy describes how the six-minute walk distance factors into the waitlist survival calculation and the post-transplant outcomes calculation of the lung CAS. These policies specify that the six-minute walk distance is "obtained while the candidate is receiving supplemental oxygen required to maintain an oxygen saturation of 88% or greater at rest. Increase in supplemental oxygen during this test is at the discretion of the center performing the test." The Committee proposes removing this description of how the six-minute walk test should be performed from policy and instead providing more direction on how to conduct the test via guidance.

Finally, the Committee proposes clarifying how age factors into the waitlist survival calculation. *Table 21-3: Waiting List Survival Calculation: Covariates and their Coefficients* currently states that "age at the time of the match run" in fractional calendar year is included in the lung waiting list survival calculation for "all candidates." However, per *Policy 10.1.A.2 Waitlist Survival Points for Candidates Less than 12 Years Old*, candidates less than 12 years old are assigned waitlist survival points based on their pediatric priority and do not receive a calculated waiting list survival score. Accordingly, the Committee proposes replacing "all candidates" in the table with language to indicate that age is incorporated into the waiting list survival calculation when "candidates are at least 12 years old."

Data Definition Change

The current data definition on the Lung Candidate Record in OPTN Waiting List for the six-minute walk distance is as follows:

Enter the total exertional distance on a flat surface the candidate is able to walk in six minutes in feet. The distance walked is a measure of functional status. The normal range is between 0 and 3000, although a value outside of this range may be entered. Enter the Test Date when this information was obtained. These fields must be updated every 6 months from the time the

candidate was added to the waiting list. If they are incomplete or expired, the least beneficial value will be used to calculate the candidate's lung composite allocation score.

The Committee proposes adding a sentence to this data definition to direct users to additional guidance on completing the six-minute walk test and clarifying that values “greater than” rather than “outside of” the specified range may be entered. Additionally, the phrase “normal range” would be replaced with “expected range of values.” The Committee also proposes striking “the distance walked is a measure of functional status” as the test may be used for different purposes and this statement does not provide instruction on how to enter the data. The proposed changes are summarized in **Appendix C**.

Recommendations

The proposed guidance offers recommendations to lung transplant programs on how to perform the six-minute walk test for their lung candidates, with specific recommendations for provision of supplemental oxygen during the test and safety considerations for the lung transplant candidate population. While the guidance does not include considerations for altitude, the Committee requests community feedback on whether any adjustments are needed to account for altitude when reporting six-minute walk distance.

Introduction

The guidance advises lung transplant programs to follow the 2002¹⁴ and 2014¹⁵ standards to the extent possible as these standards provide direction on many details of the test that can have a substantial impact on a patient’s performance. For example, the 2014 standard notes that the six-minute walk distance is “highly sensitive to changes in methodology,” including shape and length of the track used for the walk, whether a wheeled walking aid is used, whether the patient or the respiratory technician carries any supplemental oxygen used, and the instructions and encouragement provided to the patient. The patient representatives on the Workgroup emphasized that completing the six-minute walk test can be stressful and challenging for lung candidates so it is important to prevent obstacles and distractions. For example, the test should be conducted in a quiet, 100 foot (30 meter) hallway, if possible, as “a shorter corridor requires patients to take more time to reverse directions more often, reducing the [six-minute walk distance].”¹⁶ Completing the test in a busy corridor may require the candidate to navigate obstacles like people or equipment. The standards also state that the technician performing the test should not talk to anyone during the test except to say standard phrases of encouragement to the candidate. The patient representatives on the Workgroup reiterated that talking or being asked questions during the test can interfere with the patient’s performance.

Provision of Supplemental Oxygen

In addition to the policy requirement for an oxygen titration test ahead of a candidate’s initial six-minute walk test (for candidates at least 12 years old or within six months of turning 12), the Committee proposes guidance regarding provision of supplemental oxygen during the six-minute walk test. Per *OPTN Policy 10.3.B Lung Clinical Values That Must Be Updated Every Six Months*, the six-minute walk distance must be updated at least once in every six-month period following registration for each candidate on the lung waiting list. To align with this timing, the guidance recommends that transplant programs perform the oxygen titration test at least once in every six-month period. The guidance notes

¹⁴ “Guidelines for the Six-Minute Walk Test,” American Thoracic Society.

¹⁵ 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.

¹⁶ “Guidelines for the Six-Minute Walk Test,” American Thoracic Society, 113.

that both the oxygen titration test and the six-minute walk test may be completed and updated more frequently if deemed appropriate by the transplant program due to a candidate’s changing clinical status. For pediatric lung transplant programs, the guidance reiterates that candidates approaching 12 years of age should have an oxygen titration test conducted ahead of the six-minute walk test for the six-minute walk distance reported within 6 months before the candidate turns 12 years old.

The Workgroup discussed whether to prohibit transplant programs from titrating up supplemental oxygen during the six-minute walk test in policy. While oxygen titration during the six-minute walk test should be avoided, the Workgroup determined that in instances where candidates desaturate during the six-minute walk test and need additional supplemental oxygen to complete the test, it is more appropriate for the transplant program to provide additional supplemental oxygen than to halt the six-minute walk test and ask the candidate to perform the oxygen titration test and/or the six-minute walk test again. While it is important for six-minute walk distances to be reported consistently for lung allocation, completion of the test is not intended to be a barrier for granting a candidate the appropriate priority in lung allocation. If a candidate’s six-minute walk distance is missing or expired on the Lung Candidate Record in OPTN Waiting List, least beneficial values are substituted in the waiting list survival and post-transplant outcomes scores as indicated in OPTN *Policy 21.2.A Values Used in the Calculation of Lung Waiting List Survival* and *Policy 21.2.B.1 Coefficients Used in Calculating Lung Post-Transplant Outcomes* and summarized in **Table 3**. The substituted values result in a lower lung CAS than if a six-minute walk distance is reported.

Table 3. Substituted Values for Six-Minute Walk Distance if Missing or Expired¹⁷

Calculation	If six-minute walk distance is:	Then the calculation uses this substituted value:
Waiting list survival	Missing or expired	4,000 feet
Post-transplant outcomes	Missing or expired	200 feet

Safety Considerations

The Workgroup identified certain safety considerations for lung transplant candidates that are not addressed by the current technical standards for the six-minute walk. First, the current policy language indicates that candidates should be provided supplemental oxygen to maintain oxygen saturation (SpO₂) of 88% or greater at rest. However, the 2014 technical standard states that the six-minute walk test “has an excellent safety profile” when the test is stopped if the patient’s oxygen saturation falls below 80%.¹⁸ The Workgroup discussed whether to change the oxygen saturation level in policy to 80% to align with the technical standard, but many of the Workgroup members were uncomfortable with the lower threshold as they did not think it would be clinically appropriate to allow some lung transplant candidates to desaturate to that level. The patient representatives on the Workgroup also reiterated how challenging these tests can be for candidates and expressed concern about transplant programs allowing them to desaturate to 80%. The Workgroup also noted that some lung transplant candidates may not be able to maintain an oxygen saturation level of 88% at rest with supplemental oxygen but may still be able to safely complete the six-minute walk test. Accordingly, the Workgroup recommended removing the desaturation threshold from policy and leaving some discretion to transplant programs to determine what is most appropriate for their candidates.

¹⁷ OPTN Policy 21.2.B.1 *Coefficients Used in Calculating Lung Post-Transplant Outcomes* also reports that if six-minute walk distance is greater than 1,600, then the post-transplant outcomes score calculation uses the substituted value of 1,600 feet.

¹⁸ Holland et al., “Field walking tests,” 1433.

The Workgroup agreed that the six-minute walk test should be administered to lung transplant candidates if possible and “0 feet” should only be entered for the six-minute walk distance if completing the test is not safe or feasible, for example, because the candidate is on continuous mechanical ventilation and/or extracorporeal membrane oxygenation. The Workgroup also agreed that for candidates who are unable to complete the six-minute walk test due to reasons unrelated to their lung disease – for example, lower limb amputation or joint necrosis – transplant programs may consider submitting an exception request. A recommendation for developing an exception request for this situation is detailed in the guidance.

Altitude

The Workgroup discussed that some candidates live in locations at altitudes that are significantly different than the altitude of the transplant hospital where they are registered. The Workgroup noted that these candidates may have different supplemental oxygen needs at home versus at the transplant hospital. One study on individuals without lung disease found that those who lived at high altitudes had shorter six-minute walk distances at sea level compared to individuals who lived at sea level,¹⁹ though these individuals did not use supplemental oxygen. The Committee requests feedback on whether the oxygen titration test will adequately determine a candidate’s supplemental oxygen needs if they are performing the tests at a different altitude than their residence, or if any special consideration needs to be given for candidates performing the tests at a different altitude than their residence.

NOTA and Final Rule Analysis

The Committee submits this proposal for consideration under the authority of the National Organ Transplant Act of 1984 (NOTA) and the OPTN Final Rule. NOTA requires the OPTN to “establish... medical criteria for allocating organs and provide to members of the public an opportunity to comment with respect to such criteria.”²⁰ The OPTN Final Rule states that “allocation policies shall be designed to achieve equitable allocation of organs among patients” through “setting priority rankings expressed, to the extent possible, through objective and measurable medical criteria.”²¹ This proposal would not change the medical criteria for allocating lungs but it would clarify how one medical criterion, the six-minute walk distance, should be measured and reported to the OPTN for the purposes of lung allocation. The Final Rule also states that one of the performance goals for allocation policies “reducing inter-transplant program variance” in performance indicators.²² This proposal would assist in reducing inter-transplant program variance in how lung candidates of similar disease states are prioritized for transplant by promoting standardization in how the six-minute walk test is conducted for lung allocation purposes.

Transition Plan

The Final Rule requires the OPTN to “consider whether to adopt transition procedures that would treat people on the waiting list and awaiting transplantation prior to the adoption or effective date of the revised policies no less favorably than they would have been treated under the previous policies” whenever organ allocation policies are revised.²³ While this proposal would not change lung allocation,

¹⁹ Deirdre Caffrey, J. Jaime Miranda, Robert H. Gilman, et al., “A cross-sectional study of differences in 6-min walk distance in health adults residing at high altitude versus sea level,” *Extreme Physiology & Medicine* 3, no. 3 (2014), <https://extremephysiolmed.biomedcentral.com/articles/10.1186/2046-7648-3-3>.

²⁰ 42 USC §274(b)(2)(B).

²¹ 42 CFR §121.8(b)(2).

²² 42 CFR §121.8(b)(4).

²³ 42 CFR § 121.8(d).

it may impact how transplant programs measure a clinical value that affects candidates' lung composite allocation scores. The Committee determined that no transition plan is needed prior to the effective date of the revised policies. However, the Committee proposes that lung transplant programs would need to complete an oxygen titration test prior to a six-minute walk test within six months from the implementation date for candidates registered on the lung waiting list prior to the implementation of the proposed policies. This approach would ensure that lung candidates on the waiting list prior to implementation are treated similarly to candidates registered on the lung waiting list following implementation.

The Committee proposes an implementation date of September 5, 2024, which means that oxygen titration tests would need to be completed along with the six-minute walk test by March 5, 2025, for lung candidates registered prior to September 5, 2024. The Committee requests feedback on whether a deadline of March 5, 2025, would provide lung transplant programs sufficient time to prepare for this implementation if the proposal is approved by the OPTN Board of Directors in June 2024.

Implementation Considerations

Member and OPTN Operations

This proposal will impact the operations of transplant hospitals and the OPTN and is not anticipated to affect the operations of organ procurement organizations or histocompatibility laboratories.

Operations affecting Transplant Hospitals

Transplant hospitals with lung transplant programs must ensure that oxygen titration tests are completed ahead of the six-minute walk test for lung candidates as specified in this proposal. Lung transplant programs may also need to update their internal policies regarding oxygen titration and six-minute walk to align with the policy changes and guidance, and coordinate with their pulmonary function testing laboratories to schedule additional tests for lung candidates.

Operations affecting the OPTN

This proposal refers to the submission of official OPTN data that are presently collected by the OPTN. The OPTN Contractor has agreed that data collected pursuant to the OPTN's regulatory requirements in §121.11 of the OPTN Final Rule will be collected through OMB approved data collection forms. After OPTN Board approval, the updated OMB instructions for the existing data collection will be submitted to OMB.

The OPTN would publish the updated policies and guidance; update help documentation in OPTN Waiting List for six-minute walk distance; and communicate the changes to members.

Potential Impact on Select Patient Populations

Lung transplant candidates may be asked by their transplant programs to complete additional oxygen titration tests or to make other modifications to how they perform the six-minute walk test. Since the intent of this proposal is to standardize how six-minute walk distance is reported for all lung candidates for use in lung allocation, the Committee does not anticipate that any subset of lung transplant candidates would be impacted differently from other lung transplant candidates.

Projected Fiscal Impact

This proposal is expected to have a low overall fiscal impact on transplant hospitals. No fiscal impact is anticipated for organ procurement organizations or histocompatibility laboratories.

Projected Impact on Transplant Hospitals

Transplant hospitals may incur added staffing costs in the event a full-time respiratory therapist must be made available for these assessments. Transplant hospitals may need to cover costs of assessments if not covered by payors.

Projected Impact on the OPTN

The OPTN contractor estimates that 240 hours would be needed to implement this proposal. Implementation would involve providing education, guidance, and communication efforts to transplant hospitals with lung transplant programs about the proposed policy changes. The OPTN contractor estimates 10 hours for ongoing support. Ongoing support includes answering member questions, as necessary.

Post-implementation Monitoring

Member Compliance

At transplant hospitals, site surveyors will review a sample of medical records, and any material incorporated into the medical record by reference, to include an oxygen titration test, to verify that lung composite allocation score clinical values are consistent with source documentation.

Policy Evaluation

The Final Rule requires that allocation policies "be reviewed periodically and revised as appropriate." However, because this project does not incorporate any changes to OPTN data collection or allocation, at the time of project approval, the Committee identified the key metric for this project to be "qualitative feedback from the community." This project arose because of conversations within the community regarding inconsistencies in how the six-minute walk test was being performed across transplant programs. As a result, the Committee determined that these community conversations would be the best way to assess whether the policy had the intended effect to standardize six-minute walk testing practices.

Conclusion

Since a candidate's six-minute walk distance is a significant factor in lung allocation, the Committee proposes requiring an oxygen titration test in policy ahead of the initial six-minute walk test for candidates at least 12 years old and for candidates approaching 12 years of age. This proposed policy change is intended to promote a standardized approach for providing supplemental oxygen during the six-minute walk test. The Committee also proposes guidance and data definition changes to complement the proposed policy change, with the overall goal of promoting equity in lung allocation.

Considerations for the Community

- Do you support the proposed policy requirement to perform an oxygen titration test ahead of the initial six-minute walk test for candidates at least 12 years old, and for candidates approaching 12 years of age?
- Should policy specify a timeframe within which the oxygen titration test must be completed ahead of the six-minute walk test?
- If the policy change were to go into effect on September 5, 2024, would that give lung transplant programs adequate time to prepare for implementation?
- Are the data definition changes clear, and would you recommend any changes?
- Is the guidance clear, and would you recommend any changes?
- Does this proposal strike the right balance between promoting data quality for the six-minute walk distance and managing burden on lung candidates and lung transplant programs?
- What, if any, consideration should be given for altitude for candidates who live at a significantly different altitude compared to the transplant hospital where they are registered?

Policy Language

Proposed new language is underlined (example) and language that is proposed for removal is struck through (~~example~~). Heading numbers, table and figure captions, and cross-references affected by the numbering of these policies will be updated as necessary.

1 10.1.A.1 Waitlist Survival Points for Candidates at least 12 Years Old

2 For candidates at least 12 years old at the time of the match run lung waitlist survival points are
3 awarded based on the candidate's waiting list survival probability, based on the following factors:

- 4 • Age at the time of the match run (fractional calendar years)
- 5 • Bilirubin (mg/dL) value with the most recent test date and time
- 6 • Body mass index (BMI) (kg/m²)
- 7 • Assisted ventilation
- 8 • Creatinine (serum) (mg/dL) with the most recent test date and time
- 9 • Diagnosis Group (A, B, C, or D), as defined in Policy 10.1.F Lung Disease Diagnosis Groups
- 10 • Whether the candidate has one of the following specific diagnoses within Diagnosis Group A:
 - 11 ○ Bronchiectasis
 - 12 ○ Sarcoidosis with pulmonary artery (PA) mean pressure of 30 mm Hg or less
 - 13 ○ Sarcoidosis with PA mean pressure missing
- 14 • Whether the candidate has one of the following specific diagnoses within Diagnosis Group D:
 - 15 ○ COVID-19: pulmonary fibrosis
 - 16 ○ Pulmonary fibrosis, other specify cause
 - 17 ○ Sarcoidosis with PA mean pressure greater than 30 mm Hg
- 18 • Functional Status
- 19 • Oxygen needed to maintain adequate oxygen saturation (88% or greater) at rest (L/min)
- 20 • PCO₂ (mm Hg): current
- 21 • PCO₂ increase of at least 15%
- 22 • PA systolic pressure (mm Hg) at rest, prior to any exercise
- 23 • Six-minute-walk distance (feet) ~~obtained while the candidate is receiving supplemental oxygen~~
24 ~~required to maintain an oxygen saturation of 88% or greater at rest. Increase in supplemental~~
25 ~~oxygen during this test is at the discretion of the center performing the test.~~

26 Lung waitlist survival points are awarded on a scale of 0-25. *Policy 21.1.A: Waiting List Survival*
27 *Formulas* details the calculation of lung waitlist survival points.

28 10.1.B.1 Post-Transplant Outcomes Points for Candidates at Least 12 Years Old

29 For candidates at least 12 years old at the time of the match run, lung post-transplant outcomes points
30 are awarded based on the candidate's post-transplant survival probability, based on the following
31 factors:

- 32 • Age at the time of the match run (fractional calendar years)
- 33 • Creatinine (serum) (mg/dL) with the most recent data and time
- 34 • Cardiac index (L/min/m²) at rest, prior to any exercise
- 35 • Assisted ventilation
- 36 • Diagnosis Group (A, B, C, or D), as defined in *10.1.F: Lung Disease Diagnosis Groups*
- 37 • Whether the candidate has one of the following specific diagnoses within Diagnosis Group A:
 - 38 ○ Bronchiectasis

- 39 ○ Lymphangioleiomyomatosis
- 40 ○ Sarcoidosis with PA mean pressure of 30 mm Hg or less
- 41 ○ Sarcoidosis with PA mean pressure missing
- 42 ● Whether the candidate has one of the following specific diagnoses within Diagnosis Group D:
- 43 ○ COVID-19: pulmonary fibrosis
- 44 ○ Obliterative bronchiolitis (non-retransplant)
- 45 ○ Constrictive bronchiolitis
- 46 ○ Sarcoidosis with PA mean pressure greater than 30 mm Hg
- 47 ○ Pulmonary fibrosis, other specify cause
- 48 ● Functional Status
- 49 ● Six-minute-walk_distance (feet) ~~obtained while candidate is receiving supplemental oxygen~~
- 50 ~~required to maintain an oxygen saturation of 88% or greater at rest. Increase in supplemental~~
- 51 ~~oxygen during this test is at the discretion of the center performing the test~~

52 Lung post-transplant outcome points are awarded on a scale of 0-25. *Policy 21.1.B: Post-Transplant*
 53 *Outcomes Formulas* details the calculation of lung post-transplant outcomes points.

54 **10.3 Clinical Values and Update Schedule**

55 Transplant programs must report to the OPTN clinical data corresponding with the factors outlined in
 56 *Policy 10.1.A.1: Waitlist Survival Points for Candidates at least 12 Years Old* and *10.1.B.1: Post Transplant*
 57 *Outcomes Points for Candidates at Least 12 Years Old*.

58 For any six-minute walk distances reported during the six months preceding a candidate turning 12
 59 years old, and for any initial six-minute walk distances reported for candidates at least 12 years old,
 60 transplant programs must perform an oxygen titration test prior to conducting the six-minute walk test
 61 for a candidate on the lung waiting list. The final amount of supplemental oxygen from the oxygen
 62 titration test must be the amount provided to the candidate at the start of the six-minute walk test and
 63 documented in the candidate’s medical record.

64 For lung candidates registered prior to September 5, 2024, who are at least 11 years 6 months old on
 65 September 5, 2024, transplant programs must perform an oxygen titration test prior to conducting the
 66 six-minute walk test for reporting a six-minute walk distance by March 5, 2025.

67 For six-minute walk distances reported prior to the six months preceding the candidate turning 12 years
 68 old, and for any subsequent updates to the six-minute walk distance according to *Policy 10.3.B Lung*
 69 *Clinical Values That Must Be Updated Every Six Months*, transplant programs may conduct an oxygen
 70 titration test prior to the six-minute walk test and may modify the amount of supplemental oxygen
 71 provided to the candidate at the start of the six-minute walk test.

72 The data reported at the time of the candidate’s registration on the lung transplant waiting list must be
 73 six months old or less from the date of the candidate’s registration date, with the exception of the
 74 following values:

- 75 ● Cardiac index (L/min/m²) at rest, prior to any exercise
- 76 ● PA mean pressure
- 77 ● Pulmonary artery (PA) systolic pressure (mm Hg) at rest, prior to any exercise

78 The transplant program must maintain source documentation for all clinical values reported in the
 79 candidate’s medical chart.

80 **10.3.B Lung Clinical Values That Must Be Updated Every Six Months**

81 Transplant hospitals programs must update all of the following clinical values at least once in every six
 82 month period following registration for each candidate on the lung waiting list:

- 83 • Bilirubin (mg/dL) value with the most recent test date and time
- 84 • Weight to determine body mass index (BMI) (kg/m²)
- 85 • Creatinine (serum) (mg/dL) value with the most recent test date and time
- 86 • Functional Status
- 87 • Amount of supplemental oxygen required to maintain adequate oxygen saturation (88% or
 88 greater) (L/min)
- 89 • PCO₂ (mm Hg)
- 90 • Six-minute_ walk distance (feet) ~~obtained while the candidate is receiving supplemental oxygen~~
 91 ~~required to maintain an oxygen saturation of 88% or greater at rest. Increase in supplemental~~
 92 ~~oxygen during this test is at the discretion of the center performing the test.~~
- 93 • Assisted ventilation status

94 The transplant program must maintain source documentation for all clinical values reported in the
 95 candidate’s medical chart.

96 Candidates who are less than 12 years old and are assigned priority 1 based on evidence of respiratory
 97 failure in accordance with *Policy 10.1.A.2.a Candidates Less Than 12 Years Old - Priority 1* will be
 98 assigned to priority 2 if the clinical values that qualify the candidates for priority 1 are more than six
 99 months old on the six-month anniversary of the candidate's listing date.

100 **21.2.A Values Used in the Calculation of Lung Waiting List Survival**

101 *Table 21-3* provides the covariates and their coefficients for the waiting list mortality calculation.
 102 See *Policy 10.1.F.i: Lung Disease Diagnosis Groups* for specific information on each diagnosis group.

103 **Table 21-3: Waiting List Survival Calculation: Covariates and their Coefficients**

For this covariate:	When	The following coefficient is used in the lung waiting list survival calculation:
Age at the time of the match run (fractional calendar year)	All candidates <u>Candidates are at least 12 years old</u>	0.0281444188123287*age
[...]		
Six-minute_ walk distance (feet)	Obtained while the candidate is receiving supplemental oxygen required to maintain an oxygen	-0.09937981549564*Six-minute-walk distance/100

For this covariate:	When	The following coefficient is used in the lung waiting list survival calculation:
	saturation of 88% or greater at rest. Candidates are at least 12 years old	

104 [...]

105 **21.2.B.1 Coefficients Used in Calculating Lung Post-Transplant Outcomes**

106 *Table 21-6: Post-Transplant Outcomes Calculation: Covariates and Their Coefficients* lists the covariates
 107 and corresponding coefficients in the waiting list and post-transplant survival measures. See *Policy*
 108 *10.1.F: Lung Disease Diagnosis Groups* for specific information on each diagnosis group.

109 **Table 21-6: Post-Transplant Outcomes Calculation: Covariates and Their Coefficients**

For this covariate	When	The following coefficient is used in the lung post-transplant outcomes score calculation
[...]		
Six-minute-walk distance (feet) obtained while candidate is receiving supplemental oxygen required to maintain an oxygen saturation of 88% or greater at rest. Increase in supplemental oxygen during this test is at the discretion of the center performing the test.	Less than 200 feet	$-0.0002535116049789 \times (200 - \text{Six-minute-walk distance}) + 0.11168755$
	At least 200 feet and less than 600 feet	$-0.0002841805913329 \times (\text{Six-minute-walk distance} - 200) + 0.11168755$
	At least 600 feet and less than 800 feet	$-0.0000049617083362 \times (\text{Six-minute-walk distance} - 600) - 0.00198468$
	At least 800 feet and less than 1,200 feet	$-0.0001950464256370 \times (\text{Six-minute-walk distance} - 800) - 0.00297703$
	At least 1,200 feet and less than 1,600 feet	$-0.0007428583659073 \times (\text{Six-minute-walk distance} - 1200) - 0.08099560$
	At least 1,600 feet	$0.0035374143842919 \times (\text{Six-minute-walk distance} - 1600) - 0.37813894$

110 [...]

111 #

Guidance for Conducting the Six-Minute Walk Test for Lung Allocation

1 Per OPTN Policy 10.3.B Lung Clinical Values That Must Be Updated Every Six Months, transplant hospitals
 2 must update the six-minute walk distance in feet for each lung candidate at least once in every six-
 3 month period following registration on the waiting list. This guidance offers recommendations for
 4 performing the six-minute walk test to promote standardization across transplant programs in how the
 5 six-minute walk distance is reported for the purposes of lung allocation. Transplant programs are
 6 advised to follow the 2002 American Thoracic Society Guidelines for the Six-Minute Walk Test²⁴ and the
 7 2014 European Respiratory Society/American Thoracic Society technical standard on field walking tests
 8 in chronic respiratory disease²⁵ to the extent possible. If the walk distance is measured in meters, use
 9 **Appendix A** to convert the walk distance from meters to feet.

Provision of Supplemental Oxygen

11 The 2014 technical standard states, “Oxygen is not to be titrated during any of the tests where distance
 12 is a measured outcome. If oxygen titration is desired, this should be done during a separate test.”²⁶ Per
 13 OPTN Policy 10.3 Clinical Values and Update Schedule, transplant hospitals must conduct an oxygen
 14 titration test to determine the amount of supplemental oxygen that should be provided to the
 15 candidate during the candidate’s initial six-minute walk test. This requirement applies to candidates at
 16 least 12 years old and for six-minute walk distances reported during the six months preceding a
 17 candidate turning 12 years old. Pediatric lung transplant programs are advised to ensure that candidates
 18 approaching 12 years old complete an oxygen titration test ahead of the six-minute walk test for the six-
 19 minute walk distance reported within six months before the candidate turns 12 years of age. The intent
 20 of performing the oxygen titration test ahead of the six-minute walk test is to provide a standardized
 21 approach for determining supplemental oxygen needs for completing the test and to avoid titration
 22 during the test so as not to interfere with the candidate’s performance. A sample oxygen titration
 23 protocol is enclosed in **Appendix B**. If a candidate desaturates during the six-minute walk test, the
 24 transplant program may provide additional supplemental oxygen to enable the candidate to complete
 25 the test.

26 Per OPTN Policy 10.3.B Lung Clinical Values That Must Be Updated Every Six Months, the six-minute walk
 27 distance must be updated at least once in every six-month period following registration for each
 28 candidate on the lung waiting list. To align with this timing, transplant programs are advised to perform
 29 the oxygen titration test at least once in every six-month period. Both the oxygen titration test and the
 30 six-minute walk test may be completed and updated more frequently if deemed appropriate by the
 31 transplant program due to a candidate’s changing clinical status. However, transplant programs may
 32 determine that a candidate’s supplemental oxygen needs are well established and that a separate
 33 oxygen titration test is not necessary prior to performing a six-minute walk test other than the
 34 candidate’s initial six-minute walk test. For example, particularly for pediatric candidates, adherence to
 35 multiple test protocols in the same day may present a challenge and the candidates’ oxygen needs with
 36 exertion may be well established.

²⁴ “Guidelines for the Six-Minute Walk Test,” American Thoracic Society, March 2002, accessed October 9, 2023, available <https://www.atsjournals.org/doi/10.1164/ajrccm.166.1.at1102>.

²⁵ 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.

²⁶ Holland et al., “Field walking tests,” 1438.

37 Safety Considerations

38 For most candidates, it is recommended that transplant programs provide supplemental oxygen to
39 maintain a candidate’s oxygen saturation of greater than 88% during the performance of the test. The
40 2014 technical standard states that the six-minute walk test “has an excellent safety profile” when the
41 test is stopped if the patient’s oxygen saturation falls below 80%.²⁷ Depending on the candidate’s
42 diagnosis and disease severity, lung transplant programs should not feel obligated to allow their
43 candidates to desaturate below 80% before halting the test. For candidates who are unable to maintain
44 an oxygen saturation of 88% of greater at rest but can safely complete the six-minute walk test, the
45 transplant program may use a lower oxygen saturation threshold to guide supplemental oxygen needs.

46 If a candidate is unable to safely perform the six-minute walk test (e.g., while supported by continuous
47 mechanical ventilation and/or extracorporeal membrane oxygenation), then the test should not be
48 performed, and the lung transplant program should report a walk distance of 0 feet for the candidate.
49 However, lung transplant programs are advised to avoid entering a walk distance of 0 feet and to
50 administer the six-minute walk test if it is deemed safe for a candidate to attempt the test, even if the
51 candidate is not expected to walk far or is not expected to walk the full six minutes.

52 When a lung candidate is unable to complete the six-minute walk due to reasons unrelated to their lung
53 disease severity (e.g., lower limb amputation, joint necrosis, etc.), the lung transplant program should
54 report a walk distance of 0 feet for the candidate. The transplant program may submit an exception
55 request for the post-transplant outcomes component of the candidate’s lung composite allocation
56 score. In this case, transplant programs should estimate the candidate’s six-minute walk distance based
57 on the documented walk distance of candidates with similar levels of fitness and enter that value into
58 the CAS calculator²⁸ along with the candidate’s other characteristics to determine the estimated post-
59 transplant outcomes subscore for that candidate were they able to complete the six-minute walk test.
60 The transplant program should then divide this value by the total possible number of points for post-
61 transplant outcomes and multiply by 100 to determine the percentage that should be entered into the
62 exception request form. The exception request will be reviewed and adjudicated as outlined in OPTN
63 Policy 10.2 Lung Composite Score Exceptions and the Lung Review Board Operational Guidelines.²⁹

²⁷ Holland et al., “Field walking tests,” 1433.

²⁸ “Lung CAS Calculator,” OPTN, accessed October 9, 2023, available <https://optn.transplant.hrsa.gov/data/allocation-calculators/lung-cas-calculator/>.

²⁹ “Lung Review Board Operational Guidelines,” OPTN, accessed October 9, 2023, available <https://optn.transplant.hrsa.gov/about/review-boards/>.

Appendix A: Convert Walk Distance from Meters to Feet

64 Six-minute walk distance is entered in OPTN Waiting List as a whole number measured in feet. The
 65 following table is provided for converting six-minute walk distances measured in meters to a whole
 66 number in feet, where one meter is equal to 3.28084 feet. The value was rounded up to the next whole
 67 number if the converted value in feet ended in a decimal value of at least 0.5.
 68

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>0</u>	<u>0</u>	<u>35</u>	<u>115</u>	<u>70</u>	<u>230</u>	<u>105</u>	<u>344</u>
<u>1</u>	<u>3</u>	<u>36</u>	<u>118</u>	<u>71</u>	<u>233</u>	<u>106</u>	<u>348</u>
<u>2</u>	<u>7</u>	<u>37</u>	<u>121</u>	<u>72</u>	<u>236</u>	<u>107</u>	<u>351</u>
<u>3</u>	<u>10</u>	<u>38</u>	<u>125</u>	<u>73</u>	<u>240</u>	<u>108</u>	<u>354</u>
<u>4</u>	<u>13</u>	<u>39</u>	<u>128</u>	<u>74</u>	<u>243</u>	<u>109</u>	<u>358</u>
<u>5</u>	<u>16</u>	<u>40</u>	<u>131</u>	<u>75</u>	<u>246</u>	<u>110</u>	<u>361</u>
<u>6</u>	<u>20</u>	<u>41</u>	<u>135</u>	<u>76</u>	<u>249</u>	<u>111</u>	<u>364</u>
<u>7</u>	<u>23</u>	<u>42</u>	<u>138</u>	<u>77</u>	<u>253</u>	<u>112</u>	<u>367</u>
<u>8</u>	<u>26</u>	<u>43</u>	<u>141</u>	<u>78</u>	<u>256</u>	<u>113</u>	<u>371</u>
<u>9</u>	<u>30</u>	<u>44</u>	<u>144</u>	<u>79</u>	<u>259</u>	<u>114</u>	<u>374</u>
<u>10</u>	<u>33</u>	<u>45</u>	<u>148</u>	<u>80</u>	<u>262</u>	<u>115</u>	<u>377</u>
<u>11</u>	<u>36</u>	<u>46</u>	<u>151</u>	<u>81</u>	<u>266</u>	<u>116</u>	<u>381</u>
<u>12</u>	<u>39</u>	<u>47</u>	<u>154</u>	<u>82</u>	<u>269</u>	<u>117</u>	<u>384</u>
<u>13</u>	<u>43</u>	<u>48</u>	<u>157</u>	<u>83</u>	<u>272</u>	<u>118</u>	<u>387</u>
<u>14</u>	<u>46</u>	<u>49</u>	<u>161</u>	<u>84</u>	<u>276</u>	<u>119</u>	<u>390</u>
<u>15</u>	<u>49</u>	<u>50</u>	<u>164</u>	<u>85</u>	<u>279</u>	<u>120</u>	<u>394</u>
<u>16</u>	<u>52</u>	<u>51</u>	<u>167</u>	<u>86</u>	<u>282</u>	<u>121</u>	<u>397</u>
<u>17</u>	<u>56</u>	<u>52</u>	<u>171</u>	<u>87</u>	<u>285</u>	<u>122</u>	<u>400</u>
<u>18</u>	<u>59</u>	<u>53</u>	<u>174</u>	<u>88</u>	<u>289</u>	<u>123</u>	<u>404</u>
<u>19</u>	<u>62</u>	<u>54</u>	<u>177</u>	<u>89</u>	<u>292</u>	<u>124</u>	<u>407</u>
<u>20</u>	<u>66</u>	<u>55</u>	<u>180</u>	<u>90</u>	<u>295</u>	<u>125</u>	<u>410</u>
<u>21</u>	<u>69</u>	<u>56</u>	<u>184</u>	<u>91</u>	<u>299</u>	<u>126</u>	<u>413</u>
<u>22</u>	<u>72</u>	<u>57</u>	<u>187</u>	<u>92</u>	<u>302</u>	<u>127</u>	<u>417</u>
<u>23</u>	<u>75</u>	<u>58</u>	<u>190</u>	<u>93</u>	<u>305</u>	<u>128</u>	<u>420</u>
<u>24</u>	<u>79</u>	<u>59</u>	<u>194</u>	<u>94</u>	<u>308</u>	<u>129</u>	<u>423</u>
<u>25</u>	<u>82</u>	<u>60</u>	<u>197</u>	<u>95</u>	<u>312</u>	<u>130</u>	<u>427</u>
<u>26</u>	<u>85</u>	<u>61</u>	<u>200</u>	<u>96</u>	<u>315</u>	<u>131</u>	<u>430</u>
<u>27</u>	<u>89</u>	<u>62</u>	<u>203</u>	<u>97</u>	<u>318</u>	<u>132</u>	<u>433</u>
<u>28</u>	<u>92</u>	<u>63</u>	<u>207</u>	<u>98</u>	<u>322</u>	<u>133</u>	<u>436</u>
<u>29</u>	<u>95</u>	<u>64</u>	<u>210</u>	<u>99</u>	<u>325</u>	<u>134</u>	<u>440</u>
<u>30</u>	<u>98</u>	<u>65</u>	<u>213</u>	<u>100</u>	<u>328</u>	<u>135</u>	<u>443</u>
<u>31</u>	<u>102</u>	<u>66</u>	<u>217</u>	<u>101</u>	<u>331</u>	<u>136</u>	<u>446</u>
<u>32</u>	<u>105</u>	<u>67</u>	<u>220</u>	<u>102</u>	<u>335</u>	<u>137</u>	<u>449</u>
<u>33</u>	<u>108</u>	<u>68</u>	<u>223</u>	<u>103</u>	<u>338</u>	<u>138</u>	<u>453</u>
<u>34</u>	<u>112</u>	<u>69</u>	<u>226</u>	<u>104</u>	<u>341</u>	<u>139</u>	<u>456</u>

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>140</u>	<u>459</u>	<u>182</u>	<u>597</u>	<u>224</u>	<u>735</u>	<u>266</u>	<u>873</u>
<u>141</u>	<u>463</u>	<u>183</u>	<u>600</u>	<u>225</u>	<u>738</u>	<u>267</u>	<u>876</u>
<u>142</u>	<u>466</u>	<u>184</u>	<u>604</u>	<u>226</u>	<u>741</u>	<u>268</u>	<u>879</u>
<u>143</u>	<u>469</u>	<u>185</u>	<u>607</u>	<u>227</u>	<u>745</u>	<u>269</u>	<u>883</u>
<u>144</u>	<u>472</u>	<u>186</u>	<u>610</u>	<u>228</u>	<u>748</u>	<u>270</u>	<u>886</u>
<u>145</u>	<u>476</u>	<u>187</u>	<u>614</u>	<u>229</u>	<u>751</u>	<u>271</u>	<u>889</u>
<u>146</u>	<u>479</u>	<u>188</u>	<u>617</u>	<u>230</u>	<u>755</u>	<u>272</u>	<u>892</u>
<u>147</u>	<u>482</u>	<u>189</u>	<u>620</u>	<u>231</u>	<u>758</u>	<u>273</u>	<u>896</u>
<u>148</u>	<u>486</u>	<u>190</u>	<u>623</u>	<u>232</u>	<u>761</u>	<u>274</u>	<u>899</u>
<u>149</u>	<u>489</u>	<u>191</u>	<u>627</u>	<u>233</u>	<u>764</u>	<u>275</u>	<u>902</u>
<u>150</u>	<u>492</u>	<u>192</u>	<u>630</u>	<u>234</u>	<u>768</u>	<u>276</u>	<u>906</u>
<u>151</u>	<u>495</u>	<u>193</u>	<u>633</u>	<u>235</u>	<u>771</u>	<u>277</u>	<u>909</u>
<u>152</u>	<u>499</u>	<u>194</u>	<u>636</u>	<u>236</u>	<u>774</u>	<u>278</u>	<u>912</u>
<u>153</u>	<u>502</u>	<u>195</u>	<u>640</u>	<u>237</u>	<u>778</u>	<u>279</u>	<u>915</u>
<u>154</u>	<u>505</u>	<u>196</u>	<u>643</u>	<u>238</u>	<u>781</u>	<u>280</u>	<u>919</u>
<u>155</u>	<u>509</u>	<u>197</u>	<u>646</u>	<u>239</u>	<u>784</u>	<u>281</u>	<u>922</u>
<u>156</u>	<u>512</u>	<u>198</u>	<u>650</u>	<u>240</u>	<u>787</u>	<u>282</u>	<u>925</u>
<u>157</u>	<u>515</u>	<u>199</u>	<u>653</u>	<u>241</u>	<u>791</u>	<u>283</u>	<u>928</u>
<u>158</u>	<u>518</u>	<u>200</u>	<u>656</u>	<u>242</u>	<u>794</u>	<u>284</u>	<u>932</u>
<u>159</u>	<u>522</u>	<u>201</u>	<u>659</u>	<u>243</u>	<u>797</u>	<u>285</u>	<u>935</u>
<u>160</u>	<u>525</u>	<u>202</u>	<u>663</u>	<u>244</u>	<u>801</u>	<u>286</u>	<u>938</u>
<u>161</u>	<u>528</u>	<u>203</u>	<u>666</u>	<u>245</u>	<u>804</u>	<u>287</u>	<u>942</u>
<u>162</u>	<u>531</u>	<u>204</u>	<u>669</u>	<u>246</u>	<u>807</u>	<u>288</u>	<u>945</u>
<u>163</u>	<u>535</u>	<u>205</u>	<u>673</u>	<u>247</u>	<u>810</u>	<u>289</u>	<u>948</u>
<u>164</u>	<u>538</u>	<u>206</u>	<u>676</u>	<u>248</u>	<u>814</u>	<u>290</u>	<u>951</u>
<u>165</u>	<u>541</u>	<u>207</u>	<u>679</u>	<u>249</u>	<u>817</u>	<u>291</u>	<u>955</u>
<u>166</u>	<u>545</u>	<u>208</u>	<u>682</u>	<u>250</u>	<u>820</u>	<u>292</u>	<u>958</u>
<u>167</u>	<u>548</u>	<u>209</u>	<u>686</u>	<u>251</u>	<u>823</u>	<u>293</u>	<u>961</u>
<u>168</u>	<u>551</u>	<u>210</u>	<u>689</u>	<u>252</u>	<u>827</u>	<u>294</u>	<u>965</u>
<u>169</u>	<u>554</u>	<u>211</u>	<u>692</u>	<u>253</u>	<u>830</u>	<u>295</u>	<u>968</u>
<u>170</u>	<u>558</u>	<u>212</u>	<u>696</u>	<u>254</u>	<u>833</u>	<u>296</u>	<u>971</u>
<u>171</u>	<u>561</u>	<u>213</u>	<u>699</u>	<u>255</u>	<u>837</u>	<u>297</u>	<u>974</u>
<u>172</u>	<u>564</u>	<u>214</u>	<u>702</u>	<u>256</u>	<u>840</u>	<u>298</u>	<u>978</u>
<u>173</u>	<u>568</u>	<u>215</u>	<u>705</u>	<u>257</u>	<u>843</u>	<u>299</u>	<u>981</u>
<u>174</u>	<u>571</u>	<u>216</u>	<u>709</u>	<u>258</u>	<u>846</u>	<u>300</u>	<u>984</u>
<u>175</u>	<u>574</u>	<u>217</u>	<u>712</u>	<u>259</u>	<u>850</u>	<u>301</u>	<u>988</u>
<u>176</u>	<u>577</u>	<u>218</u>	<u>715</u>	<u>260</u>	<u>853</u>	<u>302</u>	<u>991</u>
<u>177</u>	<u>581</u>	<u>219</u>	<u>719</u>	<u>261</u>	<u>856</u>	<u>303</u>	<u>994</u>
<u>178</u>	<u>584</u>	<u>220</u>	<u>722</u>	<u>262</u>	<u>860</u>	<u>304</u>	<u>997</u>
<u>179</u>	<u>587</u>	<u>221</u>	<u>725</u>	<u>263</u>	<u>863</u>	<u>305</u>	<u>1001</u>
<u>180</u>	<u>591</u>	<u>222</u>	<u>728</u>	<u>264</u>	<u>866</u>	<u>306</u>	<u>1004</u>
<u>181</u>	<u>594</u>	<u>223</u>	<u>732</u>	<u>265</u>	<u>869</u>	<u>307</u>	<u>1007</u>

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>308</u>	<u>1010</u>	<u>350</u>	<u>1148</u>	<u>392</u>	<u>1286</u>	<u>434</u>	<u>1424</u>
<u>309</u>	<u>1014</u>	<u>351</u>	<u>1152</u>	<u>393</u>	<u>1289</u>	<u>435</u>	<u>1427</u>
<u>310</u>	<u>1017</u>	<u>352</u>	<u>1155</u>	<u>394</u>	<u>1293</u>	<u>436</u>	<u>1430</u>
<u>311</u>	<u>1020</u>	<u>353</u>	<u>1158</u>	<u>395</u>	<u>1296</u>	<u>437</u>	<u>1434</u>
<u>312</u>	<u>1024</u>	<u>354</u>	<u>1161</u>	<u>396</u>	<u>1299</u>	<u>438</u>	<u>1437</u>
<u>313</u>	<u>1027</u>	<u>355</u>	<u>1165</u>	<u>397</u>	<u>1302</u>	<u>439</u>	<u>1440</u>
<u>314</u>	<u>1030</u>	<u>356</u>	<u>1168</u>	<u>398</u>	<u>1306</u>	<u>440</u>	<u>1444</u>
<u>315</u>	<u>1033</u>	<u>357</u>	<u>1171</u>	<u>399</u>	<u>1309</u>	<u>441</u>	<u>1447</u>
<u>316</u>	<u>1037</u>	<u>358</u>	<u>1175</u>	<u>400</u>	<u>1312</u>	<u>442</u>	<u>1450</u>
<u>317</u>	<u>1040</u>	<u>359</u>	<u>1178</u>	<u>401</u>	<u>1316</u>	<u>443</u>	<u>1453</u>
<u>318</u>	<u>1043</u>	<u>360</u>	<u>1181</u>	<u>402</u>	<u>1319</u>	<u>444</u>	<u>1457</u>
<u>319</u>	<u>1047</u>	<u>361</u>	<u>1184</u>	<u>403</u>	<u>1322</u>	<u>445</u>	<u>1460</u>
<u>320</u>	<u>1050</u>	<u>362</u>	<u>1188</u>	<u>404</u>	<u>1325</u>	<u>446</u>	<u>1463</u>
<u>321</u>	<u>1053</u>	<u>363</u>	<u>1191</u>	<u>405</u>	<u>1329</u>	<u>447</u>	<u>1467</u>
<u>322</u>	<u>1056</u>	<u>364</u>	<u>1194</u>	<u>406</u>	<u>1332</u>	<u>448</u>	<u>1470</u>
<u>323</u>	<u>1060</u>	<u>365</u>	<u>1198</u>	<u>407</u>	<u>1335</u>	<u>449</u>	<u>1473</u>
<u>324</u>	<u>1063</u>	<u>366</u>	<u>1201</u>	<u>408</u>	<u>1339</u>	<u>450</u>	<u>1476</u>
<u>325</u>	<u>1066</u>	<u>367</u>	<u>1204</u>	<u>409</u>	<u>1342</u>	<u>451</u>	<u>1480</u>
<u>326</u>	<u>1070</u>	<u>368</u>	<u>1207</u>	<u>410</u>	<u>1345</u>	<u>452</u>	<u>1483</u>
<u>327</u>	<u>1073</u>	<u>369</u>	<u>1211</u>	<u>411</u>	<u>1348</u>	<u>453</u>	<u>1486</u>
<u>328</u>	<u>1076</u>	<u>370</u>	<u>1214</u>	<u>412</u>	<u>1352</u>	<u>454</u>	<u>1490</u>
<u>329</u>	<u>1079</u>	<u>371</u>	<u>1217</u>	<u>413</u>	<u>1355</u>	<u>455</u>	<u>1493</u>
<u>330</u>	<u>1083</u>	<u>372</u>	<u>1220</u>	<u>414</u>	<u>1358</u>	<u>456</u>	<u>1496</u>
<u>331</u>	<u>1086</u>	<u>373</u>	<u>1224</u>	<u>415</u>	<u>1362</u>	<u>457</u>	<u>1499</u>
<u>332</u>	<u>1089</u>	<u>374</u>	<u>1227</u>	<u>416</u>	<u>1365</u>	<u>458</u>	<u>1503</u>
<u>333</u>	<u>1093</u>	<u>375</u>	<u>1230</u>	<u>417</u>	<u>1368</u>	<u>459</u>	<u>1506</u>
<u>334</u>	<u>1096</u>	<u>376</u>	<u>1234</u>	<u>418</u>	<u>1371</u>	<u>460</u>	<u>1509</u>
<u>335</u>	<u>1099</u>	<u>377</u>	<u>1237</u>	<u>419</u>	<u>1375</u>	<u>461</u>	<u>1512</u>
<u>336</u>	<u>1102</u>	<u>378</u>	<u>1240</u>	<u>420</u>	<u>1378</u>	<u>462</u>	<u>1516</u>
<u>337</u>	<u>1106</u>	<u>379</u>	<u>1243</u>	<u>421</u>	<u>1381</u>	<u>463</u>	<u>1519</u>
<u>338</u>	<u>1109</u>	<u>380</u>	<u>1247</u>	<u>422</u>	<u>1385</u>	<u>464</u>	<u>1522</u>
<u>339</u>	<u>1112</u>	<u>381</u>	<u>1250</u>	<u>423</u>	<u>1388</u>	<u>465</u>	<u>1526</u>
<u>340</u>	<u>1115</u>	<u>382</u>	<u>1253</u>	<u>424</u>	<u>1391</u>	<u>466</u>	<u>1529</u>
<u>341</u>	<u>1119</u>	<u>383</u>	<u>1257</u>	<u>425</u>	<u>1394</u>	<u>467</u>	<u>1532</u>
<u>342</u>	<u>1122</u>	<u>384</u>	<u>1260</u>	<u>426</u>	<u>1398</u>	<u>468</u>	<u>1535</u>
<u>343</u>	<u>1125</u>	<u>385</u>	<u>1263</u>	<u>427</u>	<u>1401</u>	<u>469</u>	<u>1539</u>
<u>344</u>	<u>1129</u>	<u>386</u>	<u>1266</u>	<u>428</u>	<u>1404</u>	<u>470</u>	<u>1542</u>
<u>345</u>	<u>1132</u>	<u>387</u>	<u>1270</u>	<u>429</u>	<u>1407</u>	<u>471</u>	<u>1545</u>
<u>346</u>	<u>1135</u>	<u>388</u>	<u>1273</u>	<u>430</u>	<u>1411</u>	<u>472</u>	<u>1549</u>
<u>347</u>	<u>1138</u>	<u>389</u>	<u>1276</u>	<u>431</u>	<u>1414</u>	<u>473</u>	<u>1552</u>
<u>348</u>	<u>1142</u>	<u>390</u>	<u>1280</u>	<u>432</u>	<u>1417</u>	<u>474</u>	<u>1555</u>
<u>349</u>	<u>1145</u>	<u>391</u>	<u>1283</u>	<u>433</u>	<u>1421</u>	<u>475</u>	<u>1558</u>

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>476</u>	<u>1562</u>	<u>518</u>	<u>1699</u>	<u>560</u>	<u>1837</u>	<u>602</u>	<u>1975</u>
<u>477</u>	<u>1565</u>	<u>519</u>	<u>1703</u>	<u>561</u>	<u>1841</u>	<u>603</u>	<u>1978</u>
<u>478</u>	<u>1568</u>	<u>520</u>	<u>1706</u>	<u>562</u>	<u>1844</u>	<u>604</u>	<u>1982</u>
<u>479</u>	<u>1572</u>	<u>521</u>	<u>1709</u>	<u>563</u>	<u>1847</u>	<u>605</u>	<u>1985</u>
<u>480</u>	<u>1575</u>	<u>522</u>	<u>1713</u>	<u>564</u>	<u>1850</u>	<u>606</u>	<u>1988</u>
<u>481</u>	<u>1578</u>	<u>523</u>	<u>1716</u>	<u>565</u>	<u>1854</u>	<u>607</u>	<u>1991</u>
<u>482</u>	<u>1581</u>	<u>524</u>	<u>1719</u>	<u>566</u>	<u>1857</u>	<u>608</u>	<u>1995</u>
<u>483</u>	<u>1585</u>	<u>525</u>	<u>1722</u>	<u>567</u>	<u>1860</u>	<u>609</u>	<u>1998</u>
<u>484</u>	<u>1588</u>	<u>526</u>	<u>1726</u>	<u>568</u>	<u>1864</u>	<u>610</u>	<u>2001</u>
<u>485</u>	<u>1591</u>	<u>527</u>	<u>1729</u>	<u>569</u>	<u>1867</u>	<u>611</u>	<u>2005</u>
<u>486</u>	<u>1594</u>	<u>528</u>	<u>1732</u>	<u>570</u>	<u>1870</u>	<u>612</u>	<u>2008</u>
<u>487</u>	<u>1598</u>	<u>529</u>	<u>1736</u>	<u>571</u>	<u>1873</u>	<u>613</u>	<u>2011</u>
<u>488</u>	<u>1601</u>	<u>530</u>	<u>1739</u>	<u>572</u>	<u>1877</u>	<u>614</u>	<u>2014</u>
<u>489</u>	<u>1604</u>	<u>531</u>	<u>1742</u>	<u>573</u>	<u>1880</u>	<u>615</u>	<u>2018</u>
<u>490</u>	<u>1608</u>	<u>532</u>	<u>1745</u>	<u>574</u>	<u>1883</u>	<u>616</u>	<u>2021</u>
<u>491</u>	<u>1611</u>	<u>533</u>	<u>1749</u>	<u>575</u>	<u>1886</u>	<u>617</u>	<u>2024</u>
<u>492</u>	<u>1614</u>	<u>534</u>	<u>1752</u>	<u>576</u>	<u>1890</u>	<u>618</u>	<u>2028</u>
<u>493</u>	<u>1617</u>	<u>535</u>	<u>1755</u>	<u>577</u>	<u>1893</u>	<u>619</u>	<u>2031</u>
<u>494</u>	<u>1621</u>	<u>536</u>	<u>1759</u>	<u>578</u>	<u>1896</u>	<u>620</u>	<u>2034</u>
<u>495</u>	<u>1624</u>	<u>537</u>	<u>1762</u>	<u>579</u>	<u>1900</u>	<u>621</u>	<u>2037</u>
<u>496</u>	<u>1627</u>	<u>538</u>	<u>1765</u>	<u>580</u>	<u>1903</u>	<u>622</u>	<u>2041</u>
<u>497</u>	<u>1631</u>	<u>539</u>	<u>1768</u>	<u>581</u>	<u>1906</u>	<u>623</u>	<u>2044</u>
<u>498</u>	<u>1634</u>	<u>540</u>	<u>1772</u>	<u>582</u>	<u>1909</u>	<u>624</u>	<u>2047</u>
<u>499</u>	<u>1637</u>	<u>541</u>	<u>1775</u>	<u>583</u>	<u>1913</u>	<u>625</u>	<u>2051</u>
<u>500</u>	<u>1640</u>	<u>542</u>	<u>1778</u>	<u>584</u>	<u>1916</u>	<u>626</u>	<u>2054</u>
<u>501</u>	<u>1644</u>	<u>543</u>	<u>1781</u>	<u>585</u>	<u>1919</u>	<u>627</u>	<u>2057</u>
<u>502</u>	<u>1647</u>	<u>544</u>	<u>1785</u>	<u>586</u>	<u>1923</u>	<u>628</u>	<u>2060</u>
<u>503</u>	<u>1650</u>	<u>545</u>	<u>1788</u>	<u>587</u>	<u>1926</u>	<u>629</u>	<u>2064</u>
<u>504</u>	<u>1654</u>	<u>546</u>	<u>1791</u>	<u>588</u>	<u>1929</u>	<u>630</u>	<u>2067</u>
<u>505</u>	<u>1657</u>	<u>547</u>	<u>1795</u>	<u>589</u>	<u>1932</u>	<u>631</u>	<u>2070</u>
<u>506</u>	<u>1660</u>	<u>548</u>	<u>1798</u>	<u>590</u>	<u>1936</u>	<u>632</u>	<u>2073</u>
<u>507</u>	<u>1663</u>	<u>549</u>	<u>1801</u>	<u>591</u>	<u>1939</u>	<u>633</u>	<u>2077</u>
<u>508</u>	<u>1667</u>	<u>550</u>	<u>1804</u>	<u>592</u>	<u>1942</u>	<u>634</u>	<u>2080</u>
<u>509</u>	<u>1670</u>	<u>551</u>	<u>1808</u>	<u>593</u>	<u>1946</u>	<u>635</u>	<u>2083</u>
<u>510</u>	<u>1673</u>	<u>552</u>	<u>1811</u>	<u>594</u>	<u>1949</u>	<u>636</u>	<u>2087</u>
<u>511</u>	<u>1677</u>	<u>553</u>	<u>1814</u>	<u>595</u>	<u>1952</u>	<u>637</u>	<u>2090</u>
<u>512</u>	<u>1680</u>	<u>554</u>	<u>1818</u>	<u>596</u>	<u>1955</u>	<u>638</u>	<u>2093</u>
<u>513</u>	<u>1683</u>	<u>555</u>	<u>1821</u>	<u>597</u>	<u>1959</u>	<u>639</u>	<u>2096</u>
<u>514</u>	<u>1686</u>	<u>556</u>	<u>1824</u>	<u>598</u>	<u>1962</u>	<u>640</u>	<u>2100</u>
<u>515</u>	<u>1690</u>	<u>557</u>	<u>1827</u>	<u>599</u>	<u>1965</u>	<u>641</u>	<u>2103</u>
<u>516</u>	<u>1693</u>	<u>558</u>	<u>1831</u>	<u>600</u>	<u>1969</u>	<u>642</u>	<u>2106</u>
<u>517</u>	<u>1696</u>	<u>559</u>	<u>1834</u>	<u>601</u>	<u>1972</u>	<u>643</u>	<u>2110</u>

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>644</u>	<u>2113</u>	<u>686</u>	<u>2251</u>	<u>728</u>	<u>2388</u>	<u>770</u>	<u>2526</u>
<u>645</u>	<u>2116</u>	<u>687</u>	<u>2254</u>	<u>729</u>	<u>2392</u>	<u>771</u>	<u>2530</u>
<u>646</u>	<u>2119</u>	<u>688</u>	<u>2257</u>	<u>730</u>	<u>2395</u>	<u>772</u>	<u>2533</u>
<u>647</u>	<u>2123</u>	<u>689</u>	<u>2260</u>	<u>731</u>	<u>2398</u>	<u>773</u>	<u>2536</u>
<u>648</u>	<u>2126</u>	<u>690</u>	<u>2264</u>	<u>732</u>	<u>2402</u>	<u>774</u>	<u>2539</u>
<u>649</u>	<u>2129</u>	<u>691</u>	<u>2267</u>	<u>733</u>	<u>2405</u>	<u>775</u>	<u>2543</u>
<u>650</u>	<u>2133</u>	<u>692</u>	<u>2270</u>	<u>734</u>	<u>2408</u>	<u>776</u>	<u>2546</u>
<u>651</u>	<u>2136</u>	<u>693</u>	<u>2274</u>	<u>735</u>	<u>2411</u>	<u>777</u>	<u>2549</u>
<u>652</u>	<u>2139</u>	<u>694</u>	<u>2277</u>	<u>736</u>	<u>2415</u>	<u>778</u>	<u>2552</u>
<u>653</u>	<u>2142</u>	<u>695</u>	<u>2280</u>	<u>737</u>	<u>2418</u>	<u>779</u>	<u>2556</u>
<u>654</u>	<u>2146</u>	<u>696</u>	<u>2283</u>	<u>738</u>	<u>2421</u>	<u>780</u>	<u>2559</u>
<u>655</u>	<u>2149</u>	<u>697</u>	<u>2287</u>	<u>739</u>	<u>2425</u>	<u>781</u>	<u>2562</u>
<u>656</u>	<u>2152</u>	<u>698</u>	<u>2290</u>	<u>740</u>	<u>2428</u>	<u>782</u>	<u>2566</u>
<u>657</u>	<u>2156</u>	<u>699</u>	<u>2293</u>	<u>741</u>	<u>2431</u>	<u>783</u>	<u>2569</u>
<u>658</u>	<u>2159</u>	<u>700</u>	<u>2297</u>	<u>742</u>	<u>2434</u>	<u>784</u>	<u>2572</u>
<u>659</u>	<u>2162</u>	<u>701</u>	<u>2300</u>	<u>743</u>	<u>2438</u>	<u>785</u>	<u>2575</u>
<u>660</u>	<u>2165</u>	<u>702</u>	<u>2303</u>	<u>744</u>	<u>2441</u>	<u>786</u>	<u>2579</u>
<u>661</u>	<u>2169</u>	<u>703</u>	<u>2306</u>	<u>745</u>	<u>2444</u>	<u>787</u>	<u>2582</u>
<u>662</u>	<u>2172</u>	<u>704</u>	<u>2310</u>	<u>746</u>	<u>2448</u>	<u>788</u>	<u>2585</u>
<u>663</u>	<u>2175</u>	<u>705</u>	<u>2313</u>	<u>747</u>	<u>2451</u>	<u>789</u>	<u>2589</u>
<u>664</u>	<u>2178</u>	<u>706</u>	<u>2316</u>	<u>748</u>	<u>2454</u>	<u>790</u>	<u>2592</u>
<u>665</u>	<u>2182</u>	<u>707</u>	<u>2320</u>	<u>749</u>	<u>2457</u>	<u>791</u>	<u>2595</u>
<u>666</u>	<u>2185</u>	<u>708</u>	<u>2323</u>	<u>750</u>	<u>2461</u>	<u>792</u>	<u>2598</u>
<u>667</u>	<u>2188</u>	<u>709</u>	<u>2326</u>	<u>751</u>	<u>2464</u>	<u>793</u>	<u>2602</u>
<u>668</u>	<u>2192</u>	<u>710</u>	<u>2329</u>	<u>752</u>	<u>2467</u>	<u>794</u>	<u>2605</u>
<u>669</u>	<u>2195</u>	<u>711</u>	<u>2333</u>	<u>753</u>	<u>2470</u>	<u>795</u>	<u>2608</u>
<u>670</u>	<u>2198</u>	<u>712</u>	<u>2336</u>	<u>754</u>	<u>2474</u>	<u>796</u>	<u>2612</u>
<u>671</u>	<u>2201</u>	<u>713</u>	<u>2339</u>	<u>755</u>	<u>2477</u>	<u>797</u>	<u>2615</u>
<u>672</u>	<u>2205</u>	<u>714</u>	<u>2343</u>	<u>756</u>	<u>2480</u>	<u>798</u>	<u>2618</u>
<u>673</u>	<u>2208</u>	<u>715</u>	<u>2346</u>	<u>757</u>	<u>2484</u>	<u>799</u>	<u>2621</u>
<u>674</u>	<u>2211</u>	<u>716</u>	<u>2349</u>	<u>758</u>	<u>2487</u>	<u>800</u>	<u>2625</u>
<u>675</u>	<u>2215</u>	<u>717</u>	<u>2352</u>	<u>759</u>	<u>2490</u>	<u>801</u>	<u>2628</u>
<u>676</u>	<u>2218</u>	<u>718</u>	<u>2356</u>	<u>760</u>	<u>2493</u>	<u>802</u>	<u>2631</u>
<u>677</u>	<u>2221</u>	<u>719</u>	<u>2359</u>	<u>761</u>	<u>2497</u>	<u>803</u>	<u>2635</u>
<u>678</u>	<u>2224</u>	<u>720</u>	<u>2362</u>	<u>762</u>	<u>2500</u>	<u>804</u>	<u>2638</u>
<u>679</u>	<u>2228</u>	<u>721</u>	<u>2365</u>	<u>763</u>	<u>2503</u>	<u>805</u>	<u>2641</u>
<u>680</u>	<u>2231</u>	<u>722</u>	<u>2369</u>	<u>764</u>	<u>2507</u>	<u>806</u>	<u>2644</u>
<u>681</u>	<u>2234</u>	<u>723</u>	<u>2372</u>	<u>765</u>	<u>2510</u>	<u>807</u>	<u>2648</u>
<u>682</u>	<u>2238</u>	<u>724</u>	<u>2375</u>	<u>766</u>	<u>2513</u>	<u>808</u>	<u>2651</u>
<u>683</u>	<u>2241</u>	<u>725</u>	<u>2379</u>	<u>767</u>	<u>2516</u>	<u>809</u>	<u>2654</u>
<u>684</u>	<u>2244</u>	<u>726</u>	<u>2382</u>	<u>768</u>	<u>2520</u>	<u>810</u>	<u>2657</u>
<u>685</u>	<u>2247</u>	<u>727</u>	<u>2385</u>	<u>769</u>	<u>2523</u>	<u>811</u>	<u>2661</u>

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>812</u>	<u>2664</u>	<u>854</u>	<u>2802</u>	<u>896</u>	<u>2940</u>	<u>938</u>	<u>3077</u>
<u>813</u>	<u>2667</u>	<u>855</u>	<u>2805</u>	<u>897</u>	<u>2943</u>	<u>939</u>	<u>3081</u>
<u>814</u>	<u>2671</u>	<u>856</u>	<u>2808</u>	<u>898</u>	<u>2946</u>	<u>940</u>	<u>3084</u>
<u>815</u>	<u>2674</u>	<u>857</u>	<u>2812</u>	<u>899</u>	<u>2949</u>	<u>941</u>	<u>3087</u>
<u>816</u>	<u>2677</u>	<u>858</u>	<u>2815</u>	<u>900</u>	<u>2953</u>	<u>942</u>	<u>3091</u>
<u>817</u>	<u>2680</u>	<u>859</u>	<u>2818</u>	<u>901</u>	<u>2956</u>	<u>943</u>	<u>3094</u>
<u>818</u>	<u>2684</u>	<u>860</u>	<u>2822</u>	<u>902</u>	<u>2959</u>	<u>944</u>	<u>3097</u>
<u>819</u>	<u>2687</u>	<u>861</u>	<u>2825</u>	<u>903</u>	<u>2963</u>	<u>945</u>	<u>3100</u>
<u>820</u>	<u>2690</u>	<u>862</u>	<u>2828</u>	<u>904</u>	<u>2966</u>	<u>946</u>	<u>3104</u>
<u>821</u>	<u>2694</u>	<u>863</u>	<u>2831</u>	<u>905</u>	<u>2969</u>	<u>947</u>	<u>3107</u>
<u>822</u>	<u>2697</u>	<u>864</u>	<u>2835</u>	<u>906</u>	<u>2972</u>	<u>948</u>	<u>3110</u>
<u>823</u>	<u>2700</u>	<u>865</u>	<u>2838</u>	<u>907</u>	<u>2976</u>	<u>949</u>	<u>3114</u>
<u>824</u>	<u>2703</u>	<u>866</u>	<u>2841</u>	<u>908</u>	<u>2979</u>	<u>950</u>	<u>3117</u>
<u>825</u>	<u>2707</u>	<u>867</u>	<u>2844</u>	<u>909</u>	<u>2982</u>	<u>951</u>	<u>3120</u>
<u>826</u>	<u>2710</u>	<u>868</u>	<u>2848</u>	<u>910</u>	<u>2986</u>	<u>952</u>	<u>3123</u>
<u>827</u>	<u>2713</u>	<u>869</u>	<u>2851</u>	<u>911</u>	<u>2989</u>	<u>953</u>	<u>3127</u>
<u>828</u>	<u>2717</u>	<u>870</u>	<u>2854</u>	<u>912</u>	<u>2992</u>	<u>954</u>	<u>3130</u>
<u>829</u>	<u>2720</u>	<u>871</u>	<u>2858</u>	<u>913</u>	<u>2995</u>	<u>955</u>	<u>3133</u>
<u>830</u>	<u>2723</u>	<u>872</u>	<u>2861</u>	<u>914</u>	<u>2999</u>	<u>956</u>	<u>3136</u>
<u>831</u>	<u>2726</u>	<u>873</u>	<u>2864</u>	<u>915</u>	<u>3002</u>	<u>957</u>	<u>3140</u>
<u>832</u>	<u>2730</u>	<u>874</u>	<u>2867</u>	<u>916</u>	<u>3005</u>	<u>958</u>	<u>3143</u>
<u>833</u>	<u>2733</u>	<u>875</u>	<u>2871</u>	<u>917</u>	<u>3009</u>	<u>959</u>	<u>3146</u>
<u>834</u>	<u>2736</u>	<u>876</u>	<u>2874</u>	<u>918</u>	<u>3012</u>	<u>960</u>	<u>3150</u>
<u>835</u>	<u>2740</u>	<u>877</u>	<u>2877</u>	<u>919</u>	<u>3015</u>	<u>961</u>	<u>3153</u>
<u>836</u>	<u>2743</u>	<u>878</u>	<u>2881</u>	<u>920</u>	<u>3018</u>	<u>962</u>	<u>3156</u>
<u>837</u>	<u>2746</u>	<u>879</u>	<u>2884</u>	<u>921</u>	<u>3022</u>	<u>963</u>	<u>3159</u>
<u>838</u>	<u>2749</u>	<u>880</u>	<u>2887</u>	<u>922</u>	<u>3025</u>	<u>964</u>	<u>3163</u>
<u>839</u>	<u>2753</u>	<u>881</u>	<u>2890</u>	<u>923</u>	<u>3028</u>	<u>965</u>	<u>3166</u>
<u>840</u>	<u>2756</u>	<u>882</u>	<u>2894</u>	<u>924</u>	<u>3031</u>	<u>966</u>	<u>3169</u>
<u>841</u>	<u>2759</u>	<u>883</u>	<u>2897</u>	<u>925</u>	<u>3035</u>	<u>967</u>	<u>3173</u>
<u>842</u>	<u>2762</u>	<u>884</u>	<u>2900</u>	<u>926</u>	<u>3038</u>	<u>968</u>	<u>3176</u>
<u>843</u>	<u>2766</u>	<u>885</u>	<u>2904</u>	<u>927</u>	<u>3041</u>	<u>969</u>	<u>3179</u>
<u>844</u>	<u>2769</u>	<u>886</u>	<u>2907</u>	<u>928</u>	<u>3045</u>	<u>970</u>	<u>3182</u>
<u>845</u>	<u>2772</u>	<u>887</u>	<u>2910</u>	<u>929</u>	<u>3048</u>	<u>971</u>	<u>3186</u>
<u>846</u>	<u>2776</u>	<u>888</u>	<u>2913</u>	<u>930</u>	<u>3051</u>	<u>972</u>	<u>3189</u>
<u>847</u>	<u>2779</u>	<u>889</u>	<u>2917</u>	<u>931</u>	<u>3054</u>	<u>973</u>	<u>3192</u>
<u>848</u>	<u>2782</u>	<u>890</u>	<u>2920</u>	<u>932</u>	<u>3058</u>	<u>974</u>	<u>3196</u>
<u>849</u>	<u>2785</u>	<u>891</u>	<u>2923</u>	<u>933</u>	<u>3061</u>	<u>975</u>	<u>3199</u>
<u>850</u>	<u>2789</u>	<u>892</u>	<u>2927</u>	<u>934</u>	<u>3064</u>	<u>976</u>	<u>3202</u>
<u>851</u>	<u>2792</u>	<u>893</u>	<u>2930</u>	<u>935</u>	<u>3068</u>	<u>977</u>	<u>3205</u>
<u>852</u>	<u>2795</u>	<u>894</u>	<u>2933</u>	<u>936</u>	<u>3071</u>	<u>978</u>	<u>3209</u>
<u>853</u>	<u>2799</u>	<u>895</u>	<u>2936</u>	<u>937</u>	<u>3074</u>	<u>979</u>	<u>3212</u>

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>980</u>	<u>3215</u>	<u>1022</u>	<u>3353</u>	<u>1064</u>	<u>3491</u>	<u>1106</u>	<u>3629</u>
<u>981</u>	<u>3219</u>	<u>1023</u>	<u>3356</u>	<u>1065</u>	<u>3494</u>	<u>1107</u>	<u>3632</u>
<u>982</u>	<u>3222</u>	<u>1024</u>	<u>3360</u>	<u>1066</u>	<u>3497</u>	<u>1108</u>	<u>3635</u>
<u>983</u>	<u>3225</u>	<u>1025</u>	<u>3363</u>	<u>1067</u>	<u>3501</u>	<u>1109</u>	<u>3638</u>
<u>984</u>	<u>3228</u>	<u>1026</u>	<u>3366</u>	<u>1068</u>	<u>3504</u>	<u>1110</u>	<u>3642</u>
<u>985</u>	<u>3232</u>	<u>1027</u>	<u>3369</u>	<u>1069</u>	<u>3507</u>	<u>1111</u>	<u>3645</u>
<u>986</u>	<u>3235</u>	<u>1028</u>	<u>3373</u>	<u>1070</u>	<u>3510</u>	<u>1112</u>	<u>3648</u>
<u>987</u>	<u>3238</u>	<u>1029</u>	<u>3376</u>	<u>1071</u>	<u>3514</u>	<u>1113</u>	<u>3652</u>
<u>988</u>	<u>3241</u>	<u>1030</u>	<u>3379</u>	<u>1072</u>	<u>3517</u>	<u>1114</u>	<u>3655</u>
<u>989</u>	<u>3245</u>	<u>1031</u>	<u>3383</u>	<u>1073</u>	<u>3520</u>	<u>1115</u>	<u>3658</u>
<u>990</u>	<u>3248</u>	<u>1032</u>	<u>3386</u>	<u>1074</u>	<u>3524</u>	<u>1116</u>	<u>3661</u>
<u>991</u>	<u>3251</u>	<u>1033</u>	<u>3389</u>	<u>1075</u>	<u>3527</u>	<u>1117</u>	<u>3665</u>
<u>992</u>	<u>3255</u>	<u>1034</u>	<u>3392</u>	<u>1076</u>	<u>3530</u>	<u>1118</u>	<u>3668</u>
<u>993</u>	<u>3258</u>	<u>1035</u>	<u>3396</u>	<u>1077</u>	<u>3533</u>	<u>1119</u>	<u>3671</u>
<u>994</u>	<u>3261</u>	<u>1036</u>	<u>3399</u>	<u>1078</u>	<u>3537</u>	<u>1120</u>	<u>3675</u>
<u>995</u>	<u>3264</u>	<u>1037</u>	<u>3402</u>	<u>1079</u>	<u>3540</u>	<u>1121</u>	<u>3678</u>
<u>996</u>	<u>3268</u>	<u>1038</u>	<u>3406</u>	<u>1080</u>	<u>3543</u>	<u>1122</u>	<u>3681</u>
<u>997</u>	<u>3271</u>	<u>1039</u>	<u>3409</u>	<u>1081</u>	<u>3547</u>	<u>1123</u>	<u>3684</u>
<u>998</u>	<u>3274</u>	<u>1040</u>	<u>3412</u>	<u>1082</u>	<u>3550</u>	<u>1124</u>	<u>3688</u>
<u>999</u>	<u>3278</u>	<u>1041</u>	<u>3415</u>	<u>1083</u>	<u>3553</u>	<u>1125</u>	<u>3691</u>
<u>1000</u>	<u>3281</u>	<u>1042</u>	<u>3419</u>	<u>1084</u>	<u>3556</u>	<u>1126</u>	<u>3694</u>
<u>1001</u>	<u>3284</u>	<u>1043</u>	<u>3422</u>	<u>1085</u>	<u>3560</u>	<u>1127</u>	<u>3698</u>
<u>1002</u>	<u>3287</u>	<u>1044</u>	<u>3425</u>	<u>1086</u>	<u>3563</u>	<u>1128</u>	<u>3701</u>
<u>1003</u>	<u>3291</u>	<u>1045</u>	<u>3428</u>	<u>1087</u>	<u>3566</u>	<u>1129</u>	<u>3704</u>
<u>1004</u>	<u>3294</u>	<u>1046</u>	<u>3432</u>	<u>1088</u>	<u>3570</u>	<u>1130</u>	<u>3707</u>
<u>1005</u>	<u>3297</u>	<u>1047</u>	<u>3435</u>	<u>1089</u>	<u>3573</u>	<u>1131</u>	<u>3711</u>
<u>1006</u>	<u>3301</u>	<u>1048</u>	<u>3438</u>	<u>1090</u>	<u>3576</u>	<u>1132</u>	<u>3714</u>
<u>1007</u>	<u>3304</u>	<u>1049</u>	<u>3442</u>	<u>1091</u>	<u>3579</u>	<u>1133</u>	<u>3717</u>
<u>1008</u>	<u>3307</u>	<u>1050</u>	<u>3445</u>	<u>1092</u>	<u>3583</u>	<u>1134</u>	<u>3720</u>
<u>1009</u>	<u>3310</u>	<u>1051</u>	<u>3448</u>	<u>1093</u>	<u>3586</u>	<u>1135</u>	<u>3724</u>
<u>1010</u>	<u>3314</u>	<u>1052</u>	<u>3451</u>	<u>1094</u>	<u>3589</u>	<u>1136</u>	<u>3727</u>
<u>1011</u>	<u>3317</u>	<u>1053</u>	<u>3455</u>	<u>1095</u>	<u>3593</u>	<u>1137</u>	<u>3730</u>
<u>1012</u>	<u>3320</u>	<u>1054</u>	<u>3458</u>	<u>1096</u>	<u>3596</u>	<u>1138</u>	<u>3734</u>
<u>1013</u>	<u>3323</u>	<u>1055</u>	<u>3461</u>	<u>1097</u>	<u>3599</u>	<u>1139</u>	<u>3737</u>
<u>1014</u>	<u>3327</u>	<u>1056</u>	<u>3465</u>	<u>1098</u>	<u>3602</u>	<u>1140</u>	<u>3740</u>
<u>1015</u>	<u>3330</u>	<u>1057</u>	<u>3468</u>	<u>1099</u>	<u>3606</u>	<u>1141</u>	<u>3743</u>
<u>1016</u>	<u>3333</u>	<u>1058</u>	<u>3471</u>	<u>1100</u>	<u>3609</u>	<u>1142</u>	<u>3747</u>
<u>1017</u>	<u>3337</u>	<u>1059</u>	<u>3474</u>	<u>1101</u>	<u>3612</u>	<u>1143</u>	<u>3750</u>
<u>1018</u>	<u>3340</u>	<u>1060</u>	<u>3478</u>	<u>1102</u>	<u>3615</u>	<u>1144</u>	<u>3753</u>
<u>1019</u>	<u>3343</u>	<u>1061</u>	<u>3481</u>	<u>1103</u>	<u>3619</u>	<u>1145</u>	<u>3757</u>
<u>1020</u>	<u>3346</u>	<u>1062</u>	<u>3484</u>	<u>1104</u>	<u>3622</u>	<u>1146</u>	<u>3760</u>
<u>1021</u>	<u>3350</u>	<u>1063</u>	<u>3488</u>	<u>1105</u>	<u>3625</u>	<u>1147</u>	<u>3763</u>

<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>	<u>Meters</u>	<u>Feet</u>
<u>1148</u>	<u>3766</u>	<u>1167</u>	<u>3829</u>	<u>1186</u>	<u>3891</u>	<u>1205</u>	<u>3953</u>
<u>1149</u>	<u>3770</u>	<u>1168</u>	<u>3832</u>	<u>1187</u>	<u>3894</u>	<u>1206</u>	<u>3957</u>
<u>1150</u>	<u>3773</u>	<u>1169</u>	<u>3835</u>	<u>1188</u>	<u>3898</u>	<u>1207</u>	<u>3960</u>
<u>1151</u>	<u>3776</u>	<u>1170</u>	<u>3839</u>	<u>1189</u>	<u>3901</u>	<u>1208</u>	<u>3963</u>
<u>1152</u>	<u>3780</u>	<u>1171</u>	<u>3842</u>	<u>1190</u>	<u>3904</u>	<u>1209</u>	<u>3967</u>
<u>1153</u>	<u>3783</u>	<u>1172</u>	<u>3845</u>	<u>1191</u>	<u>3907</u>	<u>1210</u>	<u>3970</u>
<u>1154</u>	<u>3786</u>	<u>1173</u>	<u>3848</u>	<u>1192</u>	<u>3911</u>	<u>1211</u>	<u>3973</u>
<u>1155</u>	<u>3789</u>	<u>1174</u>	<u>3852</u>	<u>1193</u>	<u>3914</u>	<u>1212</u>	<u>3976</u>
<u>1156</u>	<u>3793</u>	<u>1175</u>	<u>3855</u>	<u>1194</u>	<u>3917</u>	<u>1213</u>	<u>3980</u>
<u>1157</u>	<u>3796</u>	<u>1176</u>	<u>3858</u>	<u>1195</u>	<u>3921</u>	<u>1214</u>	<u>3983</u>
<u>1158</u>	<u>3799</u>	<u>1177</u>	<u>3862</u>	<u>1196</u>	<u>3924</u>	<u>1215</u>	<u>3986</u>
<u>1159</u>	<u>3802</u>	<u>1178</u>	<u>3865</u>	<u>1197</u>	<u>3927</u>	<u>1216</u>	<u>3990</u>
<u>1160</u>	<u>3806</u>	<u>1179</u>	<u>3868</u>	<u>1198</u>	<u>3930</u>	<u>1217</u>	<u>3993</u>
<u>1161</u>	<u>3809</u>	<u>1180</u>	<u>3871</u>	<u>1199</u>	<u>3934</u>	<u>1218</u>	<u>3996</u>
<u>1162</u>	<u>3812</u>	<u>1181</u>	<u>3875</u>	<u>1200</u>	<u>3937</u>	<u>1219</u>	<u>3999</u>
<u>1163</u>	<u>3816</u>	<u>1182</u>	<u>3878</u>	<u>1201</u>	<u>3940</u>	<u>1220</u>	<u>4003</u>
<u>1164</u>	<u>3819</u>	<u>1183</u>	<u>3881</u>	<u>1202</u>	<u>3944</u>		
<u>1165</u>	<u>3822</u>	<u>1184</u>	<u>3885</u>	<u>1203</u>	<u>3947</u>		
<u>1166</u>	<u>3825</u>	<u>1185</u>	<u>3888</u>	<u>1204</u>	<u>3950</u>		

Appendix B: Oxygen Titration Protocol

69 This protocol³⁰ may be used in advance of the six-minute walk test to determine the amount of
 70 supplemental oxygen needed so that the candidate can complete the six-minute walk test without
 71 titrating up supplemental oxygen during the test. The oxygen titration test should be conducted on a flat
 72 standard 30-meter course with cones at each end and wall markings at 1-meter intervals as advised by
 73 the European Respiratory Society/American Thoracic Society for the six-minute walk test.³¹

- 74 1. Prior to the start of the test, record resting heart rate and room air SpO₂.
- 75 2. Supply continuous supplemental oxygen as needed to ensure a resting SpO₂ > 88%. If
 76 candidate's baseline SpO₂ is less than 88%, supply continuous supplemental oxygen as needed
 77 to ensure a resting SpO₂ equal to or greater than the candidate's baseline.
- 78 3. Stabilize the candidate on any supplemental oxygen for 5 minutes prior to the start of the test to
 79 establish resting supplemental oxygen demands. Enter this value on the Lung Candidate record
 80 in OPTN Waiting List as the amount of supplemental oxygen required at rest.
- 81 4. Instruct the candidate to walk at "a vigorous pace or one that they can maintain for at least 6
 82 minutes."
- 83 5. Station the respiratory technician performing the test near the halfway point on the course to
 84 continuously monitor the candidate without interfering with the walking pace. The technician
 85 walks directly with the candidate only if it is necessary as a safety precaution against falls.
- 86 6. Measure time via a stopwatch. The testing time starts when the candidate begins to walk.
- 87 7. Record heart rate, SpO₂, and any supplemental oxygen flow (L/min) every minute, or sooner
 88 with any significant clinical change.
- 89 8. The minimum duration of testing is 6 minutes.
 - 90 a. If no desaturation occurs (SpO₂ remains > 88%) for the duration of testing, the test
 91 concludes at 6 minutes.
 - 92 b. If desaturation occurs during testing (SpO₂ ≤ 88%), stop the candidate and timer and
 93 deliver supplemental oxygen through a nasal cannula at an increase of 2 L/min greater
 94 than the current oxygen amount until SpO₂ is ≥ 90%.
 - 95 i. Allow the candidate to stabilize at this level for 2 minutes.
 - 96 ii. Restart the timer and instruct the candidate to resume walking.
 - 97 iii. Repeat this process as necessary until at least 6 minutes of walking has occurred
 98 and the oxygen amount has remained unchanged for 3 minutes, at which point
 99 the test is terminated.
 - 100 iv. The test is also terminated if:
 - 101 1. The candidate is unable to maintain SpO₂ > 88% at 25 L/min for 3
 102 minutes.
 - 103 2. The candidate experiences chest pain or lightheadedness or requests to
 104 stop the test for any reason.
 - 105 9. The final amount of supplemental oxygen from the oxygen titration test must be documented in
 106 the candidate's medical record. Provide that amount of supplemental oxygen to the candidate
 107 when completing the six-minute walk test for lung allocation.

108 #

³⁰ Adopted with modifications from: Coral X. Giovacchini, Anne M. Mathews, Brian R. Lawlor, and Neil R. MacIntyre, "Titration Oxygen Requirements During Exercise: Evaluation of a Standardized Single Walk Test Protocol," *CHEST* 153 no. 4 (2018): 922-928, <https://doi.org/10.1016/j.chest.2017.11.009>.

³¹ 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.

Appendix C: Proposed Changes to Data Definitions

Proposed new language is underlined (example) and language that is proposed for removal is struck through (~~example~~).

Six-minute walk distance: Enter the total exertional distance on a flat surface the candidate is able to walk in six minutes in feet. Refer to *Guidance for Conducting the Six-Minute Walk Test for Lung Allocation* for additional information on conducting the test and converting walk distance from meters to feet. ~~The distance walked is a measure of functional status. The normal expected range of values is between 0 and 3000, although a value outside of greater than this range may be entered.~~ Enter the Test Date when this information was obtained. These fields must be updated every 6 months from the time the candidate was added to the waiting list. If they are incomplete or expired, the least beneficial value will be used to calculate the candidate's lung composite allocation score.