**OPTN Lung Transplantation Committee**
**Meeting Summary**
**October 8, 2020**
**Conference Call**

**Erika Lease, MD, Chair**
**Marie Budev, DO, Vice Chair**

## Introduction

The Lung Transplantation Committee met via Citrix GoTo teleconference on 10/08/2020 to discuss the following agenda items:

1. Update: *Incorporating COVID-19 Related Organ Failure in Candidate Listings*
2. Presentation: *A Revealed Preference Analysis to Develop a Composite Score that Approximates Lung Allocation Policy*

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

## 1. Update: *Incorporating COVID-19 Related Organ Failure in Candidate Listings*

The Chair notified the Committee that the OPTN Board unanimously approved the proposal *Incorporating COVID-19 Related Organ Failure in Candidate Listings* earlier in the day on 10/08/2020.

## 2. Presentation: *A Revealed Preference Analysis to Develop a Composite Score that Approximates Lung Allocation Policy*

Staff from RTI International presented their revealed preference analysis of lung allocation policy.

Summary of discussion:

### *Data and Methods*

In order to develop a composite score based on current lung policy, RTI estimated two statistical models called rank-ordered logit models to capture allocation policies for adult and pediatric lung donors. Both models assume that a candidate's rank in the match run is determined by four attributes: (1) medical priority, based on lung allocation score (LAS), (2) candidate age, (3) proximity to the donor hospital, and (4) blood type compatibility. To estimate these models, RTI used de-identified match run data from 2018. Using the models, RTI calculated composite allocation scores for each candidate to assess how well the models capture current policy. Additionally, RTI used the models to draw inferences about how candidate attributes influence lung allocation, including:

- Direction of influence of individual attributes on candidate's allocation priority
- Rank candidate attributes in terms of their relative importance in lung allocation
- Quantify the relative importance of candidate attributes via exchange rates

### *Results: Ranking Candidates Using Composite Scores*

RTI staff presented the coefficients for each attribute in the rank-ordered logit models, which provide an indication of the importance of each attribute in lung allocation:

| | | |
|---|---|---|
| | | |
| **Lung allocation score** | 0.040***<br>(<0.001) | 0.038***<br>(<0.001) |
| | | |
| **Less than 12 years old** | −1.601***<br>(0.026) | 1.946***<br>(0.056) |
| **Between 12 and 17 years old** | | 1.928***<br>(0.033) |
| | | |
| **Distance (nautical miles)** | -0.007***<br>(<0.001) | -0.007***<br>(<0.001) |
| | | |
| **Identical** | 1.008***<br>(<0.001) | 0.978***<br>(0.004) |
| **Compatible** | -1.008***<br>(<0.001) | -0.978***<br>(0.004) |

RTI staff presented examples showing how the composite scores derived from these models result in candidate rankings that match current policy. To validate the composite score, RTI calculated new rankings for each match run in the sample that ranked at least 10 candidates, and compared those ranks with the original match runs. RTI staff shared charts comparing the actual and predicted candidate match run rankings for adult and pediatric donors. There was high correlation between the actual and predicted rankings, so the composite score approximates current policy reasonably well.

An attendee asked why the pediatric donors and adult donors were modeled separately. RTI staff said that two different models were used because there are large differences between how pediatric donors and adult donors are handled by current policy. The attendee said that keeping adults and pediatrics separate may lead the analysis to miss some of the age-related determinations that current policies impose on the candidate rankings. The Chair said these models are not going to be perfect but the purpose is to give a sense of how current policy prioritizes the attributes.

A member asked what factors were used to determine the impact of distance on the composite score. RTI staff said no separate data were used. RTI used the match run data, including the distance between the donors and the candidates that received the donor lungs. RTI considered another approach to capture how distance under current policy has a tiered rather than continuous impact, which did improve the model fit in terms of prediction, but it led to worse results in terms of intuition and being able to draw inferences of how important each attribute is to lung allocation. RTI gave up some predictive power by using distance as a linear variable rather than a categorical variable, but it allowed RTI to draw more inferences from the models.

### *Results: Inferences About How Candidate Attributes Influence Lung Allocation*

The coefficients in the estimated composite allocation score indicate the direction of influence of each attribute on the candidate's allocation priority and can be used to rank candidate attributes in terms of their relative importance in lung allocation. In the adult donor model, medical priority/LAS made up 10% of the score; candidate age made up 4% of the score; proximity made up 81% of the score; and blood type made up 5% of the score.

UNOS staff explained that this analysis quantifies how the current lung allocation system works, which will be relevant when the Committee discusses the community analytical hierarchy process (AHP) exercise results and the relative importance of each attribute. This analysis provides a baseline to compare to how the attributes would be weighted based on the AHP results.

RTI quantified the relative importance of candidate attributes using exchange rates, which express how changes in one attribute are equivalent to changes in another attribute. For example, reducing a candidate's LAS by 25 points lowers their composite allocation score by one point (-1 = 0.040 * 25). This is equivalent to increasing the candidate's distance from the donor hospital by 142.857 nautical miles (nm), which also reduces their composite allocation score by one point (-1 = 0.007 * 142.857). Reducing the candidate age from at least 12 years old to below 12 years old lowers the composite score by 1.601 points, which is equivalent to increasing the distance from the donor hospital by 228.714 nm. Changing the candidate blood type from identical to donor to compatible with donor lowers the composite score by 2.016 points, which is equivalent to increasing the distance from the donor hospital by 288 nm.

An attendee asked why the pediatric model does not show much difference between the two age groups (under age 12 and ages 12-17), since current policy is designed to offer organs to children under age 12 out to 1,000 nm before offering organs to adolescents aged 12-17. RTI staff said there is a bit of a difference but it is small, likely because the pediatric candidates represent a relatively small number of patients in the overall data set. UNOS staff said the intent of the analysis was to get a rough approximation of current policy and affirmed that it is a small dataset, especially to find candidates in the same match run that fall into each classification. UNOS staff said RTI did several iterations with many different models to try to tease out that distinction between the population of candidates under age 12 and the population of candidates ages 12-17. The attendee asked if RTI could estimate a model with just pediatric candidates. UNOS staff said that would probably help reduce the dwarfing effect of the adult sample size drowning out distinctions among the pediatric candidates. UNOS staff said the estimated coefficients are reassuring because while there was the expected distinction between adults and pediatrics, the other coefficients were very similar, which makes sense because the pediatric and adult sequences are very similar except for the difference in priority for pediatric and adult candidates.

A member said there was a lot of concern in the transplant community when the continuous distribution concept was initially rolled out, and this presentation does an excellent job of clearly laying out the quantification of the current allocation system and comparing the different attributes.

UNOS staff pointed out that, based on the current system, LAS points are cheap whereas miles are very expensive, in that 25 LAS points equals about 143 nm. This exchange rate is likely very different from the results that would come out of an AHP-derived scoring system. UNOS staff will prepare a gap analysis between the revealed preferences analysis and the AHP results to share with the Committee.

An attendee asked whether the relative priority of LAS to distance remains stable at longer distances like 1,000 nm. RTI staff evaluated how the relative weights change as distance is restricted. If distance is restricted, then proximity plays less of a role than the other attributes. For example, if the maximum distance is narrowed to 500 nm, then proximity only makes up about 35% of the composite allocation score, as compared to 81% when there is no restriction on distance. The attendee suggested evaluating

the appropriate percentage of candidates and donors to use these models since there is a significant change once the distance is narrowed to the candidates most likely to receive the organ. UNOS staff said that for the purpose of comparing the revealed preference analysis with the AHP results, the 81% value for distance is the most appropriate value for comparison. However, in terms of an appropriate interpretation of current policy and how much distance plays a role relative to LAS, it may make sense to take a more nuanced look. However, across all the different ways of looking at this, distance was still the most important attribute. A member noted that even with distance constrained, proximity has much higher weight in this revealed preferences analysis than in any of the AHP exercises thus far, and the Committee will have to reconcile those differences.

Next steps:

The Committee will review and discuss the community AHP results during their upcoming calls.

**Upcoming Meetings**

- October 15, 2020 – Lung Committee
- October 21, 2020 – Lung Committee
- October 23, 2020 – Lung Committee

**Attendance**

- **Committee Members**
  - Erika Lease, Committee Chair
  - Marie Budev, Committee Vice Chair
  - Alan Betensley
  - Whitney Brown
  - Staci Carter
  - Ryan Davies
  - June Delisle
  - Cynthia Gries
  - Julia Klesney-Tait
  - Jasleen Kukreja
  - Dennis Lyu
  - Daniel McCarthy
  - Michael Mulligan
  - John Reynolds
  - Marc Schecter
  - Kelly Willenberg
- **HRSA Representatives**
  - Jim Bowman
  - Marilyn Levi
- **SRTR Staff**
  - Yoon Son Ahn
  - Ajay Israni
  - Melissa Skeans
  - Maryam Valapour
  - Andrew Wey
- **UNOS Staff**
  - James Alcorn
  - Julia Chipko
  - Craig Connors
  - Rebecca Goff
  - Elizabeth Miller
  - Janis Rosenberg
  - Darren Stewart
  - Kaitlin Swanner
  - Susan Tlusty
  - Sara Rose Wells
  - Karen Williams
- **Other Attendees**
  - Masina Scavuzzo
  - Jennifer Schiller
  - Stuart Sweet
  - Dallas Wood