OPTN Lung Transplantation Committee
Meeting Summary
November 19, 2020
Conference Call

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

Introduction

The Lung Transplantation Committee met via Citrix GoTo teleconference on 11/19/2020 to discuss the following agenda items:

1. Finalize Rating Scales
2. Relative Weights

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

1. Finalize Rating Scales

The Committee finalized rating scales for an initial modeling request on the continuous distribution of lungs allocation system. The Chair asked the Committee to focus on big changes rather than nuances at this stage, since the Committee will have the opportunity to refine and adjust the proposed system based on the results of the first round of modeling.

Summary of discussion:

Placement Efficiency

The Chair presented the placement efficiency rating scale that was developed based on the Committee's feedback on 11/12/2020.[1] This S-shaped rating scale would have no difference in priority (0%) for candidates located at the same hospital as the donor, relative to other candidates within driving distance; a 15% drop to represent the difference from driving to flying; and an infeasibility curve with a midpoint at 1,500 nautical miles (nm) and a steepness of 2.5. A member said that some transplant centers might push the infeasibility midpoint out to a farther distance, since there may not be much of a decrease in efficiency to go longer distances once the center has decided to fly for an organ if there are not concerns about ischemia time. The Chair said that some of the other efficiency concerns include time away from the hospital for a surgeon and the burden on organ procurement organizations to coordinate with a much larger number of transplant centers, and the 1,500 nm midpoint would help prevent sending organs across the country unnecessarily. The Committee agreed with this approach.

Medical Urgency

The Committee discussed whether the medical urgency rating scale, which is based on estimated days of waitlist survival, should be linear, shallow nonlinear, or steep nonlinear. UNOS staff explained that if the difference in expected survival days matters more when candidates have shorter expected survival, then the Committee should choose a nonlinear scale. If each day of survival matters the same amount, then

[1] OPTN Lung Transplantation Committee Meeting Summary, November 12, 2020. Accessed December 16, 2020: https://optn.transplant.hrsa.gov/media/4238/20201112_lung_meeting-summary.pdf

the Committee should use a linear scale. However, using a steeper nonlinear scale would result in fewer points for younger candidates assigned to pediatric priority 1 or 2, and there would be less of a difference in points between pediatric priority 1 and pediatric priority 2.

The Chair said that while it looks like pediatric candidates are at the end of the curve with a nonlinear rating scale, most adults are also distributed near the end of the curve between 325 and 365 days of expected survival. An attendee recommended superimposing the adult and pediatric distributions on the curve when presenting this rating scale to the community. A member asked for a rough approximation of where candidates fall on the waitlist survival curve based on lung allocation score (LAS). The Chair pointed out that LAS also includes post-transplant survival, whereas these data just indicate the waitlist survival component. SRTR staff showed charts on waitlist survival distribution by age group but did not have more data available on LAS. SRTR staff noted that there are very few patients with an estimated waitlist survival between 0 to 200 days, but those patients have an LAS in the 90s. An attendee asked if the post-transplant survival curves are even more skewed to the right (concentrated beyond 300 days of estimated survival). SRTR affirmed that is the case. An attendee observed that waitlist mortality is the primary driver of LAS overall.

UNOS staff showed examples of how the different shapes of the medical urgency curve would impact allocation, using comparisons between two candidates at different distances and different levels of medical urgency. The Committee took an informal poll: 0 members voted for a linear curve, 5 members voted for a shallow nonlinear curve, and 4 members voted for a steep nonlinear curve.

UNOS staff offered to work with SRTR to develop a function between a shallow and a steep nonlinear curve, since no members voted for a linear curve. A member said that the shape of the curve will not make that much difference to compare between candidates with 250 and 275 days of estimated waitlist survival, but the curve should be really steep between a candidate with 25 days of survival and a candidate with 50 days of survival. Historically, very sick patients, like those on extracorporeal membrane oxygenation (ECMO), have been assigned a high LAS, so it seems like unless the curve is steep, those candidates might be disadvantaged. UNOS staff affirmed that the intent of using a nonlinear rating scale would be to capture that phenomenon. The Committee supported this approach.

Candidate Biology

The Committee discussed whether a shallow or steep nonlinear curve should be used for the candidate biology rating scale, which encompasses the rating scales for blood type, height, and sensitization (measured in terms of Calculated Panel Reactive Antibodies, or CPRA). A steep curve would give more priority to candidates with a very high CPRA. However, since the three rating scales for CPRA, blood type, and height are aligned on a common scale, changing the shape of the curve for CPRA would also change the shape of the rating scales for blood type and height. Accordingly, a steep curve also decreases the boost based on blood type, since there is not an extreme value for blood type like there is for CPRA. While a member had suggested breaking out the three rating scales separately, UNOS staff recommended keeping equal weight on height, blood type, and CPRA, since they are all based on the number of likely donors available in the pool for that candidate.

A member asked if blood type could be kept on a linear scale while using nonlinear scales for CPRA and height, since the nonlinear curves might otherwise wipe out the priority for blood type. UNOS staff explained that blood type, CPRA, and height are essentially measuring the same thing in the context of allocation, which is access to donors. Since these three attributes all measure access to donors in terms of the percentage of donors who are likely to be compatible, they can be measured on the same scale, unless the Committee makes a value judgment that they care more about equity in one of these three attributes. If there is not a values-laden reason to prioritize blood type over CPRA and height, then the

data suggests that these three attributes should be aligned on the same scale. UNOS staff said that the weight placed on candidate biology in the analytical hierarchy process (AHP) results is smaller than the weight on blood type in the current lung allocation system. Accordingly, some members had concerns when reviewing the AHP results in the sensitivity tool about whether there is enough weight on blood type from an equity standpoint. This raises the question as to whether a system based on the AHP results will place enough weight on equity relative to medical urgency.

The Chair said that the problem is that the Committee is interested in giving priority to people at the extremes of CPRA and height, but there is no extreme value for blood type, which is why it is challenging to figure out the right approach. The Vice Chair was less concerned about the weight on blood type and more concerned about giving enough priority to candidates with very high CPRA. UNOS staff said the Committee could choose different shapes for each of the three candidate biology rating scales, though it would represent some analytical inconsistency since they measure the same thing. The Committee could also consider keeping the same shape for all three curves but placing more weight on blood type within the candidate biology rating scale, rather than providing one-third of the weight to each of the three scales. The justification for such an approach could be that blood type equity is such an important part of the current system, and it is more of a known quantity compared to CPRA or height disparities for lung candidates. For example, a blood type O candidate is incompatible with about 50% donors. A blood type A candidate is incompatible with about 14% of donors. The question for the Committee is whether the difference between that 50% and 14% of incompatibility based on blood type should be valued differently than the difference between 50% CPRA and 14% CPRA. If not, then it would make sense for all three of these curves to have the same shape and weight.

An attendee asked whether changing the shape of the curves or changing the weight on the overall candidate biology rating scale would have a bigger impact in terms of making sure these candidates have the appropriate priority in allocation. UNOS staff said that the modeling may help answer this question. The attendee suggested that the shape of the curve helps to distinguish between candidates based on one attribute, but the overall weight on candidate biology may be more important in terms of giving these candidates adequate priority overall. The Committee may need to use a nonlinear curve and increase the weight on the candidate biology to get the intended results for allocation. UNOS staff agreed that the weight may more important. The shape of the curve will not be as important if the overall weight on an attribute is only 10% or less.

A member said that if the curves are the same but more weight is placed on blood type, then blood type O candidates get more weight while maintaining the nonlinear curve. UNOS staff said that the sensitivity tool may be useful to help tease out some of these nuances. Furthermore, if the modeling results indicate that there is not enough weight on blood type, then the Committee can make adjustments.

HRSA staff noted that the data behind the three candidate biology rating scales makes all of them look different, since blood type is categorical; the height scale looks like an upside-down bell curve; and the CPRA scale looks like an exponential curve. HRSA staff said that this may raise questions with the transplant community, so the Committee should be prepared to explain the data behind these curves. UNOS staff agreed that these rating scales can be hard to visualize, and said that the important thing to remember is that blood type and height were essentially mapped to the same scale as CPRA in terms of percentage of compatible donors.

The Committee agreed to keep the three candidate biology attributes on the same rating scale for the initial modeling request to see how that approach impacts allocation. The Committee voted for a steep nonlinear curve for the overall candidate biology rating scale.

<u>Next steps:</u>

The following rating scales will be incorporated into the modeling request for SRTR:

- Medical urgency: nonlinear curve between steep and shallow
- Post-transplant survival: linear
- Candidate biology: steep nonlinear curve
- Pediatric age group: binary (yes/no)
- Prior living lung donor: binary (yes/no)
- Proximity efficiency: S-shaped curve
- Travel cost efficiency: multi-curve based on organ transportation cost data

2. Relative Weights

The Committee reviewed the proposed weights to include in the modeling request

Summary of discussion:

The modeling request would include four different options as outlined in **Table 1**, as well as the estimated weights in current policy as a baseline, for a total of five modeling runs.

Table 1. Proposed Attribute Weights for Modeling Request

	Final Committee AHP Results (Rounded)	Option 1: 2:1 LAS	Option 2: 1:1 LAS	Option 3: Higher Proximity	Option 4: Higher Candidate Biology
Medical Urgency	29.0%	**28.0%**	**21.0%**	14%	14%
Post-Transplant Survival	13.0%	**14.0%**	**21.0%**	14%	14%
Candidate Biology	17.0%	17.0%	17.0%	11%	**40%**
Pediatric	31.0%	31.0%	31.0%	20%	20%
Prior Living Donor	4.0%	4.0%	4.0%	1%	1%
Proximity Efficiency	6.0%	6.0%	6.0%	**40%**	11%

UNOS staff noted that the goal is to model more extreme options in this initial round to understand the impact on allocation. The Committee will have the opportunity to submit a second modeling request before finalizing the policy proposal.

SRTR staff shared the metrics and stratification variables that will be used in the initial modeling request.

Metrics:

- Waiting list death counts and waiting list mortality rate
- Transplant counts and transplant rates
- Post-transplant death counts and mortality rates
- Percent Likely Driving vs. Flying

Stratification Variables:

- Age (<12, 12-17, 18-34, 35-49, 50-64, 65+)
- Height (approximate quintiles)
- ABO blood type
- Distance (<50, 50-100, 100-250, 250-500, 500-1,000, 1,000+)
- LAS, waitlist mortality, post-transplant mortality
- Diagnosis group (A-D)
- Ethnicity/race
- Gender

SRTR staff noted that the "percent likely driving vs. flying" metric will be different from what SRTR has done in the past. SRTR previously set flying thresholds based on data on travel time but SRTR does not have these data for the updated cohort, so SRTR will set flying thresholds based on distance, since distance and travel time are highly correlated. The 50-100 nm distance category is generally where those transitions occur. The distance categories from 250-500 nm and beyond reflect current allocation policy. SRTR will distinguish between pediatric candidates under the age of 12 and adolescent candidates between the ages of 12-17 because the Committee previously expressed concerns about the under-12 population. SRTR generally does not evaluate modeling results based by waiting list mortality and post-transplant survival, but in this case, these variables will help distinguish whether changing the ratio of the components of LAS has an impact on allocation. Usually, SRTR would include more metrics and stratification variables, but the goal was to keep this request a bit simpler to provide a big picture overview of the modeling results before iterating on the final attribute weights.

A member asked if sensitization should be included as a stratification variable. SRTR staff said they do not have good data on sensitization so they cannot evaluate the modeling results for the impact on sensitized candidates. The attendee asked if there is another way that SRTR could estimate the impact on sensitized candidates. SRTR staff said it would be hard to do this because there are candidates that are inappropriately flagged as low-CPRA so that transplant centers can see all offers for those candidates. The OPTN does not require data submission on CPRA for lung candidates so many of those data are missing. The attendee suggested taking a subset of the data and assigning random CPRA to get a sense of how they are impacted by model. SRTR staff said that the simulated allocation models (SAMs) are modeled on past behavior of organ acceptance, so SRTR would have to know how the organ acceptance would be impacted by CPRA to generate valid predictions.

SRTR staff noted that rural vs. urban location was not included as a stratification variable. At a national level, SRTR generally has not observed differences between rural and urban centers, perhaps because if a candidate lives in a rural area, the candidate has to go to an urban area to get a transplant. There are no rural transplant centers – all are located in metropolitan areas – so this variable was not included on this primary list, but could be explored at the Committee's discretion.

HRSA staff noted that for changes in allocation policy for kidney and liver, there was some concern that pediatric candidates would be disadvantaged. HRSA staff asked if it would make sense to have an additional modeling run with more weight – perhaps 40% – on pediatric age group, since it might help reassure people that further increasing the weight on pediatric age group would not make a big difference on allocation. An attendee said that 31% seems like a significant benefit based on using the sensitivity tool, and the Committee will have an opportunity to change this in the second round of modeling if need be. A member agreed that with a weight of 31%, it looks like pediatric patients are always at the top of the match run. UNOS staff agreed that 31% is a huge boost for pediatrics. An adult at the same hospital as the donor would be ranked behind a pediatric candidate located 5,000 nm away.

<u>Next steps:</u>

The modeling request will be submitted to SRTR with the goal of presenting the initial results to the Committee in early spring of 2021. The Committee will work on other policy questions related to continuous distribution while SRTR completes the initial round of modeling.

Upcoming Meetings

- January 21, 2021
- February 18, 2021

Attendance

- **Committee Members**
  - Erika Lease, Committee Chair
  - Marie Budev, Committee Vice Chair
  - Whitney Broan
  - Ryan Davies
  - Dennis Lyu
  - Dan McCarthy
  - Kenneth McCurry
  - John Reynolds
  - Marc Schecter
  - Nirmal Sharma
  - Kelly Willenberg
- **HRSA Representatives**
  - Jim Bowman
  - Adriana Martinez
- **SRTR Staff**
  - Yoon Son Ahn
  - Katie Audette
  - Ajay Israni
  - Melissa Skeans
  - Maryam Valapour
  - Andrew Wey
- **UNOS Staff**
  - James Alcorn
  - Julia Chipko
  - Craig Connors
  - Rebecca Goff
  - Lindsay Larkin
  - Elizabeth Miller
  - Amanda Robinson
  - Janis Rosenberg
  - Leah Slife
  - Darren Stewart
  - Kaitlin Swanner
  - Susan Tlusty
  - Sara Rose Wells
  - Joann White
  - Karen Williams
- **Other Attendees**
  - Masina Scavuzzo
  - Jennifer Schiller
  - Stuart Sweet