MPSC: Enhance Transplant Program Performance Monitoring System

Proposed Metrics

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Chair, Membership and Professional Standards Committee (MPSC)

Jon Snyder  
Director, Scientific Registry of Transplant Recipients (SRTR)
What are the goals of the OPTN MPSC Performance Monitoring Enhancement project?

- To develop a holistic review of member performance throughout all phases of transplantation.
- To identify real-time patient safety issues.
- To provide support and collaboration to transplant programs for identified opportunities for improvement.
- To evaluate and modify any system of review to ensure maximum support for increasing the number transplants, promoting equitable access to transplantation and fostering innovation.
- To not let perfect be the enemy of progress, the process will be iterative.
These new metrics are for the MPSC to perform its oversight responsibility.

These new metrics are not intended for use by the public or payers to “rate” transplant programs.
What makes a good metric?

It should be:

1. Something that is important.
2. Something that is reliably measured.
3. Something for which there is reliable data.
4. Something that the monitored entity can impact.
5. Something that the monitored entity accepts as important.
Metrics Overview

Jon Snyder, PhD
Director, Scientific Registry of Transplant Recipients
Director, Transplant Epidemiology
Chronic Disease Research Group
Hennepin Healthcare Research Institute
### System Performance Metrics

- **Pre-Listing:**
  - Transplant Rate for Listed Patients
  - Transplant Rate for ESOF Patients
  - Time to Transplant
  - Deceased Donor Yield
  - Overall Survival From Listing

- **Waitlist:**
  - Listing Rate for Referred Patients
  - Waitlist Mortality Rate Ratio
  - Active vs. Inactive
  - Death to Donor Conversion

- **OPO:**
  - Offer Acceptance Rate Ratio
  - Offer Response Time

- **Early Post-transplant:**
  - Patient/Graft Survival Rate Ratios
  - LOS/Readmissions/Complications
  - Rejection

- **Later Post-transplant:**
  - Patient/Graft Survival Rate Ratios
  - Readmissions/Complications
  - Rejection

### Program/OPO Performance Metrics

- **Listing Rate for Referred Patients**
- **Waitlist Mortality Rate Ratio**
- **Active vs. Inactive**
- **Death to Donor Conversion**
- **Offer Acceptance Rate Ratio**
- **Offer Response Time**
- **Patient/Graft Survival Rate Ratios**
- **LOS/Readmissions/Complications**
- **Rejection**
- **Rejection**

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**SCIENTIFIC REGISTRY OF TRANSPLANT RECIPIENTS**
System Performance Metrics

Program/OPO Performance Metrics

Overall Survival From Listing

- Pre-Listing
- OPO
- Offer Acceptance
- Early Post-transplant
- Later Post-transplant

- Waitlist
- Death to Donor Conversion
- Offer Acceptance Rate Ratio
- Patient/Graft Survival Rate Ratios
- Rejection

- Active vs. Inactive
- Waitlist Mortality Rate Ratio
- Death to Donor Conversion
- Offer Acceptance Rate Ratio
- Patient/Graft Survival Rate Ratios
- Rejection

- LOS/Readmissions/Complications
- Rejection

Scientific Registry of Transplant Recipients
MPSC is focusing on performance metrics that are more directly under the control of the program/OPO rather than metrics that describe system performance.
MPSC has chosen these four as the proposed metrics to assess holistic transplant program performance. All are risk-adjusted “rate ratios”… that is, they compare observed to expected performance.

<table>
<thead>
<tr>
<th>Program/OPO Performance Metrics</th>
<th>Pre-Listing</th>
<th>Waitlist</th>
<th>OPO</th>
<th>Offer Acceptance</th>
<th>Early Post-transplant</th>
<th>Later Post-transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listing Rate for Referred Patients</td>
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<tr>
<td>Waitlist Mortality Rate Ratio</td>
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<tr>
<td>Stated vs. Actual Listing Behavior</td>
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<tr>
<td>Active vs. Inactive</td>
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<tr>
<td>Death to Donor Conversion</td>
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<tr>
<td>Offer Acceptance Rate Ratio</td>
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<tr>
<td>Offer Response Time</td>
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<tr>
<td>90 day Graft Survival Rate Ratios</td>
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<tr>
<td>LOS/Readmissions/Complications</td>
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<td>Rejection</td>
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<td>Day 90 365 Graft Survival Rate Ratios</td>
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<tr>
<td>Readmissions/Complications</td>
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<tr>
<td>Rejection</td>
<td></td>
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</tr>
</tbody>
</table>
Let’s Look at each metric...

Pretransplant Metrics

- Pre-transplant (waitlist) mortality rate ratio
- Offer acceptance rate ratio

Posttransplant Metrics

- 90-day graft failure rate ratio
- Conditional 1-year graft failure rate ratio
Pretransplant (waitlist) Mortality Rate Ratio
Pretransplant (Waitlist) Mortality

Question Being Addressed:
On days when a patient is not transplanted, are patients listed by this program more/less likely to die compared with similar patients nationally?
Pretransplant (Waitlist) Mortality Rate Ratio: Methodology

Compares Observed (O) deaths to expected (E) deaths from the time the patient is listed until they are transplanted.

O = Observed Deaths Between Listing and Transplant.
E = Expected Deaths Between Listing and Transplant.

Waitlist Mortality Rate Ratio = \( \frac{O+2}{E+2} \).
# Pretransplant (Waitlist) Mortality Rate Ratio: Methodology

<table>
<thead>
<tr>
<th>Evaluation Window</th>
<th>2-year evaluation window</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days evaluated</td>
<td>Any day within the window from waitlisting until transplant.</td>
</tr>
<tr>
<td>Post-removal deaths</td>
<td>Deaths are evaluated post-removal unless transferred to another program. If a person is removed for reason of recovery (transplant no longer needed), deaths are evaluated for a maximum of 60 additional days.</td>
</tr>
</tbody>
</table>
Pre-transplant mortality rates are reported with detail by adult and pediatric candidates (if applicable) and comparisons to outcomes within the donation service area (DSA), the OPTN region, and comparisons to all other programs.
Pretransplant Workbooks are Available to Perform Subgroup Analyses

Available on the SRTR Secure Site.

Programs can view evaluations within subgroups of choice. Example shown at right is by candidate age groups

<table>
<thead>
<tr>
<th>Overall Waitlist Mortality Rate</th>
<th>All candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Candidates</td>
<td>145</td>
</tr>
<tr>
<td>Observed Deaths (O)</td>
<td>9</td>
</tr>
<tr>
<td>Expected Deaths (E)</td>
<td>5.96</td>
</tr>
<tr>
<td>Overall Waitlist Mortality Rate Ratio</td>
<td>1.38</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Candidate age: &lt;40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Candidates</td>
</tr>
<tr>
<td>Observed Deaths (O)</td>
</tr>
<tr>
<td>Expected Deaths (E)</td>
</tr>
<tr>
<td>Overall Waitlist Mortality Rate Ratio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Candidate age: 40-&lt;60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Candidates</td>
</tr>
<tr>
<td>Observed Deaths (O)</td>
</tr>
<tr>
<td>Expected Deaths (E)</td>
</tr>
<tr>
<td>Overall Waitlist Mortality Rate Ratio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Candidate age: ≥60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Candidates</td>
</tr>
<tr>
<td>Observed Deaths (O)</td>
</tr>
<tr>
<td>Expected Deaths (E)</td>
</tr>
<tr>
<td>Overall Waitlist Mortality Rate Ratio</td>
</tr>
</tbody>
</table>
MPSC Screening Rule

A program will be reviewed for its waitlist mortality rate ratio if:

The probability is >50% that the program’s waitlist mortality rate ratio is >1.75.

In other words, there is more than 50% probability that the program’s mortality rate is at least 75% higher than expected.
MPSC’s Screening Rule Visualized
Q: Does monitoring waitlist mortality disincentive listing of “risky” patients?

Intuitively, avoiding higher risk listings will lower the waitlist mortality rate.

However, SRTR compares observed deaths to expected deaths after adjusting for various patient characteristics.

For example, kidney waitlist mortality is adjusted for candidate age, blood type, BMI, diabetes, education level, employment status, sex, height, weight, history of malignancy, PVD, insurance coverage, race, albumin, cPRA, primary diagnosis, years since ESRD certification, time on the waitlist, history of transplant, and multi-organ candidacy.
# SRTR Risk Adjustment Model Documentation: Waiting List Models

Choose a PSR Release Date:

- July 2021

<table>
<thead>
<tr>
<th>Organ</th>
<th>Outcome</th>
<th>Choose an age group:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney</td>
<td>Transplant Rate</td>
<td>Pediatric (&lt;18)</td>
</tr>
<tr>
<td>Liver</td>
<td>Deceased Donor Transplant Rate</td>
<td>Adult (18+)</td>
</tr>
<tr>
<td>Heart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intestine</td>
<td>Pre-transplant Mortality Rate*</td>
<td></td>
</tr>
<tr>
<td>Simultaneous Heart-Lung</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Model Elements Table

This table lists the elements included in the risk adjustment model and each element's data source. For additional information on the data sources, click the Additional Info tab.

<table>
<thead>
<tr>
<th>Element</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidate age at listing</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate blood type</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate BMI</td>
<td>Calculated</td>
</tr>
<tr>
<td>Candidate diabetes type</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate education</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate sex</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate height</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate previous malignancy</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate PVD</td>
<td>TCR</td>
</tr>
<tr>
<td>Candidate primary diagnosis</td>
<td>TCR</td>
</tr>
</tbody>
</table>
Adult (18+) Kidney Pre-transplant Mortality Rate*

July 2021 PSR Release

Hazard Ratio

Candidate age at listing

25 30 35 40 45 50 55 60 65 70 75

0.4 0.5 0.6 0.7 0.8 0.9 1.0

Hazard Ratio vs. Candidate age at listing graph.
Example: A 65-year-old candidate is expected to have a mortality rate 2.3-times higher than a 25-year-old candidate.
Q: Can I improve my waitlist mortality rate by transplanting patients faster?

Intuitively, programs with high transplant rates are more likely to transplant their candidates before they die on the waiting list.

Waitlist mortality rate measures the risk of dying on given day if the patient is not transplanted on that day.

There is no mathematical reason for a program with a high transplant rate to have a low waitlist mortality rate.

High transplant rates can result in lower numbers of total deaths before transplant, but this is not what the waitlist mortality rate is measuring.

Q: Can I improve my waitlist mortality rate by transplanting patients faster?
Q: Can I improve my waitlist mortality rate by transplanting patients faster?
Q: Can I improve my waitlist mortality rate by transplanting patients faster?

Conclusion:

Risk-adjusted transplant and waitlist mortality rate ratios are not mathematically associated with each other. Therefore, they measure different processes of care, and it is possible to have good outcomes for both.
Offer Acceptance Rate Ratio
Offer Acceptance Rate Ratio

Question Being Addressed:
Given the types of offers received to the specific candidates, does this program accept offers at a rate higher/lower than national experience for similar offers to similar candidates?
Offer Acceptance Rate Ratio: Methodology

Compares Observed (O) offer acceptances to expected (E) offer acceptances.

\[ O = \text{Observed Offer Acceptances} \]
\[ E = \text{Expected Offer Acceptances} \]

Offer Acceptance Rate Ratio = \( \frac{O+2}{E+2} \).
# Offer Acceptance Rate Ratio: Methodology

<table>
<thead>
<tr>
<th>Evaluation Window</th>
<th>1-year evaluation window</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Offers that are NOT evaluated</strong></td>
<td></td>
</tr>
<tr>
<td>1. Bypassed offers</td>
<td></td>
</tr>
<tr>
<td>2. Match run had no acceptances</td>
<td></td>
</tr>
<tr>
<td>3. Offer occurred after the organ was accepted*</td>
<td></td>
</tr>
<tr>
<td>4. Duplicate offers across multiple match runs**</td>
<td></td>
</tr>
<tr>
<td>5. Offers to multi-organ candidates***</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>*Kidney offers declined under the Kidney Accelerated Placement Program may be included after the last acceptance if normal allocation restarted.</td>
<td></td>
</tr>
<tr>
<td><strong>Kidney allocation may offer candidates dual kidneys after the single kidney. In this situation, the second offer to the candidates is kept in the cohort.</strong></td>
<td></td>
</tr>
<tr>
<td>***Kidney-alone offers are included for candidates if the program indicated the patient will entertain kidney-alone offers.</td>
<td></td>
</tr>
</tbody>
</table>
MPSC Screening Rule

A program will be reviewed for its offer acceptance rate ratio if:

The probability is >50% that the program’s offer acceptance rate ratio is <0.30.

In other words, there is more than 50% probability that the program’s offer acceptance rate is at least 70% lower than expected.
MPSC’s Screening Rule Visualized

Adult Offer Acceptance
OAR Criterion: 50% Prob. OAR < 0.3
## SRTR Risk Adjustment Model Documentation: Offer Acceptance Models

### Choose an organ of interest:
- Kidney
- Liver
- Heart
- Lung
- Pancreas

### Kidney Model Strata
- Pediatric
- Adult: KDRI < 1.05
- Adult: 1.05 < KDRI < 1.75
- Adult: KDRI > 1.75

<table>
<thead>
<tr>
<th>Model Elements</th>
<th>Model Element Plots</th>
<th>Model Fitting Process</th>
<th>Additional Info</th>
</tr>
</thead>
</table>

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Q: Can I Improve my Offer Acceptance Ratio by Filtering Offers, but ultimately harming my candidates?

There is a perception that limiting offers to those a program will accept may improve the offer acceptance ratio while ultimately harming the patient by limiting their access to transplant.
Q: Can I Improve my Offer Acceptance Ratio by Filtering Offers?

• Offer acceptance rate ratios are adjusted for many donor and candidate factors.
  • Adjustment is also made for logistical issues like offer number and distance from the recipient.

• Offers you are very likely to accept are offers all programs are very likely to accept. Filtering offers can potentially raise a poor offer acceptance evaluation to average, but not necessarily better than average.

• In addition, filtering offers the program is very unlikely to accept has the potential to speed up the allocation process, thereby benefiting all patients.
Q: Do larger programs have an advantage for the offer acceptance evaluations?

There is a perception that larger programs will have better offer acceptance evaluations because they have more chances to accept the organ for someone on their list.
Q: Do larger programs have an advantage for the offer acceptance evaluations?
Q: Do larger programs have an advantage for the offer acceptance evaluations?
Q: Do larger programs have an advantage for the offer acceptance evaluations?

Programs with larger lists do not have systematically better offer acceptance evaluations.

SRTR recommends “offer” acceptance ratios over “organ” acceptance ratios, which are biased in favor of larger programs.
90-day and Conditional 1-Year Graft Survival
90-Day and Conditional 1-Year Graft Survival

Conditional 1-year: Conditional on graft survival to day 90, evaluates graft survival from day 90 to 1-year.
Graft Failure Rate Ratio

Question Being Addressed:
Given the types of recipients and the types of donors transplanted, is the failure rate at this program higher/lower than expected based similar transplants nationally?
Graft Failure Rate Ratio: Methodology

Compares Observed (O) graft failures to expected (E) graft failures. Graft failure is defined as the earlier of graft loss or death.

\[ \text{O} = \text{Observed Graft Failures} \]
\[ \text{E} = \text{Expected Graft Failures} \]

Graft Failure Rate Ratio = \( \frac{(O+2)}{(E+2)} \).
# Graft Failure Rate Ratio: Methodology

<table>
<thead>
<tr>
<th>Evaluation Window</th>
<th>2.5-year (30 month) inclusion cohort (transplants occurring within the 30-month period).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transplants NOT evaluated</td>
<td>1. Multi-organ recipients (KP and HL evaluated separately)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Pancreas Patient Survival will be evaluated until SRTR has enough data following the implementation of the new pancreas graft failure definition.</td>
</tr>
</tbody>
</table>
MPSC Screening Rule

A program will be reviewed for its graft failure rate ratio if:

The probability is >50% that the program’s graft failure rate ratio is >1.75.

In other words, there is more than 50% probability that the program’s graft failure rate is at least 75% higher than expected.
MPSC’s Screening Rule Visualized: 90-day
MPSC’s Screening Rule Visualized: Conditional 1 Year
MPSC’s Screening Rule Visualized: Conditional 1 Year with Current MPSC Criteria
SRTR Risk Adjustment Model Documentation: Posttransplant Outcomes

Choose a PSR Release Date:

July 2021

Heart, Intestine, Kidney, Liver, and Lung  Kidney-Pancreas and Pancreas

Heart, Intestine, Kidney, Liver, and Lung

Choose a transplant type:
- Heart
- Intestine
- Kidney
- Liver
- Lung

Choose an outcome:
- Graft Survival
- Patient Survival

Choose an age group:
- Adult (18+)
- Pediatric (<18)

Choose a donor type:
- Deceased Donor

Choose a time frame:
- First-Year Outcomes
- Three-Year Outcomes
Q: How well do the models account for measured risk?

Q: Are a certain percentage of programs flagged for each metric?

<table>
<thead>
<tr>
<th>Metric</th>
<th>Heart</th>
<th>Kidney</th>
<th>Liver</th>
<th>Lung</th>
<th>Pancreas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretransplant Mortality Rate Ratio</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Offer Acceptance Rate Ratio</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>90-Day Graft Failure Rate Ratio</td>
<td>3</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Conditional 1-Year Graft Failure Rate Ratio</td>
<td>3</td>
<td>9</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

**Answer: No.** The boundaries were chosen by MPSC to review programs with meaningful deviations from expectation based on national experience. It is not required that a metric will flag any programs, e.g., zero kidney or pancreas programs were flagged for pretransplant mortality rates in the Spring 2020 cycle.
Webinars Available

May 6, 2020
SRTR Tools 101: Helpful Tools for Transplant Programs
Jon Snyder, PhD, MSc
SRTR Director
Andrew Wey, PhD
SRTR Principal Biostatistician
Allyson Hart, MD, MS
SRTR Senior Staff, Kidney/Transplantation

August 12, 2020
SRTR Risk Adjustment Models: Definition and Use

Thanks to SRTR colleagues supporting MPSC:

Andrew Wey, PhD
Nicholas Salkowski, PhD
Ryutaro Hirose, MD
Bryn Thompson, MPH

Best mode of contact: SRTR@SRTR.org

@SRTRNews

Scientific Registry of Transplant Recipients

SRTR
Provide Feedback

Submit public comments on OPTN website

- August, 3 – September 30, 2021
Regional Meeting Information

- Regional Meetings for the summer 2021 cycle will be a hybrid of in-person and virtual.
- We hope the convenience guarantees your participation!
- [https://optn.transplant.hrsa.gov/members/regions/](https://optn.transplant.hrsa.gov/members/regions/)
Thank You For Listening!