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A Dynamic Calculator of Waitlist Outcomes for Adult Heart Transplant Candidates

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SRTR decision aids

Kidney Transplant Decision Aid

Liver Waiting List Outcomes Calculator

What were the outcomes on the liver transplant waiting list? This tool shows actual patient experiences over the past two years. See more about these data here.

Select Result Options to Display

How Many Days of Follow-Up Are You Interested in?

Patient Outcomes at 90 Days

Center: Mayo Clinic Hospital, Minnesota; MELD score range: 15-29; Blood type: O; Age range: 18-54; Exception status: All patients within this MELD range.
Competing risks on heart waiting list

Cumulative incidence

Years after listing

- death or removal due to too sick
- transplant at listing center

Scientific Registry of Transplant Recipients
Aim

Develop a patient-friendly calculator to predict personalized outcomes on the heart transplant waiting list that can be updated as patient status evolves.

1. Patient-friendly
2. For transplant candidates
   • Personalized waiting time estimates
   • Time scale in months not years
Cohorts for modeling

Inclusion criteria:
- Age 18+ at listing
- Listed from 10/18/2018 – 5/31/2022
- Active within a month of listing
- No prior solid organ transplants
- No prior listings for kidney, liver, lung
- Earliest listing per person

Probabilities estimated by random forest

Three landmark cohorts:

1. Listing model: All candidates at first active status ($N=14,054$)
2. 6-month model: All candidates still waiting at 6 months ($N=3,947$)
3. 1-year model: All candidates still waiting at 1 year ($N=2,322$)
Patient-friendly predictors of waitlist outcome

Measured at listing:
- Age
- Gender
- Blood type
- Race/ethnicity
- Primary diagnosis
- Height, weight, cPRA
- ECMO, IABP, inotropes, ventilator
- On VAD
- Diabetes, dialysis, cerebrovascular disease
- History of cancer
- Transplant center

Measured at first active status:
- Medical urgency status
- Qualifying criteria for status

Updated at 6 months and 1 year:
- Medical urgency status
- Qualifying criteria for status
- cPRA
- On dialysis
- On ventilator
Discrimination: 1 month after first active
Calibration: 1 month after first active

Transplant

Death or removal due to too sick
Calibration: 6 months after first active

- **Transplant**
  - Observed vs. Expected plot showing a close alignment with the expected line.

- **Death or removal due to too sick**
  - Observed vs. Expected plot showing a close alignment with the expected line.
Calibration: 1 year after first active

Transplant

Death or removal due to too sick
Heart calculator prototype

Next steps:
Patient input
SRTR website

Figure 1: Predicted outcomes after 6 months on waiting list, averaged across transplant centers, for a 50-year-old man of average height and weight, blood type O, with cardiomyopathy, initially listed at status 4 with a VAD.
Transplantation

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Scientific Registry of Transplant Recipients

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Landmark random forest for competing risks

Random forest for competing risks (Ishwaran et al. 2014)

• Machine learning method that pools estimates across forest of decision trees to reduce variance of a single decision tree; flexibly identifies interactions from data

• Sun et al. (2020) advocate for random forest instead of Cox in landmark analyses

• Generalizability and model performance can be evaluated in “out-of-bag” estimates, without reducing sample size for modeling