

Impact of Institutional Variables on Center-Level Performance in Long-Term Survival in Heart Transplantation

Weston McDonald, BS, Khaled Shorbaji, MD, Maxwell F. Kilcoyne, DO, William Few, BS, Brett Welch, MBA, Arman Kilic, MD
MUSC Department of Cardiothoracic Surgery

BACKGROUND

- Orthotopic heart transplant (OHT) center performance is a publicly available metric that plays a significant role in a center's continued certification, reimbursement, and patient perception of a potential transplant center
- Currently, 1-year survival plays a large role in how center performance is calculated.
- Growing evidence has accumulated demonstrating this may lead to inaccurate estimates of center performance
- The aim of this study is to determine the predictive value of 5-year mortality and identify inter-center variability patterns in 5-year survival

METHOD

- Patients who underwent OHT between 2010 and 2021 were identified using the United Network of Organ Sharing (UNOS) data registry.
- The primary outcome was 5-year survival conditional on 1-year survival following OHT.
- Multivariable Cox proportional hazard models were used for assessing the risk-adjusted impact of center-level 1-year survival rates on 5-year survival rates conditional on 1-year survival.
- Correlation of 1- and 5-year survival was analyzed using Pearson's correlation coefficient
- Mixed-effect models were also used to evaluate between center variability in outcomes including a risk-adjusted analysis

RESULTS

- A total of 12,608 patients underwent OHT at 59 centers
- A total of 11,249 [89.2%] patients survived the first year and were included in the analysis
- The 5-year survival rate conditional on 1-year survival was [low volume: 86.5%, intermediate volume: 87.5%, high: volume 86.7%, log-rank p = 0.052].

Table 1: Multivariable Model for Risk-adjusted 5-year Mortality

| | Hazard Ratio (95% CI, p-value) |
|--------------------------------------|-------------------------------------|
| Center 1-year mortality | 0.99 (0.97-1.01, p=0.198) |
| Center Volume | |
| Low | Reference |
| Intermediate | 0.90 (0.71-1.16, p=0.422) |
| High | 1.10 (0.86-1.39, p=0.455) |
| Age, Years | 0.99 (0.99-1.00, p=0.083) |
| Recipient Race | |
| White | Reference |
| Black | 1.60 (1.27-2.02, p<0.001) |
| Hispanic | 1.04 (0.71-1.53, p=0.828) |
| Other | 1.10 (0.68-1.76, p=0.700) |
| BMI (kg/m²) | 1.00 (0.98-1.02, p=0.993) |
| Creatinine (mg/dL) | 1.30 (1.09-1.54, p=0.003) |
| Dialysis prior to OHT | 1.00 (0.52-1.95, p=0.989) |
| Diabetes | 1.32 (1.07-1.63, p=0.009) |
| ICU at time of transplant | 1.04 (0.84-1.29, p=0.718) |
| Panel reactive antibodies (%) | 1.00 (1.00-1.01, p=0.064) |
| Heart ischemic time, | 1.05 (0.96-1.16, p=0.291) |
| Donor Age, years | 1.02 (1.01-1.03, p<0.001) |
| Donor Race | |
| White | Reference |
| Black | 1.22 (0.95-1.57, p=0.116) |
| Hispanic | 1.13 (0.85-1.50, p=0.407) |
| Other | 0.97 (0.56-1.69, p=0.918) |
| Donor BMI, Mean (SD) | 1.01 (0.99-1.02, p=0.475) |
| Sex-matched | 1.03 (0.82-1.30, p=0.804) |
| Race-matched | 1.05 (0.83-1.31, p=0.692) |
| HLA-matched | 0.98 (0.74-1.30, p=0.898) |

Figure 1: Correlation between 1-year and Conditional 5-year survival

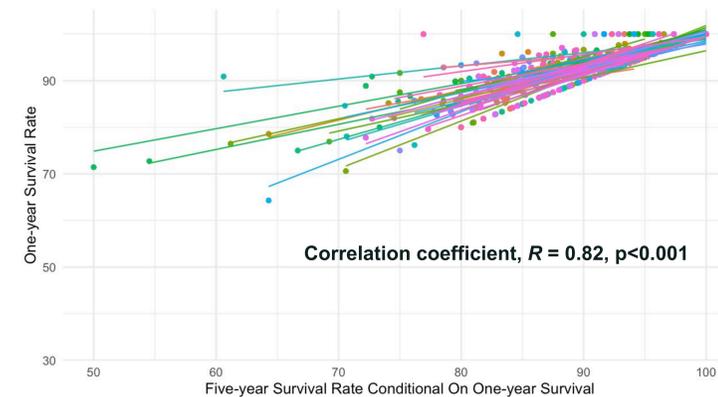
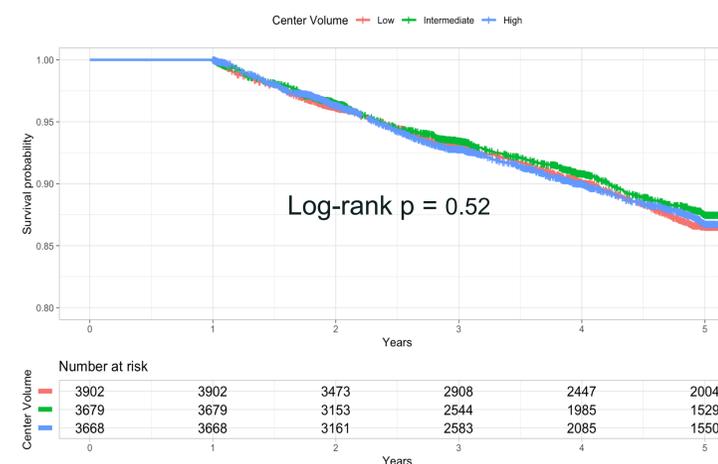


Figure 3: Conditional 5-year Survival Following Orthotopic Heart Transplant Based on Center Volume



Mixed-effect modeling

- **Substantial** variability between centers in 5-year mortality rates conditional on 1-year survival
- After risk adjustment for recipient and donor factors as well as institutional OHT volume, this variability remained significant (p<0.001).
- Measured variables only accounted for 21.4% of the variability in 5-year mortality conditional on 1-year survival between transplant centers.

CONCLUSIONS

- Although 1-year and conditional 5-year survival correlate, center-level 1-year mortality is not a predictor of a centers risk-adjusted 5-year mortality
- Patient variables that appear to be risk factors for 5-year mortality include increased age, diabetes, poor renal function, and black race
- Center volume did not appear to greatly impact conditional 5-year survival in this analysis.
- Recipient and donor variables and institutional OHT volume only account for ~20% of the variability in outcomes in the 1-to-5-year period.

FUTURE GOALS

- Integrate long-term center outcomes into center performance metrics
- Investigate the mechanism of racial disparities seen in this study
- Identify the unaccounted for variables that are responsible for a large portion of inter-center variable in outcomes

REFERENCES

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