

## Systematic donor selection review process improves cardiac transplant volumes and outcomes

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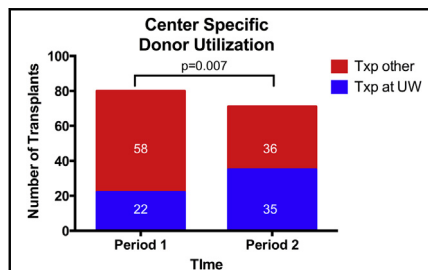
### ABSTRACT

**Background:** Heart transplant remains the definitive therapy for advanced heart failure patients but is limited by organ availability. We identified a large number of donor hearts from our organ procurement organization (OPO) being exported to other regions.

**Methods:** We engaged a multidisciplinary team including transplant surgeons, cardiologists, and our OPO colleagues to identify opportunities to improve our center-specific organ utilization rate. We performed a retrospective analysis of donor offers before and after institution of a novel review process.

**Results:** Each donor offer made to our program was reviewed on a monthly basis from July 2013 to June 2014 and compared with the previous year. This review process resulted in a transplant utilization rate of 28% for period 1 versus 49% for period 2 ( $P = .007$ ). Limiting the analysis to offers from our local OPO changed our utilization rate from 46% to 75% ( $P = .02$ ). Transplant volume increased from 22 to 35 between the 2 study periods. Thirty-day and 1-year mortality were unchanged over the 2 periods. A total of 58 hearts were refused by our center and transplanted at other centers. During period 1, the 30-day and 1-year survival rates for recipients of those organs were 98% and 90%, respectively, comparable with our historical survival data.

**Conclusions:** The simple process of systematically reviewing donor turn-down events as a group tended to reduce variability, increase confidence in expanded criteria for donors, and resulted in improved donor organ utilization and transplant volumes. (*J Thorac Cardiovasc Surg* 2016;151:238-43)



Graph showing an increase in heart utilization at our center despite a decrease in overall donors.

### Central Message

Improving quality in donor selection can markedly increase transplant volume without compromising safety and quality.

### Perspective

Heart transplant remains the gold standard treatment for end-stage heart failure, but is limited by donor availability, which has remained unchanged for 3 decades. We engaged in a donor selection review process to better understand our organ utilization and found that improving the consistency of donor selection improved our volumes and maintained outcomes, improving stewardship of a precious resource.

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It is estimated that more than 6 million people in the United States suffer from heart failure, with 10 new diagnoses each year for every 1000 persons.<sup>1</sup> Orthotopic heart transplantation (OHT) remains the gold standard for end-stage heart failure in eligible patients.<sup>2,3</sup> Transplant volumes in the US have remained static over the last 15 years at

approximately 2000 per year,<sup>4</sup> largely due to decreasing rates of violent death, stricter seat belt and helmet legislation, improved airbag technology, and overall improvement in the trauma infrastructure.<sup>5,6</sup> Owing to excellent long-term outcomes with OHT, many centers have proposed expanding the donor pool by considering organs from donors of older age, with increased infectious disease risk, with coronary artery disease, with left ventricular hypertrophy, with decreased ejection fraction, and others.<sup>7-10</sup> Interestingly, however, despite this success, donor utilization rates have decreased nationwide.<sup>11,12</sup> This decrease may be related to the increased use of left ventricular assist devices as a bridge to transplant, with these patients more stable than their inotrope-dependent counterparts.<sup>13</sup> In addition, because of stable volumes, along with increased public scrutiny of outcomes, many centers may have evolved a risk-averse donor utilization scheme.

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### Abbreviations and Acronyms

CDC	= Center for Disease Control
CDC-HR	= Centers for Disease Control and Prevention high-risk
OHT	= Orthotopic heart transplant(ion)
OPO	= Organ procurement organization
UNOS	= United Network for Organ Sharing

A review of the donor heart export rate in our organ procurement organization (OPO) found it higher than expected. In an effort to better understand organ utilization by our OPO and our center, we initiated a quality improvement initiative to examine this in detail. This study examines the donor utilization process at a single, moderate-volume center.

## METHODS

The Institutional Review Board at the University of Washington granted approval for this study. A multidisciplinary group of transplant surgeons and cardiologists was assembled in collaboration with our local OPO. Retrospectively, all donor offers from July 2012 to June 2013 (period 1) were systematically reviewed. Along with demographic data, clinical parameters were captured from DonorNet, and refusal codes were collated. All organs refused by our center and subsequently transplanted elsewhere were analyzed to determine the presence of a potential candidate at our institution who was within a reasonable size range ( $\pm 30\%$ ), devoid of unacceptable antigens, and in a position on the match run list to accept the organ.

From July 2013 through June 2014 (period 2), the multidisciplinary group implemented our quality improvement analysis of donor utilization. Using similar methodology, demographic data, clinical parameters, and refusal codes were analyzed. In addition, real-time rationales were captured at the time of organ refusal. The multidisciplinary group reviewed all organ refusals on a quarterly basis in a nonconfrontational setting. All of the refused organs that were ultimately transplanted and met the foregoing criteria were brought to a full quorum for open discussion. The review process was then continued as a regular element in our transplant program quality assessment program. The review process was facilitated to provide a constructive environment to encourage the development of best practices and consistency. Specific attention was given to pertinent literature to support decision making, and short-term outcomes on declined organs were obtained from the United Network for Organ Sharing report on organs offered to our center but transplanted elsewhere.

### Statistical Analysis

All data were analyzed using the Prism 6 statistical software package (GraphPad Software, La Jolla, Calif). Continuous variables were recorded as means and compared using an unpaired Student *t* test. categorical variables were compared using Fisher's exact test, owing to the small sample sizes. A *P* value  $\leq .05$  was used to determine the level of statistical significance. All reported *P* values are 2-sided.

## RESULTS

### Donor Characteristics

Over the period of review, 6 cardiac surgeons and 8 transplant cardiologists actively participated in donor selection. During period 1, there were 293 total heart offers, and 132

hearts were transplanted at any center. During period 2, there were 279 total heart offers, and 129 were transplanted at any center. Donor demographics and clinical parameters are presented in Table 1. Donor characteristics were similar in hearts transplanted at our institution and those transplanted at other institutions after our refusal across both time periods. Only 2 donor characteristics were statistically significantly different between the 2 groups: donor height was greater in our group (174-177 cm vs 169-170 cm; *P* = .04 for period 1, and *P* = .003 for period 2), and there was a higher incidence of gunshot wounds as an etiology of donor death in organs accepted at our institution versus those accepted elsewhere during period 1 (*P* = .03).

### Donor Utilization

During period 1, of the 132 transplanted hearts, 80 were available to recipients at our institution with no provisional acceptance, with an appropriate size match, and without unacceptable antigens. Twenty-two transplants were performed by our center, yielding a center specific donor utilization rate of 28%. In period 2, 71 of the 129 transplanted hearts were available to recipients at our institution with similar characteristics. Thirty-five transplants were performed, yielding a significantly higher donor utilization rate of 49% (*P* = .007) (Figure 1). This increase in volume was sustained over the next year, July 2014 to June 2015, with volumes increasing again to 43 transplants. Survival data are not yet available for this time period. Over this same later period, the total number of offers declined again, to 222. Of those hearts, 132 were ultimately transplanted at some institution, and of those 71 were available to our institution based on the foregoing criteria. This yielded a center utilization rate of 61%. The vast majority of hearts transplanted at our institution originated within our OPO.

There was a statistically significant decrease in the rate of organ export over the 2 time periods. A total of 21 exports and 18 hearts were accepted and transplanted at our institution during period 1, compared with 9 and 27, respectively, during period 2. This represents an improvement in center-specific, OPO-limited utilization rate from 46% in period 1 to 75% in period 2 (*P* = .02) (Figure 2).

From the OPO perspective, in period 1 there were 77 heart offers and 45 were accepted for transplant, for an OPO utilization rate of 58.4%. During period 2, there were 61 heart offers and 40 acceptances, for an OPO utilization rate of 65.6% (*P* = .40).

### Refusal Codes

We attempted to assess the variation in utilization of refusal codes. Although there was no statistical difference between the 2 periods in the use of refusal codes, there was a trend toward decreased use of codes for donor age/quality, from 39% to 32% (*P* = .15) and donor social history, from 8% to 5%. From period 1 to period 2, there was a

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