A Retrospective Evaluation of Organ Donation in the United States: Trends in Donors and Organ Utilization Over 15 Years

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Background

- Three prevalent chronic comorbid conditions is increasing amongst the general population in the United States:
  - Obesity (body mass index >30 kg/m²) affects ~40% of the population
  - Hypertension is present in up to 45% of the population
  - Diabetes affects 10-12% of the population (data from www.cdc.gov)
- Chronic medical conditions are associated with end-organ damage which may affect quality of organs prior to donation.

Aims of the present study:

1. To determine if changes in donor population were reflective of changes in health of the general population.
2. To evaluate the effects of changing donor health on donor and organ utilization.

Methods

Study Population:
- UNOS/GAP Standard Transplant Analysis and Research (STAR) file
- 132,783 potential organ donors identified between 2005-2019
- Included all ages and donation types (DBD vs DCD)
- Evaluated demographics, comorbidities, medical and social history, and terminal laboratory values.

Donor Utilization - determined by transplantation of at least one organ from a single donor.

Data Analysis:
- Donor characteristics compared using F tests, ANOVA, and Wilcoxon Rank-sum tests as appropriate.
- Multi-Variable Modeling - Logistic Regression for Donor Utilization
  - Donors categorized by donor type (DBD vs DCD)
  - Created individual models for each era
  - Created a composite model to evaluate across eras

Figure 1. Number of Organ Donors in the United States, 2005-2019.

Figure 2. Annual Organ Utilization, 2005-2019

A) Number of donors utilized for transplant for all organs - heart, lung, liver, kidney, pancreas, and intestine.
B) Annual donor utilization rate by organ type. DBD donors only.

Figure 3. Donor Utilization by Era.

100% of Utilized Donors

Figure 4. Likelihood of Donor Utilization Across Eras for DBD Donors.

Figure 5. Donor Utilization by Era. Donor utilization rates by donor DMD subgroups for A) DBD and B) DCD donors.

Conclusion

- The number of donors is increasing annually to meet the ever present need for organs for transplantation.
- The donor population closely reflects the general population in the prevalence of obesity and diabetes, however the prevalence of hypertension is lower in the donor population.
- The factors associated with donor utilization have increased over the study period - ALL factors associated with donor utilization in the most recent era (2015-2019) were present in the preceding era.
- There is an increased likelihood of organ utilization from marginal donors in the most recent era (2015-2019) – including use of organs from donors over 60 years old, obese donors, those with hypertension, diabetes, or 3 or more comorbid conditions.
- There is a large increase in the utilization of organs from Hepatitis C virus positive donors in 2015-2019, a result of the development of a successful treatments for HCV.
- DCD donors account for an increasing proportion of all donors. The factors associated with donor utilization are much more narrow than those for DBD donors.
- There will likely be continued increase in the utilization of DCD donors as machine perfusion modalities and normothermic regional perfusion (NRP) techniques become mainstream.