
Trends in Organ Donor Management: 2002 to 2012

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BACKGROUND: Refinements in donor management have resulted in increased numbers and quality of grafts after neurologic death. We hypothesize that the increased use of hormone replacement therapy (HRT) has been accompanied by improved outcomes over time.

STUDY DESIGN: Using the Organ Procurement and Transplant Network donor database, all brain-dead donors procured from July 1, 2001 to June 30, 2012 were studied. Hormone replacement therapy was identified by an infusion of thyroid hormone. An expanded criteria donor was defined as age 60 years or older. Incidence of HRT administration and number of donors and organs recovered were calculated. Using the Organ Procurement and Transplant Network thoracic recipient database transplant list, wait times were examined.

RESULTS: There were 74,180 brain-dead donors studied. Hormone replacement therapy use increased substantially from 25.6% to 72.3% of donors. However, mean number of organs procured per donor remained static (3.51 to 3.50; $p = 0.083$), and the rate of high-yield donors decreased (46.4% to 43.1%; $p < 0.001$). Incidence of traumatic brain injury donors decreased (42.1% to 33.9%; $p < 0.001$) relative to an increased number of expanded criteria donors (22.1% to 26%). Despite this, there has been an increase in the raw number of donors (20,558 to 24,308; $p < 0.001$) and organs (5,857 to 6,945; $p < 0.001$). There has been an increase in organs per traumatic brain injury donor (4.02 to 4.12; $p = 0.002$) and a decrease in days on the waiting list (462.2 to 170.4 days; $p < 0.001$) for a thoracic transplant recipient.

CONCLUSIONS: The marked increase in the use of HRT in the management of brain-dead donors has been accompanied by increased organ availability overall. Potential mechanisms might include successful conversion of previously unacceptable donors and improved recovery in certain subsets of donors. (J Am Coll Surg 2014;219:752–756. © 2014 by the American College of Surgeons)

Hormone replacement therapy (HRT) in the management of brain-dead organ donors is increasing and is now used in a majority of these cases. This strategy addresses the hormone-depleted state incurred with neurologic death¹ and serves to promote hemodynamic stability.² The use of HRT has been shown in numerous studies to increase

the number of organs procured and enhance the quality of grafts.³ We examine the change in HRT use and overall trends in donor management, organ procurement, and thoracic-recipient transplant list wait times from 2002 to 2012.

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METHODS

We examined the Organ Procurement and Transplant Network’s (OPTN) organ donor and thoracic recipient dataset from July 1, 2001 to June 30, 2012. Information from all successfully procured brain-dead donors and heart or lung recipients were analyzed. Procurement was defined as the recovery of any organ with the intention of transplantation. The donor was included if they required any hemodynamic pharmacologic support and at least one organ was successfully recovered. Donation after cardiac death was excluded. Donor data included demographics, cause of death, use of HRT, and type and number of organs procured. High-yield procurement

Abbreviations and Acronyms

EC	= expanded criteria
HRT	= hormone replacement therapy
OPTN	= Organ Procurement and Transplant Network
TBI	= traumatic brain injury

was defined as the successful recovery of ≥ 4 organs. An expanded criteria (EC) donor was defined as age 60 years or older or age 50 to 59 years with comorbidities. Days from thoracic recipient enrollment on the transplant list to ultimate transplantation surgery was calculated. Data were grouped based on academic calendar years and data are presented in reference to the year ending June 30 (ie, "2002" refers to data from July 1, 2001 to June 30, 2002). Analysis was performed using chi-square χ^2 , for categorical variables, or ANOVA for continuous variables where appropriate. All statistical analysis was performed using SPSS software for Mac (version 21.0, SPSS, Inc).

RESULTS

There were 74,180 brain-dead donors meeting our inclusion criteria. The two most common causes of donor death were cerebrovascular disease in 31,804 (42.9%) and traumatic brain injury (TBI) in 28,142 (37.9%). There has been a gradual and significant increase in the raw number of donors per year, from 5,857 in 2002 to 6,945 in 2012 ($p < 0.001$). Similarly, there has been an increase in the raw number of total organs procured, from 20,558 to 24,308 ($p < 0.001$) (Fig. 1). Coinciding with these increases was a significant escalation in the use of HRT in the management of these donors, from 25.1% to 72.3% ($p < 0.001$). Among high-yield donors, there was a similar increase in the use of HRT, from 33% in 2002 to 76.6% in 2012 ($p < 0.001$).

Despite this, there was a moderate but statistically significant decrease in the percentage of high-yield donors, from 46.1% to 43.3% ($p < 0.001$) (Fig. 2). Although the mean number of organs procured per donor remained static in the entire group (3.51 to 3.5 during the study; $p = 0.086$), there was a moderate but statistically significant increase in the mean number of organs procured from TBI donors, from 4.02 to 4.12 ($p = 0.002$) (Fig. 3). During the same time period, we observed a significant increase in the number of EC donors being used (22.1% to 26.0%; $p < 0.001$) and a decrease in the proportion of TBI as cause of death in all donors (42.1% to 33.9%; $p < 0.001$) (Fig. 4). There has been a significant increase in the percentage of donors with lungs procured during this time (13.3% to 23.4%; $p < 0.001$) and a significant

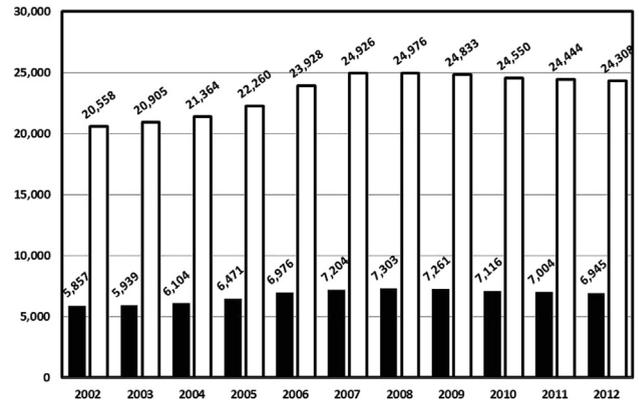


Figure 1. Raw number of donors and organs successfully procured 2002 to 2012. Black bar, number of donors; white bar, number of organs.

decrease in the percentage of hearts recovered (38.7% to 34.1%; $p < 0.001$) (Fig. 5), for a total of 21,616 heart recipients and 13,909 lung recipients included in the study. During this time period, there has been a significant decrease in the mean time spent on the waiting list for a heart transplant (231.5 days in 2002 to 198.1 days in 2011; $p < 0.001$) and a lung transplant (462.2 to 170.4 days in the same period; $p < 0.001$) (Fig. 6).

DISCUSSION

As transplant wait lists grow, the use of HRT in preprocurement management is potentially one of the most important strategies to increase the number of viable donors and transplantable grafts. The increasing use of HRT in brain-dead organ donors during the decade studied was associated with a substantial increase in the number of donors per year, number of organs procured (particularly from TBI donors), and number of EC

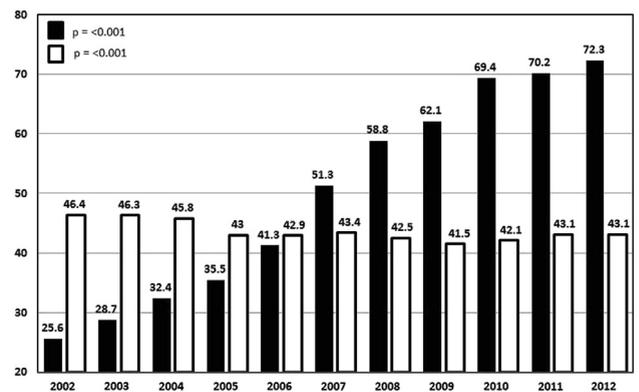


Figure 2. Incidence of hormone replacement therapy and high-yield (≥ 4 organs) procurement 2002 to 2012. Black bar, hormone replacement therapy; white bar, high-yield procurement.

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