

Clinical Science

Increasing organ donation after cardiac death in trauma patients



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Abstract

BACKGROUND: Organ donation after cardiac death (DCD) is not optimal but still remains a valuable source of organ donation in trauma donors. The aim of this study was to assess national trends in DCD from trauma patients.

METHODS: A 12-year (2002 to 2013) retrospective analysis of the United Network for Organ Sharing database was performed. Outcome measures were the following: proportion of DCD donors over the years and number and type of solid organs donated.

RESULTS: DCD resulted in procurement of 16,248 solid organs from 8,724 donors. The number of organs donated per donor remained unchanged over the study period ($P = .1$). DCD increased significantly from 3.1% in 2002 to 14.6% in 2013 ($P = .001$). There was a significant increase in the proportion of kidney (2002: 3.4% vs 2013: 16.3%, $P = .001$) and liver (2002: 1.6% vs 2013: 5%, $P = .041$) donation among DCD donors over the study period.

CONCLUSIONS: DCD from trauma donors provides a significant source of solid organs. The proportion of DCD donors increased significantly over the last 12 years.

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Advancements in transplant medicine and improved recipient outcomes have led to an increased demand for organ transplantation. The number of organ donors and transplantations in the United States has more than doubled

over the past few years; however, the demand of organs dwarfs the supply.¹⁻³ Even though the brain dead donors contribute the majority of transplanted organs, they cannot account for annual organ requirement.⁴⁻⁶ As a result new avenues are currently being explored to increase organ donation among deceased donors, such as donation after cardiac death (DCD).

DCD has always been a secondary source of organ donation. Its utility has always remained limited because of inherent concerns associated with an extended criteria donation, which include poor organ quality and adverse recipient outcomes. However with the establishment of donor management protocols and better organ preservation

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techniques, there has been a push for DCD. Since 2006, DCD has been actively promulgated as a promising option to overcome organ shortage and several institutions have implemented protocols to harvest DCD organs.⁷⁻⁹ However, this vital source of organs continues to be underutilized.¹⁰⁻¹⁴

Over the past decade, because of severe shortage of organs, the criteria for organ donation among trauma donors have been extended to include DCD as a potential source of organ donation. However, the true utilization of DCD in trauma patients remains unknown. Additionally, the impact of changing resuscitation practices and donor management protocols on the organs obtained from DCD is unclear. The aim of this study was to assess the national trends in DCD in trauma donors. We hypothesized that there is an increasing national trend in trauma organ donation after DCD over the years.

Methods

We performed a 12-year (2002 to 2013) retrospective analysis of the United Network for Organ Sharing Database (UNOS). All the deceased trauma patients who donated solid organs were identified from UNOS and included in the study. We recorded the following data points from the UNOS database: mechanism of death, total number of trauma organ donors after cardiac death, total number of trauma organ donors after brain death, and number and type of organs donated.

Trauma deaths were defined as the patients who died from blunt injury, drowning, drug intoxication, gunshot wound, stab wound, or traumatic brain injury. Blunt mechanism of injury was defined as motor vehicle collision, pedestrian struck, bicycle accidents, motorcycle collisions, and falls. DCD was defined as organ recovery process that occurred when death was defined as irreversible cessation of circulatory and respiratory functions. Donation after brain death (DBD) was defined as organ recovery process after declaration of death on brain-based definition of death. Solid organ donation was defined as donation of heart, lung, liver, kidney, pancreas, kidney-pancreas, and heart-lung.

The UNOS database is the largest online database system which is used to collect, store, analyze, and publish all Organ Procurement and Transplant Network data that pertain to the patients on waiting list, organ matching, and transplantation. The UNOS database was launched on October 25, 1999 and contains data regarding every organ donated and transplanted in the United States since 1986.

The primary outcome measures were number of organs donated and rate of organs donated per donor after cardiac death in trauma patients. We defined rate of organ donation as number of organs donated per donor and was calculated as a ratio of total number of DCD solid organs donated by the total number of DCD organ donors. Secondary outcome measures were number and type of solid organs donated.

Data are reported as proportions for categorical variables. We utilized chi-square test to identify differences in proportions for categorical variables. Analysis of variance was utilized for trend analysis. *P* value less than .05 was considered as statistically significant. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS, Version 21; IBM Corp., Armonk, NY).

This study was reviewed by the institutional review board at the University of Arizona College of Medicine and was determined to be exempt from approval.

Results

A total of 120,512 eligible trauma organ donors were identified, of which 90,586 patients donated solid organs over the study period. Of all the trauma solid organ donors ($n = 90,586$), 9.6% ($n = 8,724/90,586$) donated after cardiac death. The proportion of patients who donated after cardiac death increased significantly from 3.1% (190/6,184) in 2002 to 14.6% (1,000/6,871) in 2013 ($P \leq .001$) (Fig. 1).

When we looked at the number of organs donated during the study period, a total of 252,052 organs were donated by trauma donors. A total of 6.4% (16,258) of the donated organs were procured from trauma donors who donated after cardiac death. Over the study period, there was a significant increase in the number of organs procured after DCD from 2% (381/18,284) in 2002 to 9.5% (1,825/19,205) in 2013 ($P = .001$). Kidney ($n = 12,898$) followed by the liver ($n = 2,868$) were the most common solid organs donated. Table 1 demonstrates the number and type of organs donated over the study period.

A total of 120,572 kidneys were donated over the study period. DCD kidneys accounted for 10.6% ($n = 12,898$) of all donated kidneys. There was a significant increase in the number of DCD kidneys donated over the study period from 3.4% (291/8,539) in 2002 to 16.3% (1,520/9,314) in 2013 ($P = .001$). Fig. 2 demonstrates the trends in kidney donation in DCD and DBD donors over the study period.

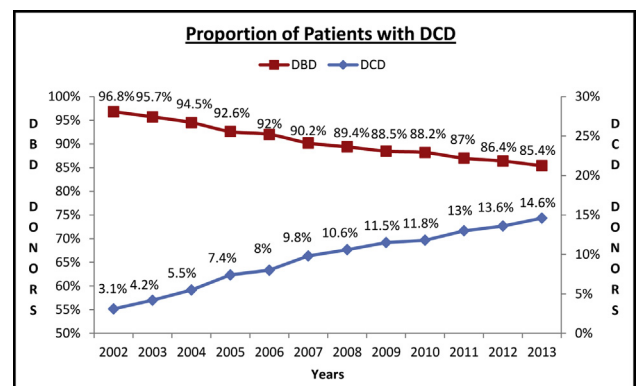


Figure 1 Proportion of trauma donors who donated after cardiac death over the years.

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