

Variation among organ procurement organizations in experience and practice of heart donation after circulatory death



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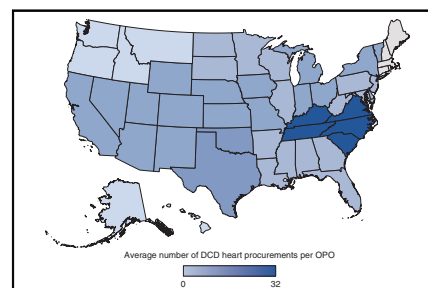
Donation after circulatory death (DCD) is important for meeting the growing demand for heart transplantation. Significant variability exists in the guidelines and practice of DCD heart procurement.¹ In the United States, organ donor evaluation is overseen by regional organ procurement organizations (OPOs), which are uniquely positioned to both influence and observe clinical practice. Despite this, little is known about OPO experience with DCD heart procurement, which varies regionally.² To this end, we conducted a cross-sectional study involving a survey assessing OPO experience with DCD heart procurement.

METHODS

All OPOs were contacted by telephone and a REDCap survey ([Online Data Supplement](#)) was distributed to identified qualified respondents. Surveys were distributed between February 1, 2022, and May 31, 2022. Descriptive data analysis was performed. This protocol was exempted by Duke University's institutional review board (Pro00109954, November 23, 2021).

RESULTS

Survey responses were received from 31 of 57 OPOs (54%) representing 11 of 12 UNOS regions ([Figure 1](#)). All responding OPOs had experience with DCD procurement of any organ ([Table 1](#)).^{3,4} Thirty OPOs (97%) had experience with DCD heart procurement ([Figure 1](#)); among these, 19 (61%) had attempted <10 such procurements and



Average number of procurements for DCD hearts as reported by OPOs.

CENTRAL MESSAGE

Experience with DCD heart procurement among US organ procurement organizations is widespread, although limited to a small number of donors. Donor evaluation and management practices vary considerably.

25 (83%) had overseen heart procurements involving normothermic regional perfusion (NRP). Total DCD experience was correlated with DCD heart experience (Kendall's Tau-b = 0.35, $P = .006$).

In addition to donor age and medical history, criteria identified as informing whether to list a potential DCD heart donor for procurement included echocardiography (94%), ventilation status (45%), neurologic examination, (42%), and neurologic imaging (13%). In evaluating the likelihood of timely progression to death among potential DCD heart donors, 4 OPOs (13%) used published clinical tools, 6 (19%) used internally developed tools, and 22 (71%) did not use any tool.

Twenty-nine OPOs (94%) oversaw withdrawal of care in an operating room, 23 (74%) in an anesthesia bay, and 14 (45%) in an intensive care unit. The time frame allowed for donor progression from withdrawal of care to circulatory death ranged from <30 minutes to 2 to 3 hours. The

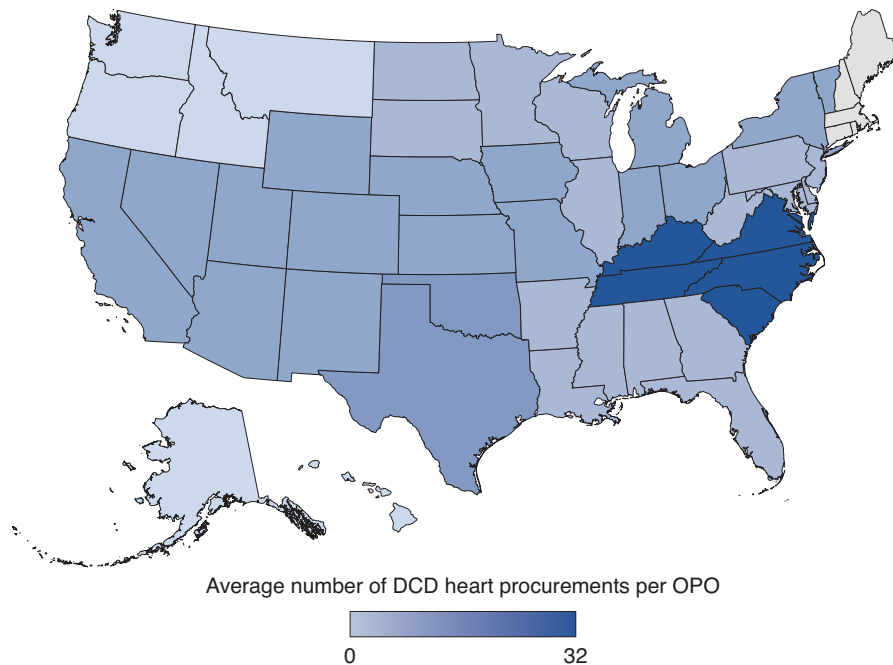


FIGURE 1. Organ procurement organization (OPO)-reported experience with donation after circulatory death (DCD) heart procurement, averaged by United Network for Organ Sharing (UNOS) region. This figure depicts the average number of DCD heart procurements reported per OPO by UNOS region. All UNOS regions were represented among survey respondents except for UNOS Region 1 (New England, depicted in gray).

duration of observation used to confirm circulatory cessation (standoff time) ranged from 2 to 6 minutes (median 5 minutes). Twenty-seven OPOs (87%) observed donor heparinization before withdrawal of care, 10 (32%) after withdrawal but before death and 4 (13%) after declaration of death.

DISCUSSION

Here we describe contemporary experience with DCD heart procurement among OPOs and identify several key findings. First, OPOs have significant experience with DCD, although DCD heart procurement experience is limited to a small number of donors. Increasing OPO familiarity with DCD heart procurement will be critical to achieving the potential benefits of DCD for expanding the heart donor pool.⁵

Second, NRP, a practice with the potential to improve transplant outcomes⁶ but whose adoption has been slowed by ethical concerns, is used in most regions, although in a minority of all US DCD heart procurements. Additional work is needed to identify donors better suited to procurement with NRP versus direct procurement and normothermic machine perfusion.

Third, the use of published tools for the selection of DCD heart donors is limited, potentially because no available tool was validated in potential heart donors, who must fulfill different clinical criteria than DCD donors at large.¹ A tool specifically for DCD heart donor evaluation is needed to efficiently expand DCD heart transplantation.

Finally, significant variability exists in withdrawal of care practices. The time frame imposed on donor progression to circulatory death varies considerably, with important implications for donor utilization.⁶ The standoff time is between 2 and 5 minutes in nearly all procurements, and most OPOs report a minimum duration of 5 minutes, consistent with data supporting the unlikelihood of autoresuscitation after 5 minutes of pulselessness. The timing of donor heparinization and the location of withdrawal of care, both of which have been shown to affect outcomes in DCD liver transplantation, are variable. The nonspecific nature of UNOS recommendations for DCD,⁷ and their tendency to defer to hospital and OPO policy, may be contributing to the observed practice variation. Uniform standards and investment in research to identify best practices in DCD procurement are needed to bolster public trust in organ donation.⁸

Limitations

Findings were limited to OPOs that completed the survey (nonresponse bias) and by respondent recall.

CONCLUSIONS

OPO experience with DCD heart procurement is widespread, although limited to a small number of donors. Donor evaluation and management practices vary considerably, with potential effects on transplant outcomes. These findings highlight the need to identify and implement an optimal standard of care if DCD heart transplantation is to achieve its full potential.

TABLE 1. Experience and observed practice in DCD heart procurement among organ procurement organizations

DCD donors attended	N = 31	None	1-10	11-25	26-50	51-100	>100
All organs		0	0	2 (6.5%)	1 (3.2%)	2 (6.5%)	26 (83.9%)
Heart		1 (3.2%)	19 (61.3%)	7 (22.6%)	3 (9.7%)	1 (3.2%)	0
Prevalence of NRP in DCD heart procurement	N = 24	None (N = 30)	<10%	10%-25%	>25%-50%	>50%-75%	>75%
		5 (16.7%)	10 (41.7%)	3 (12.5%)	4 (16.7%)	1 (4.2%)	6 (0.25%)
DCD heart donor evaluation criteria	N = 31	Echocardiography	Ventilation status	Neurologic examination	Neurologic imaging	–	–
		29 (93.5%)	14 (45.2%)	13 (41.9%)	4 (12.9%)		
Tool used for DCD heart donor selection	N = 31	DCD-N score ³	University of Wisconsin Donation After Cardiac Death Evaluation Tool ⁴	OPO-specific tool	None	–	–
		3 (9.7%)	1 (3.2%)	6 (19.4%)	22 (71.0%)		
Settings in which withdrawal of care has ever been observed	N = 31	Operating room	Anesthesia bay	ICU	–	–	–
		29 (93.5%)	23 (74.2%)	14 (45.2%)			
Prevalence of withdrawal of care in operating room	N = 27	<10%	10%-25%	>25%-50%	>50%-75%	75%	–
		5 (18.5%)	2 (7.4%)	2 (7.4%)	2 (7.4%)	16 (59.3%)	
Time allowed for donor progression, min	N = 31	<30	30-60	>60-120	>120-180	>180	–
Minimum observed		6 (19.4%)	12 (38.7%)	13 (41.9%)	0	0	
Maximum observed		0	2 (6.5%)	24 (77.4%)	5 (16.1%)	0	
Standoff time, min		2	3	5	6	–	–
Minimum observed	N = 31	13 (41.9%)	2 (6.5%)	16 (51.6%)	0		
Maximum observed	N = 30	0	0	29 (96.7%)	1 (3.3%)		
Observed timing of heparinization	N = 31	Before WLST	After WLST, before death	After death	–	–	–
		27 (87.1%)	10 (32.3%)	4 (12.9%)			
Prevalence of premortem heparinization	N = 30	<10%	10%-25%	25%-50%	50%-75%	>75%	–
		1 (3.3%)	0	0	0	29 (96.7%)	

DCD, Donation after circulatory death; NRP, normothermic regional perfusion; OPO, organ procurement organization; ICU, intensive care unit; WLST, withdrawal of life-sustaining therapy.

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