TITLE: Donation After Circulatory Death Heart Transplantation Using Normothermic Regional Perfusion – The NYU Protocol

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DISCLOSURE STATEMENT:
- Dr. Les James has nothing to disclose and reports no conflicts of interest.
- Dr. V. Reed LaSala has nothing to disclose and reports no conflicts of interest.
- Fredrick Hill has nothing to disclose and reports no conflicts of interest.
- Dr. Jennie Y. Ngai has nothing to disclose and reports no conflicts of interest.
- Dr. Alex Reyentovich has nothing to disclose and reports no conflicts of interest.
- Dr. Syed T. Hussain has nothing to disclose and reports no conflicts of interest.
- Dr. Claudia Gidea has nothing to disclose and reports no conflicts of interest.
- Dr. Greta Piper has nothing to disclose and reports no conflicts of interest.
- Dr. Aubrey Galloway has intellectual property and receives royalties from Medtronic for valve repair devices, and have intellectual property and receive royalties from Edwards Lifesciences.
- Dr. Deane Smith has nothing to disclose and reports no conflicts of interest.
- Dr. Nader Moazami has nothing to disclose and reports no conflicts of interest.

FUNDING STATEMENT: This study was funded by the Department of Cardiothoracic Surgery at NYU Grossman School of Medicine.
CENTRAL MESSAGE: A standardized protocol for DCD cardiac transplantation using NRP is reproducible, allows for metabolic optimization of the donor, and ensures minimal ischemic time for the heart. (179/200 characters)

CENTRAL IMAGE LEGEND: Co-location enables uniform DCD-NRP procurement, focusing the expertise of multiple teams.

KEYWORDS: donation after circulatory death, heart transplantation, normothermic regional perfusion

PERSPECTIVE STATEMENT: A standardized protocol for the use of cardiopulmonary bypass for thoracoabdominal normothermic regional perfusion is a burgeoning option for improving the quality of cardiac allografts from DCD donors.
GLOSSARY OF ABBREVIATIONS:

- ACT: activated clotting time
- BPM: beats per minute
- CI: cardiac index
- CIT: cold ischemic time
- CO: cardiac output
- CPB: cardiopulmonary bypass
- CVP: central venous pressure
- cCD: “controlled” donation after circulatory death
- DCD: donation after circulatory death
- DBD: donation after brain death
- DSA: donor service area
- DWIT: donor warm ischemic time
- EDR: electronic death records
- ECMO: extracorporeal membrane oxygenation
- ICU: intensive care unit
- LVEDV: left ventricular end diastolic volume
- LVESV: left ventricular end systolic volume
- LVOT: left ventricular outflow tract
- LVSF: left ventricular systolic function
- MAP: mean arterial pressure
- NRP: normothermic regional perfusion
OPTN/SRTR: Organ Procurement and Transplantation Network/Scientific Registry of Transplant Recipients

PAP: pulmonary artery systolic pressure

PCWP: pulmonary capillary wedge pressure

PRBC: packed red blood cells

SvO₂: mixed venous oxygen saturation

TEE: transesophageal echocardiogram

TTE: transthoracic echocardiogram

uDCD: “uncontrolled” donation after circulatory death

UF: ultrafiltration

UNOS: United Network for Organ Sharing

VTI²: velocity time integral

WIT: warm ischemic time

WLST: withdrawal of life sustaining therapy
INTRODUCTION

In 2021, despite the ongoing worldwide COVID-19 pandemic and severely constrained medical resources, a total of 3,817 heart transplants were performed in the United States—the highest number ever recorded.\(^1\) However, the number of heart transplants performed annually continues to be outpaced by the increasing number of waitlisted patients. The 2019 annual data report from the Organ Procurement and Transplantation Network/Scientific Registry of Transplant Recipients (OPTN/SRTR) demonstrated a 42.5% increase in the number of newly listed heart transplant candidates from 2008 to 2019.\(^2\) The persistent gap between the number of hearts available and the number of patients in need of heart transplantation has led to novel efforts to expand the donor pool, as well as a renewed interest in obtaining hearts from donation after circulatory death (DCD) donors.

The majority of deceased donor hearts in the United States are obtained from patients with irreversible cessation of neurological function, otherwise known as organ donation after brain death (DBD). In contrast, DCD involves the intentional withdrawal of life-sustaining therapy (WLST) to permit controlled circulatory death to occur. If the patient fails to progress to circulatory death within an allotted time frame, DCD donation is aborted and the patient is placed on palliative measures until they expire.

There have been three primary methods described for DCD heart transplantation. The original method, as described by Barnard and used in the first heart transplants, was direct procurement and transplantation.\(^3\)\(^,\)\(^4\) The donor and recipient were co-located in the same facility to minimize time between the withdrawal of donor life support, heart implantation, and subsequent reperfusion in the recipient. An alternative strategy involves direct procurement after circulatory death followed by \textit{ex situ} perfusion using a specialized perfusion device (e.g. TransMedics
[Andover, MA] Organ Care System [OCS]). This was first described by the Sydney group and subsequently by the U.K. group.\textsuperscript{5-7} Most recently, a randomized trial has been completed in the United States with favorable clinical results, and the device has been approved by the FDA for \textit{ex vivo} reanimation, functional monitoring, and beating-heart preservation of DCD hearts.\textsuperscript{8, 9} The third method, normothermic regional perfusion (NRP), involves the use of extracorporeal membrane oxygenation (ECMO) or cardiopulmonary bypass (CPB) to establish \textit{in situ} reperfusion of the heart and other organs with oxygenated blood after isolation and ligation of the aortic arch vessels.\textsuperscript{10} Following NRP procurement, the heart is either transported using cold storage or in the OCS.\textsuperscript{11-13} NRP has significant advantages:

1) Expedient restoration of blood flow mitigates the impact of donor warm ischemic time (DWIT)

2) Metabolic abnormalities that accompany circulatory death, primarily acidosis and hyperkalemia, can be corrected\textsuperscript{14}

3) The heart can be evaluated for suitability \textit{in situ} after it has been volume loaded to function under physiologic conditions

4) A controlled procurement process for all teams involved facilitates a safe dissection and allows for accurate assessment of all thoracic and abdominal organs

In DCD cardiac transplantation, there is considerable concern regarding the heart’s exposure to injury in three distinct phases: (I) warm hypoxic/ischemic injury during the period from WLST to decompensation and death; (II) warm ischemic injury during the standoff period after donor death; (III) ischemia and reperfusion injury in the period of organ storage or \textit{ex vivo}
heart perfusion, transportation, and implantation.\textsuperscript{15} DWIT is defined as the period from WLST until the end of the standoff period.\textsuperscript{6} Minimizing DWIT and mitigating the effects of reperfusion injury are of the utmost importance, as they are the major contributors to irreversible myocardial damage. In the context of DCD heart transplantation, DCD donors decompensate in a highly variable and unpredictable fashion after WLST, and neither donor vital signs nor DWIT can reliably predict graft performance.\textsuperscript{16} The rapid initiation of NRP after donor death aims to minimize DWIT and optimize the donor heart prior to acceptance and implantation.

As the use of NRP for DCD heart transplantation continues to expand both nationally and internationally, a standardized protocol with proven results is needed.\textsuperscript{11, 17-19} We have previously reported on our early experience with DCD heart transplantation using CPB for NRP and hereby publish our institutional protocol.\textsuperscript{17}

\textbf{DONOR SELECTION}

Potential DCD donors are stratified according to the modified Maastricht classification system. (Table 1) Categories 1 and 2 would be considered “uncontrolled” DCD (uDCD), while Categories 3 and 4 are considered “controlled” DCD (cDCD), where the duration and conditions of warm ischemia are known and the precise course of circulatory arrest can be followed.\textsuperscript{20, 21}

We accept donors between the ages of 18 and 49. Recipients are selected based on standard criteria according to United Network for Organ Sharing (UNOS) transplant listing order, blood group, cross-match, size match, and clinical stability. All organ functions of the donor are assessed for suitability upon notification of the intent to withdraw support on an active referral. If we have a suitable recipient, a transthoracic echocardiogram (TTE) is performed to assess the potential donor’s baseline cardiac function. If the echocardiographic assessment is satisfactory, in select
cases, such as a significant smoking history, uncontrolled hypertension, diabetes, age >40 years, or any clinical concern for coronary artery disease, cardiac catheterization may be requested prior to acceptance. If the organ function is determined to be acceptable, upon authorization by the patient’s health care proxy, the patient is transferred from the initial hospital to our surgical intensive care unit (ICU). The patient is transported using the same standard policies and procedures which govern all interfacility transfers at our institution. All other assessments and determinations are made by our ICU team. (Table 2)

INFORMED CONSENT

In 2012, the American Thoracic Society (ATS), International Society for Heart and Lung Transplantation (ISHLT), Association of Organ and Procurement Organizations (AOPO), and the United Network for Organ Sharing (UNOS) established a framework to guide ethics and health policy considerations in adult DCD organ donation. With respect to informed consent, discussions about DCD should be coordinated jointly by clinicians and OPO representatives, and should be obtained by individuals with appropriate experience and training. Importantly, these individuals’ organizational affiliations should always be clearly disclosed. For patients who are potentially suitable candidates for DCD, donation should be presented to the surrogate after a decision has been made to withdraw life-sustaining treatments. Prior to initiating the DCD program, we met with the OPO and their coordinators to describe thoroughly our NRP protocol. The goal of these training sessions was to provide OPO representatives with a complete understanding of the NRP process so that they could obtain informed consent from the surrogates of potential donors with full transparency. The local OPO discusses organ donation with the family only after the following three criteria are met: the decision has been made to withdraw support,
organ function is determined to be acceptable, and the donor is likely to progress to cardiac arrest within the time allotted after WLST.\textsuperscript{23} The coordinator reviews the DCD process, including all relevant \textit{ante mortem} interventions and medications. This includes the administration of heparin before WLST, and the possibility that the loved one will not proceed to cardiac arrest and may be ultimately ineligible for organ donation.

\textbf{CO-LOCATION OF DONOR AND RECIPIENT}

Our requirement for co-location of the donor and recipient is to maintain uniformity of the DCD-NRP procurement process, minimize cold ischemic time (CIT), and allow for efficient and improved team member communication. There are several benefits for co-location, the most important of which are:

1. Minimizing total warm ischemic time (WIT) and CIT for the heart
2. Standardizing the methodology of organ reperfusion to ensure safety and reproducibility
3. Reducing subjective variability in the assessment of whether or not organs are suitable for transplantation
4. Standardizing the WLST by dedicated ICU physicians and staff who understand the process
5. Focusing expertise in a single location with multiple experienced teams in cardiothoracic surgery, cardiology, critical care, anesthesiology, and abdominal transplant surgery
There are of course limitations that arise in the concept of co-location of the donor and recipient. Institutions based in densely populated metropolitan areas have the ability to perform interfacility transfers easily, which may not be feasible or practical for centers located in smaller cities or in remote rural areas. In these instances, a protocol using a portable extracorporeal circuit, blood pump, and blood reservoir has been successful for NRP procurement of DCD hearts.\(^{24}\) However, this method does not address potential inexperience in ICU management and lack of standard practices for the withdrawal of support and *ante mortem* interventions.

We have previously proposed that DCD heart transplantation using NRP should be concentrated in specialized centers accustomed to cardiac surgery.\(^{25}\) In this model, one or two cardiac transplant centers within the donor service area (DSA) of each OPO could be selected to serve as designated DCD heart centers. Once a recipient who is willing to accept the heart is identified, the potential donor would be transferred to the designated DCD heart center in that DSA. At this center, a dedicated cardiothoracic surgical team would conduct the reperfusion, assessment for heart suitability, and eventual heart procurement. The heart would then be transported to the distant recipient center using standard cold storage. Each heart would undergo a standardized resuscitation and evaluation, thereby ensuring a greater yield of transplantable hearts.

**PRE-RECOVERY SEQUENCE OF EVENTS**

Efficiency is of paramount importance in the DCD-NRP procurement process in order to limit DWIT and initiate CPB as soon as possible. Accordingly, in our protocol WLST is performed in the operating room rather than in the ICU to eliminate the DWIT during the transfer process to the OR following cardiac arrest. While in the ICU prior to transfer to the operating room, a femoral arterial line and pulmonary artery (Swan-Ganz) catheter are placed. Operating room staff are
briefed on the procedure and how this type of donation differs from that of DBD donors. When
the time comes for the patient to be transferred to the operating room, physicians, nurses, and staff
line the pathway from the ICU to the patient transport elevators in a ritual known as the Honor
Walk. The Honor Walk provides the families and loved ones of intended organ donors, as well as
the medical care team, an opportunity acknowledge the donor for sharing the gift of life. The
Honor Walk is a symbol of compassion and unity among families, loved ones, and care teams of
the donor and is a powerful way to say goodbye.

Family members or loved ones who have accompanied the donor from the ICU are escorted
to an adjacent conference room on the same floor as the operating room. The patient is transferred
to the operating room and prepped and draped prior to WLST, with the CPB circuit prepared on
the surgical field and ready for cannulation. Another sterile sheet is used to cover the draped
patient, which allows the intensivist to confirm death after the 5-minute “no-touch” period without
contaminating the surgical field. After confirmation of circulatory death, the cover drape is
removed and discarded so that the operation may commence. (Figure 1)

WITHDRAWL OF LIFE-SUSTAINING TREATMENT

Prior to WLST, an arterial blood gas is drawn to establish a metabolic baseline. The
presence of 4 units of cross-matched packed red blood cells (PRBC) in the operating room is
confirmed and verified. The intensivist administers 50,000 units of heparin three minutes before
WLST. At this point, the organ recovery teams and perfusion team exit the operating room. Family
members or loved ones may choose to be present with their loved one during the WLST and are
escorted to the operating room after the patient has been draped. WLST is performed by the critical
care team, who are not involved in the organ procurement process. During this period, comfort
care measures are taken to ensure a dignified and appropriate end of life for the patient. When the patient is draped, their arm remains exposed so that family members may hold their hand after WLST. Family members typically remain in the operating room until the declaration of death. No members of the organ recovery teams re-enter until the family has been escorted out the operating room. We strictly adhere to this protocol to maintain complete separation of WLST and declaration of death from the initiation of NRP and organ procurement.

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**PRONOUNCEMENT OF DEATH**

Our policy for pronouncement of death adheres to the recommendations of The Institute of Medicine (1997 NonHeart Beating Organ Transplantation: Medical and Ethical Issues in Procurement).\(^{27}\) These recommendations include separating decisions about management of care with respect to WLST and those of organ donation, as well as the determination of death and the act of organ procurement. Furthermore, the responsibilities of the critical care attending physicians and other personnel charged with patient care must be kept separate from those of the transplant or procurement physicians and personnel. An interval of five minutes must elapse between cardiopulmonary arrest and the declaration of death. This time is described in the Electronic Death Records (EDR) as the “Start of the Observation Period” and is documented accordingly. Cardiopulmonary arrest must be verified by clinical observation, electrocardiographic monitor and/or pulseless electrical activity with direct blood pressure monitoring. Death is pronounced by the critical care attending physician who is wholly separate from the transplant and procurement teams. The organ recovery teams only re-enter the operating room if the patient meets criteria for cardiopulmonary arrest and the obligatory five minute stand-off period has elapsed.
POST-EXPIRATION SEQUENCE OF EVENTS

Following declaration of death, the cardiothoracic organ procurement team begins first in order to minimize the number of people competing for space around the operating table. A rapid median sternotomy is performed and the pericardium is partially opened to expose the aorta and the right atrium. Consistent with standard practice, the innominate vein is ligated and divided and the innominate artery, carotid artery, and subclavian artery are clamped to achieve complete cerebral circulatory isolation. After placement of a purse-string suture in the distal aorta, the aortic cannula is placed and connected to the bypass circuit. The right atrium is entered through a stab incision and the patient is placed on circulatory support. When the bypass cannulas have been secured, the donor is reintubated. We generally place a left ventricle vent through the right superior pulmonary vein or left atrial appendage depending on consideration for lung procurement. Once normothermic CPB (37°C) has been established, the perfusion team works diligently and efficiently to correct fluid and electrolyte abnormalities and optimize the metabolic milieu of the donor. This process begins with immediate administration of 3 sodium chloride (NaCl) zero-balance ultrafiltration (Z-BUF) bags containing 50 mEq sodium bicarbonate and 0.5 grams calcium carbonate. The use of ultrafiltration (UF) for patients undergoing cardiac surgery with CPB is a well-accepted technique for hemoconcentration and correcting electrolyte imbalances. The most common UF modality is conventional UF, which typically denotes the use of UF during CPB as a hemoconcentrating process without the addition of asanguineous solutions, whereas Z-BUF is performed in a euvoletic manner with equal volumes of fluid added and removed. Z-BUF provides a means to reduce circulating elements generated most often through inflammatory processes or electrolyte imbalances created by cardioplegic solutions, and in this case the hyperkalemia that accompanies circulatory death. Arterial blood gas measurements are obtained
at 15 minute intervals after each Z-BUF bag is infused. Blood is transfused as needed to maintain hemoglobin (Hgb) >8 mg/dL. We have found that the use of CPB for NRP improves the metabolic milieu of the donors, which may lead to improved graft function in transplant recipients. (Table 3)

At 30-minutes of reperfusion, CPB is weaned off completely as the heart is refilled with blood for cardiac assessment by transesophageal echo (TEE) and hemodynamic monitoring under the normal physiologic state. If cardiac function is determined to be adequate and the heart is accepted for transplant, CPB is resumed to rest the heart as the recipient operation is commenced in the proximate operating room. If the heart has not yet recovered, full CPB is resumed and the heart is permitted to beat empty for further resuscitation. This evaluation is repeated every 30 minutes for a maximum of 180 minutes. Inotropes are not used during the weaning process, although patients may require vasopressors for blood pressure support. We aim to maintain mean arterial pressure (MAP) between 70-90 mmHg and a heart rate <120 beats per min (bpm). If patients are hypertensive or tachycardic to >120 bpm, we administer low dose esmolol.

TRANSESOPHAGEAL ECHOCARDIOGRAPHIC ASSESSMENT PROTOCOL

1. Standard mid-esophageal 2D TEE views (at 0°, 60°, 90°, and 120°) are used to assess left and right ventricular wall motion, valve anatomy and function, presence or absence of a patent foramen ovale or ventricular septal defect, left atrial appendage anatomy, and pulmonary vein anatomy. Objectively, left ventricular systolic function (LVSF) can be calculated by obtaining the left ventricular end diastolic and systolic volumes (LVEDV and LVESV, respectively) using the modified Simpson’s rule. LVSF ≥50% is the suggested threshold for adequate cardiac function.
2. Standard trans-gastric TEE views are used to assess global and regional left and right wall motions, while a deep, trans-gastric 5 chamber view allows visualization of left ventricular outflow tract (LVOT) velocity time integral (VTI^2); VTI^2 ≥15 cm is the suggested threshold.

3. Tissue Doppler is used to measure the S wave at the lateral aspects of both mitral and tricuspid valves in the mid-esophageal 4 chamber view, at 0° to 15°; S wave ≥10 cm/sec is the suggested threshold.

4. Full volume 3D TEE acquisition and mid-esophageal views from 0° to 120° encompassing the full left ventricle and right ventricle are obtained to visually assess ventricular function.

**RECOVERY OF THE HEART AND OTHER ORGANS**

While the above criteria serve as the framework for our approach to the assessment of DCD-NRP hearts, the ultimate decision to accept or reject the donor heart rests with the decision of the transplanting heart team based on their clinical judgement. Once the heart is accepted, the implanting surgeon can begin the recipient operation. The decision of whether to return to CPB or not is primarily determined by the adequacy of lung function, the amount of bleeding encountered, and the patient’s hemodynamic stability. If there are any concerns, the patient can be maintained on CPB until cross-clamp. When all teams are prepared for cross-clamp, the patient’s blood volume is emptied into the CPB circuit and the organs are flushed with preservation solution. This terminal venting strategy results in a very clean field and excellent cardiac decompression.

Between January 2020 and May 2022, we performed 18 heart transplants using the DCD-NRP protocol. Out of the 18 donors who underwent NRP, all hearts were deemed suitable for recovery.
and successfully transplanted, a yield of 100%. (Table 4) Other organs successfully recovered and transplanted include kidneys (80.6% yield), livers (66.7% yield), and bilateral lungs (27.8% yield).

ETHICAL CONCERNS

While a complete review of the ethical framework for DCD-NRP cardiac transplantation is far beyond the scope of this review, it is nevertheless necessary to touch upon some of the ethical concerns raised in the face of our innovative transplant protocol. In April 2021, the American College of Physicians asserted that DCD-NRP raises serious ethical considerations and recommended a pause in its use, pending further professional and public discussion.29 The ACP claim that the act of restoring the circulatory capacity of the heart within the deceased donor’s body for in situ preservation of organs prior to procurement violates the dead donor rule, invalidates the declaration of circulatory death, and poses disproportionate risks to stigmatized and marginalized groups. We have previously published comprehensive responses addressing these concerns.14, 30, 31 These assertions rely on an incomplete understanding of DCD-NRP as well as a limited interpretation of the dead donor rule. Both standard DCD and DCD-NRP begin when a decision is made by the patient and/or their surrogate(s) to withdraw further life-sustaining therapies and to allow death to occur. Support is subsequently withdrawn and the patient is declared dead; the 5 minute hands-off period is observed to ensure there is no spontaneous auto-resuscitation. At this point in time, the patient is no longer alive and has transitioned to a deceased organ donor. As with standard DCD, in DCD-NRP death is declared using acceptable medical criteria by a physician who is wholly separate from the transplant team. The argument put forth by the ACP hinges on the idea that restoring cardiac function with CPB invalidates the declaration of circulatory death. We believe that during DCD-NRP, the inability of the heart to function within the donor is definitively established by the declaration of death and is not reversed by the institution
of CPB. As DCD-NRP becomes more widely adopted in the United States, it will be necessary to maintain an ongoing dialogue about the ethics of DCD-NRP organ donation with physicians, surgeons, community stakeholders, ethicists, professional organizations, and most importantly, patients and their loved ones.

CONCLUSION

We have previously published results for our early experience on 8 DCD donor heart transplantations. Our protocol, which combines donor and recipient co-localization with TA-NRP using CPB, results in remarkable improvement, and in some cases complete correction, of electrolyte imbalances and metabolic derangements in donors prior to organ recovery. The combination of donor resuscitation and the decrease in WIT and CIT afforded by our co-localization strategy has resulted in procurement of excellent quality of all recovered organs and leads to results comparable to those for DBD transplantation.

REFERENCES:

1. UNOS. All-time records again set in 2021 for organ transplants, organ donation from deceased donors. Vol 20222022.


### Table 1 – The Modified Maastricht Classification of DCD

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<tr>
<th>Category</th>
<th>Circumstances</th>
<th>Definition</th>
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<td>I. Uncontrolled</td>
<td>Found dead</td>
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<td>IB. In-hospital</td>
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<td>Witnessed cardiac arrest</td>
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<td>IIB. In-hospital</td>
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<td>III. Controlled</td>
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<td>IV. Uncontrolled/Controlled</td>
<td>Circulatory arrest after neurological determination of death</td>
<td>Sudden circulatory arrest after neurological determination of death diagnosis during donor management but prior to planned organ recovery</td>
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### Table 2 – Donor demographics

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<tr>
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<td>HBI</td>
<td>HBI</td>
<td>SAH</td>
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<td>TBI</td>
<td>HBI</td>
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<td>BZD, cocaine, PCP, THC</td>
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<td>THC</td>
<td>THC</td>
<td>THC</td>
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<td>Organs procured and successfully transplanted</td>
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<td>Heart Lungs Kidneys</td>
<td>Heart Liver Kidneys</td>
<td>Heart Liver Kidneys</td>
<td>Heart Lungs Liver Kidneys</td>
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*BMI,* body mass index; *BZD,* benzodiazepine; *CVA,* cerebrovascular accident; *ESLD,* end-stage liver disease; *HBI,* hypoxic brain injury; *ICH,* intracerebral hemorrhage; *LVEF,* left ventricular ejection fraction; *PCP,* phencyclidine; *PSA,* polysubstance abuse; *SAH,* subarachnoid hemorrhage; *TBI,* traumatic brain injury; *THC,* tetrahydrocannabinol

* Recovered for research
** Recovered but not transplanted
*** Both kidneys recovered, only one transplanted
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Donor 1</th>
<th>Donor 2</th>
<th>Donor 3</th>
<th>Donor 4</th>
<th>Donor 5</th>
<th>Donor 6</th>
<th>Donor 7</th>
<th>Donor 8</th>
<th>Donor 9</th>
<th>Donor 10</th>
<th>Donor 11</th>
<th>Donor 12</th>
<th>Donor 13</th>
<th>Donor 14</th>
<th>Donor 15</th>
<th>Donor 16</th>
<th>Donor 17</th>
<th>Donor 18</th>
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<td>15</td>
<td>23</td>
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<td>9</td>
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<td>13</td>
<td>7</td>
<td>3</td>
<td>16</td>
<td>16</td>
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<td>16</td>
<td>25</td>
<td>17</td>
<td>10</td>
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<td>8</td>
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<td>21</td>
<td>25</td>
<td>23</td>
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<td>14</td>
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<td>11</td>
<td>11</td>
<td>12</td>
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<td>7</td>
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<td>33</td>
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<td>119</td>
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<td>64</td>
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<td>32</td>
<td>35</td>
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<td>8.1</td>
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<td>6.9</td>
<td>7.5</td>
<td>7.8</td>
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<td>Hgb at end of CPB, g/dL</td>
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<td>4</td>
<td>2</td>
<td>2</td>
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Table 4 – Organs recovered from DCD donors and successfully transplanted

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<th>DCD-NRP Donors (n=18)</th>
<th>Yield</th>
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<tr>
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<tr>
<td>Bilateral lungs</td>
<td>5</td>
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<tr>
<td>Liver</td>
<td>12</td>
<td>66.7%</td>
</tr>
<tr>
<td>Kidneys</td>
<td>29</td>
<td>80.6%</td>
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