Organ Donation After Circulatory Death: NSW Guidelines

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Summary: The Guideline describes the necessary requirements for health facilities to undertake organ donation after circulatory (formerly cardiac) death (DCD) in NSW including the applicable setting for DCD in NSW, donor referral criteria, patient management (including decision making and consent processes), criteria for the declaration of death, care of the patient and family (before and after the patient's death), the phases of organ retrieval and subsequent organ allocation.

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Director-General
ORGAN DONATION AFTER CIRCULATORY DEATH

PURPOSE

The Guideline describes the necessary requirements for health facilities to undertake organ donation after circulatory (formerly cardiac) death (DCD) in NSW. This approach to organ donation entails retrieval of organs after the patient’s death where death is certified according to the irreversible cessation of circulation of blood in the body (rather than according to neurological criteria). The Guideline outlines the applicable setting for DCD in NSW, donor referral criteria, patient management (including decision making and consent processes), criteria for the declaration of death, care of the patient and family (before and after the patient’s death), the phases of organ retrieval and subsequent organ allocation.

This Guideline should be read in conjunction with:

PD 2013_001 Deceased Organ and Tissue Donation-Consent and Other Procedural Requirements
PD 2013_002 Designated Officer Policy and Procedures
PD 2005_406 Consent to Medical Treatment –Patient Information
GL 2005_057 End of Life Care and Decision Making –Guidelines
PD 2010_054 Coroner’s Cases and the Coroners Act 2009

KEY PRINCIPLES

DCD provides further donation opportunities for people who wish to be organ donors after their death and is a potential means of increasing the availability of deceased donor organs in NSW within current accepted ethical and legal requirements.

Quality end of life care for a potential organ donor, as with any individual whose cardio-respiratory support is being withdrawn, is the priority and must not be compromised by the donation process.

Once donation has been agreed upon and consented to, efforts should be made to ensure optimal outcomes for the donation. This includes ensuring that the family are fully informed regarding donation processes and that warm ischemic time for the donor organs is minimised.

USE OF THE GUIDELINE

Chief Executives of Local Health Districts (LHD) and Speciality Health Networks (SHN) are responsible for ensuring that:

- Relevant staff are made aware of these guidelines
- Local protocols to support DCD consistent with this Guideline are documented.
The NSW Organ and Tissue Donation Service (NSW OTDS) is responsible for:

- Ensuring that organ and tissue donation and retrieval protocols in NSW are consistent with this guideline
- Facilitating education and training on DCD for LHD/SHN staff as required.

Intensivists/Treating Clinicians/Donation Specialists in LHD/SHNs should:

- Familiarise themselves with the donor referral criteria and management of potential DCD donors as outlined in these guidelines (section 2, 3 and 4).

Clinicians certifying death for the purposes of DCD:

- Must do so according to the criteria outlined in the attached procedures and using the proscribed State form (section 2.3.7 and Appendix 1).

Designated Officers in hospital facilities:

- Must ensure that authorisation is provided for the removal of tissue after death for its use for donation and transplantation (sections 2.3.4 and 2.3.7).

Transplant Units who accept DCD organs for transplantation:

- Should familiarise themselves with the general principles of allocation of DCD organs (section 5).

**REVISION HISTORY**

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<td>Deputy Secretary, Population and Public Health &amp;</td>
<td>Replaces GL2011_005. Amendments include: Revised terminology from “cardiac” to “circulatory” death. Changes to donor selection criteria. A statement regarding the donation of DCD hearts for transplantation. Changes in relation to the declaration of death including processes that are necessary after death before retrieval may commence. Use of a State-wide form for the certification of death in these organ donors.</td>
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<td>Deputy Director General Population and Public</td>
<td>Replaces GL2007_012. Amendments relate to lung retrieval following DCD</td>
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1 INTRODUCTION

1.1 About this document

Donation after Circulatory Death (DCD) (formerly referred to as Donation after Cardiac Death in New South Wales [NSW]) is an established pathway to multi-organ donation in a number of countries, including Australia.

DCD is a practice that is supported by international consensus statements and guidelines and the National Protocol for Donation after Cardiac Death, July 2010. This NSW guideline has been revised in accordance with the Australian national protocol and a review of evidence related to this practice.

This NSW Health guideline has adopted the term donation after circulatory death as it is consistent with international standards; is better aligned with the NSW Human Tissue Act 1983 definition of death for transplantation purposes; and is a more clinically accurate term for the process by which death occurs in these donors.

DCD is a practice that involves organ retrieval after a person has died where that person’s death has been determined on the basis of permanent cessation of circulation in their body (‘circulatory death’). This requires an initial decision by the patient’s treating team and family to discontinue cardio-respiratory support in a critical care setting.

This scenario differs from the pathway to organ and tissue donation where neurological criteria (‘brain death’) is the basis for declaring the patient deceased prior to proceeding with organ donation. Once death has been determined by neurological criteria, ventilation and circulation are maintained until time of organ retrieval.

1.2 Legal and legislative framework

Human Tissue Act 1983, (HTA)

S33 of the HTA provides that for the purposes of the law of NSW, a person has died when there has occurred:

(a) irreversible cessation of all function of the person’s brain, or

(b) irreversible cessation of circulation of blood in the person’s body.

S23 of the HTA allows for a designated officer of a hospital to authorise the removal of tissue from a deceased person’s body for the purposes of transplantation (or other therapeutic, medical or scientific purpose) where either:

- the deceased had given written consent to the removal in their lifetime or
- a senior available next of kin has given written consent, or consent by other prescribed means, to the removal of tissue after the person’s death and the deceased had not objected.
S23 (3)(a) allows a designated officer to consider information from relatives and friends that the deceased having previously registered an objection has subsequently indicated that they would like to donate.

S 37(2) and s37 (3) of the HTA makes it an offence for a person (including any health care professional) to disclose information that may lead to the identity of either a donor or a recipient becoming publicly known without their consent.

2 POTENTIAL DONOR CATEGORIES AND SELECTION CRITERIA

The ‘Maastricht’ categories for DCD have been developed as a way to categorise potential donors on a clinical basis and are widely accepted internationally.

Category I. Dead on arrival. Tissue (corneas, heart valves, skin, bone, etc.) can be recovered from category I donors or any individuals who die in a manner not suitable for solid organ recovery. Since there are no immediate time constraints to minimise tissue injury, there is no requirement for a precisely timed approach to tissue recovery.

Category II. Unsuccessful resuscitation (CPR). These are patients who suffer a witnessed cardiac arrest outside the hospital and undergo unsuccessful cardiopulmonary resuscitation (CPR). When CPR fails in a medically suitable organ donor, uncontrolled organ donation is an option.

Category III. Awaiting cardiac arrest following withdrawal of care. With the permission of the donor or donor family, organs may be recovered after death is declared from patients with irreversible brain injury or respiratory failure and in whom treatment is withdrawn. Death is declared after a predetermined period of circulatory arrest.

Category IV. Cardiac arrest after brain death. Rarely, a consented brain dead donor has a cardiac arrest before scheduled organ recovery. Such category IV donors should either proceed as for a normal multi-organ retrieval - if this has already started- or should be managed as a category III donor as appropriate to the circumstances of cardiac arrest.

Category V. Cardiac arrest in a hospital patient. This category is made up of category II donors that originate in-hospital.1

2.1 Donor categories: consent provisions in NSW and the use of pre-mortem procedures

Only category 3 and category 4 donors are permitted in NSW.

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2.1.1 Use of Pre Mortem Procedures in NSW

Pre-mortem procedures such as the use of some medications or bronchoscopy are permitted in some jurisdictions within Australia and internationally with the aim of maximising the quality and viability of the organs procured from a DCD donor. These non-therapeutic interventions are permitted in other states consistent with their state law (and the National Protocol for Donation after Cardiac Death, July 2010).

However, provision of consent to pre-mortem interventions by the ‘person responsible’ is not possible under the Guardianship Act 1987 (NSW). The Act requires that those providing substitute consent do so only for treatments that ‘promote or maintain the health and well-being’ of the person involved. Furthermore, consent for pre-mortem interventions is not within the powers of the Senior Available Next-of-Kin, under the Human Tissue Act 1983, as their consent has no authority until the person’s death.

2.2 Referral criteria

All patients who may be considered as potential DCD donors should be referred to the NSW OTDS for medical assessment of suitability for donation. This will include consideration of whether the patient may progress to death based on neurological criteria.

All the following referral criteria must be met:

- Patient identity is known
- The patient falls within Maastricht category 3 or 4
- Age:
  - Adults - up to 70 years age
  - Paediatrics- for infant and paediatric donor selection is based on weight (rather than age). Paediatric donors should weigh 3 kilograms or greater
- Expectation that death is likely to occur within 90 minutes.

Where there is uncertainty regarding the suitability of the patient as a potential DCD donor, expert opinion should be sought from the NSW Organ and Tissue Donation Service (NSW OTDS).

2.3 Patient management

2.3.1 Identification of patients who may proceed to DCD

The decision to withdraw cardio-respiratory support measures such as mechanical ventilation and/or inotropes and vasopressors must be made prior to, and independent of, any consideration of DCD. (See NSW Health Guidelines for end of life care and decision-making (GL2005_057).

Either the family or the treating team may raise organ and tissue donation as a potential end of life outcome.
2.3.2 Referral to NSW State Coroner and NSW Tissue Bank

Where the death of the patient is reportable to the Coroner, the investigating police (if applicable), forensic pathologist and State Coroner should be contacted pre-mortem by the NSW Organ and Tissue Donation Service (OTDS).

Potential tissue donation should be referred to the NSW Tissue Bank.

2.3.3 Preliminary evaluation of patient suitability for potential DCD donation

Organ donation is not appropriate if, in the judgement of the treating Intensivist, it is anticipated that a patient is likely to survive after withdrawal of cardio-respiratory support for significantly longer than 90 minutes.

This 90 minute timeframe reflects the limit of time after withdrawal of cardio-respiratory support in which the donation of any viable solid organs may be possible in DCD and will be referred to throughout this guideline for ease of reference. The specific time limits that apply to the donation of particular organs are outlined in section 4.2.

Accurately predicting the timing of death can be difficult, in that there will be occasions where a patient’s dying process takes longer than anticipated. The use of predictive algorithms to assess the likelihood of the patient dying within the 90 minute period is a matter for the treating Intensivist/s.

The patient is no longer suitable for organ donation if the patient does not die within the requisite timeframe (as applicable to the organs planned for donation). In this situation normal end of life care for the patient is continued. Tissue donation after death may still be possible.

2.3.4 Decision-making and consent

Discussion with the family regarding potential DCD must (to the extent possible) be separate from, and follow the discussion and decision related to withdrawal of cardio-respiratory support. Separating the discussion of withdrawal of cardio-respiratory support from the organ donation discussion is important for bereaved families and helps minimise any potential perception of conflict of interest on the part of any persons involved in the care of the patient or by the patient’s family.

A multidisciplinary team approach to managing end-of-life decisions with families should occur, as per the NSW Health Guidelines for End-of-Life Care & Decision Making. Other attending medical specialists should be informed where DCD is being considered.

Discussions with the family regarding withdrawal of cardio-respiratory support and DCD must be clearly documented.

Where consensus with the patient’s family about withdrawal of cardio-respiratory support cannot be reached, or conflict cannot be resolved, then consideration of the patient as a potential DCD donor is not appropriate.

Following discussion about potential organ and tissue donation and if there is agreement to proceed with donation after the patient has died, consent must be obtained.
If the patient has previously given written consent to donation through the Australian Organ Donor Registry, or other accepted means, the designated officer for the hospital may authorise donation in accordance with the Human Tissue Act 1983. This authorisation may be provided before death but becomes effective only after death has been certified.

If the patient has not previously given written consent to donation, the senior available next of kin must provide written consent to the donation, effective upon the person’s death, after which the designated officer may authorise donation, in accordance with the Human Tissue Act 1983. This authorisation may be provided before death but becomes effective only after death has been certified.

If the death falls within the Coroner’s jurisdiction (adult or child) then the matter must be referred to the Coroner for advice as to the appropriateness of potential donation (See 2.3.2). Donation in this context cannot proceed without the Coroner’s consent.

2.3.5 Comprehensive evaluation of the patient as a potential donor

The attending Donation Specialist Nurse will complete the necessary details in the Electronic Donor Record to facilitate risk assessment of the patient and assessment of individual organs and tissues for their suitability for transplantation.

Pre-mortem blood sampling including serology is permissible in NSW for the purposes of organ and tissue donation, for clinical assessment and to allow matching of potential recipient/s to the donor organ/s.

The Donation Specialist Coordinator (DSC) will contact the medical consultant on call for the OTDS to discuss the patient’s suitability as a donor.

The DSC will then refer clinical and risk assessment information to the relevant on call medical specialist for determination of medical suitability.

The management of any additional devices the patient may have in situ such as pacemakers and chest drains etc. should be considered in evaluating the patient.

2.3.6 Withdrawal of cardio-respiratory support

Responsibility for all end-of-life care should remain with the patient’s treating team.

Location

Retrieval of the liver and the heart requires minimal warm ischaemic time, as these organs are extremely sensitive to the effects of warm ischaemia. The optimal location of withdrawal of cardiorespiratory support life support for DCD therefore is the operating room environment.

On occasion withdrawal of cardiorespiratory support will need to occur in the ICU for logistical reasons.

Preparing the family
It is appropriate to allow the family to remain present while cardio-respiratory support is withdrawn and until the patient’s death if that is the family’s preference, regardless of the location of treatment withdrawal.

The family should be informed that medications given following withdrawal of cardio-respiratory support are to keep the patient comfortable.

The family should be prepared for the speed with which procedures will need to commence after the patient’s death.

Clinical management

The focus of management for the patient and family at this stage should be on good end of life care. Any pain or distressing symptoms following withdrawal of cardio-respiratory support may be managed with analgesia and sedation. These medications should be titrated to obtain the appropriate clinical effect of patient comfort.

Potential donors who are on Extracorporeal Membrane Oxygenation (ECMO) should have the ECMO withdrawn along with other cardio-respiratory support.

Following the withdrawal of cardio-respiratory support, monitoring of arterial blood pressure, heart rate and oxygen saturation should continue as this can assist in establishing death.

2.3.7 Declaration of Death

The Australian New Zealand Intensive Care Society Statement on Death and Organ Donation specifies that death will be determined to have occurred when all the following features are present:

- Immobility;
- Apnoea;
- Absent skin perfusion; and
- Absence of circulation as evidenced by absent arterial pulsatility for a minimum of two minutes, as measured by feeling the pulse or, preferably, by monitoring the intra-arterial pressure.

When all of these criteria have been met, the patient is determined to be dead and retrieval surgery may proceed.

Death should be certified by a medical officer, other than a member of the organ retrieval or transplant team using the form at Appendix 1.

Interventions, such as reintubation of the lungs should not be instigated until after death has been declared

The appropriate authorisations are then obtained and documentation finalised (see section 4.1). This short period of time may be used by the family to say goodbye.

Once all documentation is finalised the retrieval surgery phase may commence.

All significant time-points, including the time of death, the period after death, and commencement of organ retrieval must be accurately documented in the patient notes and formal DCD data sheet (sample at Appendix III).
2.3.8 Death and the use of DCD hearts for transplantation

It is the terminal pathology within the patient’s body that causes the heart and circulation to cease. Given that resuscitation is not appropriate for a dying person in this circumstance, when the circulation does cease and there is an absence of circulation for two (2) minutes, the circulation is considered to have irreversibly stopped and death is then certified. Although it may be technically possible to restore the arrested circulation, it should not and therefore must not be restored in this context.

There are no legal barriers to using hearts removed from DCD donors for transplantation provided death of the patient is declared consistent with the law in NSW.

2.3.9 Counselling

Counselling support should be offered to the family, as required, and in accordance with usual hospital procedures. Following DCD, the family should be offered bereavement aftercare via the Donor Family Support Service as facilitated by OTDS.

If required, staff members should be offered counselling support.

3 CONSIDERATION OF SPECIFIC ISSUES FOR PAEDIATRIC DCD

Paediatric organ donation following circulatory death is an uncommon event. During this process the best end of life care for the dying child and the family is paramount. As it is an uncommon event, paediatric centres should aim to develop a common protocol consistent with this Guideline. Care and attention should be placed on:

- Appropriate patient identification
- Provision of information to the family

Ideally, paediatric DCD will occur in facilities that have paediatric expertise to guide the process. Consideration may need to be given to potential transfer of patients from an adult facility to a paediatric facility. If transfer is not deemed suitable, as in the case of an older child or teenager, then support from a paediatric specialist for end of life care should be considered.

4 RETRIEVAL SURGERY

It should be noted that the nature of the surgical process is dependent on whether renal only retrieval versus multi-organ retrieval is to be performed.

4.1 Pre-operative phase

After death has been declared and prior to retrieval surgery commencing, the following need to occur as expeditiously as possible:

- completion of essential documents related to death certification and authorisation of organ donation(as described in section 2.3.7)
- family leave taking
• transfer to Operating Theatre in some circumstances
• reintubation of the donor without ventilation
• transfer onto the operating table (if required).

4.2 Intra-operative phase
The surgical retrieval process is partly dictated by which organs are to be retrieved:
• liver, pancreas and heart retrieval may occur if death occurs within 30 minutes of the withdrawal of cardio-respiratory support
• renal retrieval may occur if death occurs within 60 minutes of the withdrawal of cardio-respiratory support
• lung retrieval may occur if death occurs within 90 minutes of the withdrawal of cardio-respiratory support.

For multi-organ retrieval, an ultra-rapid laparotomy is performed in tandem with a sternotomy. The aim is to cannulate the aorta and, if necessary, the pulmonary artery to initiate preservation solutions as required. The thoracic aorta is cross-clamped and the right atrium vented. Heparin is added to the preservation solution.

Topical cooling of the thoracic and abdominal viscera with saline slush is also performed, as required. Once organ flushing with preservation solution has occurred, the surgical procedure continues as for a standard multi-organ retrieval, or as a renal only retrieval depending on the circumstances.

Liver retrieval generally will not be possible when the time from cessation of circulation to organ preservation is greater than 10 minutes.

The commencement of ECMO to simulate physiologic function as a post-mortem donor management tool (such as augmentation of oxygen delivery to re-perfuse organs) is not permitted in NSW at this time.

Assessment of the quality of organs from DCD donors should use the same criteria as assessment of organs from donors determined dead by neurological criteria. This includes an intra-operative assessment of the adequacy of perfusion with the preservation solution along with identification of any abnormalities.

4.3 Post-operative management of the donor
Families should be offered the opportunity of viewing the patient’s body after donation.

Following retrieval surgery, the donor’s body should be transported to the facility’s mortuary or other suitable viewing area to facilitate this if requested by the family.

If the death falls within the Coroners jurisdiction (adult or child), the formal identification of the deceased for the purposes of coronial jurisdiction may also occur in the mortuary or other suitable viewing area.

If the donor has consented to tissue retrieval, the NSW Tissue Bank should also be notified of the completion of solid organ retrieval surgery.
5 GENERAL PRINCIPLES OF ALLOCATION OF DCD ORGANS

Allocation of DCD organs should be in (general) accordance with TSANZ allocation protocols.

Consideration should be given to the fact that organs retrieved from DCD donors will have been subjected to varying periods of warm ischaemia. Additionally, it is recommended that cold ischemic times (CIT) be minimized and while this does not preclude DCD organs from being offered to interstate recipients, the potential increased CIT should be taken into account.

Information provided to a potential recipient of a DCD organ at the time of wait-listing and/or when obtaining their consent to transplantation should include the potential implications of receiving a DCD organ (e.g. delayed graft function).
6 ATTACHMENTS

APPENDIX I: DOCUMENTATION OF DEATH DETERMINED BY CIRCULATORY CRITERIA: STATE FORM

APPENDIX II: OVERVIEW: DONATION AFTER CIRCULATORY DEATH: PROCESS

APPENDIX III: ELECTRONIC DONOR RECORD: DCD FLOW SHEET
APPENDIX I: DOCUMENTATION OF DEATH DETERMINED BY CIRCULATORY DEATH

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Under the law in NSW, a person has died when there is irreversible cessation of circulation of blood in the person’s body (s 33 Human Tissue Act 1983).

For the purposes of organ donation after circulatory death (DCD), death will be determined to have occurred when the attending intensivist or other designated doctor determines that there is irreversible cessation of circulation of blood in the person’s body. The doctor must certify that A and B have occurred and all of the features in C are present.

**A.** Intensive therapies (including endotracheal tube, ventilatory support, inotropic support) were withdrawn at ________ hrs (24-hour clock) on __/__/____.

**B.** I have determined by the absence of vital signs that death has occurred.

**C.** All of the following features were present:
- Immobility
- Apnoea
- Absent Skin Perfusion
- Absence of pulsatility on the arterial line of at least 2 minutes duration or
- Absence of pulse by palpation of at least 2 minutes duration

Death occurred at ________ hrs (24-hour clock) on __/__/____.

Doctor (print name):

Designation:

Signature:

*(adapted from the Australian New Zealand Intensive Care Society. The ANZICS Statement On Death And Organ Donation edition 3.1 2010)*
APPENDIX II

OVERVIEW: DONATION AFTER CIRCULATORY DEATH: PROCESS

- Patient with irreversible cardiorespiratory or neurological injury
  - Decision to withdraw cardiorespiratory support
    - Family conversation
      - Decision to proceed with donation after circulatory death
        - Transfer to Operating room environment for withdrawal of cardiorespiratory support.
          - Withdrawal of cardio-respiratory support
            - Cessation of circulation
              - 2 minutes observation of absent arterial pulsatility from cessation of circulation
                - Death is declared
                  - NB: Where withdrawal of cardio-respiratory support does not occur in OT, rapid transfer to OT is required
                    - Pre operative phase commences
                      - Intra operative phase
                        - Post operative phase
    - If death does not occur within timeframe organ donation does not proceed.
      - Continue end of life care until death occurs
        - Tissue donation possible
**APPENDIX III: ELECTRONIC DONOR RECORD: DCD FLOW SHEET**

![DCD Flow Sheet](image)

- **Organ OR / POST**
  - **Location of WCRS**
  - **Mode of WCRS**
    - Extubation
    - Removed from ventilator but not decanulated
    - Inotropes ceased
- **Withdrawal of Cardio Respiratory Support**
- **Onset of warm ischaemic time (SBP < 50mmHg)**
- **SpO2 < 50%**
- **Cessation of circulation**
- **Declaration of death**
- **Date**
- **Time**

![Graph](image)

- **Respiratory Rate**
- **SaO2 %**

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### Intraoperative management

**Hospital information**

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National Protocol for Donation after Cardiac Death. Australian Organ and Tissue Authority 2010

Pediatric Organ Donation and Transplantation. Committee on Hospital Care, Section on Surgery, and Section on Critical Care; *Pediatrics* 2010; 125:822–8


8 GLOSSARY:

**Cold ischemic time (CIT):** The period of time when an organ is cooled with a cold perfusion solution after retrieval surgery, until the tissue reaches physiological temperature during implantation procedures.

**Designated Officer (DO):** A Designated Officer is
- In relation to a hospital, a person appointed under s5(1) (a) of the *Human Tissue Act 1983*, to be a Designated Officer for the hospital, or
- In relation to a forensic institution, a person appointed under s5(1)(a) of the *Human Tissue Act 1983*, to be a Designated Officer for the forensic institution

**Senior Available Next of Kin:** The hierarchy of Senior Available Next of Kin is defined in S4 of the *Human Tissue Act 1983*. In relation to a deceased child it is:
- Parent of the child;
- Sibling of child who is 18 years of age or over where a parent is not available; or
- Guardian of the child at the time of death where none of the above is available.
  
  However, where the child is in the care of the state specific provisions for consent to organ and tissue donation apply (see *Human Tissue Act 1983*).

In relation to any other deceased person a Senior Next of Kin is a:
- Spouse (which can include a de facto spouse and same sex partner);
- Son or daughter of the deceased person (18 years of age or over) where above is not available;
- Parent where none of the above is available; or
- Sibling of the deceased person (18 years of age or over), where none of the above is available.

**Warm ischemic time (WIT):** Is variously defined as either the time from WCRS to commencement of cold preservation solution; the time from arrest until cold flush or regional perfusion of organs or the time from when systolic blood pressure ≤ 50mmHg to the commencement of cold perfusion.

**Withdrawal of Cardio-respiratory Support (WCRS):** Withdrawal of cardio-respiratory support is defined as the cessation of cardiac and ventilatory support. The withdrawal of ventilatory support includes the removal of the endotracheal tube or the tracheostomy tube. The withdrawal of cardiac support most commonly refers to the cessation of inotropes and vasopressors but could also include the cessation of intra-aortic balloon counter pulsation and/ or extra corporeal membrane oxygenation.

**Extra Corporeal Membrane Oxygenation (ECMO):** A technique providing both cardiac and respiratory support oxygen to patients whose heart and lungs are so severely diseased or damaged that they can no longer serve their function.