Proposal for blood utilisation for donor organ retrieval, *ex situ* perfusion and preservation technologies

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Definitions:

1. **Direct procurement and perfusion (DPP) of heart/lung** – DCD heart/lung retrieval is undertaken rapidly and the organs placed on portable perfusion technology(ies) using donor blood. Abdominal procurement is undertaken as standard with cold perfusion.
2. **Thoraco-abdominal NRP (TANRP)** – NRP of thoracic and abdominal compartments, restarting the heart *in situ* prior to procurement. This is similar to a DBD donor procurement.
3. **NRP** – abdominal normothermic regional perfusion
4. **Donor blood** – this refers to the donor's own circulating blood.
5. **Bank blood** – blood that is crossmatched to the donor (for technologies used at the donor centre) or recipient (for technologies used at the recipient centre).

Background

- The approach to DCD retrieval is evolving, with an increased utilisation of abdominal normothermic regional perfusion (NRP), or extended thoraco-abdominal NRP to include heart and lung retrieval. NRP recirculates the donor blood to establish the extra-corporeal circuit and throughout the duration of perfusion, prior to cross-clamping and cold perfusion.
- At the same time there has been an increased utilisation of novel *ex situ* preservation and perfusion technologies for heart, lung, liver and kidneys donated for transplantation in the UK.
- Some of these approaches utilise a normothermic approach and therefore require access to blood to prime the circuit and perfuse the organ, immediately after retrieval at the donor centre.

It is, therefore, important to avoid any potential competing interests for access to donor blood and establish the need for banked blood products availability at the donor hospital for all new perfusion technologies.

Working principles

- The retrieval process and technique should not be compromised by the use of the *ex situ* technologies (for example if abdominal NRP is utilized, donor blood should not be taken for *ex situ* technologies until completion of NRP).
- *Ex situ* perfusion should utilise allogeneic blood, or use donor blood only after circulatory arrest and NRP have finished.
- This document should be used by the SNOD and retrieval teams to ensure a smooth process at the donor hospital

The indicative amount of blood required during **donor surgery (table 1)** and **organ specific *ex situ* perfusion/preservation technology (table 2)** is illustrated below.

Donor and retrieval technique	Blood requirement	ABO and Rh type
DBD	None	
DCD with abdominal NRP (no CT component)	4 units RBC	Donor typed
TANRP DCD	4 units RBC	Donor typed
DPP heart/lung with abdominal NRP	4 (for DPP) + 4 (for NRP) = 8 units RBC	Donor typed
DPP DCD	none	

Table 1. Indicative amount of blood required, source and ABO/Rh type for the donor procedure according to the type of planned organ procurement technique.

Organ	Retrieval type	Blood requirement	ABO and Rh type
Heart	DBD With *ex situ* perfusion	Donor blood taken immediately prior to cross clamp or 4 units RBC*	Donor typed
Heart	DCD TANRP with *ex situ* perfusion	Donor blood taken at end of NRP phase immediately prior to cold perfusion; or 4 units RBC*	Donor typed
Heart	DCD DPP with *ex situ* perfusion	Donor blood taken immediately prior to cold perfusion or 4 units RBC*	Donor typed
Heart	DCD DPP of heart with *ex situ* perfusion and abdominal NRP	8 units RBC*	Donor typed
Lung	DBD with *ex situ* perfusion	Donor blood taken immediately prior to cross clamp or 4 units RBC*	Donor typed
Lung	DCD TANRP with *ex situ* perfusion	Donor blood taken immediately prior to cold perfusion for the heart, (end of NRP phase) 4 units RBC for the lungs* (4 units for lung +4 units for heart if donor blood not used)	Donor typed
Lung	DCD DPP *ex situ* perfusion	Donor blood taken immediately prior to cold perfusion or 4 units RBC*	Donor typed
Lung	DPP lung with abdominal NRP	4 + 4 = 8 units RBC*	Donor typed
Liver	DB All DCDs	4-6 units RBC#	Donor typed (if liver placed on machine at donor hospital) Donor and recipient compatible (if liver

			placed on machine at recipient hospital)
Kidney	DBD All DCDs	1 unit RBC	Donor and recipient compatible

* Organ priorities may apply if more than one ex-situ technology is to be used for organs from the same donor / # - depending on the ex-situ machine used

Table 2. Indicative amount of blood required, source and type for *ex situ* perfusion and preservation technologies.

- The use of allogeneic blood should comply with all current regulations for testing and safety and its use should be clearly recorded in the paperwork accompanying the organ as well as the donor notes (where appropriate).
- If the type of the retrieval procedure allows for the use of donor blood and if several *ex situ* technologies are to be used for different organs, it is unlikely that the donor blood volume will be insufficient to accommodate the use of all these devices. In these cases, a suggested organ priority strategy is proposed below.
- It is likely that during NRP DCD retrieval, allogeneic blood will be administered to the Donor. Allogeneic blood should be used for all *ex situ* perfusion of organs retrieved before completion of NRP. At the completion of NRP, donor blood use will be prioritised according to Figure 1.

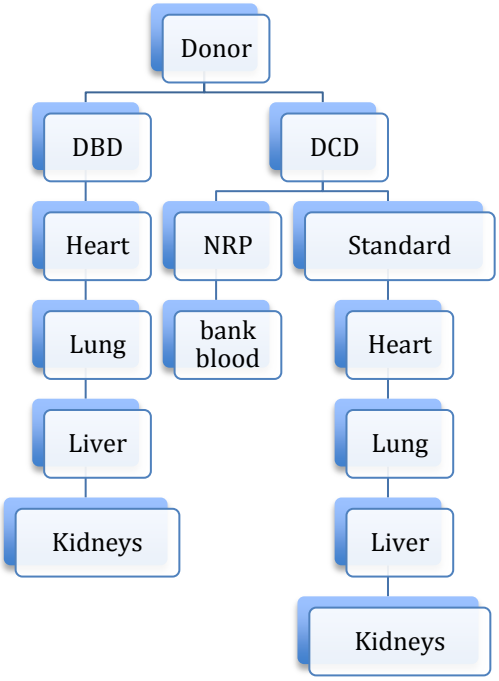

Figure 1. Suggested organ priority for allocation of donor blood when the type and technique of organ retrieval allows it and several technologies are to be used.