Peer Review File
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Review Comments
Reviewer A

Major Comments

Comment 1: There is a good paper in here, and often includes an excellent summary of topic areas, but becomes overwhelming with too many ideas and currently, lacks a clear coherent narrative goal. I am confident you as authors can improve without a large amount of additional work.

My major comments are therefore given to aid you as authors to tighten what is already a reasonably good paper.

I was left unsure who the audience of the paper was for. Republic of Ireland? Are your audience clinicians in the ROI or wider?

Reply: This was intended as a broad review to try present the evidence for a change in practice which we are trying to adopt. In Ireland in common with 17 other countries worldwide cDCD is the only form of DCD practiced and therefore we have concentrated on this process *(Dominguez-Gill ICM 2021).* What we hope to achieve is to encourage people towards DCD in the first instance by presenting a balanced viewpoint. We have added the following to try engage the reader

> *The target audience are healthcare professionals, from those may have a superficial knowledge of DCD, to those working in Intensive Care Medicine or Transplantation, to finally, people in a position to implement change within their own healthcare community*.

Comment 2: As sentences like "DCD is not a common process or end of life care pathway in the intensive care unit (ICU) and healthcare professionals are justifiably wary of the unfamiliar."
Is simply not true in the UK or Netherlands or Spain. In the UK more families consent to DCD than DBD (but because not all DCD proceeds the number of actual donors is less).
The paper would benefit by explaining who you are writing for?
Similarly, this sentence, "It is a difficult process which has not been adopted worldwide."
Majority of countries in the world do not do DBD either, so what is your point here?

Reply:
Globally, DCD is not a common process, and while this may not be the case in the countries as mentioned, a significant number of readers may not have encountered DCD. We believe this is a valid point to make, even if exceptions to this exist (Netherlands, Spain)

In Europe DCD is practiced in 18 countries, 8 countries uDCD and CDCD, 4 countries cDCD and 6 uDCD only. While the UK ranks 4th Across Europe for donation of organs Ireland ranks 15th, (Roadmap B Dominguez Gill). We are significantly down the ranks in terms of donation rates and have much to learn. It is important to frame the situation, Germany does not do DCD, Australia and Canada don't do NRP though hopefully this will change with Sam Shemie's recent paper and surrounding work.

While we have advocated for DCD for some years now, our rates of donated organs from DCD are poor, Rates of stand-down are low because only in the most definite of cases are DCD's being considered. While the target audience is international, a peer reviewed publication by local authors does add weight to our efforts to gain acceptance on a national stage.

Per Million Population	*2018*	*2019*	*2020*	*2021*
ROI	0.8	1.5	1.4	1.6
UK	9.3	10.3	6.4	8.3

Commment 3: Is the purpose of your paper to commence or increase DCD in countries without an already well-established program and give reassurance? I think it is. Because the paper has less to say to those with established DCD programs, as you often argue for things that are well established in these countries. The paper would benefit from a clearer narrative goal.

Reply: The purpose of this paper is to try publish a broad balanced document, exploring areas of contention within DCD, to lead into Normothermic regional perfusion.

Comment 4: The paper is so broad in scope that at times it can start to ramble and, at other times, ***unsubstantiated comments or value judgements creep in***. Please look to tighten these areas.

Reply:

Line 71: Life saving organs- a bit value laden – deleted

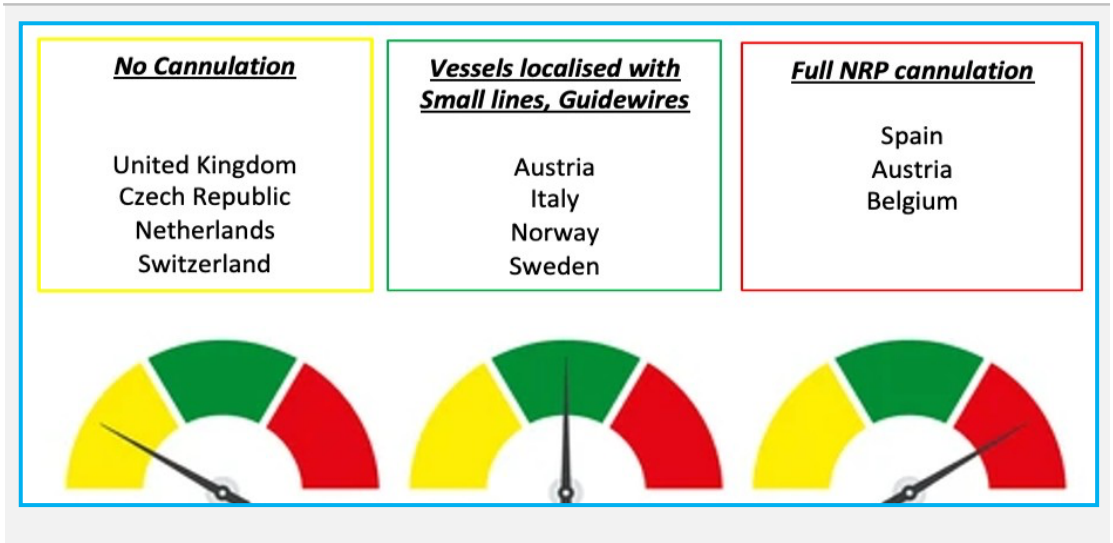
On reflection, we have omitted the reference relating to the Spanish paper by A Mateos-Rodriguez (67). The paper presented the practice of uDCD in Spain and within the commentary of our initial draft the duration of CPR and the fact that a decision was made to transfer to a transplant facility with CPR but without medications. It raised questions about the appropriate duration of CPR, when is irreversible, truly irreversible. While the point we raised was a valid criticism, your points relating to the ERC guidelines and prolonged CPR following

thrombolysis for suspected PE, eCPR and special situations make the point more succinctly. Therefore we have redrafted to include the points you raised

Third, although the term "unworthy of living" is a direct quotation from the paper by W Heide in relation to cDCD (64), your interpretation for the reasons why the German Ethics committee have repeatedly rejected the concept of NHBD is much more correct. Therefore we have addressed this and omitted this comment and corrected the paper on this point. We have inserted the following into the text

> *"In an article titled "Non-Heart Beating Donors sind nicht geeignet" (non heart beating donors are ineligible) the author outlines reasons why the German Medical Association (BÄK) guided by the German Ethics Council have repeatedly rejected the concept of DCD, consequently, the only type of deceased donation which may occur in Germany is DBD. There are several reasons for this, while they argue that the diagnosis of brain death is an extremely safe diagnosis, they argue on the other hand that DCD involves uncertainty. In Maastricht Categories 1 and II (uncontrolled DCD) , when does irreversible become completely irreversible ? While informed by protocols and expert opinion there cannot be 100% certainty that resuscitation becomes irreversible at even 30, 60 or 90 minutes. Maastricht Category III (controlled DCD) was also deemed unsatisfactory for several reasons: when can medically administered therapies to sustain life be deemed inappropriate with absolute certainty ? After how many minutes of circulatory arrest is it appropriate to diagnose death and proceed with organ donation ? Could the decision to withdraw life sustaining therapies be influenced in any way by the potential for organ donation?"*

Third: We have deleted Figure 5 below, The speedometers could be misinterpreted as yellow - afraid, green OK, red a bit cavalier, Instead we have mentioned Spain only and discussed practice in other countries rather than a more detailed presentation of other countries.



Comment 5: Ideally, I suggest you lose 10% of your words. And yes, I hate it too, when reviewers say this to me; but for this paper, it will certainly aid its readability.

Reply: We have chopped pieces out, and tried to improve the clarity of several other areas throughout the document. The addition of the methods section has added words. We hope that the reviewers will agree that although we haven't been very successful in shortening the manuscript, the introduction has tried to sharpen the objectives, a section was added to explain Maastricht 5. One area we did identify was much more technical in nature in the cannulation piece, where we would be happy to drop details of the type of rail wire and cannula sizes. We can delete this section should the reviewer think too much.

Comment 6: Normothermic regional perfusion is, in the end, only a small part of your paper. The title is therefore misleading. The title should summarise the goal of the paper.

Reply: We have dedicated a large portion of the paper to normothermic, with substantial re-organisation, we believe this is more evident. We have amended the title of the paper as per as per editorial suggestion.

Comment 6: The NRP section of the paper just begins, almost unheralded at the end of the paper. As a reader it was surprising as there was no logical build up to it. Then the conclusion is only about NRP which has not been the major focus throughout.
If this was a paper designed specifically to promote NRP, it fails.
If it was a paper to promote DCD, it succeeds.

Reply: We have made major changes to the paper, what was previously a disorganized selection of topics relating to DCD and NRP has hopefully changed to a more focused discussion of the obstacles faced in DCD in general, the options for preservation and evidence to support the adoption of NRP. We have added paragraphs on the use of ex-situ machines. Finally we have placed particular emphasis on the most recent criticisms of NRP, those statements by the American College of Physicians, Capron and Glazier and the article by Harry Peled and James Bernat. We have included as suggested the papers by Sam Shemie on the brain-based definition of death.

Additionally, I found the NRP section is not to the same quality as previous sections. The cannulation section is just a few quotes from different papers without a real analysis.
Your recommendations for safety in isolating the cerebral circulation are also mixing techniques of balloon and clamp occlusion. It does not make sense as written to those who know there are two techniques.

Reply: We have improved the quality of the Aortic cross clamp section, this is an important point, We have amended Figure 4: two options 4a and 4b for clarity: 4a Balloon and wiring lumen for the measurement of pressure and in 4b External clamp and DLP cannula,

Comment 7: I think at times you overstate the scientific evidence base and give a free pass on what is actually poorly evidenced practice and borders on surgical wishful thinking.

Example: "The reasons for this are not a lack of scientific evidence of efficacy, but are rather cultural, ethical and legal in nature."

Liver yes. Heart maybe, Kidneys not really. Lungs no.
Similarly, Page 3 Line 80: "DCD organs are prone to early graft dysfunction, increased reintervention rates and frequently result in inferior outcomes when compared with DBD organs."- for livers and pancreas yes, but not for kidneys, lungs or hearts. Delayed graft function in kidneys is 'effectively' ignored as a metric of importance, in countries with well-established DCD programs. Long term outcomes equal DBD and DCD kidneys, lungs may even be better DCD.

Reply: While we agree that there is a lack of blinded randomized trials between DCD and DCD-NRP. Most studies are retrospective, have small numbers are limited by heterogeneity and have scored at risk of significant bias. However, the evidence as outlined in tables 4-6 does seem convincing. Since the first draft of this manuscript, the paper by Oniscu et al has been published, 35% less DGF and improved GFR at 1 year (possibly leading to an additional year of graft function at the other end) is compelling. Oniscu also makes this point in the Webinar from ESOT on the adoption of NRP (reference 69).

From our own perspective we believe the evidence for using NRP to support a renal program is reasonable. Generally, in cDCD, less DGF and improved GFR at 1 year cannot be dismissed lightly. Our rates of DGF in DCD are 36% (DBD 18%) in a previous publication, while one might argue this is a good number, it really reflects a reluctance to consider anything higher risk on the part of our retrieval teams. Opportunities are wasted where a WLST to theatre time of 30 minutes is given by retrieval teams, where a timeframe such as this is placed, there is undue pressure on ICU and most of us would just avoid trying in these circumstances. In our hospital DBD transplants have an inpatient stay of 8 days, DCD recipients stay 14 days. This can be a significant resource issue, if we had NRP and regardless of whether we used the WIT or fWIT, time becomes less of an issue and then the consequent reduction in DGF will engender support from renal and transplant clinicians.

While several countries have an excellent potential donor audit, our own audit has been limited. we believe there are missed opportunities for donation. The fear of stand-downs or for those who have had a DCD stood-down, their ability to influence the future cannot be under-estimated. NRP allows relaxation of time-constraints which does influence a persons willingness to propose DCD.
We are trying to progress the case for renal NRP in the hope that hepatic NRP will gain momentum, we believe that liver NRP will follow where there is an established program. We have referenced Van der Hilst CS et al (14) which estimated the additional cost of a DCD liver to be 20,000.

Kidney transplant Medicare payments and length of stay: associations with comorbidities and organ quality Gerardo Machnicki	We confirmed previously reported OPTN factors associated with higher Medicare payments or LOS, such as longer duration of dialysis before transplant, African American race, and use of a DCD [2, 8]. Type
Agence De Bio Medecine *Maryne Lepoittevin*	*3.2. Optimization of organ collection* *Regarding DCD-MIII, the quality of procured organs can first be optimized by systematically reconditioning abdominal organs with NRP.* *According to the ABM, this is **strongly recommended** for renal collection, but is only mandatory for liver and pancreas.*
The increased costs of donation after cardiac death liver transplantation: caveat emptor ***Coleen Jay***	**Conclusions:** Higher rates of graft failure and biliary complications translate into markedly increased direct medical care costs for DCD recipients. These important financial implications should be considered in decisions regarding the use of DCD livers

We agree Lung DCD outcomes are equal and do not benefit from DCD-NRP. This said the increased incidence of anastomotic strictures is a notable concern. From a purely financial perspective where Thoraco-Abdominal NRP is used with DCD and the heart allowed restart, then viability assessments may be conducted. The ex-situ disposables or "rig" for the Transmedics device costs 75000 Euro. (Harry Peled)

We have amended Page 3 line 80 to qualify this statement

Comment 8: Similarly, "In effect, NRP changes the period of warm ischaemia into a period of ischaemic pre-conditioning followed by reperfusion and oxygenation of the organs (figures 3 & 4)."
The pre-conditioning is a theory not proven.

More accurate I suggest, “In effect, NRP changes the period of warm ischaemia into a period of theoretical ischaemic pre-conditioning followed by reperfusion and oxygenation of the organs (figures 3 & 4).” Or just delete the pre-conditioning aspect. We have been here before in anaesthesia in other areas of claiming a role for pre-conditioning to little real eventual evidence.

Reply: In light of your comments we have deleted the reference to pre-conditioning.

Uncontrolled DCD

Comment 9: “The Uncontrolled categories of DCD (Maastricht 1 and 2) are frequently criticized because some would argue the appropriate duration of resuscitative efforts. Permanent and irreversible circulatory death are determined on the basis that patient cannot be resuscitated.”
- the first sentence does not make grammatical sense.
The second sentence is incorrect from the literature on this debate. Irreversible is generally define as ‘cannot return’. Permanent is ‘will not return’ (either because there is a decision to stop CPR, not attempt CPR and the period where autoresuscitation may occur has passed.
- while your reference 67 caused some stir at the time, countries like Spain all practice only Maastricht II now. CPR is continued to hospital and death determined in the Emergency Department. This may or may not be with resuscitation drugs from the community in transit to the donation hospital; so that part of the criticism does remain.

David Rodriguez-Arias’criticism in the Lancet ‘Protocols for uncontrolled donation after circulatory death.’ Lancet 2012;379:1275–6 is more compelling.

Reply: We have amended this section. We have referenced the David Rodrigeiz Arias paper and dropped the reference by Mateos-Rodriguez,
We have added criticism, have all resuscitative efforts been tried, PCI, eCPR, ECMO as a bridge to life support devices. IABP, thrombolysis where suspicion of MI is first on list

Comment 10: “The principal criticism of controlled DCD (cDCD) is that life sustaining therapies have been withdrawn in patients prematurely, the term “unworthy of living” is very emotive and provocative (64).”
This is not the principal criticism, and you use a very odd reference. The principal criticism is that the donor is not dead at 2,5, 10 mins as with CPR (or ECMO) they are reversible. What you have outlined is a criticism, but it is linked typically with conflicts of interest concerns.

Reply: Apologies you are correct, we have amended the statement to reflect your point in this regard.

Comment 11: Autoresuscitation
“The time of death in many guidelines is based on international experience recommendations with respect to the potential for autoresuscitation also known as the Lazarus Phenomenon.

"Lazarus rose from the dead without resuscitation attempts, there are no case reports of it occurring in someone who has died without CPR performed beforehand" (68)
- This makes no sense when placed against the NEJM paper, where autoresuscitation in this context did occur, just not after five minutes.

Reply: Good point, we have deleted the point about Lazarus, while it is a direct quotation. We have revised this section, Zorko, Shemie, and Hornby et al have published the most up to date data on this published in a large systematic review from May 2023.

Comment 12: "To summarise, the diagnosis of death must meet 2 criteria, permanence and irreversibility, an accepted definition is outlined below:

> *"Death is the permanent loss of capacity for consciousness and all brainstem functions. This may result from permanent cessation of circulation or catastrophic brain injury. In the context of death determination, 'permanent' refers to loss of function that cannot resume spontaneously and will not be restored through intervention"*

This is mistaken and what you are saying makes no sense. You say must meet two criteria: permanent AND irreversible. Then you quote a definition that only uses one of these criteria - permanent. The whole debate on this topic is BETWEEN permanent and irreversible. Those that support DCD accept permanent. Perhaps one might argue in Italy they wait 20 mins so they can apply both. But with ECMO-CPR, even 20 mins looks like permanence.

Reply: We have amended this piece in consideration of your comments, we have added the section below to qualify the preceding statement, hopefully more correctly, (all mostly copied from Shemie et al 2014, but also including the most recent updated Canadian guidelines for the diagnosis of death)

The "irreversible" component within the definition is somewhat more open to interpretation: in the context of death determination in DCD, "irreversible" may mean (a) the loss of function that cannot be restored now or at any time in the future, or (b) the loss of function that cannot be restored by those present at the time, or (c) the loss of function that will not resume and will not be restored. In the context of DCD, once the period where autoresuscitation is possible has passed and provided that no attempts will be made to restore circulation as in (c), then the permanence criterion has been satisfied and death may be diagnosed.

Comment 13: Heparin is prohibited pre-death in UK and NSW (Australia). Only recently was it permitted in the Netherlands. I think without recognising this I am not sure why you even include this section.

Reply: I think there is variability in practice, we believe antemortem heparin merits discussion, there is considerable evidence to support the use of heparin in Liver and pancreas transplantation, I believe were the UKDEC committee still working then it could be in use routinely (recommendation No 32, UKDEC 2011), international position presented briefly below.

USA

Administration of intravenous heparin at the point of the WLST is the current standard of care. There are no reported cases of heparin administered at this time hastening death.

The American Association for Thoracic Surgery 2023 Expert Consensus Document: Adult cardiac transplantation utilizing donors after circulatory death
Jacob N. Schroder, MD,a Sarah Scheuer, MD, PhD,b Pedro Catarino, MD,c Arthur Caplan, PhD,d Scott C. Silvestry, MD,e Valluvan Jeevanandam, MD,f Stephen Large, MD, PhD,g Ashish Shah, MD,h Peter MacDonald, MD,b Mark S. Slaughter, MD,i Yoshifumi Naka, MD, PhD,j and Carmelo A. Milano, MDa

Australia

"In Australia, the permissibility of antemortem heparin varies between ICUs and states. This variability is due in part to the complex ethics surrounding DCD transplantation and to the dearth of scientific evidence to support a practice of antemortem heparin administration".

Joshi Y, Villanueva J, Gao L, et al. Donation After Circulatory Death: A New Frontier. Curr Cardiol Rep. 2022 Dec;24(12):1973-1981. doi: 10.1007/s11886-022-01798-y. Epub 2022 Oct 22. PMID: 36272050; PMCID: PMC9747832..

ANZICS 2021 4.1

Retrieval-related antemortem interventions in Australia

In Australia, the AOTA national protocol and the NHMRC ethical guidelines on organ and tissue donation support antemortem interventions to maintain organ viability under the following circumstances, providing there is no legal impediment:

- **administering heparin (e.g. 25,000 units [or 300 u/kg]) to prevent small-vessel thrombosis — if there is any concern than heparin may foreshorten the patient's life, the heparin can be given when the patient is apnoeic.**

Antemortem interventions are not currently permissible in NSW because the necessary conditions for consent by donors are not present, and the laws relating to substitute consent do not have the scope to enable non-therapeutic procedures in incompetent patients. However, a process of review is underway. The wording of relevant acts elsewhere in Australia considers the best interests of the individual and published ethical and legal opinion contends that antemortem procedures are supported by such consideration.

Retrieval-related antemortem interventions in New Zealand

> In New Zealand, the ODNZ national protocol requires the informed consent of the family for antemortem interventions of no benefit to the patient, including the administration of heparin 300 u/kg at the time of withdrawal of treatment.
>
> *Statement on Death and Organ Donation 2021 4.1*

There are a number of optional interventions that may be undertaken to either assist with assessing organ quality (e.g. bronchoscopy) or to improve organ viability (e.g. administration of heparin).

> *National protocol for donation after cardiac death.* Melbourne: Australian Organ and Tissue Donation and Transplantation Authority 2010.

Europe

	Belgium	France	Italy	The Netherlands	Norway	Spain
	DO_2/VO_2 relationship				8-10 g/dL: Heparin to maintain activated clotting time >350 s	depending on activated clotting time
Ante mortem interventions	Heparin (300 IU/kg), prior to WLST: Guidewires for femoral vessel localisation: Cannulation may be performed, if donor hospital policy permits	Heparin (20000 IU or 300 IU/kg), prior to WLST: Guidewires or catheters for femoral vessel localisation allowed	Heparin (300 IU/kg), after onset of functional warm ischaemia: Guidewires for femoral vessel localisation allowed	None	Heparin (5000 IU), during agonal phase; Small-bore catheters for femoral vessel localisation allowed	Heparin (3 mg/kg), prior to cannulation or WLST: Femoral cannulation may be performed, if donor hospital policy permits

UK

- **Heparin in the donor before circulatory arrest**

Maastricht 3 donors: No pre-mortem interventions are currently allowed in the UK
Maastricht 4 donors (donor is already certified dead by brain stem criteria): heparin can be given. A suggested dose is 300units/kg (around 25000 units for a 80kg person) given just prior to withdrawal of treatment

Chris Watson, NRP national Protocol 1.10 28th April 2023

&

Marius Berman, National protocol for Direct retrieval and Perfusion of DCD hearts and lungs with or without NRP (A-NRP to ex-situ normothermic perfusion November 2021

UKDEC.

We are sorry to announce that in April 2016 government funding for the UK Donation Ethics Committee (UKDEC) was withdrawn and it is no longer in operation

UK Donation Ethics Committee 2011

Recommendation 32

"UKDEC is of the view that further work should be undertaken to reconsider whether some interventions that may be helpful for preservation of organs (pharmacological or mechanical) should be permissible within the current legal framework in the UK, as is the case elsewhere in the world. At present, for an intervention to be considered, it has to be shown not to cause or risk causing harm or distress to the patient, but the degree of risk versus benefit is undefined."

3.2.1. The UK Health Departments published legal guidance on nonheartbeating donation,[9,10,11], which clarified a number of issues relating to the legal status of the processes required for donation after circulatory death. There remains a concern that the legal status of some pharmacological or mechanical interventions to support and protect the organs, remains problematic. The difficulty arises as these could be undertaken after the withdrawal of life sustaining treatment, but beforedeath has been confirmed. The document states

> *: the person's best interests in this situation. A clinician would need strong and compelling reasons to consider these types of actions and would be recommended to seek a declaration from the Court of Protection in relation to the person's best interests in doing so.*

3.2.2. UKDEC understands there is a growing view that this stance on heparin in particular needs to be revisited, as heparin or equivalent medication is considered a beneficial (and in some cases an essential) element of some transplantation protocols, while the risk of harm to the donor varies substantially and would be better assessed on a case-by-case basis.

3.2.3. UKDEC is clear that there is no ethical barrier to such interventions, providing that the treating clinician is satisfied that there is sufficient evidence that this accords with the patient's wishes and values. (See Part One for discussion of determining overall benefit). UKDEC has further outlined an approach to the assessment of harm that balances the risk of undesirable physical effects of an intervention with the risk of doing wrong by ignoring a patient's wish to donate their organs (see paragraph 1.4.2 – 1.4.4).

Minor Comments

Abstract.

Comment 15: I wonder if better "These objectives must be achieved in the context of optimal and ethical end of life care."

Reply: done

Introduction.

I am sure they did call the organs cadaveric, but in 2023 that's a jarring word to use. Suggest choosing differently.

> "Throughout the text, we use the term "cadaveric" rather than "deceased donor" to refer to organs that are recovered after death. We do this because the term "donor" implies that one has a choice. Routine recovery would eliminate choice; under this plan, there would be no deceased donors but rather organ sources."
>
> *Organ Conscription: Theoretical Medicine and Bioethics 2023 Derrick Pemberton*

Reply: We have changed the term from cadaveric to "deceased donor organs"

Comment 16: Page 2 Line 64. Donation after Brainstem Death (DBD). For a more worldwide use I suggest Donation after Brain Death (DBD) accepting that for some countries that term will conceptually be different.

Similarly the use of brainstem throughout. This is a decision for you and the associate editor – is this a paper predominantly for ROI, UK and India audiences (brainstem death) or international (brain death)?

Reply: The terms have been changed within the manuscript, the word brainstem was not changed in one paragraph as it formed part of a quotation on the definition of death

Comment 17: Page 3 Line 84. "In DCD, a prolonged period from Withdrawal of Life-Sustaining-Therapy (WLST) to death will expose organs to the detrimental effects of warm ischaemia." Warm ischaemia continues until cold perfusion, so longer than just death. As well, most established DCD programs don't start counting warm ischaemia until BP falls e.g. < 50 mmHg.

Reply: We have changed the word "death" to "cold perfusion", we have also added reference to table 2 here, an additional line was considered differentiating between WIT and Functional WIT but the impact of second line within the paragraph is lost by the time the reader comes to it.

Comment 18: Page 3 Line 89. "Where the time from withdrawal to cardiac arrest exceeds that set by the transplant team, the process of DCD is stood down." For your interest this time in

the UK for kidneys of 3 hours is set by logistics not warm ischaemia. The science for the stand down time is laughably poor.

Reply: We agree, it is very much an arbitrary process here also, unfortunately we have seen stand-downs at 30 minutes which is completely disheartening for all involved,

Comment 19: As many have commented 'ex-vivo' makes little sense when the purpose is to compare to machine perfusion inside the body which can hardly be called in-vivo (within the living). Ex situ and in situ preferred internationally by consensus. But given the frequency many insist on using ex-vivo, especially for lungs, feel free to choose as you wish.

Reply: Vivo changed to the word situ in 6 places throughout text

Comment 20: Is anyone still doing in-situ cold perfusion? I was not aware anyone still was. Missing 'is'. "In practise this technique is limited to uncontrolled DCD (uDCD, Maastricht 2) (figure 1).

Reply: we have corrected the spelling of practise to practice and inserted "is"

Comment 21: "NRP has the potential to increase the time-period from WLST until organ donation begins by several hours without detrimental effects on donor organ outcomes."

True, sort of. uDCD is not typically described as commencing following WLST. And controlled DCD the NRP is commenced after donation has commenced. There are cases where it is used as you suggest – commenced in ICU after death but before organ recovery commences, but it is rare and quite confusing as one of your main points in this section.

Reply. I think the point and principle reason we support DCD is to try get away from the stand-down after 30, 60, 90 or 120 minutes, the use of NRP will hopefully allow us an increased tolerance to a prolonged time-period from WLST until death without the imminent threat of stand down. Having experienced stand down a couple of times myself it is a fairly deflating and disappointing end. Hopefully with NRP the surgeons should become less impatient.

In the WHO classification and pathways for organ donation, the step between potential and eligible deals with donor identification and also with time from WLST to death. By increasing the time period perhaps more potential organ donors could be identified.

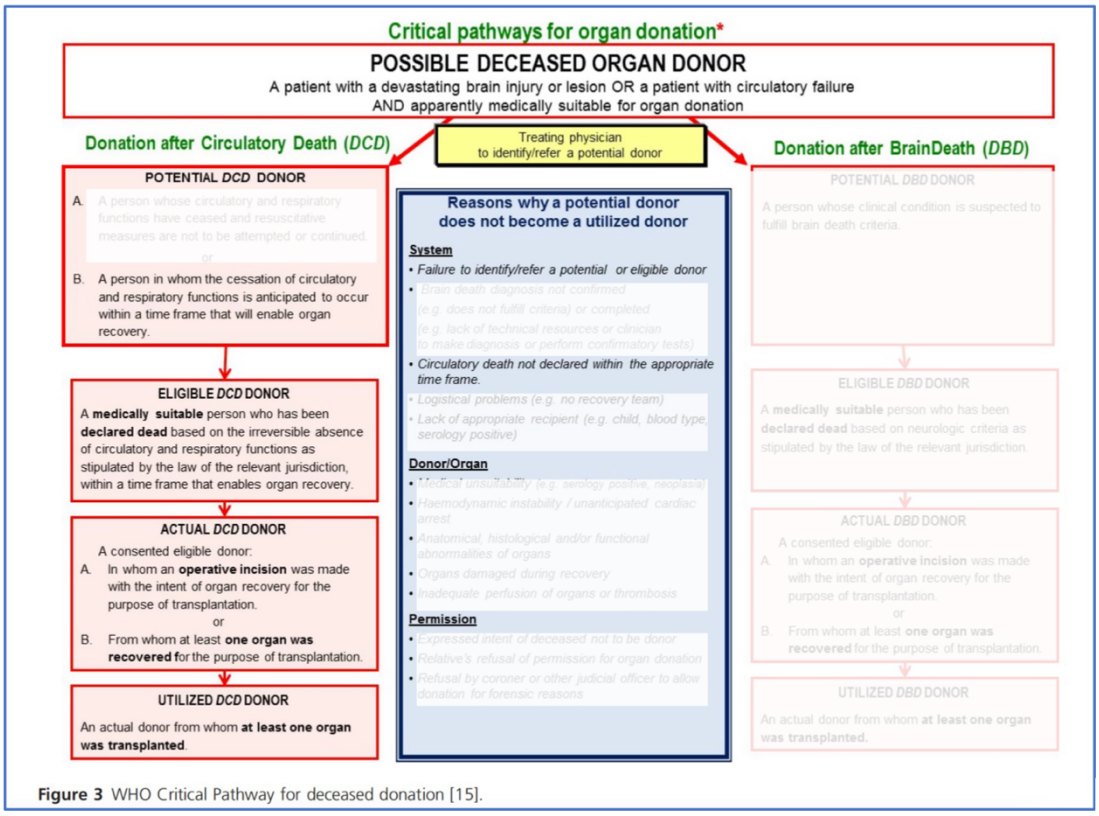


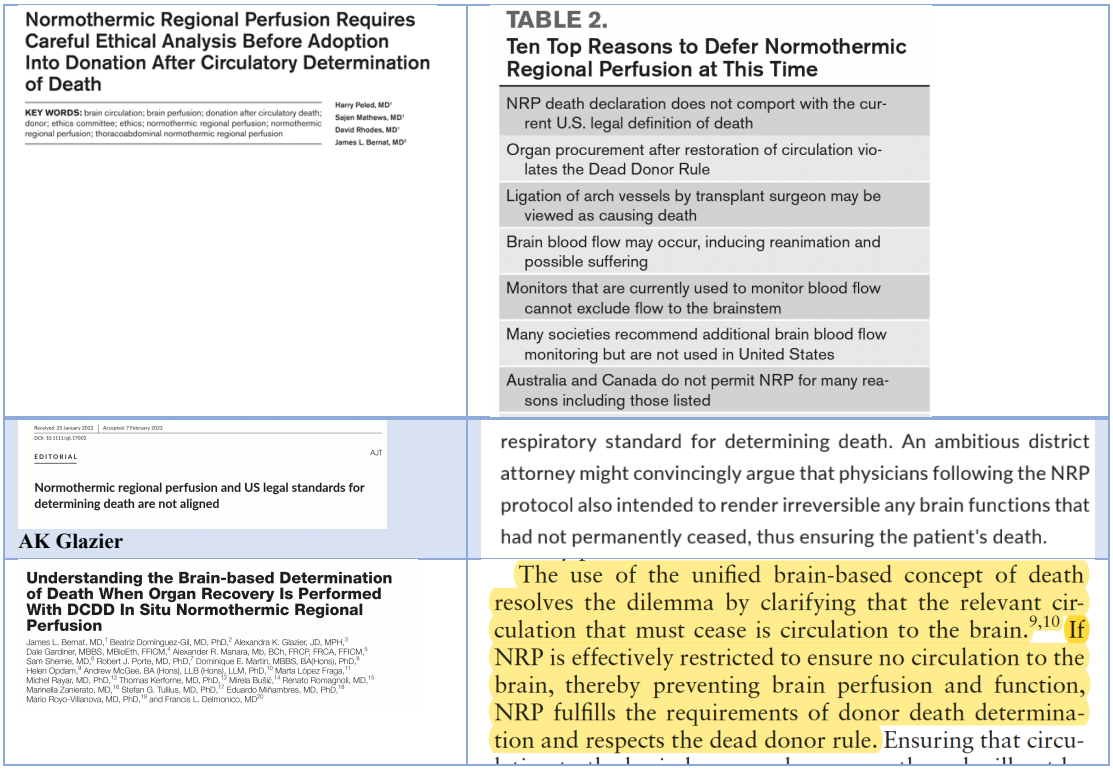
Figure 3 WHO Critical Pathway for deceased donation [15].

We have amended this sentence and added a small piece,

"NRP has the potential to increase the time-period from WLST until organ donation begins by several hours in cDCD without detrimental effects on donor organ outcomes. If the timer is only started with the onset of functional warm ischaemia, and NRP is adopted, then it is likely that less stand-downs will occur. Transplanting surgeons are provided with reassurance that the organ injury will be limited and can have confidence that transplanted organs are optimized prior to cold storage or hypothermic ex-situ perfusion."

Comment 22: This is true, "The importance and contribution of perfusion repair is supported by a large international group from several centres within the USA, the UK, Canada, Australia and a number of leading European centres(25)." And yet Australia and Canada do not practise NRP.

Reply: With the adoption of unified brain-based concept of death several leading authors have changed their stance to a certain extent with respect to a post mortem circulation and the dead donor rule, specifically I am referring to James Bernat and Alexandra Glazier



Normothermic Regional Perfusion Requires Careful Ethical Analysis Before Adoption Into Donation After Circulatory Determination of Death

KEY WORDS: brain circulation; brain perfusion; donation after circulatory death; donor; ethics committee; ethics; normothermic regional perfusion; normothermic regional perfusion; thoracoabdominal normothermic regional perfusion

Harry Peled, MD[1]
Sajen Mathews, MD[1]
David Rhodes, MD[1]
James L. Bernat, MD[2]

TABLE 2.
Ten Top Reasons to Defer Normothermic Regional Perfusion at This Time

NRP death declaration does not comport with the current U.S. legal definition of death
Organ procurement after restoration of circulation violates the Dead Donor Rule
Ligation of arch vessels by transplant surgeon may be viewed as causing death
Brain blood flow may occur, inducing reanimation and possible suffering
Monitors that are currently used to monitor blood flow cannot exclude flow to the brainstem
Many societies recommend additional brain blood flow monitoring but are not used in United States
Australia and Canada do not permit NRP for many reasons including those listed

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EDITORIAL

AJT

Normothermic regional perfusion and US legal standards for determining death are not aligned

AK Glazier

respiratory standard for determining death. An ambitious district attorney might convincingly argue that physicians following the NRP protocol also intended to render irreversible any brain functions that had not permanently ceased, thus ensuring the patient's death.

Understanding the Brain-based Determination of Death When Organ Recovery Is Performed With DCDD In Situ Normothermic Regional Perfusion

The use of the unified brain-based concept of death resolves the dilemma by clarifying that the relevant circulation that must cease is circulation to the brain.[9,10] If NRP is effectively restricted to ensure no circulation to the brain, thereby preventing brain perfusion and function, NRP fulfills the requirements of donor death determination and respects the dead donor rule. Ensuring that circu-

"According to previous DCD guidelines reliant on the permanent cessation of circulation for determining death, restoring circulation would invalidate death determination; if organ recovery proceeded, it would also violate the dead donor rule, the ethical injunction that organ recovery cannot cause a donor's death.
Nevertheless, the updated Canadian Death Determination Guidelines in this Special Issue of the Journal clarify that postmortem resumption of regional circulation and subsequent organ recovery does not equate to a violation of the dead donor rule. By articulating a unified concept of death based on the permanent loss of brain function, the Guidelines illuminate how cessation of circulation is a valid biological indicator of death only because it is a reliable proxy for the permanent cessation of intracranial circulation and brain function. Consequently,the updated Guidelines imply that—provided brain function has ceased permanently at the time of death determination (something that is inferred from cardiac arrest literature in humans and animals but awaits confirmation in a study involving patients who undergo withdrawal of treatment), and on the condition that intracranial circulation is precluded—postmortem interventions restoring regional extracranial circulation may be permissible."

Implications of the updated Canadian Death Determination Guidelines for organ donation interventions that restore circulation after determination of death by circulatory criteria
Nicholas B. Murphy, PhD . Charles Weijer, MD, PhD . Marat Slessarev, MD . Jennifer A. Chandler, LLM . Teneille Gofton, MD, MSc

Comment 23: With the long-term outcomes of DCD kidneys matching DBD kidneys I find your evidence in delayed graft function in renal transplants, weakly persuasive. Renal teams agree and are not the ones advocating for NRP. Suggest you lead with something where NRP is really making a difference - livers. Especially if a purpose of your paper is to argue for NRP.

A benefit you have not articulated is the benefit to surgeons as they can slow down and the procedure is less hasty. Less organ damage is suggested. Less stress on surgeons and calmer in theatre for those assisting and observing.

Reply: We have made this point within the document line 204 and also within the concluding section. It is an interesting point which is mentioned in the ACP statement of concern, I think they have misconstrued this statement from the NYU heart retrieval that the institution of TA-NRP converts a standard DCD retrieval to to support their argument of induced brain death

"*Should be renamed Organ retrieval after cardiopulmonary arrest and induction of brain death"*

ACP statement of concern

Donation after circulatory death heart transplantation using normothermic regional perfusion: The NYU Protocol

Check for updates

Les James, MD, MPH,[a] V. Reed LaSala, MD,[b] Fredrick Hill, RN, CCP,[c] Jennie Y. Ngai, MD,[d] Alex Reyentovich, MD,[e] Syed T. Hussain, MD,[a] Claudia Gidea, MD,[e] Greta L. Piper, MD,[f] Aubrey C. Galloway, MD,[a] Deane E. Smith, MD,[a] and Nader Moazami, MD[a]

echocardiogram evaluation of the donor heart. The remainder of the procurement, including the abdominal organs, proceeds in a similar controlled fashion as is performed for a standard donation after brain death donor.

Comment 24: This sentence sits oddly in the liver section.
"NRP will not interfere with lung donation where the lungs are considered suitable." – I wish that was true in the UK. We are learning from the French here who have made it true.
"Finally NRP affords the opportunity to consider pancreas and heart transplants from DCD donors." – most heart DCD programs worldwide are direct recovery and perfusion.

Reply: We have moved the section referring to lungs and placed in its own section. We have referenced the dual hypothermic chest, normothermic abdomen, as you say I think this is difficult.

I applaud your section on 'Language and attitudes."
Then you undermine your stance and use the offensive term 'procurement' in your conclusion.

Reply: We have changed the term "procurement procedure" to "organ retrieval procedure"

Comment 25: Page 12, 376. 'verification of death' Odd to move to using 'verification' when you have been using 'diagnosis' throughout. Later you use "The determination and certification of death indicate that an irrevocable point in the dying process has been reached."
Please choose between your terms and be consistent.

Reply: The word verification has been dropped in favour of diagnosis, equally the term determination of death has been replaced in title and once in the text, it has been left in two instances first within the direct quote from ANZICs and second in the synonyms for DCD piece.

Comment 26: Additionally, this is just wrong that in DCD there is an irrevocable point which is why there is the permanence vs irreversible argument. And 'irrevocable' is another new term, and not part of the literature base in this debate.

Reply. This is an exact quotation from ANZICs Statement on Death and organ Donation 2021. It was our mistake that we should have indented and made it clear that it was a quotation.
Insofar as the second point is concerned we are happy to remove this but have qualified the term by the addition of the sentence:

The word "irrevocable" comes from Australian literature on the topic of Death and Organ Donation, of note NRP is not allowed in Australia and therefore in context this word defines the time beyond where autoresuscitation is possible.

Comment 27: Page 12, 379. You can not say this. "There will always be kind and caring healthcare professionals for whom involvement in the process of DCD may be too distressing." Are those who support DCD unkind and uncaring? Worded like this, that seems to be what you are suggesting. Some philosophers would even challenge and say there is nothing kind and caring about an individual who would put their personal distress ahead of the deaths of three people. There is a whole literature base on conscientious objection. You lack the words to venture into this topic area, so I strongly suggest you remove value laden comments like this.

Reply: We have deleted this section as per your suggestions.

Comment 28: Reference 82 is very odd. Was it ever published? You would be better to quote something from UK DEC. https://www.aomrc.org.uk/reports-guidance/interventions-death-optimise-donor-organ-quality-improve-transplant-outcomes-guidance/

Reply: We have included this reference to the UKDEC and also corrected the error in the reference, Gillian and I spent some time discussive whether a slideset from NHSBT put

up on slideshare was referenceable. Professor Danbury was speaking on behalf of NHSBT on the day

https://www.slideserve.com/akiko/law-and-donation-masterclass-best-interests-is-best-practice

Comment 29: Figures
Did you design your own figures and have copyright?
Figure 2 and 3. Are you allowed to use the apple battery image? For the editor to advise.

Reply: All figures are original and drawn by Dr Gillian Crowe we have completely revised figures 2, 3 and 4

Comment 30: Figure 1 would benefit by having an additional note to the cross clamping technique which is also very common worldwide.

Reply: I'm not sure if it is perhaps figure 4 the reviewer is referring to. We have amended this into 4a and 4b

Comment 31: Figure 2. Why 120 mins when UK uses 180 mins?

Reply: We have completely revised figures 2 and 3. These were originally drafted from the Irish Guideline. We have redrafted to reflect what the variability in stand-down times are from an international perspective.

Excerpt from Ankur Pranjal Choubrey, Clinical Transplantation 2020 (USA)

- *19 OPOs mandated a maximum 60 minutes before aborting DCD organ procurement.*
- *2 OPOs allowed a maximum of 75 minutes,*
- *28 OPO policies recommend 90 minutes,*
- *7 organizations outlined 120 minutes*
- *2 deferred to hospital policy*

Chris Watson UK NRP guideline 2021
As per NORS guidance the retrieval team is expected to stay for 3 hours. There should be no need for premature stand down since viability will be tested during NRP.

Comment 32 Figure 5 is odd colours. Red normally means stop or no. Are you using red for blood?

Reply: On reflection we have deleted this table, on the basis of yellow green and red and meanings associated with these colours, we have replaced with something less judgemental as per your comment 4

Comment 33: Tables
I suggest many of the tables should be online supplemental as good but not core to the paper.

Reply: We have no objection should the editors see fit

Reviewer B

Comment 34: At line 434 the authors make the statement

To summarise, the diagnosis of death must meet 2 criteria, permanence and irreversibility, an accepted definition is outlined below: "Death is the permanent loss of capacity for consciousness and all brainstem functions. This may result from permanent cessation of circulation or catastrophic brain injury. In the context of death determination, 'permanent' refers to loss of function that cannot resume spontaneously and will not be restored through intervention.

The concept of permanence as stated above is correct but to determine death by the permanent loss of brain function, the declaration of death does not require irreversibility of brain function.

Brain functions are defined as the capacity for consciousness, the capacity to breathe spontaneously and be receptive to a stimulus.

Reply. We have qualified this section as per comment 12 of Reveiwer A

Comment 35 DCDD is ethically proper without in situ NRP because there is no further circulation to the brain. Without circulation to the brain there can be no brain function.
In situ thoracic NRP in the circumstance of DCDD introduces collateral circulation to the brain.
The conflict is evident.
Yet to be determined is the threshold volume of blood flow that enables sustained brain function.
That investigation is underway.

Reply: This is certainly something which we will all follow closely, Thoraco-Abdominal NRP does seem to be a very attractive concept, per their consensus statement (Jacob N Schroder), it decreases warm ischaemic time when compared with a DPP-MP protocol. 20% of the hearts in the USA are retrieved using TA-NRP. The colatteral circulation and potential for blood flow despite ligation of the cerebral arch vessels is of significant concern and we have referenced Basmaji who makes this point in the paper (reference 90).

Reviewer C

The authors provide a review paper looking at various aspects of donation after circulatory death (DCD) donation with focus on normothermic regional perfusion.

-Page 5 (and throughout the paper). The authors do not really mention until the very end that there are other techniques of organ preservation with DCD (not limited to ISP, SRR and NRP). To name a few: 1) ex-situ normothermic machine perfusion (there are multiple liver platforms: TransMedics, OrganOxf etc) 2) Ex-situ hypothermic machine perfusion with or without HOPE or D-HOPE (Lifeport, VitaSmart etc), 3) TA-NRP, A-NRP. I totally support the authors' enthusiasm for NRP, but it is not the only modality available.

Reply: We have referenced ex-situ technologies as a significant area of expansion, we have also referenced ex-situ technologies in the section

Organ Preservation techniques

These technologies are presented as a 4th option We have referenced the editorial by Roll GR et al DCD-NMP vs DBD and also the paper by Mokham NRP vs NMP liver and finally papers by Schroder et al (American Association of thoracic surgeons Consensus) and trial DCD-OCS vs DBD (NEJM)

The paper is UK centric, which is not unexpected seeing as the authors are from the UK. Brain death criteria in the US was established by the AD Hoc Committee of Harvard medical school in 1968.

-Page 3 introduction: There has not been a decline in brain death donors in the USA. This may be true in the UK but is not universal across the world.

Reply: We were wrong on this point, on closer examination our demographic of patient with brain death has changed towards less trauma to now an older population with haemorrhage rather than a smaller absolute number. We have deleted the sentence and indeed much of the section dealing with history in an attempt to improve the focus of the paper and also in the interst of word count

-Page 4 introduction: the authors sate that "retrieval surgeons will not have the opportunity to witness oxygenated blood flow through the organs and there confidence in such organs is compromised". I understand where the authors are going with this, but DCD organs are frequently used with SCS. Perhaps I statement to the effect that NRP gives additional information in assessing the organ, would be more appropriate.

Reply: The point we are attempting to make here is that in DCD where the standard rapid retrieval technique is used, estimates of flow and perfusion and colour are not possible. When we introduce NRP we make the point about viability assessments. We also make the point that

further assessment is also possible while on an ex-situ machine perfusion device.

-Page 8: A heater-cooler is not always needed for NRP. Published US series have not used one.

Reply: We have added a plus minus to the heater cooler unit, some circuits do not use a reservoir

-Page 8: I would agree that language is very important. I would add to the list terms like reanimate, resuscitate and restore circulation. A recent US consensus paper discussed this. American Society of Transplant Surgeons recommendations on best practices in donation after circulatory death organ procurement. Am J Transplant. 2023 Feb;23(2):171-179. doi: 10.1016/j.ajt.2022.10.009.

Reply: The paper by Croome et al is referenced (ASTS)

Authors should differentiate TA-NRP and A-NRP in discussion. It is my understanding that TA-NRP is no longer allowed in the UK, yet A-NRP is.

Reply: This is correct, we have differentiated TA-NRP and A-NRP in most places with particular emphasis on A-NRP. It may well be that best practice thoracic NRP is a more comprehensive cerebral circulation isolation than abdominal. At present in accordance with Basmaji's paper we will try to promote and focus on A-NRP while also highlighting the fact that TA-NRP may hold the promise that more organ may be deemed suitable for transplant

The authors should touch on the different ethical concerns. Why was this decision reached?

Reply: According to Basmaji et al, A-NRP is less likely to cause colatteral perfusion, we have highlighted this in the Preventing reconstitution of the cerebral circulation section.

-Page 15: premortem heparin is routinely given in USA.

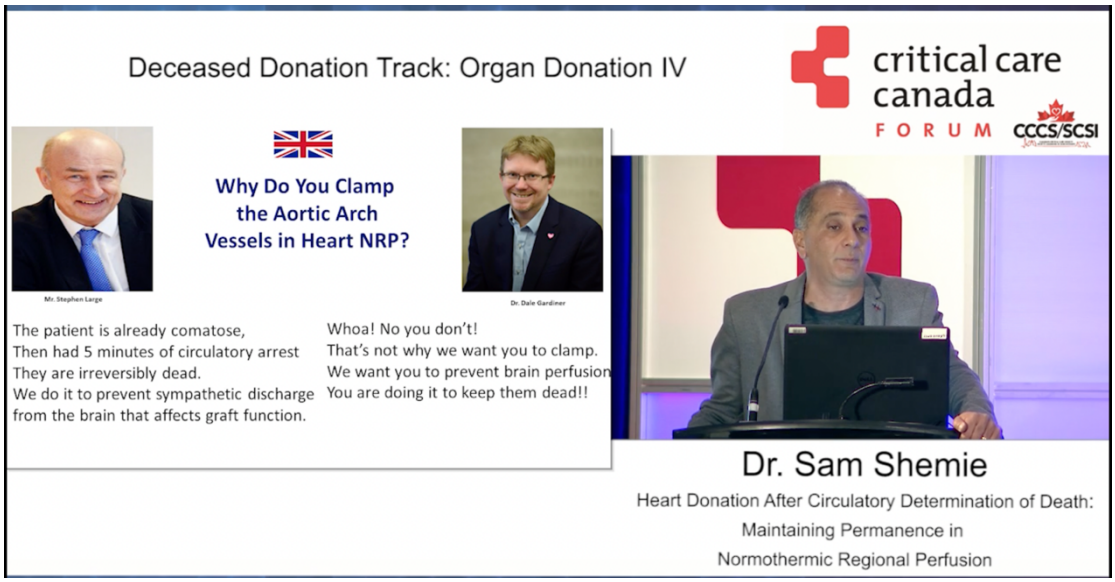
Reply: We have completely rewritten and updated the heparin section, while it is not the main focus of our paper, we have referenced the ATS, ISHLT and SCCM position with respect to antemortem heparin. In addition we have referenced the consensus paper from the American Association of thoracic surgery 2023

-Page 18: The authors use the term circulation when describing NRP. Please choose a different term like in-situ perfusion.

Reply: We have done this

-Page 19: whether diagnosis of death "is contingent on lack of cerebral blood flow" when performing NRP in DCD donation is unclear. Some would argue that since they are already deceased by circulatory criteria, we are not occluding cerebral blood flow to prevent perfusion of the brain, but to direct perfusion to only the organs that are being procured. If you are saying they become alive if you perfuse the brain you are sort of contradicting the notion that they have been declared deceased by circulatory criteria. These are subtly different ways of saying the same thing, but intent becomes important when you are dealing with legality.

Reply



I think the point you raise is very interesting and Sam Shemie's video on Vimeo addresses this point, minutes 12-14 of his presentation URL below, it is his opinion from the video that we use the intra-aortic endoclamp balloon or external aortic clamp or alternately in TA-NRP ligate the aortic arch vessels to prevent prevent flow to the cerebral arteries
We have taken short extracts from papers by AE Wall's Nicholas Murphy and , Bernat J, Dominguez paper which hopefully clarify the point, clamping is to maintain a state of cerebral circulatory arrest
https://vimeo.com/392258814

-Recent NRP papers from USA to add to table 5:

Development of a portable abdominal normothermic regional perfusion (A-NRP) program in the United States. Liver Transpl. 2023 Apr 13. doi: 10.1097/LVT.0000000000000156. Epub ahead of print.
Early United States experience with liver donation after circulatory determination of death using thoraco-abdominal normothermic regional perfusion: A multi-institutional observational study. Clin Transplant. 2022 Jun;36(6):e14659. doi: 10.1111/ctr.14659.

Reply Added to Table 6. We have added Croome's article on the portable A-NRP to table 6. We have also cited Bekki Y which perhaps gives a more comprehensive picture of the use of TA-NRP than the article by Sellers et al.

Reviewer D

This is a timely manuscript and reviews the process of DCD donation, yet the manuscript is sometimes difficult to follow as it combines many different thoughts and processes specifically related to NRP and the differentiation between thoracic and abdominal NRP. There is also a lot of discussion on the use of appropriate language and the manuscript becomes difficult to follow. I think a major re-organization of the manuscript is needed to make it a coherent read.

Thank you for your comments, we have taken the paper apart and rewritten substantial sections, All of the reviewers comments have been very useful as on reflection there were apsectos of the previous draft which needed major work

Reply: Who is this for

This paper was intended as a broad review to try present the evidence for a change in practice which we are trying to adopt. In Ireland in common with 17 other countries worldwide cDCD is the only form of DCD practiced and therefore we have concentrated on this process *(Dominguez-Gill ICM 2021).*
What we hope to achieve is to influence people towards DCD in the first instance by presenting a balanced viewpoint on the pro and the anti DCD camps might think. We have outlined our 4 objectives more clearly at the end of the introduction. In addition, we have attempted to identify our target audience.
We have tried to make the paper less UK centric (being honest only Rob is from the UK), the rest of us are Irish, nonetheless much of what we do here is guided by the UK.

Reviewer E

Thank you for your in-depth review. NRP is an exciting advance that shows much promise but we agree there is controversy

In lines 59-65 perhaps clarify where these laws originated and are accepted.

Reply We had revised substantially in accordance with your suggestions, but in the interests of word count and focus we dropped references to historical evolution of Brain death

Lines 79-82 you need a citation, what evidence is there that DCD organs are poorer quality?

Reply: I think References 12 Manara (decreased number of organs retrieved) and 14 Van der Hilst (increased cost and reintervention rates) make the points raised about quality issues in DCD organs

Line 87, need citation

Line 101-103 DCD heart donation has proven a source of good quality organs, while the rate of VA ECMO is higher in NON-NRP DCD donors, it is still in the range of 25-30% at most (Australian experience), and not a "guarantee in the post op period"

Reply: We believe the evidence from Schroder's NEJM paper and consensus document and Joshi's "a new frontier" papers are really impressive, we have referenced all three. The point is that doing a DCD heart transplant without MP or TA-NRP would be risky without the availability of ECMO postoperatively. MP or TA_NRP provides a lot of reassurance. We have revised the wording to reflect this point.

Line 110- Need to distinguish between the two forms of DCD in general in the paper. In direct procurement and preservation DPP- DCD the surgeons do not get to see oxygenated blood perfuse the organs. This is not true in NRP DCD

Reply: We have added the line that the focus of the paper is on Abdominal NRP, we have checked each reference to NRP and made a decision in each case on which type we were specifically referring. For some paragraphs NRP is used as an umbrella term to cover both A-NRP and TA-NRP. We state that our focus (as something which is attainable within our own community) is on A-NRP in cDCD. We also have devoted some time to the ex-situ options within the organ preservation techniques

Line 206- 208- Hearts are already being used from DCD donors (DPP) without NRP. There is some debate on how NRP impacts the lungs, Abdominal only NRP may not impact the lungs, however some authors believe TA NRP negatively impacts lungs (I am not one of them), this remains to be studied further.

Reply: We have deleted this as the point was already made in the paragraph dealing with Ex-situ machine perfusion technologies. We have referenced the UNOS data on TA-NRP and lung transplantation. We have also eluded to the lack of lung perfusion until the heart begins beating which was raided in the paper by Beatriz Dominguez-Gil on the expansion of cDCD (ref)

> *"Insofar as heart transplantation is concerned the Direct Procurement Protocol and Machine Perfusion (DPP-MP) strategy has yielded equal outcomes to a matched DBD cohort of heart donors. In the USA 20% of DCD heart donors are Thoraco Abdominal-NRP (TA-NRP) and 80% DPP-MP (Cardiac Schroder & Schroder), while in Australia and the UK the current standard is DPP-MP."*

Line 234- There is no such thing as an NRP machine. NRP is a technique wherein either a modified cardiopulmonary bypass circuit or an ECMO circuit is used. See Hoffman et al in ISHLT for better description.

Reply: We have corrected this

Line 240- in what country?

Reply: We have amended to In the UK. These individuals are mostly former nurses who have worked in intensive care, they will generally have had significant exposure and training in ECMO, previously. I think the Edinburgh Transplant program are responsible for accreditation of their training. For most other countries the NRP is run by perfusion specialists. I think it essentially boils down to the cost of rotas

Line 390-391. The definition of death varies depending on country, this needs a citation

Reply: This quotation was from ANZICs, We had not correctly highlighted this point previously, I think two words irrevocable and arbitrary have upset more than one reviewer, we have changed the wording at 391 to try clarify this point.

Dying is the process during which cellular activities and organ functions

progressively cease. The determination and certification of death indicate that an irrevocable point in the dying process has been reached. The precise time of death is somewhat arbitrary and represents a societal consensus that is informed by biological understanding (11).

Line 435 accepted by whom?

Reply: This definition comes from Shemie 2014 International Guideline development the definition is correctly referenced in this second version

Line 493-496 You should be more conclusive about this, you should evidence that heparin not harmful to donor and beneficial to recipients. Unless you show evidence that heparin is harmful to donor, I would advocate that recommendation be that heparin be given

Reply: We have significantly rewritten this section. So far, no data to support a potential hastening of death due to heparin comes from 2013 Arne Neyricnk, Dirk Van Raemdonk. We have included the line from the American Thoracic Society consensus statement Schroder JN, Scheuer S et al. It was a pity that the UKDEC committee did not revisit this topic before their funding was withdrawn and their efforts stagnated. They had said they were going to revisit the point. Note also Comment 13

Line 504-506.. how does NRP decrease these time constraints? I do not think that is a true statement, the time constraints are the same as would be for any DCD

Reply: In our national policy a wait time of 90 minutes is stipulated. On a significant number of occasions I have seen to process stood down after a considerably shorter time-period 30 minutes, with the possibility of NRP I think surgeons are much more likely to tolerate a longer period of time before stand-down. We have also made the point above. comment 21.

Section on premortem cannulation- You should also comment that NRP can be performed without peripheral cannulation such as is the case with TA NRP, and this pre mortem cannulation is not necessary

Reply: We have added this as a paragraph at the beginning
In the section discussing prevention of cerebral circulation (and thoughout your entire article, you need to distinguish between Abdominal NRP and TA NRP…, as there is not balloon in TA NRP)

Line 615-617 It depends which definition of death you are applying and this varies by country

Reply: We have revised and rewritten this section completely. We have referenced Sam Shemie's Brain-based definition of death and criteria 2023 clinical practice guideline and also The viewpoint articles be James Bernat's expert insight paper and Nicholas Murphy's paper interpreting how the definition changes the landscape where the determination of death and coexistence of NRP programs are concerned.

Line 628 I don't know if "safer" is the correct word, perhaps it is "less likely to cause collateral perfusion"

Reply We have amended this point, the second time the word "safer" in used is within a direct quotation from Basmaji's paper, therefore we have not changed the word this time. we are happy to delete this if recommended

Line 678 to 681 you seem to come out against NRP in this statement, but l later in the conclusions you support the use of NRP, please clarify

Reply: Certain commentators here question who should be the drivers of NRP. While our areas of expertise are ICU medicine and Anaesthesia, some have questioned our interest and suggested perhaps that the process should be driven by our surgical colleagues. We are involved in end of life care, determination of death and frequently in consent conversation, we are also involved in donor management where appropriate. The statement that we should not embark on a program of NRP without all of the components is probably true, we are bound to fail, and at the same time risk losing the confidence of our colleagues with 2nd, 3rd, 4th attempts and so on. We are very much in favour of NRP but cannot go it alone. .