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Editorial

Controlling the uncontrolled: Can we realise the potential of uncontrolled donation after circulatory death?



Out-of-hospital cardiac arrest (OHCA) is common. In Europe, it is estimated that more than 350,000 citizens are affected each year.¹ Strategies to improve outcomes and to save more lives have been published,² and implementation of pathways for OHCA based on best scientific evidence, national and international guidance, and expert opinion^{3,4} are helping to achieve this. Further improvements may be made by addressing all aspects of the chain of survival for victims of OHCA.⁵ The outcome of those who achieve return of spontaneous circulation (ROSC) and who are transported to hospital and admitted to ICU is also improving.⁶ However, despite this, the mortality and morbidity after OHCA remain high: ROSC is achieved in approximately 25%, and only 7–8% of those in whom cardiopulmonary resuscitation (CPR) is attempted will leave hospital alive.⁵

Many of the in-hospital deaths following an OHCA will result from hypoxic brain injury, some patients progressing to brain death and many others undergoing the withdrawal of life sustaining treatment (WLST) once treatment is no longer considered to be in the patient's best interests. In these situations, organ donation should be considered routinely as part of the patient's end of life care, and when it is a possibility, the family should be approached, and this option discussed. Indeed, the OHCA community accept that while good quality survival of patients is the primary objective, organ donation is a positive secondary outcome of their pathways.⁷ The possibility of donation after brain death (DBD) should be considered in those who are confirmed to be brain dead and controlled donation after circulatory death (cDCD) in those in whom a decision to WLST has been made. Hypoxic brain injury, including those after cardiac arrest is now the second most common condition associated with both DBD and DCD after intracranial haemorrhage.

Most deaths from OHCA, however, occur following CPR and the inability to achieve ROSC either in the community or after transfer to hospital. In this situation, uncontrolled donation after circulatory death (uDCD) may be possible and this potential should be considered for these patients as recommended by professional societies.⁸ Yet, the EuReCa study highlighted a large missed potential for uDCD in 27 European countries. In a one-month period only 25% of 7000 cases of witnessed OHCA treated by emergency medical services had ROSC on arrival at hospital.⁹ This missed potential has also been reported in OHCA registry studies from France and Spain, the two countries with the largest uDCD

programmes.^{10,11} This missed potential is again highlighted in another registry study from Sweden, a country without an uDCD programme, in this issue of the Journal.¹² The study looked at all OHCA in the Stockholm county to identify the potential for uDCD. The authors assessed the eligibility for uDCD using the selection criteria used by five different uDCD programmes. They found a potential for uDCD varying from 1.5 to 7.5% of all OHCA, with a theoretical possibility of doubling of the number of donors in the Stockholm County. The French, Spanish and Swedish studies^{10–12} have similar strengths in that they are based on national or regional registries which collect data on all OHCA and include all the data required to identify non-survivors who meet the criteria for inclusion in a uDCD programme. They also have the same weakness of not being able to identify those who would be excluded from uDCD programmes because of the presence of co-morbidities and coroner/judicial exclusions. They also do not consider the loss of potential due to family declines, failure to identify potential donors and logistic or technical reasons. These limitations are recognised by the authors and mean that, although the potential for uDCD is likely to be overestimated in these studies, it may still make significant contributions to the overall number of donors and transplant undertaken.

Despite this significant potential of uDCD to increase the donor pool, it is practiced in only a few countries, with the most successful programmes being in France, the Russian Federation and Spain.¹³ There are many challenges to countries implementing this form of deceased donation. The economic costs of establishing and running a uDCD programme need to be weighed against investments in other forms of donation or improving transplant outcomes. Implementing a uDCD programme requires an established out of hospital emergency medical service, with personnel trained not just in providing and deciding when to terminate CPR, but also in identifying and referring potential uDCD donors, communicating with families and transporting patients to an appropriate centre. The programmes tend to be limited to large urban areas and provided in a transplant centre with the availability of technical expertise, particularly in techniques of maintaining organ viability until retrieval.

A number of potential uDCD donors do not progress to becoming actual donors,¹⁴ and only 80% of actual donors will have at least one organ utilised for transplantation.¹⁵ There are also concerns about outcomes of organs transplanted from

uDCD donors. Kidney transplants have a higher incidence of primary non-function and delayed graft function compared with DBD and cDCD,¹⁶ but the risk of graft loss within a year of transplantation can be reduced five-fold if normothermic regional perfusion is used during the retrieval procedure instead of standard cold perfusion.¹⁷

There is also an essential requirement to develop a legal or professional framework to support these programmes in different jurisdictions, addressing the ethical concerns that arise in the practice of uDCD.¹³ These include how to confirm death after unsuccessful CPR and, in particular which post-mortem interventions to maintain organ viability are considered acceptable.¹⁸ Also, the advent of extracorporeal cardiopulmonary resuscitation (E-CPR) protocols, has created a need to develop algorithms that provide clarity to professionals on when such a protocol should be activated and, if no indication for E-CPR exists and the criteria for termination of resuscitation are met, uDCD should follow.¹⁹

The challenges of establishing a successful uDCD programme should not be underestimated: many may view uDCD as a high investment-low return strategy. This view needs to be balanced against the World Health Organisation's (WHO) estimate that the 130,000 solid organ transplants undertaken globally each year meet only 10% of the global demand for transplants.²⁰ This gap will not be filled by introducing uDCD programmes alone. It requires more countries to accept deceased organ donation and introduce DBD and cDCD programmes as well, working to achieve self-sufficiency in organ transplantation as urged by the WHO.²¹ However, the large potential of uDCD suggests that it can contribute significantly to organ transplantation in countries with active deceased organ donation programmes. The increasing use of new technologies for organ preservation will also increase the quantity and quality of organs retrieved from uDCD donors. Finally, uDCD programmes will allow the wishes of more people who chose to donate their organs after death to be met.

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Conflict of interest

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REFERENCES

1. European Registry of Cardiac Arrest — Study TWO (EuReCa TWO). An international, prospective, multi-centre, three-month survey of epidemiology, treatment and outcome of patients suffering an out-of-hospital cardiac arrest in Europe. Newsletter, September 2017. (Accessed January 2019, at <https://www.erc.edu/news/european-registry-of-cardiac-arrest-study-two-eureca-two>).
2. Department of Health. Cardiovascular disease outcomes strategy. Improving outcomes for people with or at risk of cardiovascular disease. 2013 (Accessed January 2019, at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/217118/9387-2900853-CVD-Outcomes_web1.pdf).
3. Nolan JP, Hazinski MF, Aickin R, et al. Part 1: Executive summary: 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Resuscitation* 2015;95: e1–31.
4. The American Heart Association. Guidelines update for CPR and ECC. 2015 (Accessed January 2019, at <http://www.cercp.org/images/stories/recursos/Guias%202015/Guidelines-RCP-AHA-2015-Full.pdf>).
5. Out of Hospital Cardiac Arrest Steering Group. Resuscitation to recovery: a national framework to improve care of people with out-of-hospital cardiac arrest (OHCA) in England 2017. 2017 (Accessed January 2019, at https://aace.org.uk/wp-content/uploads/2017/03/FINAL_Resuscitation-to-Recovery_A-National-Framework-to-Improve-Care-of-People-with-Out-of-Hospital-Cardiac-Arrest-in-England_March-2017.pdf).
6. Nolan JP, Ferrando P, Soar J, et al. Increasing survival after admission to UK critical care units following cardiopulmonary resuscitation. *Crit Care* 2016;20:219.
7. Cheetham OV, Thomas MJC, Hadfield J, et al. Rates of organ donation in a UK tertiary cardiac arrest centre following out-of-hospital cardiac arrest. *Resuscitation* 2016;101:41–3.
8. Bossaert LL, Perkins GD, Askitopoulou H. Ethics of resuscitation and end-of-life decisions section Collaborators (2015) European Resuscitation Council Guidelines for Resuscitation 2015: section 11. The ethics of resuscitation and end-of-life decisions. *Resuscitation* 2015;95:302–11.
9. Grasner JT, Lefering R, Koster RW, et al. EuReCa ONE-27 Nations, ONE Europe, ONE Registry: a prospective one month analysis of out-of-hospital cardiac arrest outcomes in 27 countries in Europe. *Resuscitation* 2016;105:188–95.
10. Jabre P, Bougouin W, Dumas F, et al. Early identification of patients with out-of-hospital cardiac arrest with no chance of survival and consideration for organ donation. *Ann Intern Med* 2016;165:770–8.
11. Navalpotro-Pascual JM, Echarri-Sucunza A, Mateos-Rodríguez A, et al. Uncontrolled donation programmes after out-of-hospital cardiac arrest. An estimation of potential donors. *Resuscitation* 2018;122:87–91.
12. Af Geijerstam P, Forsberg S, Claesson A, et al. Potential organ donors after Out-of-Hospital Cardiac Arrest during a ten-year period in Stockholm, Sweden. *Resuscitation* 2019;137:215–20.
13. Domínguez-Gil B, Duranteau J, Mateos A, et al. Uncontrolled donation after circulatory death: European practices and recommendations for the development and optimization of an effective programme. *Transpl Int* 2016;29:842–59.
14. Fondevila C, Hessheimer AJ, Flores E, et al. Applicability and results of Maastricht type 2 donation after cardiac death liver transplantation. *Am J Transplant* 2012;12:162–70.
15. Domínguez-Gil B, Haase-Kromwijk B, Van LH, et al. Current situation of donation after circulatory death in European countries. *Transpl Int* 2011;24:676–86.
16. Minambres E, Rubio JJ, Coll E, Domínguez-Gil B. Donation after circulatory death and its expansion in Spain. *Curr Opin Organ Transplant* 2018;23:120–9.
17. Del Río F, Andrés A, Padilla M, et al. Kidney transplantation from uncontrolled donors after circulatory death: the Spanish experience. *Kidney Int* 2018;307:17–8, doi:<http://dx.doi.org/10.1016/j.kint.2018.09.014> pii: S0085-2538 [Epub ahead of print].
18. Manara AR, Thomas I. The use of circulatory criteria to diagnose death after unsuccessful cardiopulmonary resuscitation. *Resuscitation* 2010;81:781–3.
19. Manara AR, Domínguez-Gil B, Perez Villares JM, Soar J. What follows refractory cardiac arrest: death, extra-corporeal cardiopulmonary

resuscitation (E-CPR), or uncontrolled donation after circulatory death? *Resuscitation* 2016;108:A3–5.

20. Manyalich M, Istrate M, Páez G, et al. Self-Sufficiency in organ donation and transplantation. *Transplantation* 2018;102:S801, doi: <http://dx.doi.org/10.1097/01.tp.0000543831.69729.e4>.
21. The Madrid resolution on organ donation and transplantation: national responsibility in meeting the needs of patients, guided by the WHO principles. *Transplantation* 2011;91:S29–31.

Alex Manara^{a,*}

^a*The Intensive Care Unit, Southmead Hospital, Bristol BS10 5NB, United Kingdom*

Beatriz Domínguez-Gil^b

^b*Organización Nacional de Trasplantes, C/ Sinesio Delgado 6, pabellón 3, 28029 Madrid, Spain*

* Corresponding author.

E-mail addresses: alex.manara@nbt.nhs.uk (A. Manara)
bdominguez@mscbs.es (B. Domínguez-Gil).

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