Conference paper

Organ donor optimisation in the United Kingdom

Ahmed ElHaddad[1] and Hatem Soliman Aboumarie[2,3,*]

1. *Department of Critical Care, St Mary's Hospital, Imperial College NHS Foundation Trust, London, UK*
2. *Department of Anaesthetics, Critical Care and Mechanical Circulatory Support, Harefield Hospital, Royal Brompton and Harefield Hospitals, Uxbridge UB9 6JH*
3. *School of Cardiovascular and Metabolic Medicine and Sciences, King's College London.*

* hatem.soliman@gmail.com

Abstract

Organ donor optimisation remains a cornerstone in addressing the imbalance between organ supply and demand in the United Kingdom. This narrative review explores the legal, organisational, and clinical frameworks that underpin donor optimisation, outlines key interventions in donor management, and examines recent innovations aimed at improving donor organ yield and equity. We highlight the impact of legislative reforms including the adoption of the soft opt-out system, national strategies coordinated by NHS Blood and Transplant (NHSBT), clinical protocols for brain-dead and circulatory-death donors, and future directions in technological integration and equitable matching. The UK model provides a multifaceted, evolving paradigm in organ donation, balancing clinical rigour, ethical sensitivity, and system-level coherence.

Introduction

A central responsibility of modern intensive care medicine is not only to sustain life but, when death is inevitable and appropriately diagnosed, to preserve the opportunity for organ donation through meticulous optimisation of the potential donor. High-quality multi-organ support delivered in the intensive care unit plays a decisive role in maximising both the number of organs retrieved and their functional quality at the time of transplantation, directly influencing recipient outcomes and graft survival [1,2]. This process requires early identification of donor potential, proactive physiological stabilisation, and coordinated multidisciplinary care, all undertaken within a robust ethical and legal framework that respects both the donor and their family [3].

Organ transplantation remains one of the most effective life-saving therapies for patients with end-stage organ failure, conferring substantial survival and quality-of-life benefits across cardiac, pulmonary, hepatic, renal, and pancreatic disease [4]. Despite continued advances in surgical technique, immunosuppression, and peri-operative care, the global and national demand for transplantable organs continues to exceed supply [5]. In the United Kingdom, this imbalance is

reflected in persistent waiting-list mortality and prolonged waiting times, reinforcing the imperative to optimise donor identification and management within critical care settings [6].

Over the past two decades, the UK has undergone substantial reform in its approach to organ donation, driven by legislative change, national coordination, and an explicit shift toward donor optimisation as a core component of intensive care practice. The introduction of a soft opt-out system of consent under the Organ Donation (Deemed Consent) Act, alongside public engagement initiatives, has been associated with improved consent rates while maintaining family involvement in decision-making [7,8]. Parallel developments have included the expansion of specialist nurse roles in organ donation, the establishment of national retrieval services, and the implementation of standardised clinical pathways, coordinated centrally by NHS Blood and Transplant [6,9].

These system-level changes have been accompanied by an evolving clinical understanding of donor optimisation as an active, physiology-driven process rather than a passive extension of end-of-life care. Contemporary donor management strategies emphasise haemodynamic optimisation, lung-protective ventilation, endocrine and metabolic support, infection surveillance, and timely organ-specific assessment, all of which have been shown to influence organ utilisation rates and post-transplant outcomes [10-12]. This approach aligns the goals of intensive care medicine and transplantation, reinforcing the principle that excellence in donor care is inseparable from excellence in critical care practice [13].

This review examines the UK approach to donor optimisation across legislative frameworks, national organisational structures, and bedside clinical practice. It also identifies future opportunities for improvement, including refinement of donation after circulatory death pathways, integration of emerging organ preservation technologies, enhanced workforce education, and continued alignment with international best practice. By situating donor optimisation at the intersection of critical care, transplantation, and ethical end-of-life care, this review highlights how sustained, coordinated improvement can translate into tangible survival benefits for patients awaiting transplantation [5,14].

Legislative and ethical frameworks

The foundation of the UK's modern donor optimisation effort lies in legislative reform. Initially guided by the recommendations of the Organ Donation Taskforce (ODTF) in 2008, the focus was on improving infrastructure, training, and public engagement without immediately resorting to presumed consent.

Wales led legislative change with the Human Transplantation (Wales) Act 2013, which introduced a soft opt-out model from 2015. England followed with the Organ Donation (Deemed Consent) Act 2019, effective from May 2020, and Scotland enacted similar legislation in 2021. These reforms were accompanied by public awareness campaigns to ensure transparency, maintain trust, and support family decision-making.

Systemic and organisational optimisation

NHS Blood and Transplant (NHSBT), formed in 2005, is the central body coordinating donation and transplantation activities across the UK. It provides national leadership, standardised procedures, and dedicated personnel such as Specialist Nurses in Organ Donation (SN-ODs), Clinical Leads in Organ Donation (CLODs), and embedded Organ Donation Committees.

The national strategy "Taking Organ Transplantation to 2020" set goals to enhance deceased donor rates, improve organ utilisation, and create shared infrastructures. These initiatives, along with real-time audit and feedback systems, have helped increase the deceased donation rate from 13 to over 24 per million population between 2008 and 2019.

Clinical optimisation strategies

Two groups of potential organ donors need to be identified and treatment should be planned accordingly:

1- Donation following Death with Neurological Criteria (DNC)
2- Donation following Circulatory Death (DCD)

Donor identification and referral

Early identification of potential donors is key. Triggers include death with neurological criteria (DNC) or catastrophic brain injury, with timely referral to the SN-OD team. The UK's mandatory referral policy facilitates early intervention and assessment.

Management of Donors after Brain Death (DBD)

Special experience and learning are needed to deliver the best care following brain death [15]. Awareness of the acute physiological sequalae is key to guide the clinically appropriate interventions [22]. A global systemic inflammation has been described. Common sequalae following Death with Neurological Criteria include hypotension, cardiac arrythmia, pulmonary oedema and/or acute respiratory distress syndrome (ARDS), diabetes insipidus, disseminated intravascular coagulation, the failure of the hypothalamic-pituitary axis and metabolic acidosis [16].

Cardiovascular changes usually start with hypertension and a possible Cushing Reflex in cases of brain herniation. This can be associated with marked sympathetic stimulation and a catecholamine surge. Following that a period of cardio-vascular failure can occur due to loss of sympathetic tone. Shock and organ hypo-perfusion should be anticipated at this stage and treatment should be tailored in a dynamic fashion to minimize the risk of loss of donor potential. Assessment of volume responsive and haemodynamic monitoring tools can be considered to guide the treatment.

Several factors can affect the respiratory system following rain death. Pulmonary oedema and ARDS can overlap. Cardiomyopathy can also be an underlying factor in respiratory failure. Other factors like the catecholamine surge, possible disruption of alveolar-capillary barrier can also continue. Using the standard intensive care tools to help in diagnosis of the underlying causes if cardio-pulmonary axis failure can help reverse many of those factors and improve the organs condition. Interventions like lung recruitment and ventilation optimisation are frequently needed.

Clinical optimisation in DBD focuses on maintaining haemodynamic stability, adequate oxygenation, and hormonal support. Interventions need to be dynamic and should include:

- Invasive monitoring
- Vasopressor support
- Diabetes insipidus management
- Administration of corticosteroids and thyroid hormone

There is a potential role for statins which is yet to be proven. Studies are underway in the UK to investigate such role.

Management of Circulatory Death Donors (DCD)

Although initially associated with inferior graft outcomes, controlled DCD has shown comparable success in recent years [17], especially for renal and liver transplantation. Optimizing the process and the expertise leading to patient selection is key. Careful planning of withdrawal of life-sustaining therapy (WLST), use of normothermic regional perfusion (NRP), and strict warm ischaemia time limits are critical to success.

It is essential to highlight that organ donation specific treatment and interventions, should only start after the decision of (WLST) is confirmed and agreed upon. Following the consensus on the decision, any treatment aimed at maintaining the condition of the potentially donated organs is considered in the patient's best interest as long they wanted to be an organ donor.

Donor optimisation bundles

The NHSBT Donor Optimisation Extended Care Bundle provides standardised guidance, encompassing haemodynamic targets, fluid and electrolyte management, ventilatory strategies, and endocrine therapy[18]. These protocols have been shown to increase the number of transplantable organs per donor[19].

In the UK, an actual DBD donor donates an average of 3.5 organs. The number of organ transplants being retrieved and transplanted fall sharply in donors over the age of 50 years. There is now considerable evidence that the application of standardised donor management protocols increases the number of retrieved organs, with a particular impact on retrieval of cardiothoracic organs.

Clinical management protocols and donor optimisation bundles

National guidance from NHS Blood and Transplant (NHSBT) and clinical societies underpins daily practice. For both DBD and DCD donors, "optimisation bundles" are recommended[18], including:

- Cardiovascular Support: Maintenance of systolic blood pressure above 100mmHg, optimal central venous pressure (CVP), and urine output. Use of vasoactive infusions as required (e.g., noradrenaline, vasopressin).
- Respiratory Management: Lung-protective ventilation, maintaining adequate oxygenation and normocapnia, regular recruitment manoeuvres, and reducing oxygen toxicity.

- Endocrine and Electrolyte Management: Early thyroid hormone replacement, corticosteroids, and maintenance of normoglycaemia, serum sodium <150mmol/L, and normal calcium/magnesium levels.
- Haematological Parameters: Optimising haemoglobin (>10g/dL for multi-organ, >8g/dL for single organ), correction of coagulopathy, and judicious transfusion of blood products.
- Temperature Control: Active temperature management, targeting ≥35°C.
- Minimising Time to Retrieval: Rapid assessment, documentation, and pre-retrieval planning to minimise both warm and cold ischaemic time.

Equity and innovation in organ matching

Persistent disparities, particularly affecting ethnic minorities, prompted NHSBT to introduce a risk-based donor-recipient matching algorithm that accounts for tissue compatibility, waiting time, deterioration, and urgency[20,21]. Early results indicate a potential to shorten waiting times for hard-to-match recipients.

Technological innovation, including real-time data analytics, machine perfusion systems, and AI-based organ viability prediction, offer promising avenues for enhancing organ utilisation and long-term outcomes.

Challenges and future directions

While progress has been substantial, challenges remain. Geographic variability in donation and transplant rates, limited utilisation of extended criteria donors, and ongoing workforce pressures require continued attention. Future directions should include:

- Expansion of normothermic perfusion technologies
- Continued investment in workforce training and retention
- Use of machine learning for donor-recipient matching
- Cross-border collaboration for rare tissue matches

Conclusion

The UK's approach to organ donor optimisation is a dynamic model that integrates legal, clinical, and organisational strategies. The move to opt-out consent has complemented—not replaced—the need for robust clinical care, public trust, and system leadership. Continued innovation and vigilance are essential to sustain gains and address remaining disparities in access and utilisation.

References

1. Organ Donation Taskforce. Organs for Transplants: A Report from the Organ Donation Taskforce. Department of Health, 2008.
2. NHS Blood and Transplant. Taking Organ Transplantation to 2020: A UK Strategy, 2013.

3. Bera KD et al. Organ donor management: A narrative review. Anaesthesia. 2020;75(Suppl 1):e169-e177.
4. Human Transplantation (Wales) Act 2013. [Legislation.gov.uk]
5. Organ Donation (Deemed Consent) Act 2019. [Legislation.gov.uk]
6. NHSBT. Donor Optimisation Extended Care Bundle. 2020.
7. Wired UK. Can AI Make Organ Transplants Fairer? 2022.
8. Transplant International. Impact of Presumed Consent in the UK. 2023.
9. https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/1360/donation-after-circulatory-death-dcd_consensus_2010.pdf
10. Manara AR, Murphy PG, O'Callaghan G. Donation after circulatory death British Journal of Anaesthesia (2012)
11. Bera, KD. Shah, A. English, MR. Harvey, D. Ploeg, RJ. Optimisation of the organ donor and effects on transplanted organs: a narrative review on current practice and future directions. *Anaesthesia.* 2020; 75:1191-1204
12. Pinsard M, Ragot S, Mertes PM, et al. Interest of low-dose hydrocortisone therapy during brain-dead organ donor resuscitation: the CORTICOME study. Critical Care 2014
13. Dujardin KS, McCully RB, Wijdicks EF, et al. Myocardial dysfunction associated with brain death: clinical, echocardiographic, and pathologic features. Journal of Heart and Lung Transplantation 2001
14. Audibert G, Charpentier C, Seguin-Devaux C, et al. Improvement of donor myocardial function after treatment of autonomic storm during brain death. Transplantation 2006;
15. Kotloff RM, Blosser S, Fulda GJ, et al. Management of the potential organ donor in the ICU:Society of Critical CareMedicine/American College of Chest Physicians/Association of Organ Procurement Organizations Consensus Statement. Critical Care Medicine 2015
16. Smith M, Dominguez-Gil B, Greer DM, Manara AR, Souter MJ. Organ donation after the diagnosis of death using neurological criteria: a consensus report. *Intensive CareMed*. 2019;45(5):660–74.
17. Domínguez-Gil B, Ascher NL, Capron AM, et al. Expanding controlled donation after the circulatory determination of death. *Lancet*. 2016;387(10038):2092–100.
18. NHS Blood and Transplant. *UK Donor Optimisation Pathway*. London: NHSBT; 2020.
19. NHS Blood and Transplant. *Organ Donation and Transplantation Activity Report 2023/24*. London: NHSBT; 2024.
20. Academy of Medical Royal Colleges. *A Code of Practice for the Diagnosis and Confirmation of Death*. London: AoMRC; 2025.
21. Bernat JL. Ethical issues in organ donation after circulatory death. *Prog Transplant*. 2013;23(2):124–9.
22. Smith M. Physiologic changes during brain stem death—lessons for management of the organ donor. *J Heart Lung Transplant*. 2004;23(9 Suppl):S217–22.