Critical care in the Emergency Department: organ donation

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ABSTRACT

Organ transplantation is associated with improved outcomes for some patients with end-stage organ failure; however, the number of patients awaiting a transplant exceeds the available organs. Recently, an extended role has been proposed for EDs in the recognition and management of potential donors. The present review presents an illustrative case report and considers current transplantation practice in the UK. Ethical and legal considerations, the classification of deceased donors and future developments promising greater numbers of organs are discussed.

INTRODUCTION

The first successful human kidney transplant was carried out by Murray and Hartwell-Harrison in Boston, USA in 1954, and the first heart transplant was performed by Barnard in South Africa in 1967. The early transplants from deceased donors were carried out after deaths resulting from cardiorespiratory arrest, now known as donation after circulatory death (DCD). The Belgian surgeon Guy Alexandre carried out the first organ donation after brainstem death (DBD) in 1963, which allowed organs to be recovered with less damage from warm ischaemia. Warm ischaemia is the time that an organ remains at body temperature with a low or ceased blood supply. If prolonged, adverse physiological consequences will threaten the survival of the implanted organ. Following the adoption of UK criteria for brain death in 1976, DCD was abandoned almost entirely for 35 years because of better outcomes with DBD. This is because in DBD death is confirmed using brainstem criteria while the patient is still on mechanical ventilation. Therefore, circulatory function can be maintained until organ retrieval, minimising warm ischaemia. Despite the problems of warm ischaemia, DCD was reintroduced at the beginning of the 21st Century due to a shortage of organs.

Overall, transplant outcomes remain superior after DBD, particularly for the liver and pancreas. For the kidneys and lungs, the long-term outcomes suggest equivalence between DBD and DCD. There are single-centre experiences with heart DCD in the USA, Australia and UK. Tissues that are not rapidly degraded, such as corneas, bone, heart valves, tendons and skin, may still be suitable for transplantation even though the donor is not suitable for the donation of organs. Tissues may be recovered up to 48 hours after death. All categories of deceased organ donors should also be considered as potential tissue donors.

In the UK, the responsible authority for organ donation and retrieval is NHS Blood and Transplant (NHSBT) which works in cooperation with individual transplant units and operates within the legal framework of the Human Tissue Acts and associated codes of practice. These codes regulate the transplantation of organs (heart, lungs, liver, kidney, pancreas, bowel), cells and tissues, composite tissue transplants (hand, face), as well as haematopoietic, reproductive and embryonic stem cells.

Donors may be living or dead. From 1 April 2014 to 31 March 2015 in the UK, there were 1092 living organ donations (1052 kidney, 40 liver lobes), 1282 from deceased donors (772 DBD, 510 DCD) and over 2500 deceased corneal donations.[1] DCD is classified according to the modified Maastricht classification (table 1).

Categories I, II and V describe organ retrieval following unexpected and irreversible cardiac arrest (uncontrolled DCD), while categories III and IV refer to the planned withdrawal of life-sustaining treatment (controlled DCD). In the UK, Maastricht category III is the predominant type in intensive care units (ICUs) and EDs. Donation can occur after withdrawal of life-sustaining treatment (LST), if a decision made on grounds that continuation of LST is no longer in the patient's best interests, independent of any donation considerations and death follows within 3 hours. Category II DCD occurs commonly in Spanish and French EDs but is restricted to single centre experiences in the UK.

ILLUSTRATIVE CASE REPORT

A 65-year-old female is brought to the ED following a sudden collapse at home. Prior to the collapse, she had presented with a headache. Her medical history is notable for essential hypertension and type-2 diabetes mellitus. She is on metformin and ramipril and does not take anticoagulants. She is independent for all activities of daily living, she lives with her husband and is a retired school teacher. She is a smoker of 20 cigarettes a day. On arrival of prehospital personnel, she loses her cardiac output and is diagnosed with cardiac arrest in pulseless electrical activity. Immediate cardiopulmonary resuscitation (CPR) is commenced. She is intubated by a paramedic and receives one cycle of CPR and epinephrine 10 mL of 1:10 000 before return of spontaneous circulation is established.

On examination in the resuscitation room, her airway is secure with a cuffed oral endotracheal tube in good position, and end tidal CO_2 monitoring shows a value of 4.0 kPa. She is on a ventilator set to deliver a fractional inspired concentration of 0.5 at 16 breaths per min with 5 cm of positive end

Table 1 Modified Maastricht Classification for non-heart beating donors[2]

Category I	Dead on arrival
Category II	Unsuccessful resuscitation
Category III	Awaiting cardiac arrest
Category IV	Cardiac arrest in a brainstem dead donor
Category V	Unexpected cardiac arrest in a hospitalised patient

expiratory pressure. Air entry is equal on auscultation with no added sounds and oxygen saturation is 99%. The HR is 116, regular and BP is 152/100 without inotropic support. The GCS is 3/15, and both pupils are fixed and dilated. A radial arterial line and internal jugular venous line, inserted under ultrasound guidance, allow full monitoring. The central venous pressure (CVP) is measured at 12 cm H_2O.

An urgent CT scan reveals a large intracerebral haemorrhage in keeping with a hypertensive bleed and with ventricular extension and massive midline shift. The neurosurgical team advises that this is a non-survivable brain haemorrhage in which no neurosurgical intervention is indicated and the patient should receive end-of-life care. The ED and critical care consultants agree that death is inevitable.

QUESTIONS 1

1. What is the role of the ED in enabling organ donation?
2. What action should be taken on recognition of potential donor in the ED?
3. Discuss the expected outcomes for recipients after solid organ transplantation.

What is the role of the ED in enabling organ donation?

A 2008 Organ Donation Taskforce report[3] called for the focus on organ donation to extend beyond the ICU to other areas where potential donors are cared for, including the ED. Up to 15% of UK potential deceased organ donors are identified in the ED. Emergency physicians have a vital role in identifying and referring dying patients where organ donation is a possibility. In 2011, a joint professional statement from the College of Emergency Medicine and the British Transplantation Society advised that dying patients in the ED should be afforded the same opportunity to donate as those in critical care.[4] The statement provided professional support for the identification of potential donors and their continuing management in the ED setting if admission to ICU is not possible.

The joint statement also recommended that the ED should provide a representative to hospital Donation Committees and regularly review the potential donor audit as it relates to ED. The potential donor audit is carried out by NHSBT and investigates all deaths in UK ICUs and EDs in patients aged 80 years or less, for the potential for organ donation. This enables the Donation Committee to identify any potential donors not referred for consideration. Local policies and protocols should be developed to facilitate closer cooperation between ED and ICU and to minimise delays in the referral process. Organ donation is recognised as a core competency in emergency medicine, and as a consideration within end-of-life care pathways.

Two practical ways were identified in which the ED could play a role in organ donation. The first concerned the identification of donor potential among patients with non-survivable brain injury and timely referral to the Specialist Nurse-Organ Donation (SN-OD) who are employed by NHSBT but based in ICUs throughout the UK. SN-ODs, present in all acute trusts, are employed and trained by NHSBT, a Special Health Authority concerned with safeguarding blood supply and increasing the number of donated organs across the whole of the UK. It is the role of the SN-OD to manage the donation process from the identification of potential donors through to outcome and audit, and with special responsibility for the care of donors' families. The typical situation is that a patient with donation potential identified in the ED will be managed on the ICU rather than having life-sustaining treatment withdrawn in the ED.

Secondly, where there is no ICU bed available, the management of the entire pathway before theatre can be completed in the ED. It was anticipated that this would be an infrequent occurrence. Every effort should be made to avoid the need for interhospital transfer of a potential organ donor.

What action should be taken on recognition of potential donor?

Once the decision has been made for brainstem death (BSD) testing or withdrawal of treatment, all mechanically ventilated patients should be considered for organ donation. These decisions are made independently of organ donation consideration and in line with local and national guidance. The General Medical Council (GMC) guidance for end-of-life care 2010 reminded doctors that organ donation should be part of end-of-life care and they have a responsibility to identify any potential organ donors.[5] The Royal College of Emergency Medicine also advises that organ donation should be considered as a usual part of end-of-life care in the ED.[6] Consideration must be given to issues of consent and the protection of organs to ensure the maximum benefit of the gift.

Consent

Once a potential donor has been identified, a referral should be made to the SN-OD; an on-call service is available 24 hours a day to every hospital. It is important to ensure that every potential organ donor becomes an actual donor in appropriate cases. But families should not be approached where the deceased person is ineligible because of, for example, cancer or some serious infections.

There are few 'absolute' contraindications for organ donation and these are set out in the Taskforce document. They include advanced age (>85), some tumours (melanoma, haematological malignancies, secondary brain cancers) untreated tuberculosis, HIV disease (not HIV infection) and possible Creutzfeldt-Jakob disease (CJD). The SN-OD has the most up-to-date information on contraindications to transplantation, and so early referral is warranted as successful donation and transplantation has occurred in rare circumstances even from within the list of absolute contraindications. Organ-specific contraindications refer to the liver (hepatitis, cirrhosis, metabolic liver disorders, portal vein thrombosis), kidney (chronic kidney disease 3B or worse, previous transplant more than 6 months ago and renal malignancy), lungs (cancer, suppurative lung disease, contusion) and heart (ischaemic heart disease, heart failure, previous cardiac surgery, massive inotropic support). Patients with obesity and diabetes are not considered for pancreas donation. Patients over 65 years may not donate the heart and there is an upper age limit of 70 years for lung donation following DBD (65 years for DCD). Age limits also apply to potential donations of pancreas and bowel. As stated, all potential donors, even those with apparent contraindications, should be discussed with the SN-OD as soon as possible who will advise resuitability for

organ donation using the above, or potentially updated, guideline, along with confirmation as to whether the patient is on the Organ Donor Register (ODR) or not.

Procedures exist for the SN-OD to liaise with the recipient transplant team in order to balance the risks and benefit of organs from an individual donor, taking account of the past medical history and clinical and behavioural information. The SN-OD will also arrange for laboratory testing of the donor for markers of transmissible infection once consent for donation has been obtained. If the patient is not suitable for organ donation, the family will not be approached. Advice may then be given on tissue donation.

It is essential the SN-OD is involved in the initial approach to relatives regarding organ donation. The SN-OD has received training in advanced communication skills and have experience in the organ donation process and family support. The SN-OD coordinates the proceedings in three distinct phases; a planning stage is followed by confirmation that the family understand and accept the reasons for treatment withdrawal. Finally, the discussion on donation occurs at a time deemed appropriate for the family.[7] The SN-OD takes the patient details to establish with the transplant teams whether the patient is suitable for organ donation and whether they are on the NHS Organ Donor Register (ODR).

Meeting with the family to explore patient wishes and consent (authorisation in Scotland) for organ donation is the final step. If the family decline organ donation the patient's planned end-of-life care should continue and the family supported throughout. If agreement is forthcoming, the SN-OD takes written consent and continues the process, remaining in contact with family members and providing support to the patient, family and staff.

Timely identification and referral of potential donors allows for conditions to be optimised with the anticipation that consent rates, number of organs retrieved and experience for families and staff will be optimised. However, the family should be given as much time as needed to understand, accept and absorb information being given to them.

Organ protection

The transition to death by neurological or cardiovascular criteria is attended by a number of pathological changes that threaten the viability of organs for transplantation and contribute to organ loss.[8] Management priorities after confirmation of death are focused on the preservation of organ perfusion, often for a prolonged period of time when retrieval follows BSD. Catastrophic brain injury leads to massive catecholamine release; an initial pressure surge causes vasoconstriction and organ ischaemia, including subendocardial necrosis. Hypoperfusion is made worse by a subsequent myocardial depression, the emergence of dysrhythmias and neurogenic diabetes insipidus. A variety of metabolic, endocrine (due to ischaemia of the hypothalamus) and immunological sequelae may impact on organ survivability and must be anticipated by ED and ICU teams prior to transfer to the operating theatre. Intravascular volume status may be depleted due to diabetes insipidus in brain-injured patients and must be optimised with boluses of balanced crystalloid, titrated to (monitored) response and blood to ensure a haematocrit of about 30%. There are specific indications for the administration of desmopressin including polyuria (urine output >3–4 L/day or 2.5–3.0 mL/kg/hour), inappropriately dilute urine (urine osmolality <200 mOsmoL/kg), increased serum osmolality and hypernatraemia (Na+ >145 mmol/L).

The availability of lungs for transplantation is often limited by acute lung injury (ALI) caused by the catecholamine surge and made worse by volume overload. In the critical care setting, the patient will have central venous and invasive cardiac output and BP monitoring, while lung-protective ventilation strategies help to mitigate the effects of ALI. Treatment with corticosteroids is also used to reduce systemic inflammation and cytokine release that are injurious to the lung. Vasoactive drugs are used only after volume resuscitation is complete.

In the resuscitation room, the care of the potential donor may be summarised as the maintenance of homoeostasis; preservation of vital signs, ensuring adequate oxygenation guided by ABG, cautious fluid resuscitation, monitored urine output, correction of serum potassium, magnesium, calcium and phosphate and the avoidance of lung injury by excess fluids or overly aggressive ventilation. Other treatments, sometimes begun in the resuscitation room and continued preoperatively, may include blood products, such as fresh frozen plasma (FFP) and cryoprecipitate, guided by coagulation tests and insulin to maintain euglycaemia. Hypothermia and acidosis must be avoided as they may worsen coagulopathy. Finally, there is a growing belief that organs should receive a period of reconditioning, either in the deceased donor or on ex situ machine perfusion devices after organ recovery, to offset the damage that occurred during the dying process.[1]

What are the expected outcomes for recipients after solid organ transplantation?

For patients receiving an organ, the long-term outcome is favourable. In 2012, for the first time, the most common type of renal replacement therapy in the UK was transplantation. Both DBD and DCD kidneys have a 10-year graft and patient survival after first kidney transplant of over 70%. This compares with 10-year patient survival for the heart 60%, lungs 32% and liver 63%.

The rise of DCD may potentially worsen transplant outcomes as a result of the warm ischaemic damage that occurs in DCD. For abdominal organs, transplantation outcomes from DCD are mixed when compared with DBD organs; liver and pancreas transplants fare worse after DCD, but the long-term results for kidneys are equivalent to DBD. Lung DCD results may be superior to DBD for lungs, as the lack of a coning phase in brainstem death reduces the risk of neurogenic pulmonary injury.

CASE PROGRESSION

There is discussion between consultants in emergency medicine and critical care medicine. It is agreed that further life-saving interventions are not in the patient's best interests and that treatment should be withdrawn in favour of comfort measures only. In accordance with hospital policy, the SN-OD is contacted and she attends the resuscitation room. The ED consultant informs the patient's family of the hopeless prognosis and they are being comforted by ED nursing staff and SN-OD in the relatives' room. Unfortunately, no level 3 ICU bed is available.

QUESTIONS 2

1. What are the preoperative procedures for DBD?
2. What are the preoperative procedures for DCD?
3. What are the intraoperative procedures for organ retrieval and implantation?

What are the preoperative procedures for DBD?

Patients with catastrophic neurological conditions resulting in suspected BSD should have this diagnosis confirmed. This establishes that the patient has died, and if donation follows, DBD results in more organs per donor being donated than DCD. Moreover, DBD is currently the predominant source of hearts for transplantation and maintaining organs in an optimal condition prior to retrieval is much easier to achieve than in DCD. Identification of patients for BSD testing starts with the diagnosis of irreversible catastrophic brain injury. The CT scan demonstrates the morbid anatomy, often with signs of severe raised intracranial pressure and imminent or actual coning. Patients will be in deep apnoeic coma requiring mechanical ventilation and should be referred to the critical care team for the consideration of BSD testing and referred to the SN-OD. Even if organ donation does not subsequently occur, a diagnosis of BSD will avoid prolonging uncertainty for the patient's family and clinicians.

There are a number of conditions that must be fulfilled for the diagnosis of BSD. Procedures are laid down by the Academy of Medical Royal Colleges (AOMRC).[9] As well as irreversible brain damage of known cause, there must be no potentially reversible cause of the coma, including drugs, hypothermia, neuromuscular, circulatory, metabolic and endocrine causes. Prior to testing, it is essential that patient physiological stability is maintained as far as possible. The diagnosis is made on the basis of absent brainstem reflexes and failure of spontaneous breaths on apnoea testing.

Signs of absent brainstem reflexes are listed in box 1.

Apnoea testing is carried out only if the preceding tests show no brainstem activity. Following preoxygenation, the patient is disconnected from the mechanical ventilator and oxygen given via an oxygen tube in the trachea. The patient is then observed for 5 min for the presence of any respiratory activity. Blood gases before and after testing are required to confirm an appropriate rise in $PaCO_2$.

Testing is performed by two doctors, both fully registered for more than 5 years and one a consultant. If the first set of tests show BSD, then the patient's family are informed that the patient has died, and this is the legal time of death. The SN-OD should be present at this point. Discussion with family members regarding the patient's previously expressed wishes and organ donation should then take place.

A second confirmatory set of BSD tests is mandated by the AOMRC code and is carried out by the same pair of doctors. The second set may follow shortly after the first set, once all vital observations and gases have normalised. If the family agrees to donation, the transplant team is contacted and the patient is managed as a potential donor.

All patients who may be brainstem dead should be tested and referred to the SN-OD, regardless of any potential or actual contraindication to donation. Organs from older donors (up to 80 years) are increasingly being accepted by transplant teams and not all infections, for example, are reasons for exclusion. The risk assessment is a matter for the SN-OD and the transplant team.

In reality, brainstem testing to confirm death will invariably occur on ICU and would require the patient's transfer from the ED.

Box 1 Signs of absent brainstem reflexes

1. Fixed pupils not responding to sharp change in light intensity
2. No corneal reflex
3. Absent oculovestibular reflexes
4. No motor responses within the cranial nerve distribution
5. No cough reflex to bronchial stimulation with suction catheter or gag from posterior pharynx stimulation

What are the preoperative procedures for DCD?

Successful renal, liver, pancreas and lung organ transplantation is possible following organ retrieval from mechanically ventilated patients who suffer an asystolic or circulatory death following planned withdrawal of therapy in a ventilated patent. Heart transplantation with DCD has also been recently described.

DCD should be considered for patients for whom death is inevitable but in whom the conditions for BSD are not met. Where death is inevitable and this outcome can be predicted, there may be time for information gathering before circulatory arrest and organ retrieval. This usually occurs following a separate and clear decision to withdraw treatment on the grounds of futility. In this situation, the SN-OD will determine whether the potential donor had given consent for organ or tissue donation by checking with the NHS ODR. If consent (authorisation in Scotland) is established, persons close to the donor should be informed of their wishes. The possibility of organ or tissue donation should be discussed, making them aware of the primacy given to the wishes of the donor and ensuring that practice adheres to the Human Tissue Authority (HTA) Codes of Practice on consent. Where the wishes of the deceased have not been recorded, consent for donation may be given by a person in a qualifying relationship. The HTA has published a hierarchy of persons eligible to give consent, highest first (box 2) for use in England, Wales and Northern Ireland.

Once consent has been obtained, the patient should be cared for in a clinical area suited to their needs. This will usually be ICU but may be a theatre recovery area or the ED, depending on available staff and resource. Caring for such a patient during the dying process will include measures to maintain the organs in the best possible condition for donation, such as the use of vasopressor or inotropic drugs. Such measures are considered to be of overall benefit provided that they do not cause harm or distress to the patient.[10]

Once the organ retrieval team is ready, treatment withdrawal should commence. Circulatory arrest is confirmed by the absence of an arterial line waveform (or asystole on the ECG) and the absence of both central pulse and heart sounds on auscultation. The patient is then observed by the doctor responsible for confirming death for a further 5 min to establish that irreversible cardiorespiratory arrest has occurred. After 5 min of continued arrest, the lack of response to supraorbital pressure and the absence of pupillary and corneal reflexes should be

Box 2 Qualifying relationships to the deceased person (https://www.hta.gov.uk/policies/qualifying-relationships)

1. Spouse or partner (including civil or same sex partner)
2. Parent or child (in this context a 'child' can be any age)
3. Brother or sister
4. Grandparent or grandchild
5. Niece or nephew
6. Stepfather or stepmother
7. Half-brother or half-sister
8. Friend of long standing

confirmed and the time of death recorded when these criteria are met. Any cardiac or respiratory activity during this period of observation should prompt a further 5 min of observation. Following withdrawal of treatment and during this period of 5 min, the next of kin will have the opportunity to spend time with the patient before they are taken to the operating theatre. Patients may take longer to die than anticipated and may not be able to donate their organs. Many protocols dictate that if cessation of circulation does not occur within 60 min, then DCD is suspended; though, in the UK, this time is extended to 3 hours. In these circumstances, the patient will continue to receive appropriate end-of-life care.

The taskforce acknowledged the potential for organ donation in some patients who suffer an unexpected cardiac arrest, as opposed to the anticipated arrest following the withdrawal of life-sustaining treatment. Uncontrolled DCD is an extremely challenging process requiring a great deal of coordination between clinical teams (usually in the same hospital) and HM Coroner. A successful programme for uncontrolled DCD was reported from Leicester in 1996[11] and has also been implemented in other centres. Rapid assessment by the transplant team is essential to the success of such programme.

What are the intraoperative procedures for organ retrieval and implantation?

Donor

Many relatives are concerned to know what will happen to the deceased donor following a decision to proceed to organ retrieval. The SN-OD is well versed in the procedure, and it is his/her role to deal with any questions from family members. Nevertheless, it is incumbent on the referring physician to have a broad understanding of the sequence of events.

After confirmation of death by brainstem or cardiorespiratory criteria the donor is transported to the operating theatre (from the ED or ICU) and prepared for surgery. Sedative and analgesic drugs are not required, but neuromuscular blocking agents are used to prevent spinal reflexes and to reduce abdominal muscle tone for laparotomy. The anaesthetist must also be alert to organ ischaemia resulting from aortic cross-clamping.

In both DBD and DCD, several surgical teams may be present, sometimes operating simultaneously, along with theatre staff and technicians. The surgeons remove the organs after inspecting them for quality and pass them to technicians who use instillation of ice-cold preservative solution to limit the impact of ischaemic time.

At the end of the procedure, the ventilator is turned off and the incisions are closed before transfer of the body to the hospital mortuary. Organs retrieved at the local hospital are transported to transplant centres where the recipients are prepared for the second part of the procedure. More than one recipient may benefit from the organs and they may be transported to different centres.

Recipient

Graft implantation is a complex surgical procedure whose outcome depends upon the maintenance of optimum physiological status and the treatment of comorbidities, which can be challenging in elderly patients. The intraoperative management of renal transplantation was discussed recently by Mayhew and colleagues.[12] Renal graft recipients will, of course, have end-stage renal failure (ESRF), often associated with diabetes mellitus and/or hypertension. Many patients will also be at risk of ischaemic heart disease and most will be receiving regular dialysis. Preoperative assessment includes comprehensive physical examination, chart review and investigations to determine volume status and electrolyte concentrations. Dialysis is sometimes advocated before theatre. A full blood count reveals anaemia in many patients with ESRF, although preoperative transfusion is not routine because of the adverse effect of transfused red cells and because major intraoperative blood loss is unusual. However, platelets may be depleted in ESRF and their function impaired by long-term use of antiplatelet agents. Group and save serum samples must be sent, and a transfusion target of 70 g/L is accepted. Occult infection may be implied by the neutrophil and lymphocyte counts and must be considered because of the added risks of perioperative immunosuppressant drugs. ECG and chest radiographs are routinely performed. Anaesthetists choose the induction, maintenance and analgesic agents carefully and doses are adjusted to account for impaired renal excretory function. Maintenance of renal perfusion is critical and volume loading may be appropriate early in the procedure, avoiding excessive amounts later on. Anaesthetists favour balanced crystalloid rather than saline. Starch solutions are not used. Intraoperative invasive haemodynamic monitoring of the recipient is usual, taking care to avoid any arteriovenous fistula, which may be required postoperatively. Postoperatively, the graft recipient is nursed in a dedicated post-transplant unit, usually not intubated. Continuous monitoring of cardiovascular parameters and urine output allows early identification of complications. Patient-controlled IV analgesia is the preferred method of pain relief.

CASE CONCLUSION

The SN-OD ascertains that the patient recently became a registered organ donor and it was her wish to help others in the event of her death. Her family are agreed that her wishes should be respected. The SN-OD finds no contraindication to donation after reading the electronic patient record. She draws relevant bloods from the arterial line and liaises with the transplant team at an adjacent hospital.

The team arrives several hours later and play no part in the patient's care.

While ordinarily the patient would have been moved to ICU, there are no level-3 beds. A decision between the ED consultant and critical care consultant was made that waiting for the formal confirmation of brainstem death, which would require ICU admission and a longer observation period, is not possible and therefore donation will be DCD and will be facilitated from within ED. Senior ED nurses, along with the SN-OD, are involved and efforts are made to support the family.

With family members present, ventilation is withdrawn and the endotracheal tube removed in the ED. Cardiac arrest in asystole is observed within 15 min. Five minutes from the time of cardiorespiratory arrest, death is confirmed by the ED consultant, with appropriate information communicated to her relatives at the bedside on a continuous basis by medical and nursing staff. The family is given time to say goodbye to their loved one. They understand that organ retrieval is time-sensitive and is content to allow the transplant team to take the patient to the operating theatre within a further few minutes. Kidneys are retrieved and are subsequently transplanted into recipients in two different cities.

QUESTIONS 3

1. What is the ethical and legal basis for organ donation?
2. How does transplant activity in the UK compare with other countries?
3. How might we increase the number of transplants carried out?

What is the ethical and legal basis for organ donation?

In the UK, the ethical and legal position on organ donation and transplantation is set out in a number of statutory instruments and publications from authoritative bodies. It is illegal to use organs for transplantation without proper consent, or to give or receive any reward for organs (Human Tissue Act 2004; Human Tissue [Scotland] Act 2006). The HTA recognised as the competent authority in an EU Directive incorporated into UK law in 2012, governs the practice of organ donation and licenses organisations involved in the sector.

A potential deceased donor does not have capacity and healthcare professionals must act in his/her best interests as defined in the 2005 Mental Capacity Act and the Adults with Incapacity [Scotland] Act 2000. Their wish to become a donor, evidenced for example by their signing up to the ODR should be respected. Where the patient has not expressed a prior wish, there is a hierarchy for obtaining consent from relatives and friends in the HTA Codes of Practice which apply to England, Wales and Northern Ireland, and in the Human Tissue Act [Scotland] 2006.

Primacy must be given to the wishes of the deceased, ensuring that practice complies with the Acts. Organ donation is an altruistic act and depends on the clearly expressed wish of the patient to become a donor. In any event, it is always necessary to ask for the agreement of family members. Family members' wishes may not, under the law, prevail over those of the potential donor, although the doctor is permitted to decline to proceed in the face of objections by relatives.[13 14]

Some deaths or impending deaths must be referred to HM Coroner (Procurator Fiscal in Scotland), if donation is being considered. Organs must not be removed in these circumstances without the approval of the coroner.

Ethical concerns most commonly relate to the diagnosis of death, decisions about organ donation in patients without capacity and potential conflicts of interest. There is a duty of care to the recipient to ensure the availability of organs in the best possible condition. And there is a responsibility to ensure the highest standard of care to the donor and their family. This may produce an ethical dilemma; how may one provide compassionate withdrawal of life-sustaining treatment, managing the patient's death and caring for his/her family, while preserving organs for transplantation? Is it appropriate to modify end-of-life care to preserve organs for potential transplantation even before consent has been obtained?

GMC guidance on treatment and care towards the end-of-life[5] encourages doctors caring for patients close to death, whose views cannot be determined, to explore with relatives, based on their knowledge of the patient, whether donation is a possibility. National procedures exist for identifying potential organ donors and the involvement of the SN-OD. Doctors must make clear that any decision on organ acceptance or allocation would be made by the transplant team, and not by the team providing treatment.

The UK Donation Ethics Committee (UKDEC) hosted by the AOMRC was an independent body established in 2010 following a recommendation of the Organ Donation Taskforce. Membership included clinicians, ethicists and lay members. Its purpose was to provide ethical guidance where there are barriers to decision-making in donation and transplantation. UKDEC published on DCD[15] and antemortem interventions; a DBD publication will be published in 2016. The Committee supported the principle that all patients entering end-of-life care should be offered the opportunity to donate, irrespective of where that end-of-life care takes place. Unfortunately, government funding for UKDEC was ceased in 2016 despite support for its work.

The 2011 National Institute for Health and Care Excellence Guideline CG135: Organ Donation[16] offers evidence-based advice on identifying potential organ donors as a result of BSD or circulatory death. It also gives advice on obtaining consent for deceased organ donation for transplantation, including the optimum timing for approaching families of potential donors.

In the UK, criteria for the definition of death are laid down in the 2008 AOMRC Code of Practice for the Diagnosis and Confirmation of Death.[9] In organ donation after BSD, neurological criteria are used to confirm the death of the patient. The code builds on guidelines first agreed in 1976 and has been upheld in the courts as sufficient for the declaration of death, allowing doctors to cease interventions that are no longer of benefit to the patient. The diagnosis and confirmation of death must be independent of any consideration of organ donation; organ removal must not cause death (Dead Donor Rule).

UKDEC published an ethical framework for DCD in 2011.[10] It is a guiding principle that the potential for organ donation should be considered when caring for a dying patient in whom it has been established (verified by two senior doctors, one of whom is a consultant) that further life-saving treatment is not of overall benefit to the patient. When it becomes known that donation is consistent with the patient's wishes, then interventions should become an integral part of end-of-life care. The AOMRC Code gives criteria for diagnosing and confirming death after cardiorespiratory arrest that are applicable regardless of any consideration of donation. Where CPR is not to be commenced or continued, death by cardiorespiratory criteria can be diagnosed after 5 min of observed apnoea and pulselessness. This 'hands off' interval is important, since there are recorded cases of the *Lazarus phenomenon*, particularly after failed CPR. The 5 min ensures that the chance for spontaneous resumption of the circulation will have passed. In DCD, it is only after this period that the duty of care is transferred to the retrieval team.

How does transplant activity in the UK compare with other countries?

Around 4000 individual organs were transplanted in the UK in 2014 from nearly 1300 deceased donors. Seventy per cent were kidney transplants. The number of organ transplants from deceased donation has increased by 52% in the past decade and, aided by living donation, the transplant waiting list in this country has decreased in each of the past 5 years. Despite this, at the end of 2015, there were nearly 7000 people awaiting a transplant. Last year, 429 persons died while on the waiting list and a further 807 were removed from the list, usually because of deteriorating health. For those waiting for lungs, there is only a 60% chance of receiving a lung transplant within 3 years, by which time a quarter of those initially listed will have died. The median wait time for recipients to receive a kidney in the UK is 1000 days.[1]

In the UK, organ donation is altruistic. Nearly, a third of the population is on the ODR, with almost a million new registrants each year, the majority through the Driver and Vehicle Licensing Agency scheme. Nevertheless, rates of deceased organ donation in this country lag behind many others in the developed world (figure 1).

How might we increase the number of transplants carried out?

The widening gap between the demand for organs and their supply was addressed in the 2008 Organ Donation Taskforce

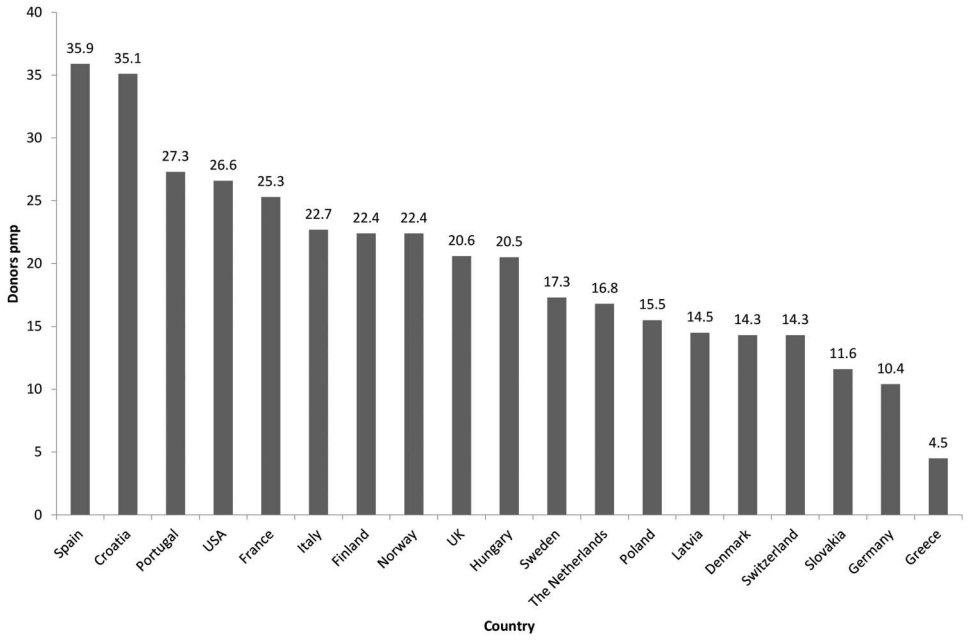

Figure 1 Deceased organ donor rates for Europe and the USA, 2014.

Report. The taskforce made 15 recommendations, establishing the national organisational framework under the auspices of NHSBT, a Special Health Authority, as well as an independent Donation Ethics Group. A UK-wide network of dedicated organ retrieval teams was to be established. Local policies and national guidelines were recommended with the objective that organ donation would become a usual, not an unusual event. Uptake of taskforce recommendations in NHS trusts has been virtually universal; clinical leads for organ donation, the majority from intensive care but with some from other specialties, including emergency medicine, are now present in all major hospitals and the network of transplant coordinators have been transformed into SN-ODs. The taskforce set out its explicit aim to increase the number of deceased donors by 50% within 5 years from a baseline of 809 donors. By the end of that 5-year period, there were 1212 deceased donors, an increase of 50% over the 2007/2008 figure, and by 2015, the total had reached 1282 an increase of 58%. The majority of the increase is attributable to greater identification and referral of potential donors by clinical staff and by approaching more families to offer the opportunity to donate. Despite the fact that the great majority of potential donors are now referred to a SN-OD, there is a continuing problem of family refusal, with only 58% of relatives approached authorising the donation.

'Taking Organ Transplantation to 2020'[17] was published by NHSBT on behalf of the four UK Health Departments and the NHS, following extensive consultation with stakeholders. The strategy aims to achieve four main outcomes by 2020: that the UK's organ donation record is among the best in the world, that there is uniformly excellent care in support of organ donation (ensuring maximum rates of donation from each donor), increased useable organs and better support systems and processes from NHSBT and commissioners. It is proposed that the first outcome will be delivered by a national strategy to change public behaviour through education and publicity campaigns to increase consent rates. Work will be undertaken to further engage Black, Asian and Minority Ethnic (BAME) communities to promote the importance and benefits of donation. Patients from BAME groups are more likely to need a transplant than the wider population yet consent rates remain low. To achieve the remaining objectives, there must be better adherence to national standards and improved support, training and resources for hospital staff and an increase in DCD. Efforts will be made to ensure that the clinical care of donors optimises organ quality.

There will be a new training and accreditation programme for organ retrieval alongside the adoption of enhanced organ preservation technology. Variation in practice for organ implantation will be reduced by evidence-based risk assessment guidance and other work to ensure optimal rates of organ implantation. A number of metrics have been developed to measure the success of the strategy by 2020. These include consent/authorisation rates above 80%, an increase in donors from 19.1 to 26 donors per million of the population (pmp), increased deceased donor transplant rate from 49 to 74 pmp and a 5% increase in the number of organs offered from actual donors.

The biggest challenge for the 2020 UK strategy is to change public attitudes to consent and authorisation. Some have argued that the introduction of legislation on presumed (or mandated) consent could increase donation rates.[18] Countries, such as Spain that use opt-out consent schemes, have higher organ donation rates, and organ donation is viewed as a normal part of end-of-life care. The Spanish model has been introduced elsewhere—which includes not only legislative changes but also intensive care clinicians employed as transplant coordinators. Shepherd and colleagues in 2014[19] found that deceased donor rates were higher in 23 countries with a system of opt-out consent, including Spain, France, Belgium, Portugal, Poland and Singapore compared with countries such as the UK and Ireland, Australia, New Zealand, Hong Kong, Malaysia, and the USA and Canada, where opt-in consent applies. A new system of deemed consent, described as a soft opt-out because families will always be consulted before proceeding to donation, was introduced in Wales in 2015[20] with the aim of increasing consent rates for organ donation. Impact will take a number of years to assess.

DISCUSSION

The management of patients at the end of their lives is an essential aspect of Emergency Medicine (EM) practice. Opportunities are being missed to consider some of these patients for possible organ donation when LST is to be withdrawn. Uncontrolled DCD may be a step too far for many emergency physicians, pending the outcome of current evaluations. However, the recognition of more eligible patients for controlled DCD or DBD, applied consistently throughout the NHS, would yield more organs with the prospect of life-enhancing treatment for many patients currently on the waiting list for transplantation. It is possible to reconcile humane end-of-life care with the ethical and consent issues of organ donation and procedures to optimise organ survival, including in the ED setting.

Registering to donate is straightforward, using an application form at the NHSBT website (https://www.organdonation.nhs.uk/register-to-donate/). One-third of the UK population is on the ODR and 43% of donors in 2014/2015 were on the register.

There is a duty on the part of healthcare professionals to be ready to explore donation at the end of life. It is essential therefore for the emergency physician to have an understanding of procedures and the central role of the SN-OD. The ethical framework has been clarified in recent years and provided it causes no harm or distress, ICU admission to enable donation is consistent with good practice in DBD and DCD and is likely to improve the end of life experience for patients and relatives, irrespective of Organ Donation and Transplantation.

Lack of an available ICU bed should not rule out either approach, and potential donors should not normally be transferred to another hospital. Recent initiatives have already begun to improve the availability of organs for transplant and the hope is that within the next 5 years the UK will match the world's best performing nations.

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SCB read and contributed to the manuscripts, ensuring consistency with the objectives of laboratory science and NHS Blood and Transplant. PAN is the series editor. He invited the authors to contribute and coordinated the writing. He wrote the submissions, bringing together the contributions of other authors and he takes overall responsibility for the paper.

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Notes