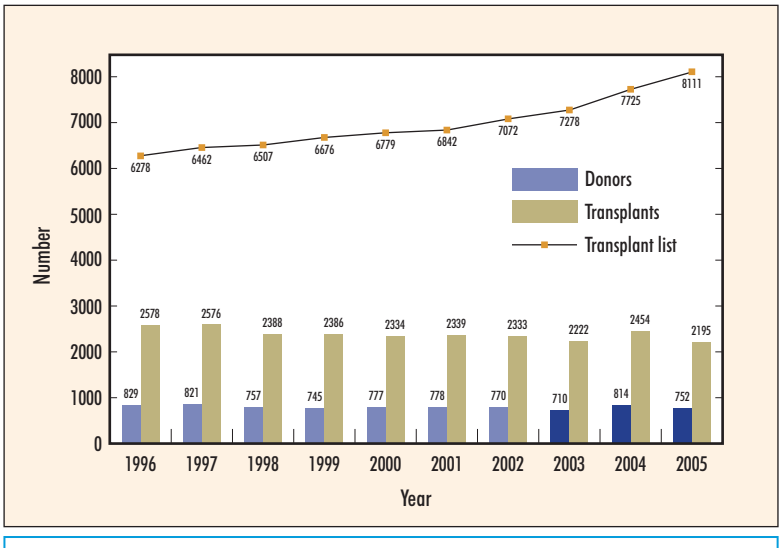
Controlled non-heart-beating organ donation in intensive care

Controlled non-heart-beating organ donation offers the option of donation following anticipated cardiac death on an intensive care unit. Although a number of units in the UK have successful non-heart-beating organ donation programmes, many clinicians still have significant ethicolegal uncertainties about the process.

Although the first transplanted cadaveric organs were retrieved from asystolic donors (US Institute of Medicine, 2000), poor graft survival related to prolonged warm ischaemia of the donor organs has resulted in transplantation services becoming increasingly reliant on organs procured from heart-beating donors who are brainstem dead. The very success of solid organ transplantation has, however, led to an ever-widening gap between the number of patients awaiting solid organ transplantation and the number of heart-beating brainstem-dead donors (Royal College of Surgeons of England, 1999; British Medical Association, 2000; Department of Health, 2003). Thus, while the waiting lists for transplantation have expanded steadily year by year, the number of cadaveric donors is at best static and possibly in decline (*Figure 1*).

There is now strong evidence that with better retrieval techniques and improved immunosuppressive regimens, successful transplantation from donors who have suffered a cardiac death is technically possible, with clinical outcomes that may match transplantation from brainstem-dead donors. For instance, graft survival following kidney transplantation from donors without a heartbeat is similar to that from brainstem-dead donors (Weber et al, 2002) (*Figure 2*), and there is emerging evidence that the procurement of transplantable lungs and livers (White and Prasad, 2006) may also be possible in selected cases. As a result of these clinical developments, and in response to the extant shortage of transplantable organs, various agencies (including the Department of Health, UK Transplant and the British Transplant Society) have encouraged intensive care clinicians to consider as potential solid organ donors not only the current mainstay of cadaveric donation, i.e. those patients who are brainstem dead, but also those whose death has been the result of irreversible asystole that follows the withdrawal of futile cardiorespiratory support in the intensive care unit – so-called controlled non-heart-beating organ donation (NHBOD), or donation after cardiac death. As a result, the professional representative body of intensive care clinicians, the Intensive Care Society, established a working party to consider the feasibility of NHBOD, the conclusions of which were published in the form of national guidelines for the management of NHBOD on intensive care units in 2005 (Ridley et al, 2005).

Figure 1. Number of deceased donors and transplants in the UK, 1996–2005, and patients on the active and suspended transplant lists at 31 December. From UK Transplant (2007).



The impact of the Intensive Care Society endorsement of the process of donation after cardiac death on intensive care practice and the subsequent availability of transplantable organs remains uncertain, however. For instance, while the donation and transplant activity data published by annually by UK Transplant reveals that the number of non-heart-beating donors rose from 87 in 2004–5 to 125 in 2005–6 (an increase of 44%), further analysis suggests that there has been no substantial change in the number of intensive care units offering such donors (49 in 2004–5 compared to 54 in 2005–6). Thus, while there is evidence that those units with a NHBOD programme are offering more asystolic donors there remain many centres that are unable or unwilling to support the process. Although in some circumstances this appears to be the result of inadequate retrieval capacity, a more widespread issue appears to be ongoing resistance from intensive care clinicians who continue to harbour considerable anxieties over various ethicolegal aspects of the process, issues that were largely untouched in the Intensive Care Society guidance (Gardiner and Riley, 2007).

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Controlled NHBOD relates to organ retrieval after a cardiac death that is anticipated following the withdrawal of futile cardiorespiratory support within an intensive care setting. It usually occurs in the setting of a catastrophic brain injury that precludes functional recovery but has not progressed to brain death. Central to controlled NHBOD is that:

- A potential organ donor is identified while they are dying rather than after they have died, and
- The timing of withdrawal of care is adjusted to not only meet the needs of the patient and his/her family, but also the preparedness of the surgical retrieval team (since the procurement process must occur soon after death if significant warm ischaemia is to be avoided). This may mean that withdrawal of care is delayed by some hours while the retrieval team travels to the donor hospital and makes their necessary preparations in the operating theatre.

In order to establish public and professional confidence in a process that poses a variety of ethical and legal challenges, it is essential that the operational policies for controlled NHBOD consider the following key elements of the process:

- The relationship between the declaration of the futility of continued active critical care and a subsequent approach regarding organ donation
- The continued clinical management of an identified donor before withdrawal of cardiorespiratory support while the necessary arrangements for organ retrieval are being made, and the acceptability of interventions that are related purely to maintaining physiological stability and the viability of procured organs
- The diagnosis of death in circumstances where organ retrieval needs to commence as soon as possible after the confirmation of irreversible asystole.

Withdrawal of therapy, consent for donation and conflict of interest

The temporal proximity of the acceptance of futility with a subsequent approach regarding donation after death may generate the anxiety that the decision to withdraw therapy is more to do with organ procurement than a pursuit of the best interests of a dying patient. It is crucial that units take a coherent and robust approach to withdrawal of care in a way that is consistent with guidance from various professional bodies (Cohen et al, 2003; General Medical Council, 2006). In principle, the approach regarding potential donation should not be part of the initial discussions with the family about futility and withdrawal of care. Some units consider that the request for donation should be made by a clinician who has not hitherto been involved in the clinical care of the patient, and under no circumstances should this discussion involve a clinician who might subsequently be involved in any element of the transplant process. The approach to the family should be based upon identifying the wishes of the patient with regards to donation and include an open description of the process of asystolic donation. Specific mention should be made of:

- The need to synchronize the timing of withdrawal with the availability of the retrieval team
- That the retrieval will be stood down if asystole does not occur within a number of hours after withdrawal
- That the time available to be spent with the patient after death is very limited
- That if possible blood will be taken before death in order to facilitate early tissue typing and virology screening.

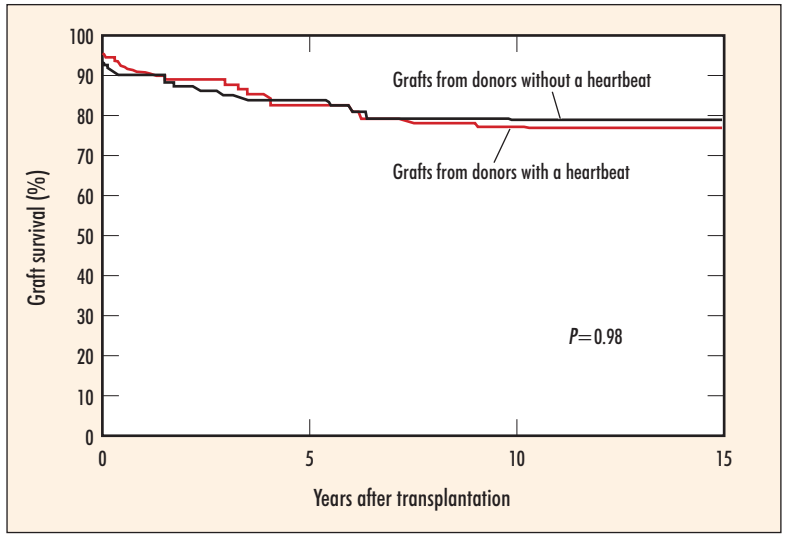
It is important that the family understand that their consent for donation, even once offered, can be withdrawn at any time.

Management of treatment withdrawal and organ optimization

Cardiorespiratory support is withdrawn once the surgical team have made the necessary arrangement for organ retrieval. Although withdrawal usually takes place within the intensive care unit, geographical factors may require the patient to be transferred to theatre before withdrawal. The mode of withdrawal must not be in any way modified in order to suit the interests of organ procurement. While the interval between withdrawal and asystole is variable, high inotrope requirements and an inspired oxygen fraction in excess of 0.6 are predictive of rapid deterioration in this agonal phase.

Pharmacological analgesia and anxiolysis should be administered according to local practice, but must not be given simply to accelerate asystole and thereby facilitate donation. A protracted agonal phase will preclude donation, both because it may imply an extended period of pre-mortem organ ischaemia and because of other conflicting demands upon the services of the organ retrieval team. The permitted maximum duration of this agonal period varies between 2 and 4 hours.

Figure 2. Graft survival from donors with or without a heartbeat. From Weber et al (2002).



NHBOD protocols elsewhere in the world permit the administration of anticoagulants, vasodilators, steroid or antibiotics, and even the pre-mortem cannulation of the femoral vessels (in preparation for prompt preservation of the splanchnic organs after death) in this agonal period. However, the evidence to support such interventions, which have the sole purpose of improving the viability of the donated organ, is very limited, and current UK guidance advises against any manipulation that is purely for the benefit of a third party (i.e. the recipient of a transplant) rather than the dying patient (Ridley et al, 2005). Others argue that the gift of donation after death is based upon the ethical principles of autonomy and best interests, and that these principles endorse clinicians to both take reasonable steps to facilitate donation if they believe that this would have been the patient's wishes and also to optimize the condition of the retrieved organs, providing that in so doing their duty to the dying patient's comfort and dignity is not in any way breached. Furthermore, it can be argued that in such circumstances it would indeed be unethical to withhold medications that carry minimum morbidity should this then result in a recipient receiving an organ of questionable viability.

The diagnosis of death and the dead donor rule

Organ retrieval cannot begin until death has occurred. The need to begin surgical retrieval as soon as possible after death has challenged current understanding of cardiac death, with most anxieties relating to when a state of simultaneous and irreversible unresponsiveness, apnoea and circulatory arrest, can be identified (Ethics Committee et al, 2001; Gardiner and Riley, 2007). Specific concerns related to the spontaneous recovery of cardiac function and neurological activity after a declaration of irreversible asystole (the so-called 'Lazarus' phenomenon) (Maleck et al, 1998).

The available data suggest that cardiac autoresuscitation is very unlikely after 2 minutes of sustained asystole (DeVita, 2001). Brain function is lost within seconds of circulatory arrest (Hossmann and Kleihues, 1973; Losasso et al, 1992), although full recovery can be anticipated if the circulation is restored within up to 11 minutes (Xiao et al, 1995). Thereafter, progressive irreversible brain damage can be anticipated. Similarly, the likelihood of successful cardiac resuscitation after more than 10 minutes of asystole is practically zero. As a result, it is clear that cardiac death cannot be diagnosed within the first 120 seconds of asystole because within this time interval there remains a significant likelihood of cardiac autoresuscitation, in the event of which some neurological recovery would be anticipated. Thereafter, when death can be declared is dependent upon whether there is any intention to attempt cardiopulmonary resuscitation. Within the context of futility and the withdrawal of active cardiorespiratory support, it is argued that death can be declared after 2 minutes of asystole, because the chances of autoresuscitation are negligible, global brain function has been lost and there is no intention of attempting cardiopulmonary resuscitation. Despite this, most guidelines prohibit any surgical intervention within the first 10 minutes of asystole. Guidelines from the Intensive Care Society (Ridley et al, 2005) advise that:

- The diagnosis of death should not be considered before 5 minutes of the simultaneous onset of apnoea, unresponsiveness and an absent circulation
- The diagnosis of death should be made by a member of the critical care unit team
- The absence of the circulation be confirmed on the basis of 5 minutes of continuous absence of central pulse or heart sounds, asystole on electrocardiogram, and absence of pulsatile flow on arterial line. Absence of contractile activity on echo is an optional extra for confirmation, although this is not necessary
- After confirming the absence of the circulation, loss of neurological function should be confirmed clinically by the absence of pupillary light and corneal reflexes, the absence of respiration and the absence of any response to supraorbital pressure.

The patient's family are offered a further 5 minutes with the patient before transfer to theatre; if the family require more time with their loved one then donation should be stood down.

KEY POINTS

- Controlled non-heart-beating organ donation offers the option of organ donation when death occurs following the withdrawal of futile cardiorespiratory support on intensive care.
- The overall outcome of kidney transplants from non-heart-beating donors is just as good as those from brainstem-dead donors.
- Controlled non-heart-beating organ donation may also increase the number of liver and lung transplants.
- Ethicolegal concerns regarding non-heart-beating organ donation relate principally to potential conflicts of interest, the need to adjust the of timing of withdrawal cardiorespiratory support and uncertainties over the definition of cardiac death.

Conclusions

Several areas of the country have established and successful NHBOD programmes that make a significant contribution to transplantation services around the country, particularly with regards to renal transplantation. There is no evidence that NHBOD presents any specific issues for donor families, and indeed some families opt for donation after cardiac death even when their loved one is brainstem dead. Clinicians who support NHBOD do so in the belief that the concept of best interests can be extended to translate the belief that an individual would have wished to donate in the event of their death into an authority to adjust the dying process to enable a success-

ful retrieval to take place. Intensivists who are currently unwilling to offer their dying patients the option of donation after cardiac death remain concerned about the ethicolegal probity of various aspects of the process. Such divisions are likely to remain until these issues are resolved nationally by the relevant statutory and regulatory bodies. **BJHM**

Conflict of interest: Dr Murphy is a member of the UK Transplant Donation Advisory Group.

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