Developments in addressing the organ donor shortage

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Non-heartbeating donation is not a new concept but it is one that has been out of vogue for many years. However, increasing shortage of organs for transplantation has led to its increased use as a viable source of organs. This article outlines the rationale for its re-emergence and the challenges it poses for health care professionals.

Organ transplantation has been an evolving specialty for a number of decades and most solid organ transplantation has become an accepted and viable treatment option for end-stage organ failure. Since the first successful kidney transplant by James Murray in 1954 over one million people worldwide have had their lives saved or their quality of life improved by an organ transplant.

The estimated one-year survival for patients who have undergone a transplant procedure within the UK is over 80 per cent (Fig 1, p26). However, the number of organ donors has been falling for at least a decade, while the number of people in the UK registered on the waiting list for an organ transplant has been rising year on year. In 2003, while 2,222 transplants were undertaken in the UK, 7,278 people were registered on transplant waiting lists.

Surveys have found organ donation is well regarded – UK Transplant (2004a) suggests 90 per cent of people support donation. All major faiths support the principles of organ donation and many encourage individual choice with regard to it (Howitt, 2000). Nevertheless, donation rates in the UK remain some of the lowest in Europe. The reasons are multifactorial and include improved road safety, which has reduced traumatic head injury, and the significant decrease in deaths from intracranial haemorrhage (BTS, 2004).

**Possible solutions**

A twofold approach has been pursued to address the shortage of organs for donation. The first has been to improve the donor pool of organs through a number of strategies including:

- Better management of potential organ donors and protocols to promote haemodynamic stability following brain stem death;
- Use of marginal donors – organs are retrieved from donors who would not have previously been considered, such as those with hypoxic injuries and those previously deemed unsuitable, for example due to extremes of age;
- Live donor organ transplants – this has been undertaken in renal, liver and lung transplantation. A kidney, lung or part of a liver (60–70 per cent) is usually retrieved from a relative of the recipient;
- Split liver transplantation – a cadaver liver is split to allow two recipients to receive a transplant. The left lateral segment is usually given to a paediatric recipient and the remainder to an adult.

The second approach relates to health policy. Saving Lives, Valuing Donors (Department of Health, 2003) aims to increase available organs by maximising donation from living and cadaveric sources and optimising the effectiveness of transplantation.
UK Transplant (2004b) has set a target to increase the number of people registered as willing to donate organs by a million to coincide with the tenth anniversary of the organ donor register. Although it is not a new concept, non-heart-beating donation (NHBD) has been suggested as an alternative source of organs. NHBD is the removal of organs from a person where cardiopulmonary function has ceased. The pioneering transplantation work 30–50 years ago was initially based on the retrieval of organs from non-heart-beating cadavers. These donors are categorised by the Maastricht criteria (British Transplantation Society, 2004):
- Category 1: Dead on arrival at hospital;
- Category 2: Unsuccessful resuscitation;
- Category 3: Awaiting cardiac arrest;
- Category 4: Cardiac arrest in a brainstem dead cadaver;
- Category 5: Unexpected cardiac arrest in patient in an ICU/critical care unit.

### Differences between heartbeating and non-heartbeating donors

The characteristics of these two donor groups are similar as on the whole they will have suffered catastrophic brain injuries such as traumatic injury, intracranial haemorrhage or hypoxic brain insult. Although the NHBD group does not fulfill brainstem death criteria further active treatment would be deemed futile so they could be a non-heartbeating donor (ICS, 2004).

Transplantation of organs from NHBDs is not without complications. The shift to heartbeating donors about 25 years ago was related to a more predictable outcome due to reduced organ damage, as organs retrieved from heartbeating sources have not been exposed to a period of warm ischaemia. This is defined as the period between the final cardiac arrest and the start of organ cooling and is implicated in cell damage (Kievit et al, 2001). It was assumed in the past that organs would not withstand the cellular damage caused during this process.

It is well documented that delayed graft function following transplant is associated with organ retrieval from NHBDs. White et al (2000) showed rates of up to 93 per cent in these organs for delayed graft function compared with 17 per cent from heartbeating donors in the renal transplant population. In liver transplantation there is a 30 per cent increase in the risk of graft failure (Abt et al, 2003). In renal transplantation delayed graft function can be supported by maintenance dialysis but after liver transplant this is much more problematic.

### Developing NHBD programmes

A number of challenges must be overcome to improve donor rates. Transplantation is a unique process in that it relies on the altruism of donors, whether they are heartbeating, non-heartbeating or live. The challenges associated with developing NHBD programmes can only be overcome by educating health care professionals and the public, providing financial resources and accepting different criteria of death.

There are several complex issues associated with NHBD. The Intensive Care Society (2004) suggests the NHS can only meet the need for organ and tissue transplantation if a variety of conditions are met: 
- Health care professionals, particularly critical care teams, should attempt to identify all potential donors. Winter and Cohen (1999) report that 70 per cent of deaths in intensive care occur after withdrawal of treatment. A second study by UK Transplant (2004b) showed the relative refusal rate varied between 30 and 49 per cent. This suggests there is potential to raise the profile of organ donation and educate professionals on approaching families about donation;
- Skilled transplant professionals must retrieve high-quality organs and tissues and use them effectively – the advancement in surgical techniques and preservation of organs has been improving over a number of years and these developments have led to fewer organs being subjected to preservation injury. Health care professionals in transplant units also need education to be able to discuss with potential recipients the pros and cons of receiving an organ from NHBDs, to enable them to make informed decisions about whether to go ahead;
- The public needs to be made aware of the possibilities of donating organs and tissues and encouraged to donate. This should include positive reinforcement of organ donation through campaigns explaining the different organ donation techniques so the general public can consider alternative types of organ donation.

The Organ Donor Line is: 0845 60 60 400.