

Global trends and challenges in deceased donor kidney allocation

Diana A. Wu¹, Christopher J. Watson², J. Andrew Bradley², Rachel J. Johnson³, John L. Forsythe¹ and Gabriel C. Oniscu¹

¹Transplant Unit, Royal Infirmary of Edinburgh, 51 Little France Crescent, Edinburgh, EH16 4SA, UK; ²Department of Surgery, University of Cambridge and the NIHR Cambridge Biomedical Research Centre, Hills Road, Cambridge, CB2 0QQ, UK; and ³Organ Donation and Transplantation, NHS Blood and Transplant, Fox Den Road, Stoke Gifford, Bristol, BS34 8RR, UK

Worldwide, the number of patients able to benefit from kidney transplantation is greatly restricted by the severe shortage of deceased donor organs. Allocation of this scarce resource is increasingly challenging and complex. Striking an acceptable balance between efficient use of (utility) and fair access to (equity) the limited supply of donated kidneys raises controversial but important debates at ethical, medical, and social levels. There is no international consensus on the recipient and donor factors that should be considered in the kidney allocation process. There is a general trend toward a reduction in the influence of human leukocyte antigen mismatch and an increase in the importance of other factors shown to affect posttransplant outcomes, such as cold ischemia, duration of dialysis, donor and recipient age, and comorbidity. Increased consideration of equity has led to improved access to transplantation for disadvantaged patient groups. There has been an overall improvement in the transparency and accountability of allocation policies. Novel and contentious approaches in kidney allocation include the use of survival prediction scores as a criterion for accessing the waiting list and at the point of organ offering with matching of predicted graft and recipient survival. This review compares the diverse international approaches to deceased donor kidney allocation and their evolution over the last decade.

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Correspondence: G.C. Oniscu, Transplant Unit, Royal Infirmary of Edinburgh, 51 Little France Crescent, Edinburgh, EH16 4SA, UK. E-mail: gabriel.oniscu@ed.ac.uk

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The superior outcomes of kidney transplantation over dialysis and the growing incidence of end-stage renal disease have led to an exponential increase in the need for kidney transplantation worldwide.¹ In contrast, the number of deceased donors has changed little and is vastly insufficient.² Consequently, patients face longer waiting times, as well as a higher risk for morbidity and mortality while on the waiting list. In the US alone, the number of patients on the waiting list has doubled over the past decade, reaching around 100,000 patients, median waiting time has increased to over 4.5 years, and nearly 5000 patients die while waiting for a deceased donor kidney transplant every year.³ Similar trends have been noted in other countries (Figure 1 and Table 1).

While living donors usually donate to a specified recipient, in most countries, deceased organ donation is non-directed and organs are offered to patients on a waiting list via an allocation scheme. Allocation schemes are generally governed by appointed transplant organizations that may operate at a regional, national, or even international level. Ownership of deceased donor organs is a controversial matter; in some countries, they are considered a national resource, whereas in others, they are retained within the donor region, and sharing among regions may be limited to payback requirements. Thus, allocation schemes vary from simple local programs to complex national algorithms. Furthermore, there is no universal consensus on the factors that should be considered in the allocation process, leading to considerable variation in the way patients are prioritized within different schemes.

The major debate in the allocation of scarce donor organs centers on the competing ethical values of utility (maximum outcomes) and equity (fairness). Consideration must be given to the efficient use of organs to optimize outcomes and the overall benefits to society, as well as to the welfare of individual patients and fair access to transplantation.⁴ Utility-based allocation prioritizes patients with the best chance of a favorable outcome, aiming to achieve the maximum benefit from every transplanted organ. Inevitably, this gives rise to a debate over how benefit should be measured, that is whether by graft survival, patient survival, life years gained from transplant, or quality of life. Furthermore, it disadvantages patients who are less likely to experience a good outcome, such as those who are older, have diabetes, have more comorbidity, or have been on dialysis for a longer period of time.⁵⁻⁹ Although an increasing

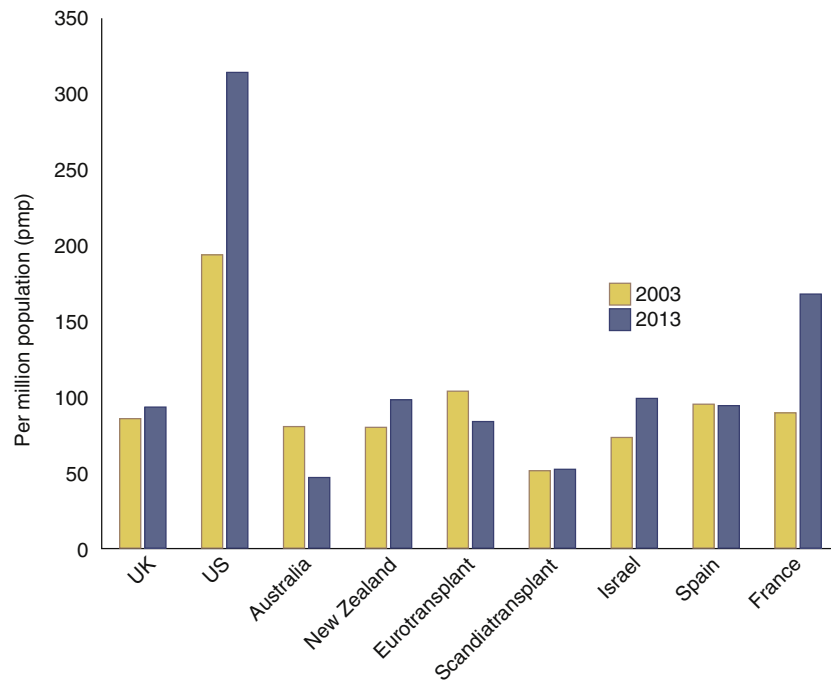


Figure 1 | Patients on kidney transplant waiting list 2003 versus 2013. Eurotransplant 2003: Austria, Belgium, Germany, the Netherlands, Luxembourg, and Slovenia. Eurotransplant 2013: Austria, Belgium, Croatia, Germany, Hungary, the Netherlands, Luxembourg, and Slovenia. Scandiatriansplant: Denmark, Finland, Iceland, Norway, and Sweden. Data sources: UK,^{87–89} US,^{3,90,91} Australia,^{92,93} New Zealand,^{92,93} Eurotransplant,^{94,95} Scandiatriansplant,^{96,97} Israel,^{98,99} Spain,^{98,99} and France.^{98–100} Population data from United Nations. Department of Economic and Social Affairs Population Division. World Population Prospects: The 2015 Revision. Total Population – Both Sexes. Available at: <https://esa.un.org/unpd/wpp/Download/Standard/Population/>. Accessed April 11, 2016.

proportion of patients on the waiting list fall into the above categories, they still derive a significant survival benefit from transplantation.^{1,10–12} The principle of equity necessitates fairness in organ allocation; however, this may be interpreted in various ways. Equity is commonly conceived as “equal opportunity,” that is, every person who may benefit from a transplant should have an equal opportunity of receiving one.¹³ It is important not to misinterpret this as equality; although equality involves treating all patients exactly the same (i.e., allocation by lottery), it neglects the fact that patients do not start from equal circumstances.¹⁴ The discovery of human leukocyte antigen (HLA) matching as a major determinant of graft survival led to its principal role in the first formal allocation schemes.^{15–17} However, it became apparent that such schemes resulted in inequitable access to transplantation for difficult-to-match patients.^{18–20} Consequently, most schemes now award extra priority to highly sensitized patients and patients with rare HLA types (most commonly from ethnic minorities) who are biologically disadvantaged in finding a compatible donor, to equalize their opportunity for transplantation. “Queuing” (first come, first served) is another concept of equity that has been widely accepted in kidney allocation. However, with the increasing age and morbidity of patients on the waiting list, this approach has been challenged for favoring those who are able to survive the ever-increasing wait. Furthermore, with growing evidence for disparities in access to the waiting list, many schemes now measure the waiting time from the start date of dialysis as opposed to the listing date, although some countries

are yet to adopt this approach. Priority for pediatric patients is universally acknowledged in view of the detrimental impact of renal failure and prolonged dialysis on growth and development (although the age cutoff and priority level substantially varies among different schemes). In contrast, the prioritization of younger adults over older ones is widely disputed. While advocates of the “fair innings” concept believe that equity should be measured by the opportunity to reach a normal life expectancy, critics argue that preferential allocation to younger patients is age discrimination.²¹ The “prudential lifespan” provides an alternative concept of equity through the allocation of kidneys by age matching. This justifies the allocation of younger (and therefore “higher quality” kidneys) to younger recipients and the allocation of older kidneys to older recipients because all patients are treated similarly at a particular stage of life.²² However, this approach becomes problematic if there is a discrepancy in the age distribution of donor and recipient pools. Moreover, age is just one of the many factors that influence the outcome of transplanted kidneys. A range of survival predictors are utilized in the emerging concept of longevity matching, where kidneys are allocated on the basis of matching estimated graft and recipient survival. This approach remains controversial, reflecting the enduring difficulties in achieving an acceptable balance between utility and equity.

This review compares the allocation schemes of several different countries and explores their evolution over the last decade.

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