

Kidney donation and transplantation in Australia: more than a supply and demand equation

The Australian organ allocation system relies on equity and maximising effectiveness, but these are sometimes difficult to reconcile

Donated kidneys are scarce and valuable, generously supplied by living donors or altruistically after death. Access to the Australian kidney transplant waiting list requires individuals with end-stage kidney disease to be eligible for Medicare and accepted by a transplant program through meeting the medium to long term life expectancy eligibility criteria from the Transplantation Society of Australia and New Zealand (TSANZ).¹ There are state by state and transplant unit specific approaches to listing based on geography and population variability.² The current overall Australian 5-year kidney transplant recipient survival rate is about 90%, with 5-year kidney survival at about 80%,³ as reported through the Australia and New Zealand Dialysis and Transplant Registry.⁴ There is, on average, a five- to ten-fold reduction in mortality for patients who have received a kidney transplant compared with those who remain on dialysis, explaining the continued demand for kidneys for transplantation.⁵

Despite the recent transformation of donor rates in Australia through the work of the Organ and Tissue Authority (OTA), the network of state donor agencies and all hospital intensive care units, patient needs continue to outweigh kidney availability. It is therefore important to use as many donated organs as possible, despite donor comorbidities and suboptimal organ quality, while also maximising the outcomes of each transplant. The critical connection between these competing demands is through the allocation system, which relies on two principles: equity, that is, the fair distribution of available organs, and maximising effectiveness, through distribution of organs to those patients likely to benefit most from each kidney. These principles are aligned with the governmental, recipient and community expectations, but they are often quite difficult for the transplant programs to reconcile.

To maximise benefit to the individual, optimal outcomes are derived from accepting organs from younger donors without comorbidities and allocating them by human leucocyte antigen (HLA) tissue matching, primarily to young recipients without comorbidities. This strategy would leave older, less fit recipients and Indigenous Australians (because of their poor HLA match with white donors) experiencing long waits. Allocation based on a simple lottery or based exclusively on recipient waiting time would lose lives by allocating low quality kidneys to young people, and would lose years of functioning kidney transplants through transplantation of excellent kidneys to people with a shorter prognosis due to comorbidity. A more complex strategy under consideration is for better organs from younger donors to be allocated to the younger, fitter patients, while older and more



marginal quality kidneys would be allocated to the older and less fit patients.

Kidney allocation at present

Commencing in 2009, the OTA is responsible for improving and managing organ donation, and is focused on hospital infrastructure changes to allow the identification of as many donors as possible, improving donor and family consent rates and supporting donor coordination services. Highly audited practices have been implemented to allow continuous improvements to be made in the overall rate of organ donation.⁶

Deceased donation rates in Australia reached 20.8 donors per million population (dpmp) in 2016 and 20.7 dpmp in 2017,⁷ which is a 104% increase above the pre-reform historical mean of 10.2 dpmp (2000–2008).⁸ There were 832 kidney recipients from deceased donors in 2017,⁷ compared with 452 in 2009.⁸ By international standards, this has been a dramatic increase in donor rates, but similar to other countries that invest seriously in national reform.⁷

The increased number of organs has largely occurred through an increase in older, more medically complex donors with brain death (DBD), as well as through donation after circulatory death (DCD). Before 2009, the majority of organs came via the DBD pathway, but by 2016, Australia had reached 25.5% of organs donated via the DCD pathway.⁷ A total of 103 kidney donors were 65–74 years of age, representing 12.2% of all donors; only 0.7% of donors were aged over 75 years in 2017. The average age of kidney donors has risen steadily to just over 45 years now compared with 32 years in 1989.⁸

Increased donation has shortened waiting times for kidney transplants from an average of 3–4 years at its peak in the early 2000s,⁹ to 3.2 years (median 2.4 years) at

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doi: 10.5694/mja18.0067

Podcast with Jeremy Chapman available at <https://www.mja.com.au/podcasts>

present.² The total number of patients waiting for a kidney in Australia has also fallen from 1580 at its peak in 2002, to just under 1000 currently. Despite these advances, challenges remain, especially for potential kidney transplant recipients who have been sensitised to HLA antigens. About 25–30% of the patients in the waiting list have high levels of anti-HLA antibodies and, thus, it is hard to find a donor to whom they have no antibodies. Sensitising events, such as previous transplants, blood transfusions or pregnancy, make these potential kidney recipients wait much longer to find a compatible donor.

There are many patients on dialysis who never get listed for transplantation. Comorbidities, especially heart and lung disease, can make the risks of transplantation and immunosuppression unacceptable, while obesity and vascular disease may provide technical surgical challenges, and continued smoking, advanced age or poor treatment adherence may predict a very short transplant prognosis. Nevertheless, it is difficult to ignore the possibility that suitable candidates do not reach the Australian waiting list appropriately.²

The current allocation system is coordinated through custom built computer software known as the National Organ Matching System, the principles and rules of which are defined by the national Renal Transplant Advisory Committee. This is a committee of TSANZ, which presents the resulting national allocation rules for formal adoption by OTA; the complex allocation rules and protocols are publicly available at the TSANZ¹ and OTA websites.¹⁰ Using this computer algorithm, the Australian kidney allocation system takes into account blood group compatibility, immunological factors (the T cell crossmatch test must be negative and good HLA matching is favoured), as well as waiting time on dialysis. Kidneys are matched and allocated at either a national level, if there is a well matched kidney, especially for a sensitised recipient anywhere in the country, or at a state level, where more weight is given to time on the list.

The national allocation criteria account for about 20% of the allocated kidneys and are predominantly immunologically based. This prioritises blood group-compatible patients with a negative crossmatch test who are difficult to match due to the presence of anti-HLA antibodies. If there are no patients matched by the national algorithm, allocation occurs within the state where the donation occurs and is predominantly based on duration of waiting time. Paediatric recipients receive a degree of priority at both national and state levels. There is also a state balancing mechanism to allow the number of kidney donations within a state to equal the number of transplants performed within that state. In a practical sense, the state-based allocation rules help to reduce travel times for the kidney and minimise the cold ischaemia time, thus improving transplant outcomes as well as ensuring efficient use of local donation, laboratory and retrieval team resources.

The use of waiting time on dialysis as one of the major factors determining the order of potential recipients for state-based kidney allocation promotes a patient perspective of fairness. Regardless of age, comorbidities, social status, religion or gender, to which the allocation system is blind, those who are suitable for the transplant and who have waited the longest, get the first offer. Each state can also promote the rare patient to an urgent category, usually those who become nearly impossible to dialyse for one reason or another.

Improving kidney allocation in the future

Australia and New Zealand have all the elements of a continuous quality improvement process for kidney allocation. The data on all aspects of donation and transplantation outcomes are comprehensively measured through our registries. Review of those data involving all stakeholders, including patients, determines changes to the wait listing and allocation algorithms. The impact of those changes is then analysed as the data become available.

Matching the quality of the donor kidney to the likely survival of the recipient has become an important principle in many countries. Survival matching or longevity matching is under consideration here too, and we are building the computer system capable of using this approach to allocation. The broadened spectrum of both donors and recipients now demands a more sophisticated approach. Good quality kidneys from younger and fitter donors have a longer predicted lifespan and thus, logically, should be allocated to recipients with longer predicted life expectancy. Those kidneys with a shorter predicted lifespan are better allocated to older patients with a shorter predicted lifespan. Survival of younger transplant patients is most affected by the quality of the kidney, while survival of older recipients is most affected by their comorbidities and less so by the quality of the kidney.¹⁰ Moving to an allocation system based on the Kidney Donor Profile Index might allow for better overall outcomes from the entire available donor pool to avoid wasted life years of kidney function.¹¹

We owe it to those individuals who altruistically donate their kidneys to ensure that each donation counts and the outcomes for the community are maximised. We are at a point now where the systems that have served the community well for the past 30 years are being redesigned using Australian data and in the light of the changing donors, changing recipients and improving technologies available today.

Competing interests: No relevant disclosures.

Provenance: Commissioned; externally peer reviewed. ■

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