The information on this cover page is based on the most recent submission data from the authors. It may vary from the final published article. Any fields remaining blank are not applicable for this manuscript.

**Article Type:** Global Communication

**Global Perspective on Kidney Transplantation: Australia**

**DOI:** 10.34067/KID.0003692021

Melanie Wyld, Kate Wyburn, and Steve Chadban

**Key Points:**

* 
* 
* 

**Abstract:**

**Disclosures:** S. Chadban reports the following: Consultancy Agreements: CSL; Research Funding: Novartis, CSL, Baxter payments made to hospital; Honoraria: Novartis, AstraZeneca; Scientific Advisor or Membership: CSL, Novartis. The remaining authors have nothing to disclose.

**Funding:**

**Author Contributions:** Melanie Wyld: Conceptualization; Writing - original draft; Writing - review and editing Kate Wyburn: Conceptualization; Writing - review and editing Steve Chadban: Conceptualization; Writing - review and editing

**Clinical Trials Registration:** No

**Registration Number:**

**Registration Date:**

**How to Cite this article:** Melanie Wyld, Kate Wyburn, and Steve Chadban, Global Perspective on Kidney Transplantation: Australia, Kidney360, Publish Ahead of Print, 10.34067/KID.0003692021
Global Perspective on Kidney Transplantation:

Australia

Melanie LR Wyld,1,2,3 Kate R Wyburn,1,3,4 Steve J Chadban1,3,4

1 Department of Renal Medicine, Royal Prince Alfred Hospital, Camperdown, NSW
2 Department of Renal and Transplant Medicine, Westmead Hospital, Westmead, NSW, Australia
3 Sydney Medical School, Faculty of Medicine and Health, The University of Sydney, Sydney, Australia
4 Kidney Node, Charles Perkins Centre, University of Sydney

Corresponding author:

Dr Melanie Wyld ORCID ID: 0000-0001-9250-107X

Kidney Centre, Royal Prince Alfred Hospital
Missenden Road, Camperdown, NSW 2050
Australia

Email: Melanie.wyld@health.nsw.gov.au
Transplantation in Australia

The first living and deceased donor kidney transplants were performed in Australia in 1965. In the 56 years since, kidney transplantation has become a cornerstone of treatment for kidney failure in Australia and is performed in most capital cities. In 2019, the most recent year for which complete data is available, 1104 kidney transplants (44pmp) were performed, a growth of 16% (and an additional 4pmp) from just four years prior (1). This reflects a transplantation rate of 7.1 transplants/100 dialysis-years (all dialysis patients included in the denominator) or 11.6 transplants/100 dialysis-years (only dialysis patients aged 15-64 included in the denominator)(2). Of the 1,104 kidney transplants performed in 2019, 22% were from living donors, including 40 patients transplanted via paired kidney exchange (3). The total number of people living with a functioning transplant in Australia was 12,815 (505pmp) in 2019, up from 10,479 (440pmp) in 2015 and 8510 (386pmp) in 2010 (1).

Despite annual growth in the number of transplants performed, similar increases in the number of candidates waitlisted has prevented any reduction in the size of the waitlist. In 2019 there were 1,100 people active on the kidney transplant waitlist, largely unchanged from the 1,145 in 2014 (2).

Recognising the importance of transplantation, the Australian Government in 2009 established the Organ and Tissue Authority (OTA). OTA was charged with maximising the rate of organ donation from deceased donors for transplantation in Australia, which at that point lagged international best practice. To do this OTA adopted elements of the “Spanish model” including the optimisation of hospital infrastructure such that potential donors could be more easily recognised, establishing organ donor specialists in all major intensive care units, and improving donor and family consent rates through targeted training(4). By
collaborating with specialist societies, particularly the Transplantation Society of Australia and New Zealand (TSANZ), transplant and organ donation specialists, data analysts, researchers and the ANZDATA Registry, the OTA facilitated a 100% increase in the organ donation rate between 2009-2019, yielding an increase in deceased donor transplantation exceeding 100% in 10 years. A similar approach has been taken to address the impact of COVID-19 in Australia through formation of the COVID-19 Rapid Response Taskforce (5).

Indigenous Australians

The dynamics of transplantation are significantly different in Australia’s indigenous population. Indigenous Australians are overrepresented in Australia’s dialysis units, both due to a large burden of kidney disease, and because of a lower rate of transplantation (6). Only 13% of Indigenous Australians on renal replacement therapy are sustained by a kidney transplant, compared to 51% of non-Indigenous Australians (7). As this inequity has been increasingly recognised there have been some improvements. In 2019, 54 Indigenous Australians received a kidney transplant, up 50% from 36 in 2014 (2). Alongside the growth in transplantation, there has been growth in the number of Indigenous Australians who are active on the transplant waitlist – from 43 people in 2014 to 77 people in 2019 (2).

Despite this improvement, substantial disparities in access to transplant remain. In 2019, following a review into the care gaps and obstacles faced by Indigenous patients with kidney failure, a government supported National Indigenous Kidney Transplantation Taskforce (NIKTT) was established. The overarching aim of this taskforce is to improve equity and access to transplantation for indigenous Australians. To this end, the NIKTT is supporting a number of pilot projects including: (1) increased pre-transplant data collection for indigenous patients to deepen the understanding of barriers to transplantation, (2) expansion of targeted
health services areas including indigenous health workers, clinical champions, and transplant coordinators, and (3) programs that provide increased social, emotional and health literacy support to indigenous Australians. The results of these projects will inform the ongoing efforts to further improve transplantation rates and outcomes for Indigenous Australians.

Kidney transplant outcomes in Australia

Australia is a global leader in graft and patient survival. In a recent study comparing transplant outcomes in the USA, UK, Australia and New Zealand, Australia was found to have the lowest risk of graft failure with a short term (one year) hazard ratio of 0.90 compared to the USA (p=0.001), and a long term hazard ratio of 0.74 (p<0.001) (9). Median graft survival was >14.7 years compared to 11.2 years for US (9). This study specifically looked at case-mix and unmeasured confounders as a cause for such difference, and found that these were unlikely drivers of the difference (9).

Current one-year kidney transplant survival in Australia is 96% and 98% for deceased and living donors respectively, while five-year graft survival is 83% and 91% for deceased and living donors respectively (1). Patient survival is similarly excellent, with one-year patient survival rates of 98% and 100% for deceased and living donor transplants respectively, and five-year patient survival of 89% and 96% for deceased and living donors respectively (1).

Delivery of transplant care

Transplant care in Australia is delivered via a hub-and-spoke model. Patients are referred to transplant centres by their local treating nephrologist. There are 19 adult kidney transplant centres in Australia. By state NSW has 6 (32% of national transplant centres vs 32% of the Australian population), Victoria also has 6 (32% vs 26%), Western Australia has 3 (16% vs
10%), Queensland has 1 (5% vs 20%), South Australia has 2 (11% vs 7%). There are no transplant centres in Tasmania (2% of the Australian population), the Australian Capital Territory (2% of the Australian population) or the Northern Territory (1% of the Australian population). Patients in these states must fly interstate to have a kidney transplant (10).

Transplant centres conduct the candidate assessment, assessment of any potential living donors, waitlist management, transplant surgery and acute post-transplant care (see Figure 1). Once this is complete, usually between one- and three-months post-transplant, patients are referred back to their treating nephrologist for ongoing care. At this time, the treating nephrologist is provided with a discharge letter and summary of investigations. A strong link to the transplant centre remains. Protocolised follow-up at the transplant centre is offered by most services at twelve months post-transplant, and at any time to evaluate clinical problems.

The transplant assessment process in Australia mirrors that performed internationally and is largely consistent with KDIGO Guidelines (11), with a focus on a patient’s physical and psychological suitability for transplantation. In Australia, only patients who have commenced dialysis are eligible for deceased donor transplantation, whereas pre-emptive transplantation may be conducted if a suitable living donor is available. In accordance with the TSANZ guidelines, eligibility for deceased donor listing requires that patients have a high likelihood of significant benefit from kidney transplantation. Concurrent with the assessment for transplant suitability is a review of whether the patient would be eligible for a deceased donor, a living donor and/or for entry to the Australia and New Zealand Paired Kidney Exchange (ANZKX). The Australian kidney exchange program was established in 2010, and joined with New Zealand in 2019, matching incompatible kidney donors with recipient pairs with other incompatible donor/recipient pairs across Australia and New Zealand.
When a patient undergoes kidney transplantation they are admitted under a (transplant) nephrologist, who manages the immunosuppression, medications and medical care. Most acute post-transplant care occurs on the transplant ward, rather than the intensive care unit. Transplant surgeons perform deceased donor retrieval surgery, living and deceased donor kidney transplant surgery, and manage post-transplant surgical issues including wound management and decisions around the in-dwelling catheter. Urologists typically perform the living donor retrieval surgery. Pre- and post-transplant nursing teams as well as specialised social workers, dieticians, pharmacists and psychiatrists also play critical roles in patient care.

Patients are admitted for a minimum of four days post-transplant by which time induction immunosuppression is complete and the in-dwelling catheter has been removed. The length of stay post-transplant is generally between 6-9 days, but may be longer in elderly and multi-morbid recipients who comprise a growing portion of Australia’s transplant population.

**The costs of transplant care**

Australian citizens enjoy government-funded universal healthcare, hence kidney transplantation is publicly funded, and patients have no out-of-pocket costs for the transplant surgery and associated hospitalisation. There are indirect costs however. Australia is geographically dispersed, and transplants are only performed in capital cities. Many patients must travel for transplantation and incur travel and accommodation costs. Although these costs are often re-imbursed by the Australian government, paying the up-front cost can an issue for many patients.
Immunosuppression is often provided at no-charge from transplant hospitals in an effort to remove any financial barriers to adherence. For those who choose to get their scripts from private pharmacies, or whose transplant hospitals do not offer such a service, a co-payment is required. This is currently set at a maximum of AUD $6.60 per script for those with a concession card (welfare recipients), or AUD$41.30 per script for those not eligible for a concession card (12). There is also a medication spend ‘safety net’ which sees families with a concession card spending a maximum of AUD$316.80 (after which all medications are free), and all other families spending a maximum of $1,497.20 (after which medications cost the concessional rate)(12). Despite these efforts to remove financial barriers to adherence, a single centre survey of 156 transplant patients found that 55% of patients were not adherent due to dose timing errors (30%) or skipped doses (25%).(13)

Discussion

Transplantation in Australia has a long history of success, with world leading graft and patient survival. Underpinning this success is a commitment to basic and clinical research in transplantation and immunology, with strong regional and global collaborations, yielding pivotal publications in transplant pathology (14) and immunosuppression (15). Although conducting for <2% of global transplants, Australian sites have participated in most major multinational studies in transplantation immunosuppression. Australia has been at the forefront of developing Standardised Outcomes in Nephrology (the SONG initiative) as well as Patient Reported Outcome Measures (PROMs) in transplantation.

Australia has benefited from the most complete and longest running transplant registry, ANZDATA. ANZDATA has a number of unique aspects including (i) it is a complete inception cohort from the start of renal replacement therapy (be that pre-emptive transplant or
dialysis) to death which enables the observation of treatments and outcomes following graft loss (ii) it records outcomes such as acute rejection episodes and cancer that are not recorded in other registries, (iii) complete (>98%) population based coverage of the ESKD population since inception in 1977, and (iv) the data collection is clinician driven with decisions about which data to collect (or not collect) made by clinicians, not administrators. These unique aspects of ANZDATA have been pivotal to landmark publications defining the outcomes of paediatric transplantation and the impact on transplant outcomes of recurrent disease, acute rejection, cancer and pregnancy (16-19).

Despite this success, there are areas where ongoing improvement is required. As with many countries, access to transplantation, particularly for Indigenous and rural/remote populations, is a persistent issue (6). Although Australia has, thus far, fared better than many countries with COVID-19, there have been twenty-two cases (including two deaths) in kidney transplant recipients(20). COVID-19 was also associated with a 30% reduction in transplantation rates in 2020, further exacerbating the failure of supply to meet demand for organs. A living donor registry was established in 2004 , and while donor data is universally supplied at baseline, provision of follow-up data is incomplete which limits our ability to ascertain long-term donor outcomes. Movement to virtual cross-matching and refinement of pharmacological and technical strategies to improve organ preservation and transplant outcomes remain key challenges.
Disclosures:

S. Chadban reports the following: Consultancy Agreements: CSL; Research Funding: Novartis, CSL, Baxter payments made to hospital; Honoraria: Novartis, AstraZeneca; Scientific Advisor or Membership: CSL, Novartis. The remaining authors have nothing to disclose.

Funding:

None

Author Contributions:

Melanie Wyld: Conceptualization; Writing - original draft; Writing - review and editing
Kate Wyburn: Conceptualization; Writing - review and editing
Steve Chadban: Conceptualization; Writing - review and editing
REFERENCES


Transplantation in Australia

**Waitlist**
- Patient referred by nephrologist to transplant centre for transplant assessment
- Assessed by tx nephrologist, tx surgeon & others for tx suitability
- Quarterly serology for cross-match

**Acute transplant admission**
- Annual review for medical suitability for transplant
- Deceased donor kidney retrieval and recipient transplant surgery performed by transplant surgeons
- Post-transplant care & immunosuppression management by nephrology
- Discharge from hospital
- Typical LOS is 6-9 days

**Post transplant chronic care**
- Regular clinic follow up and immunosuppression management
- Protocol and indication biopsies performed
- Discharged from transplant centre at 1-3 months
- Patient referred back to nephrologist by transplant centre for ongoing chronic care

**Prevalent dialysis # in Australia (2019): 13,931 (549pmp)**
- 8% of total dialysis pts are on waitlist

**Prevalent transplant # in Australia (2019): 12,815 (505pmp)**
- Deceased donors
  - 5yr Patient survival: 89%
  - 5yr graft survival: 83%
- Living donors
  - 5yr Patient survival: 96%
  - 5yr graft survival: 91%

^ Living kidney donor surgery performed by urologists
LD Living Donor
DD Deceased donor
Tx Transplant