ANZ DATA
AUSTRALIA & NEW ZEALAND DIALYSIS & TRANSPLANT REGISTRY

CHAPTER 12

Paediatric Patients with Kidney Failure Requiring Replacement Therapy

As well as a summary of current trends in the frequency and causes of Kidney Failure in paediatrics, this report focuses specifically on current trends in the epidemiology and outcomes of paediatric transplantation

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SUMMARY AND HIGHLIGHTS

The incidence of kidney replacement therapy (KRT) among children in Australia and New Zealand has not changed over the last 20 years, remaining stable at around nine per million. In contrast there appears to be an increase in prevalence in Australia (but not New Zealand) of KRT in children aged 10-17 years with 87 per million receiving KRT in 2023 compared with approximately 66 per million in 2003.

The leading cause of kidney failure among children overall is Congenital Anomalies of the Kidney and Urinary Tract (CAKUT, 38%). However, among children aged 15-17 years, Glomerular Disease is the leading cause of kidney failure (35% vs CAKUT 31%). For the second consecutive year, the updated classification system from the European Renal Association/European Dialysis and Transplant Association (ERA/EDTA) has been utilised for categorising primary kidney disease, allowing for more detailed and refined analyses. For instance, it is now clear that Nephronophthisis/Autosomal Dominant Tubulointerstitial Kidney Disease represents 6% of primary kidney disease.

Pre-emptive transplantation as the initial modality of KRT is uncommon at 20% compared with haemodialysis at 27%. However, reflecting the relatively high rate of transplantation in children, the prevalent population of children on haemodialysis aged 0-17 years in Australia and New Zealand in 2023 is extremely low at just 12, representing 3% of those receiving KRT. This insight exemplifies the difficulty in providing a patient centred model of care for paediatric haemodialysis, due to the small number spread across each of the eight centres.

Missing data remains a problem that we recognise and aim to improve. Body mass index (BMI) is unavailable for over 25% of children in Australia and New Zealand on peritoneal dialysis, yet we know that growth and nutrition is a high priority of care and is likely monitored very carefully in clinical practice. This remains an important priority area, given that 14% of the transplant cohort are obese and a further 18% are overweight. Given the high lifetime risk of cardiovascular disease in this cohort, it is important to recognise this and other modifiable risk factors in childhood.

This year, as well as providing a summary of current trends in the frequency and causes of Kidney Failure, the paediatric report for 2023 data focuses on current trends in the epidemiology and outcomes of paediatric transplantation.

Pre-emptive kidney transplants in children peaked in 2020 and 2021, representing 24% and 29% of all transplants, respectively. However, they have since become less frequent in Australia and New Zealand. Over the past five years, more than half of living donor transplants were not pre-emptive. Living donation overall has declined, with nearly 50% of transplants in the period from 2012 to 2017 being living donor transplants, compared to less than 40% from 2018 to 2023. At the same time, the number of children waiting more than three years for a transplant is at its highest level since before 2012.

In terms of donor characteristics, less than 10% of donors for children from 2012-2023 were above 55 years of age and approximately 10% of all donors were below 25 years old. Around 30% of all transplants had 5-6/6 HLA mismatches at A, B and DR.

Work by paediatric nephrologists from Australia and New Zealand have highlighted disparities in access to transplantation according to ethnicity and gender[1-3]. As a result, it was felt important to provide this information in the ANZDATA report to ensure transparency and enable ongoing monitoring and awareness of these disparities. It is, however, important to consider the small numbers in these cohorts which may prevent accurate analysis.

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This year's report highlights that Aboriginal and/or Torres Strait Islander children are highly unlikely to receive a living donor kidney. In New Zealand, Māori children have greater rates of living donation, though Pacific Peoples children are still affected, albeit to a lesser extent than Aboriginal and/or Torres Strait Islander children. Overall, children from Aboriginal and/or Torres Strait Islander, Māori, and Pacific Peoples backgrounds experience significantly longer wait times for their first transplants compared to other groups.

Female gender is associated with a lower likelihood of receiving a living kidney donation, particularly pre-emptively. This is further evidenced by the longer wait times for primary transplants in female children compared to males within the first 18 months of starting KRT. It is crucial for paediatric nephrologists in Australia and New Zealand to recognise the potential for unconscious bias in the transplant process, particularly for female children and those from Aboriginal and/or Torres Strait Islander, Māori, and Pacific Peoples backgrounds.

Patient survival post-transplantation is high. Graft survival, however, is also different by gender. Comparing graft survival for Aboriginal and/or Torres Strait Islander children in Australia against non-Indigenous is impeded by the small numbers at risk and this is also true for the New Zealand Māori, Pacific Peoples and Non-Māori, non-Pacific populations.

Next year, the priorities for data collection will focus on reducing missing data. Additionally, ANZDATA will continue gathering genetic data from prospective patients, with plans to publish this information next year. We also encourage contributors to enter retrospective data for the remaining prevalent paediatric population, as this will be invaluable in assessing the burden of genetic diseases within the paediatric kidney failure population.

SUGGESTED CITATION

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INCIDENCE AND PREVALENCE

The definition of paediatric used throughout this chapter is any patient below 18 years of age (at the time of commencing kidney replacement therapy (KRT) for incident data, or at the time of the annual survey (31 December 2023) for prevalent data). It is acknowledged that some of these patients may have been receiving their care in adult renal units, and some patients treated in paediatric units who are aged 18 years or older will not be included.

Population estimates for Australia and New Zealand used throughout this chapter for the calculation of incidence per million population were sourced from the Australian Bureau of Statistics (2023)[4] and Stats NZ (2023)[5], respectively.

Figure 12.1 shows the annual incidence of KRT per million age matched population. There is no change in the incidence of KRT in children and adolescents in either Australia or New Zealand. The small absolute numbers of incident patients produce large year to year fluctuations.

Figure 12.1.1
Incidence of KRT - Age 0-17 Years - Australia

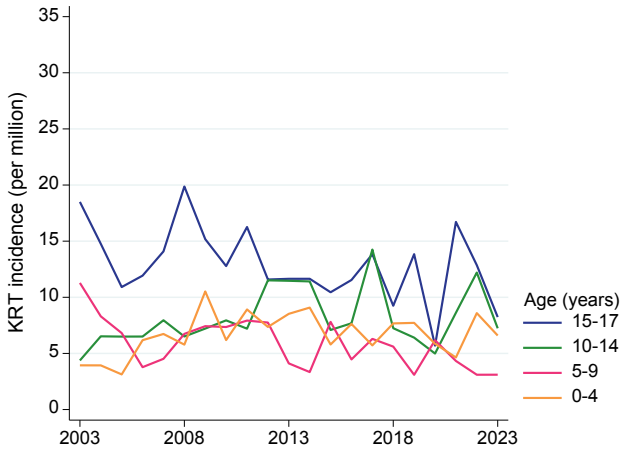
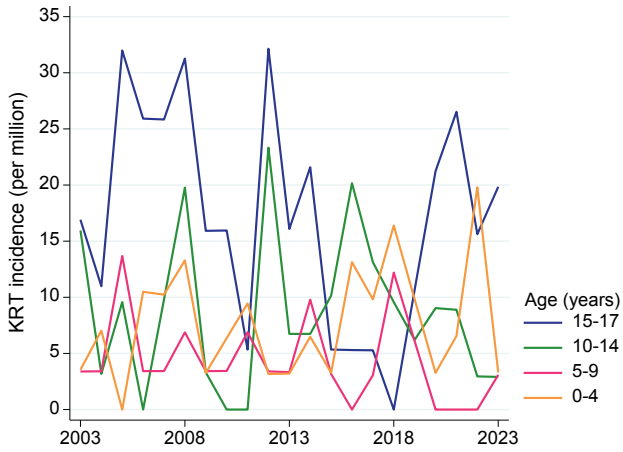


Figure 12.1.2
Incidence of KRT - Age 0-17 Years - New Zealand



In Australia the prevalent numbers of treated kidney failure have gradually increased in older age groups (Figure 12.2.1); the trends are less clear in New Zealand (Figure 12.2.2).

Figure 12.2.1
Prevalence of KRT - Age 0-17 Years - Australia

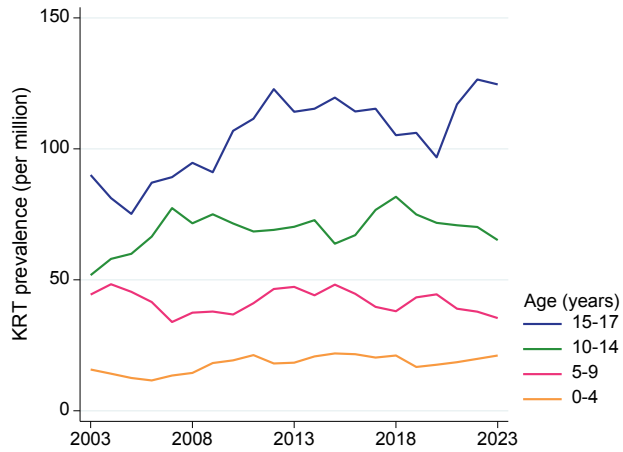
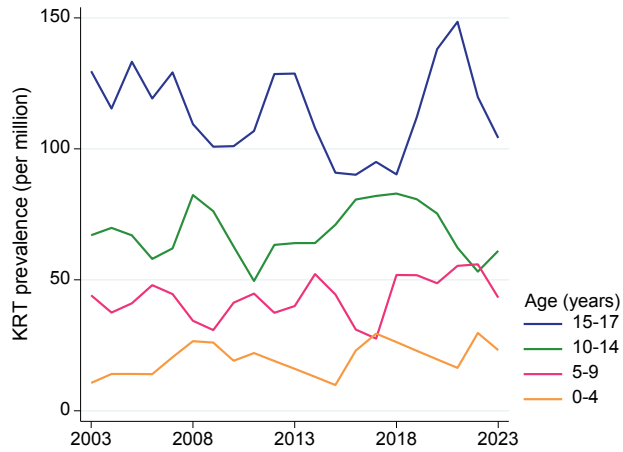


Figure 12.2.2
Prevalence of KRT - Age 0-17 Years - New Zealand



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PRIMARY KIDNEY DISEASE

The primary kidney disease of new patients over 2018-2023 are shown by age group in Table 12.1. From 2022, primary kidney disease was collected according to the updated European Renal Association/European Dialysis and Transplantation Association categories, with primary diseases reported prior to 2022 mapped to these categories. Collectively, congenital abnormalities of the kidney and urinary tract (CAKUT) are the predominant cause of kidney failure in younger children, with glomerular disease being the most common cause in adolescents.

Table 12.1
Primary Kidney Disease by Age, Incident Patients Australia and New Zealand 2018-2023

Primary kidney disease	0-4	5-10	10-14	15-17	Total
CAKUT	38 (47%)	18 (38%)	32 (36%)	24 (31%)	**112 (38%)**
- Hypodysplasia/Dysplasia	25 (31%)	11 (23%)	22 (25%)	14 (18%)	**72 (24%)**
- Reflux Nephropathy	-	2 (4%)	4 (5%)	6 (8%)	**12 (4%)**
- Posterior Urethral Valves	13 (16%)	5 (10%)	6 (7%)	4 (5%)	**28 (9%)**
Glomerular Disease	15 (19%)	15 (31%)	23 (26%)	27 (35%)	**80 (27%)**
- Congenital Nephrotic Syndrome	14 (17%)	1 (2%)	-	2 (3%)	**17 (6%)**
- Focal Segmental Glomerulosclerosis (FSGS)	1 (1%)	7 (15%)	9 (10%)	7 (9%)	**24 (8%)**
- Alport Syndrome	-	1 (2%)	1 (1%)	2 (3%)	**4 (1%)**
Polycystic Kidney Disease	4 (5%)	3 (6%)	4 (5%)	-	**11 (4%)**
Nephronophthisis/ Autosomal Dominant Tubulointerstitial Kidney Disease (ADTKD)	5 (6%)	2 (4%)	7 (8%)	5 (6%)	**19 (6%)**
Haemolytic Uraemic Syndrome	3 (4%)	-	1 (1%)	-	**4 (1%)**
Diabetic Kidney Disease	-	-	-	1 (1%)	**1 (0%)**
Cortical Necrosis	2 (2%)	1 (2%)	2 (2%)	1 (1%)	**6 (2%)**
Interstitial Nephritis	1 (1%)	1 (2%)	-	2 (3%)	**4 (1%)**
Cystinosis	-	1 (2%)	2 (2%)	1 (1%)	**4 (1%)**
Uncertain	6 (7%)	3 (6%)	8 (9%)	7 (9%)	**24 (8%)**
Miscellaneous/Other	5 (6%)	3 (6%)	7 (8%)	9 (12%)	**24 (8%)**
Not reported	2 (2%)	1 (2%)	2 (2%)	1 (1%)	**6 (2%)**
Total	**81**	**48**	**88**	**78**	**295**

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MODALITY OF TREATMENT

The modality of the first kidney replacement treatment is shown in Table 12.2. Although numbers are small and therefore fluctuate from year to year, around 15-20% of children and adolescents receive pre-emptive kidney transplants. Of the remainder, PD is more common in younger patients (<10 years), and for older patients similar numbers start on HD and PD.

Table 12.2
Modality of Initial Kidney Replacement Therapy by Year of First Treatment, Australia and New Zealand

Age group	2018	2019	2020	2021	2022	2023	Total
0-9 Years	**30**	**22**	**20**	**16**	**24**	**17**	**129**
HD	7 (23%)	3 (14%)	4 (20%)	5 (31%)	2 (8%)	3 (18%)	**24 (19%)**
PD	14 (47%)	15 (68%)	13 (65%)	8 (50%)	17 (71%)	11 (65%)	**78 (60%)**
Transplant	9 (30%)	4 (18%)	3 (15%)	3 (19%)	5 (21%)	3 (18%)	**27 (21%)**
10-17 Years	**22**	**26**	**20**	**37**	**36**	**25**	**166**
HD	6 (27%)	10 (38%)	5 (25%)	15 (41%)	13 (36%)	8 (32%)	**57 (34%)**
PD	10 (45%)	12 (46%)	10 (50%)	14 (38%)	20 (56%)	11 (44%)	**77 (46%)**
Transplant	6 (27%)	4 (15%)	5 (25%)	8 (22%)	3 (8%)	6 (24%)	**32 (19%)**
Total	**52**	**48**	**40**	**53**	**60**	**42**	**295**

For prevalent patients (Table 12.3), a very different pattern is seen, with the great majority (83% in 2023) of children and adolescents with a functioning transplant. This reflects the relatively high rate of transplantation among children.

Table 12.3
Modality of Prevalent Patients by Year of Treatment, Australia and New Zealand

Current treatment	2018	2019	2020	2021	2022	2023	Total
HD	21 (6%)	16 (4%)	17 (5%)	20 (5%)	17 (4%)	12 (3%)	**63 (35%)**
PD^	46 (12%)	47 (13%)	50 (13%)	53 (14%)	66 (17%)	52 (14%)	**82 (46%)**
Transplant	310 (82%)	313 (83%)	305 (82%)	310 (81%)	309 (79%)	317 (83%)	**33 (19%)**
Total	**377**	**376**	**372**	**383**	**392**	**381**	**312**

^Includes Hybrid Dialysis

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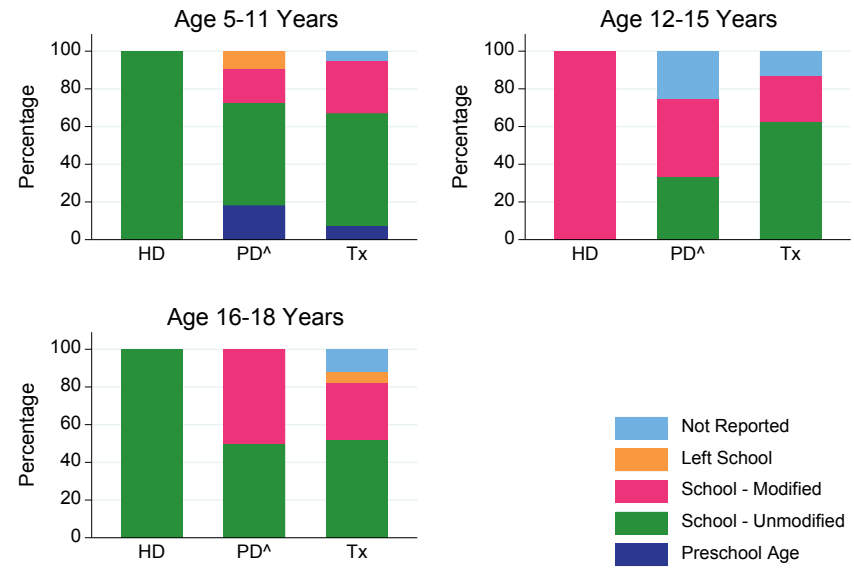
PAEDIATRIC ASSESSMENT

The paediatric survey is collected on all children commencing kidney replacement therapy before the age of 15 and collection continues until they reach 18 years of age (children aged 15 years and older at time of starting KRT are excluded from the data presented below). This survey records data on height, weight and an assessment of educational participation.

Amongst those 12 years or older, modified schooling (within an additional needs class, and/or school, requirement for a teacher's aid or home schooling) was undertaken for a substantial percentage of dialysis recipients (Figure 12.3 and Table 12.4). Note that multiple categories of paediatric assessment have been collapsed into single groups for reporting purposes (see the survey form for details: (https://www.anzdata.org.au/wp-content/uploads/2020/11/PaediatricForm.pdf)

Figure 12.3.1

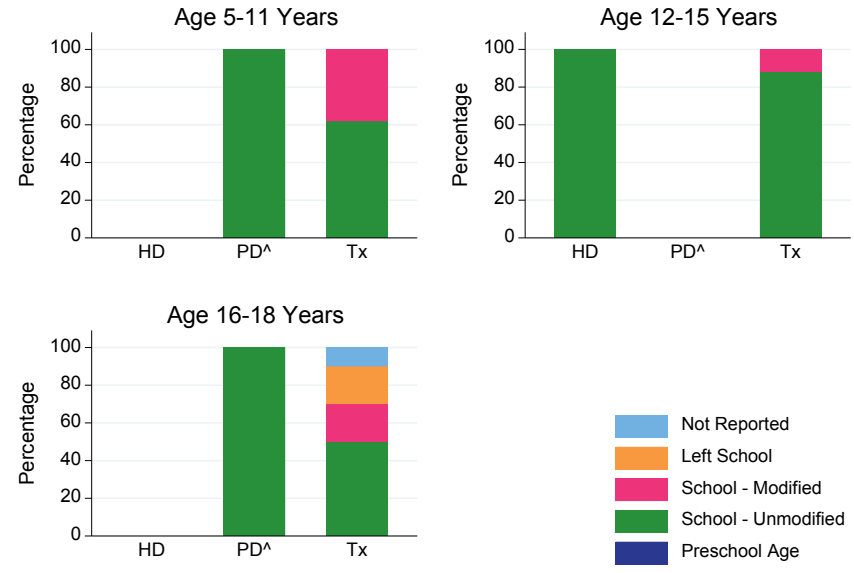
Educational Participation by Age Group and Treatment Modality - Australia 2023



^Includes Hybrid Dialysis

Figure 12.3.2

Educational Participation by Age Group and Treatment Modality - New Zealand 2023



^Includes Hybrid Dialysis

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Table 12.4

Educational Participation by Age Group and Treatment Modality 2023

Country	Educational Participation	Haemodialysis				Peritoneal Dialysis^				Transplant			
		5-11	12-15	16-18	Total	5-11	12-15	16-18	Total	5-11	12-15	16-18	Total
Australia	Preschool Age	0	0	0	**0**	2	0	0	**2**	6	0	0	**6**
	School - Unmodified	1	0	3	**4**	6	4	1	**11**	49	57	35	**141**
	School - Modified	0	2	0	**2**	2	5	1	**8**	23	22	20	**65**
	Left School	0	0	0	**0**	1	0	0	**1**	0	0	4	**4**
	Not reported	0	0	0	**0**	0	3	0	**3**	4	12	8	**24**
	Total	1	2	3	**6**	11	12	2	**25**	82	91	67	**240**
New Zealand	Preschool Age	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**
	School - Unmodified	0	2	0	**2**	1	0	1	**2**	13	15	5	**33**
	School - Modified	0	0	0	**0**	0	0	0	**0**	8	2	2	**12**
	Left School	0	0	0	**0**	0	0	0	**0**	0	0	2	**2**
	Not reported	0	0	0	**0**	0	0	0	**0**	0	0	1	**1**
	Total	0	2	0	**2**	1	0	1	**2**	21	17	10	**48**

^Includes Hybrid Dialysis

Paediatric body mass index (BMI) categories are determined using age adjusted z-scores. Z-scores are calculated by comparing an individual's measurements to a "growth reference" or "growth standard". In Australia, a higher proportion of transplant recipients and haemodialysis patients were overweight or obese, compared with children and adolescents treated with peritoneal dialysis (Figure 12.4 and Table 12.5). New Zealand data should be interpreted with caution due to low numbers of patients.

Figure 12.4.1

Body Mass Index of Prevalent Paediatric Patients by Treatment Modality - Australia 2023

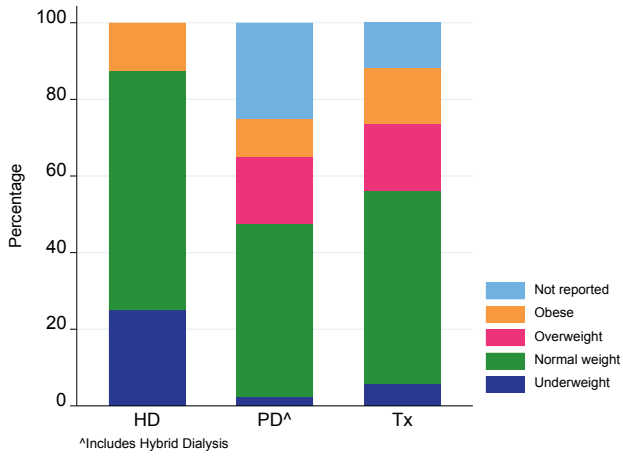

Figure 12.4.2

Body Mass Index of Prevalent Paediatric Patients by Treatment Modality - New Zealand 2023

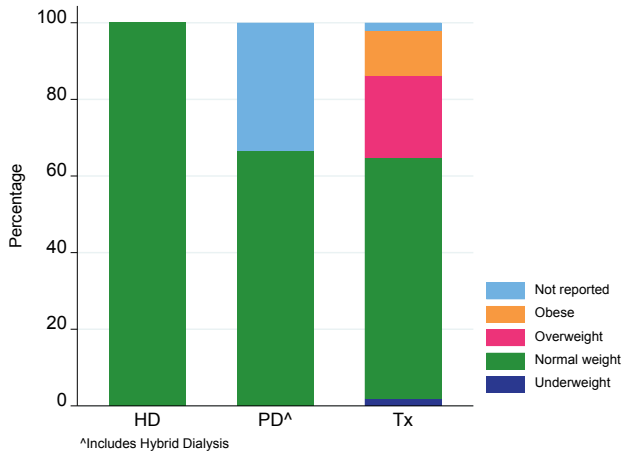

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Table 12.5

Body Mass Index by Treatment Modality 2023

Country	Body Mass Index	Haemodialysis	Peritoneal Dialysis^	Transplant	Total
Australia	Underweight	2	1	15	18
	Normal weight	5	18	128	151
	Overweight	0	7	45	52
	Obese	1	4	37	42
	Not reported	0	10	30	40
	Total	8	40	255	303
New Zealand	Underweight	0	0	1	1
	Normal weight	2	4	32	38
	Overweight	0	0	11	11
	Obese	0	0	6	6
	Not reported	0	2	1	3
	Total	2	6	51	59

^Includes Hybrid Dialysis

TRANSPLANTATION

DONOR AND TRANSPLANT CHARACTERISTICS

Figures 12.5-12.8 and Tables 12.6-12.7 show the trends in paediatric transplantation over the 12-year period from 2012-2023, including donor source, donor and recipient age by donor type, overall human leukocyte antigen (HLA) matching, time to transplantation and graft numbers.

Table 12.6
Donor Source by Year, Paediatric Kidney Transplants 2014-2023, Number (% of Transplants)

Donor type	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
LD pre-emptive	9 (18%)	13 (27%)	6 (17%)	9 (15%)	15 (29%)	7 (16%)	8 (24%)	11 (29%)	8 (17%)	8 (15%)
LD not pre-emptive	18 (36%)	22 (45%)	10 (28%)	20 (34%)	12 (23%)	13 (29%)	7 (21%)	8 (21%)	10 (22%)	13 (24%)
DNDD	19 (38%)	12 (24%)	18 (50%)	27 (46%)	17 (33%)	19 (42%)	11 (33%)	14 (37%)	22 (48%)	27 (49%)
DCDD	4 (8%)	2 (4%)	2 (6%)	3 (5%)	8 (15%)	6 (13%)	7 (21%)	5 (13%)	6 (13%)	7 (13%)
Total	**50**	**49**	**36**	**59**	**52**	**45**	**33**	**38**	**46**	**55**

LD: Living Donor, DNDD: Donation after neurological determination of death, DCDD: donation after circulatory determination of death

Table 12.7
Graft Numbers, Paediatric Kidney Transplants 2014-2023 Australia and New Zealand

Graft number	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1	46	48	33	51	49	43	31	35	44	55
2	3	1	3	8	3	2	2	3	2	0
3	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Figure 12.5
Donor Age by Donor Source - Paediatric Kidney Transplants 2012-2023

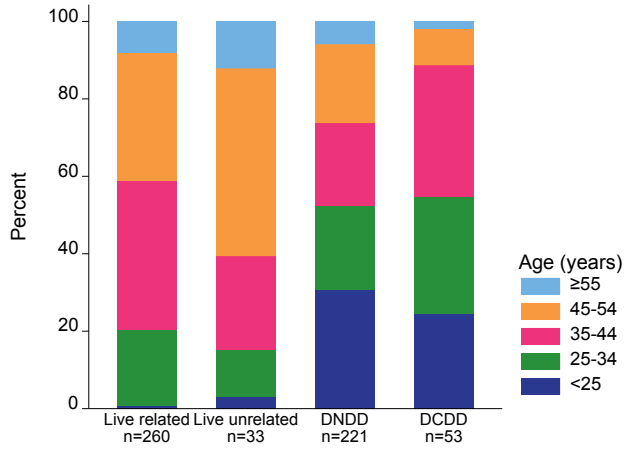

Figure 12.6
Recipient Age by Donor Source - Paediatric Kidney Transplants 2012-2023

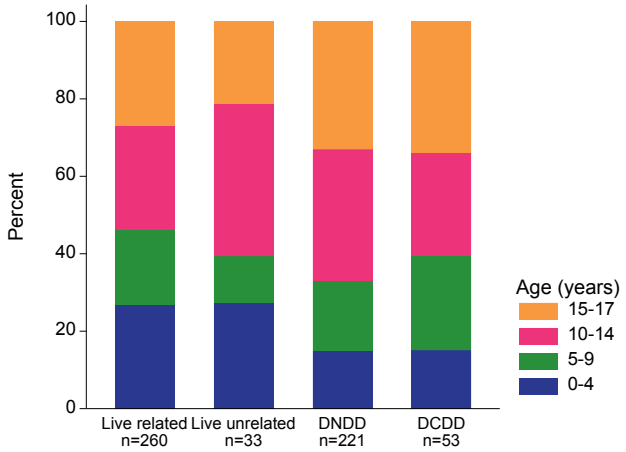

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Figure 12.7
Number of HLA Mismatches - Paediatric Kidney Transplants 2012-2023

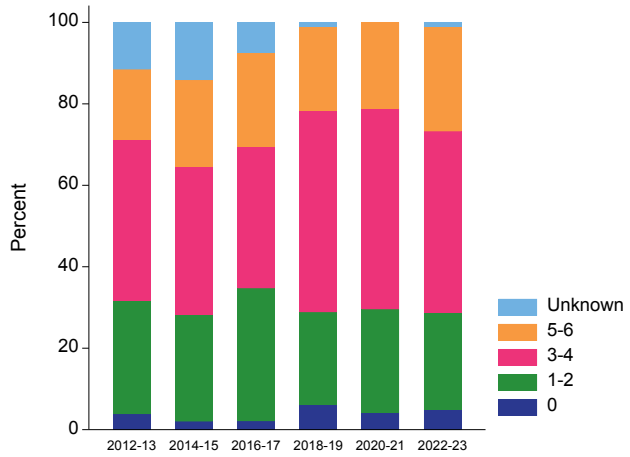
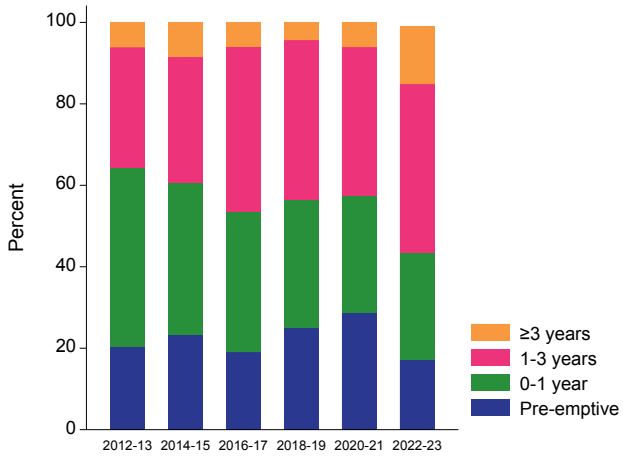


Figure 12.8
Time to First Kidney Transplant - Paediatric Kidney Transplants 2012-2023



TIME TO PRIMARY TRANSPLANT

Figures 12.9 to 12.16 show the cumulative incidence curve of primary kidney transplant from commencement of KRT, by era, gender and ethnicity. The first of each pair of figures shows the cumulative incidence of transplantation (including both deceased and living donor transplant), accounting for the effect of the competing risk of death. The second of each pair of figures shows the cumulative incidence of deceased donor transplantation, living donor transplantation and death. In the latter figures, each outcome is considered a competing risk for the other outcomes, and only the first event is considered.

Figure 12.9
Time to Primary Transplant from KRT Start by Era - Incident Paediatric KRT Patients Australia and New Zealand 2012-2023

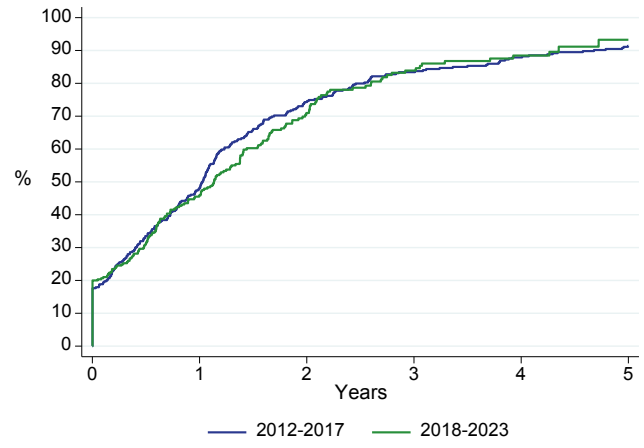


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Figure 12.10

Time to Primary Transplant from KRT Start by Era and Donor Source - Incident Paediatric KRT Patients Australia and New Zealand 2012-2023

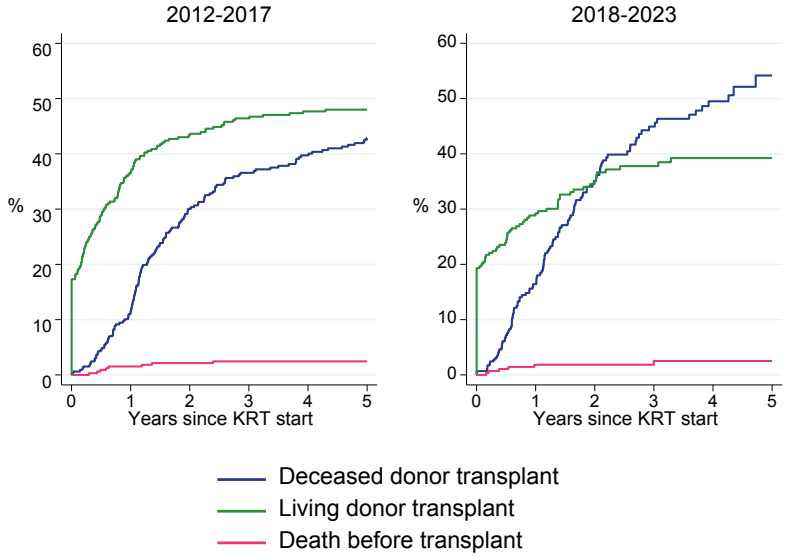

Figure 12.11

Time to Primary Transplant from KRT Start by Gender - Incident Paediatric KRT Patients Australia and New Zealand 2018-2023

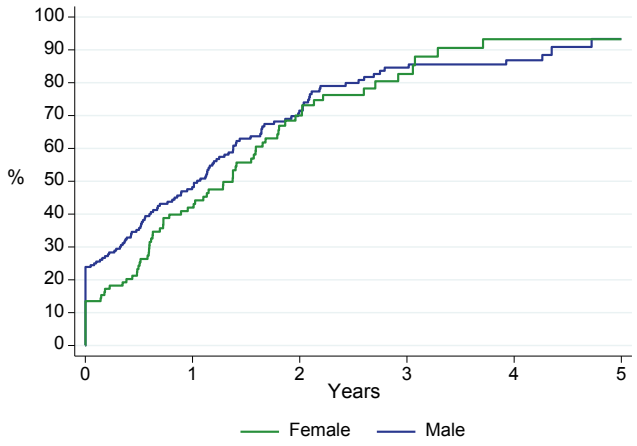

Figure 12.12

Time to Primary Transplant from KRT Start by Gender and Donor Source - Incident Paediatric KRT Patients Australia and New Zealand 2018-2023

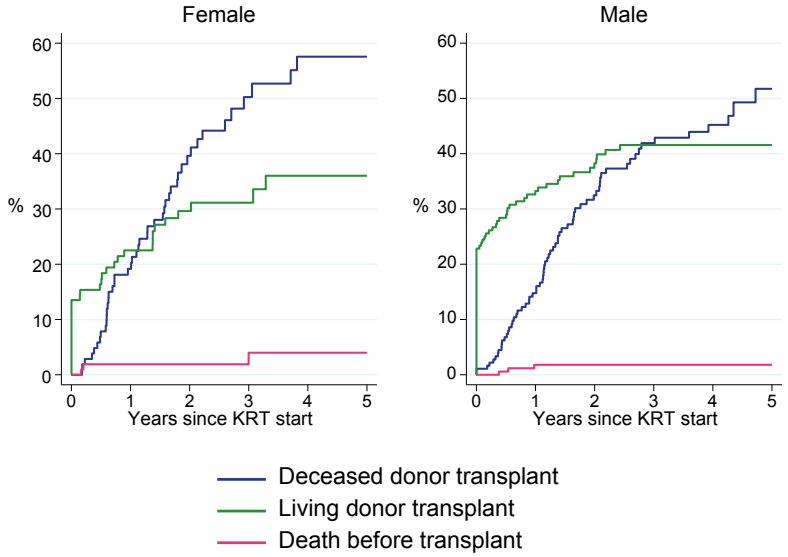

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Figure 12.13

Time to Primary Transplant from KRT Start by Ethnicity - Australian Incident Paediatric KRT Patients 2012-2023

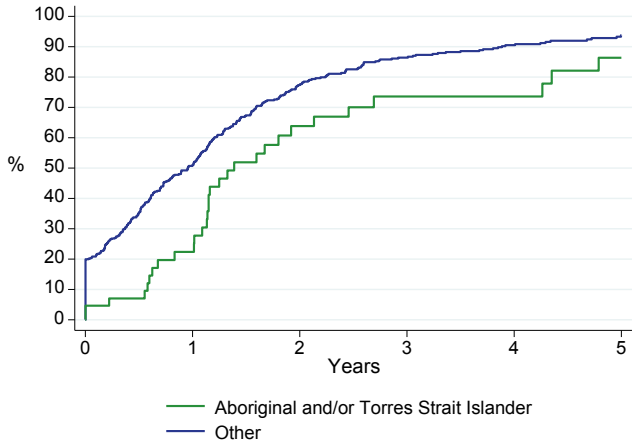

Figure 12.14

Time to Primary Transplant from KRT Start by Ethnicity and Donor Source - Incident Paediatric KRT Patients Australia 2012-2023

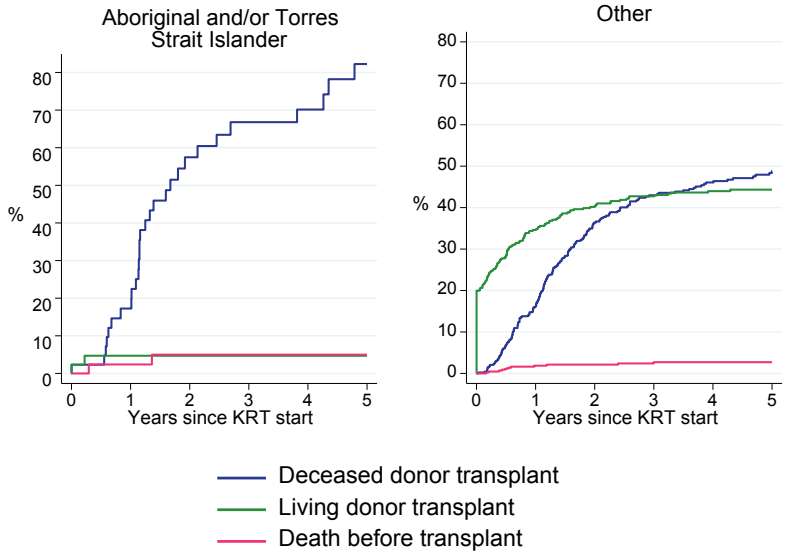

Figure 12.15

Time to Primary Transplant from KRT Start by Ethnicity - New Zealand Incident Paediatric KRT Patients 2012-2023

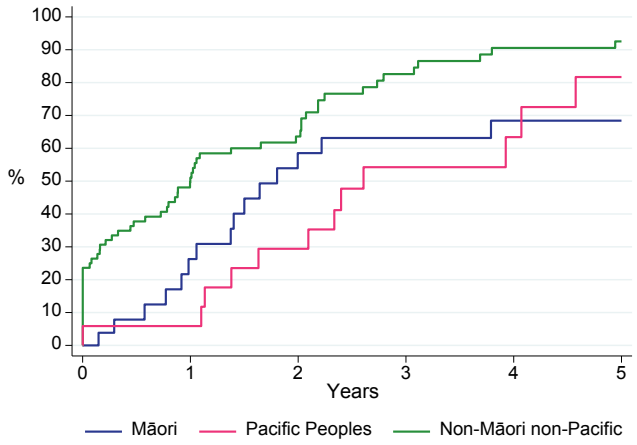

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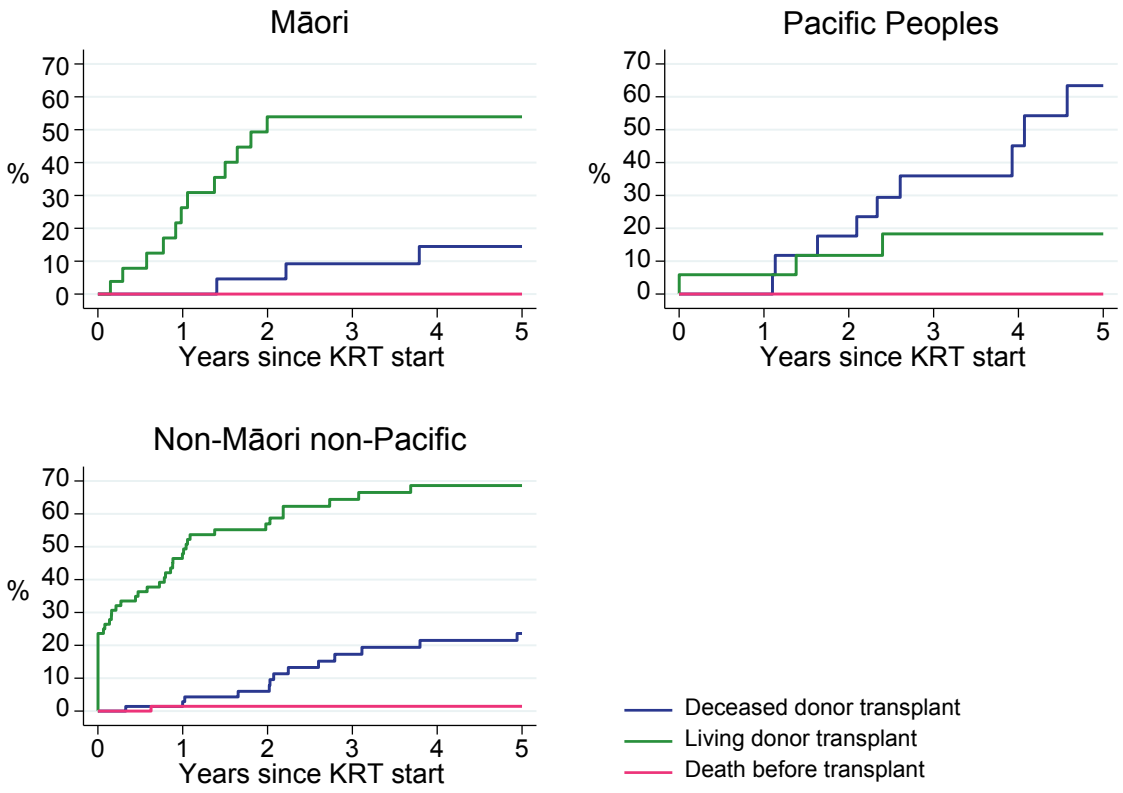
Figure 12.16

Time to Primary Transplant from KRT Start by Ethnicity and Donor Source - Incident Paediatric KRT Patients New Zealand 2012-2023



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IMMUNOSUPPRESSION

Most patients in both countries receive induction antibody therapy with anti-CD25 agents (Table 12.8).

Table 12.8
Antibody Use for Induction Immunosuppression in Paediatric Kidney Transplants, Number Receiving (%)

Country	Type of agent	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Australia	Intravenous immunoglobulin	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Anti-CD25	44 (95.7%)	33 (80.5%)	26 (86.7%)	52 (96.3%)	44 (97.8%)	29 (87.9%)	25 (96.2%)	28 (96.6%)	34 (91.9%)	42 (87.5%)
	Rituximab	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (3.0%)	0 (0.0%)	0 (0.0%)	1 (2.7%)	0 (0.0%)
	T cell depleting polyclonal Ab	1 (2.2%)	3 (7.3%)	1 (3.3%)	1 (1.9%)	0 (0.0%)	1 (3.0%)	1 (3.8%)	1 (3.4%)	1 (2.7%)	0 (0.0%)
	Other	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Not reported	0 (0.0%)	1 (2.4%)	2 (6.7%)	1 (1.9%)	0 (0.0%)	2 (6.1%)	1 (3.8%)	0 (0.0%)	2 (5.4%)	5 (10.4%)
	Total new transplants	**46**	**41**	**30**	**54**	**45**	**33**	**26**	**29**	**37**	**48**
New Zealand	Intravenous immunoglobulin	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Anti-CD25	4 (100.0%)	8 (100.0%)	6 (100.0%)	5 (100.0%)	7 (100.0%)	11 (91.7%)	7 (100.0%)	9 (100.0%)	9 (100.0%)	7 (100.0%)
	Rituximab	0 (0.0%)	1 (12.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (11.1%)	0 (0.0%)	0 (0.0%)
	T cell depleting polyclonal Ab	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Other	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Not reported	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (8.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	Total new transplants	**4**	**8**	**6**	**5**	**7**	**12**	**7**	**9**	**9**	**7**

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Tacrolimus is the most commonly used calcineurin inhibitor (CNI) at induction and at 1, 5 and 10 years post-transplant (Table 12.9).

Table 12.9
Tacrolimus (Tac), Cyclosporin A (CsA) and mammalian target of rapamycin inhibitor (mTOR) use among Paediatric Kidney Transplant Cohorts (By Year of Transplant)

Time	Year transplanted	Tac	CsA	mTOR	Combo	None reported	Number of transplants
Initial Treatment	2023	46 (84%)	-	-	1 (2%)	8 (15%)	55
	2022	43 (93%)	1 (2%)	-	-	2 (4%)	46
	2021	35 (92%)	1 (3%)	-	-	2 (5%)	38
Treatment at 1 year	2022	41 (89%)	1 (2%)	-	1 (2%)	3 (7%)	46
	2021	33 (87%)	2 (5%)	-	-	3 (8%)	38
	2020	31 (94%)	-	-	-	2 (6%)	33
Treatment at 5 years	2018	31 (60%)	-	2 (4%)	2 (4%)	17 (33%)	52
	2017	40 (68%)	2 (3%)	-	1 (2%)	16 (27%)	59
	2016	26 (72%)	2 (6%)	-	1 (3%)	7 (19%)	36
Treatment at 10 years	2013	26 (54%)	-	1 (2%)	-	21 (44%)	48
	2012	34 (61%)	-	1 (2%)	-	21 (38%)	56
	2011	27 (60%)	-	2 (4%)	-	16 (36%)	45

Mycophenolate (MMF/MPA) is the most used antimetabolite at induction and long-term use has increased over time, with only a small proportion of patients treated with azathioprine (AZA) (Table 12.10).

Table 12.10
Antimetabolite use among Paediatric Kidney Transplant Cohorts (By Year of Transplant)

Time	Year transplanted	MMF/MPA	AZA	None reported	Number of transplants
Initial Treatment	2023	46 (84%)	-	9 (16%)	55
	2022	44 (96%)	-	2 (4%)	46
	2021	35 (92%)	1 (3%)	2 (5%)	38
Treatment at 1 year	2022	41 (89%)	-	5 (11%)	46
	2021	30 (79%)	3 (8%)	5 (13%)	38
	2020	29 (88%)	1 (3%)	3 (9%)	33
Treatment at 5 years	2018	36 (69%)	1 (2%)	15 (29%)	52
	2017	36 (61%)	11 (19%)	12 (20%)	59
	2016	23 (64%)	4 (11%)	9 (25%)	36
Treatment at 10 years	2013	25 (52%)	4 (8%)	19 (40%)	48
	2012	26 (46%)	9 (16%)	21 (38%)	56
	2011	27 (60%)	2 (4%)	16 (36%)	45

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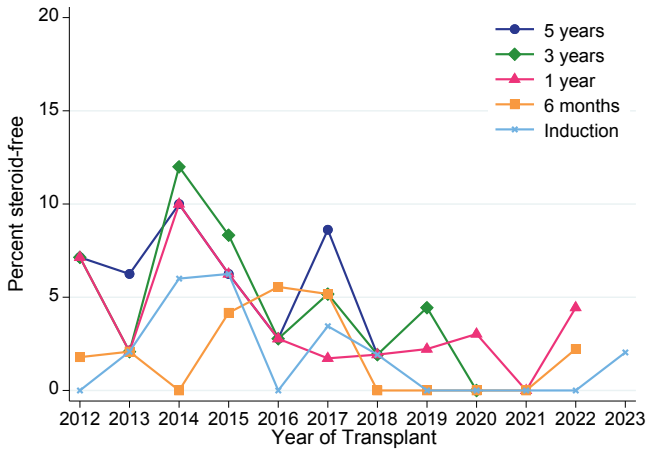
Figure 12.17 shows the percentage of paediatric transplant recipients not receiving steroid immunosuppression (Prednisolone) by transplant year and time since transplant.

Figure 12.17
Steroid-Free Fraction - Paediatric Kidney Transplant Cohorts 2012-2023



TRANSPLANT OUTCOMES

Graft and patient survival for primary transplants performed in Australia and New Zealand on recipients aged <18 years, calculated by the Kaplan-Meier method, are shown in Table 12.11. Unadjusted one, three and five year patient survival have remained relatively stable over the past ten years. Graft survival curves by donor source, gender and ethnicity are shown in Figures 12.18-12.21. Note that in the survival graphs the y axis ranges from 0.50 to 1.00 in order to show the differences between the groups more clearly.

Table 12.11
Patient and Graft Survival (95% CI), Paediatric Primary Kidney Transplant Recipients 2014-2023

Outcome	Transplant year (N)	6 months	1 year	3 years	5 years
Patient Survival	2014-15 (n=94)	100	100	100	100
	2016-17 (n=84)	99 (92-100)	99 (92-100)	99 (92-100)	99 (92-100)
	2018-19 (n=92)	100	100	100	99 (91-100)
	2020-21 (n=66)	98 (90-100)	98 (90-100)	98 (90-100)	-
	2022-23 (n=99)	100	100	-	-
Graft Survival	2014-15 (n=94)	97 (90-99)	97 (90-99)	93 (85-96)	88 (80-93)
	2016-17 (n=84)	96 (89-99)	96 (89-99)	96 (89-99)	89 (80-94)
	2018-19 (n=92)	99 (93-100)	99 (93-100)	97 (90-99)	92 (84-96)
	2020-21 (n=66)	97 (88-99)	97 (88-99)	94 (84-98)	-
	2022-23 (n=99)	97 (90-99)	97 (90-99)	-	-

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Figure 12.18

Graft Survival, Recipients of Primary Transplants - By Donor Source, Australia and New Zealand 2014-2023

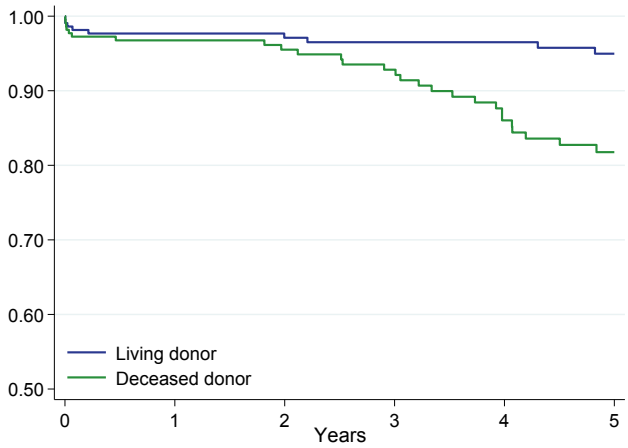


Figure 12.19

Graft Survival, Recipients of Primary Transplants - By Gender, Australia and New Zealand 2014-2023

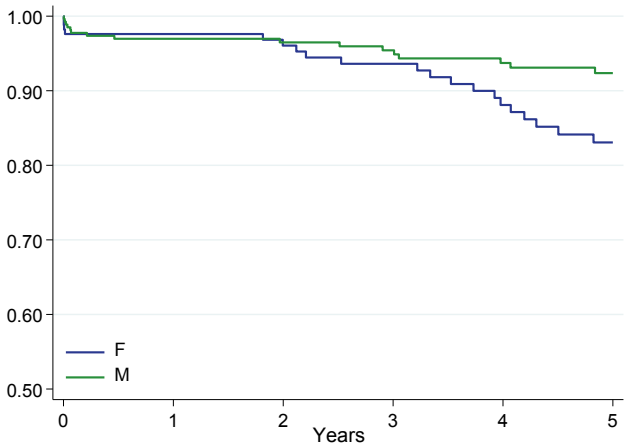


Figure 12.20

Graft Survival, Recipients of Primary Transplants - By Ethnicity, Australia 2014-2023

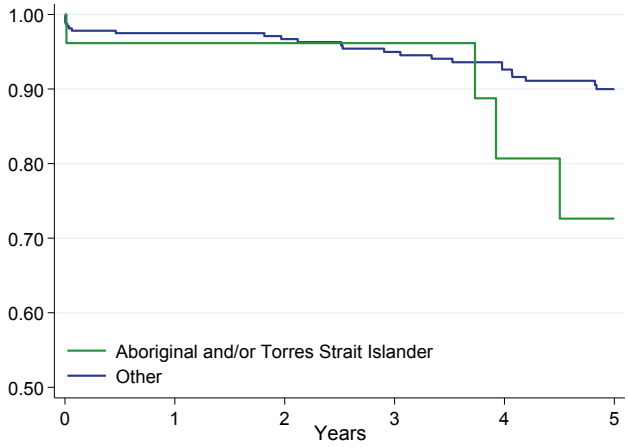
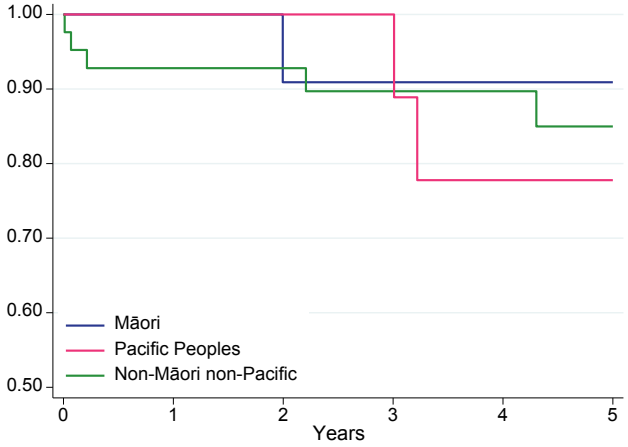


Figure 12.21

Graft Survival, Recipients of Primary Transplants - By Ethnicity, New Zealand 2014-2023



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The causes of graft loss by age at transplant and age at graft loss are shown in Tables 12.12 and 12.13 respectively. New categories have been in use for reporting chronic allograft rejection since 2020 (see the Kidney Transplantation chapter for further details).

Table 12.12
Cause of Graft Loss, Paediatric Kidney Transplants Performed 2014-2023 by Age at Transplant

Cause of graft loss	0-4	5-9	10-14	15-17	Total
Death with function	2	1	0	3	6
Acute rejection	0	1	1	1	3
Chronic allograft nephropathy	0	0	0	1	1
Chronic antibody mediated rejection	1	0	0	7	8
Gradual graft failure - biopsy not performed	0	2	2	1	5
Vascular	2	0	2	3	7
Glomerular Disease	0	0	3	7	10
Non-compliance	0	0	2	5	7
Unknown	0	0	0	3	3
Other	0	0	1	1	2
Not reported	0	0	1	2	3
Total	**5**	**4**	**12**	**34**	**55**

Table 12.13
Cause of Graft Loss, Paediatric Kidney Transplants Performed 2014-2023 by Age at Graft Loss

Cause of graft loss	0-4	5-9	10-14	15-17	Total
Death with function	1	2	0	0	3
Acute rejection	0	0	1	2	3
Chronic allograft nephropathy	0	0	0	1	1
Chronic antibody mediated rejection	0	0	1	0	1
Gradual graft failure - biopsy not performed	0	0	2	2	4
Vascular	2	0	2	3	7
Glomerular Disease	0	0	0	5	5
Non-compliance	0	0	0	7	7
Other	0	0	1	0	1
Not reported	0	0	0	2	2
Total	**3**	**2**	**7**	**22**	**34**

REJECTION

The proportion of patients experiencing at least one episode of acute rejection (biopsy proven or clinically diagnosed) in the first six months post-transplant has remained low (Figure 12.22). The proportion experiencing rejection between 6-24 months post-transplant has remained largely unchanged for cohorts since 2010 (Figure 12.23). The majority of rejection episodes reported to the registry are cellular rejection (Table 12.14).

Figure 12.22
Rejection <6 Months Post-Transplant - Paediatric Kidney Transplant Cohorts 2014-2022

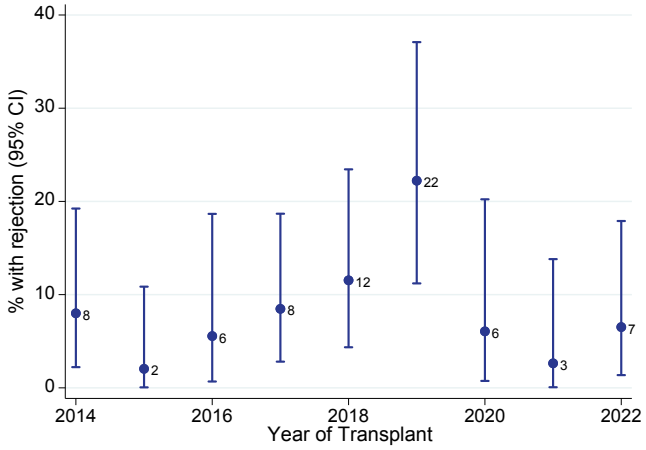

Figure 12.23
Rejection 6-24 Months Post-Transplant - Paediatric Kidney Transplant Cohorts 2014-2020

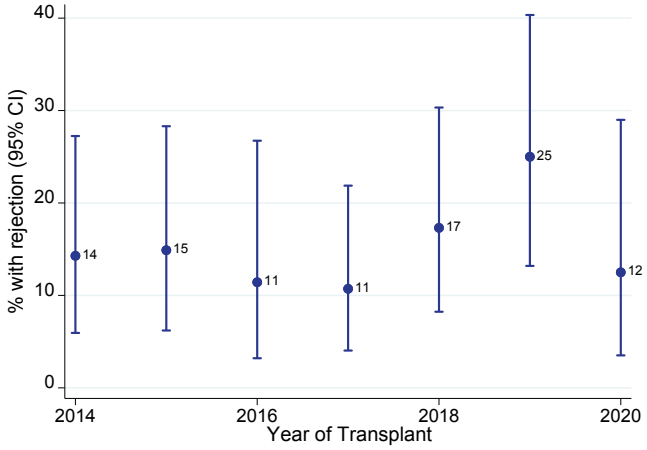

Table 12.14
Type of Rejection, Paediatric Kidney Transplants 2014-2022

Timing of rejection	Type of rejection	2014	2015	2016	2017	2018	2019	2020	2021	2022
<6 months	No biopsy	0	0	0	1	0	0	0	0	0
	Cellular	4	1	4	3	5	7	0	0	3
	ABMR	0	0	0	0	1	1	1	0	0
	Cellular + ABMR	0	0	0	3	1	1	0	0	0
6-24 months	No biopsy	0	0	0	0	0	0	0	-	-
	Cellular	8	8	5	6	14	11	4	-	-
	ABMR	0	0	0	0	1	1	0	-	-
	Cellular + ABMR	1	2	0	1	0	1	0	-	-

Excludes rejection episodes where a biopsy was performed, and rejection reported as neither antibody mediated, nor T-cell mediated.
ABMR - antibody-mediated rejection

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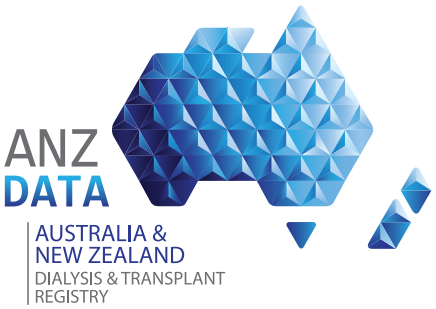

CHAPTER 12

Paediatric Patients with Kidney Failure Requiring Replacement Therapy