CHAPTER 11

PAEDIATRIC REPORT

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This year, as well as providing a summary of current trends in the frequency and causes of ESKD, the paediatric report will focus on current trends in the epidemiology and outcomes of paediatric transplantation.

INCIDENCE AND PREVALENCE OF ESKD IN CHILDREN AND ADOLESCENTS 1991 - 2009

GENERAL OVERVIEW

As shown in Figure 11.1, the incidence of children and adolescents developing ESKD and being treated with renal replacement therapy has remained relatively stable over the past 20 years, although as numbers are small, there are fluctuations from year to year.

Prevalent numbers of treated ESKD have also remained mostly stable over the past ten years, although there appears to be a trend to increasing prevalence in the 10-14 year age group in Australia and the 15-19 year age group in New Zealand (Figure 11.2).

Figure 11.1

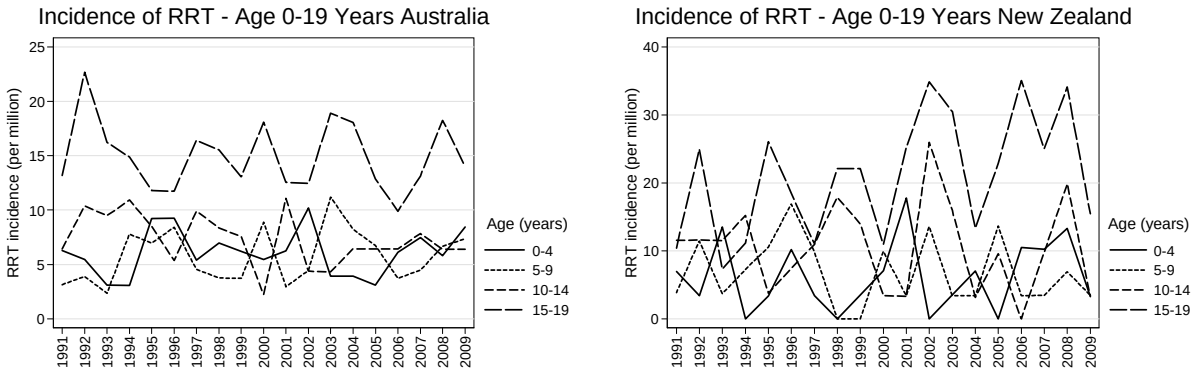
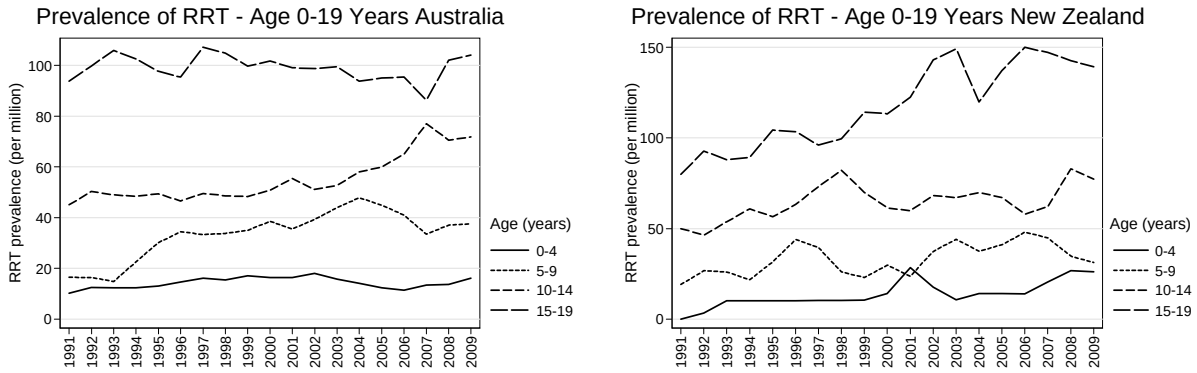


Figure 11.2



CAUSES OF ESKD IN CHILDREN AND ADOLESCENTS 2004 - 2009

Overall, glomerulonephritis remains the most common cause of ESKD in children and adolescents (32%) but causes vary significantly with age. In young children renal hypoplasia/dysplasia is the most common cause while glomerulonephritis is more common in older children and adolescents.

Figure 11.3

Causes of End Stage Kidney Disease
In Children and Adolescents 2004 - 2009

Primary Renal Disease	Age Groups (Years)				Total
	0-4	5-9	10-14	15-19	
Glomerulonephritis	12 (20%)	12 (20%)	23 (33%)	69 (41%)	116 (32%)
Familial Glomerulonephritis	-	-	1 (1%)	7 (4%)	8 (2%)
Reflux Nephropathy	2 (3%)	2 (3%)	6 (9%)	30 (18%)	40 (11%)
Polycystic Kidney Disease	5 (8%)	3 (5%)	2 (3%)	-	10 (3%)
Medullary Cystic Disease	-	1 (2%)	1 (1%)	10 (6%)	12 (3%)
Posterior Urethral Valve	9 (15%)	6 (10%)	7 (10%)	4 (2%)	26 (7%)
Haemolytic Uraemic Syndrome	7 (12%)	2 (3%)	2 (3%)	3 (2%)	14 (4%)
Hypoplasia / Dysplasia	15 (25%)	17 (28%)	11 (16%)	14 (8%)	57 (16%)
Cortical Necrosis	1 (2%)	2 (3%)	1 (1%)	5 (3%)	9 (3%)
Interstitial Nephritis	-	1 (2%)	-	2 (1%)	3 (1%)
Cystinosis	-	2 (3%)	1 (1%)	-	3 (1%)
Uncertain	1 (2%)	1 (2%)	2 (3%)	9 (5%)	13 (4%)
Miscellaneous / Other	8 (13%)	11 (18%)	13 (19%)	17 (10%)	49 (14%)
Total	**60**	**60**	**70**	**170**	**360**

MODALITY OF TREATMENT 2004 - 2009

The modality of the first renal replacement treatment is shown in Figure 11.4. Although numbers are small and therefore fluctuate from year to year, around 16% of children and adolescents receive pre-emptive kidney transplants. Of the remainder, 45% commence renal replacement therapy with haemodialysis compared with 39% starting with peritoneal dialysis.

Figure 11.4

Modality of Initial Renal Replacement Therapy By Year of First Treatment - Australia and New Zealand

Current Treatment	Year						
	2004	2005	2006	2007	2008	2009	Total
Haemodialysis	31 (53%)	23 (43%)	23 (45%)	26 (43%)	35 (46%)	24 (40%)	162 (45%)
Peritoneal Dialysis	22 (38%)	18 (33%)	18 (35%)	26 (43%)	29 (38%)	26 (43%)	139 (39%)
Transplant	5 (9%)	13 (24%)	10 (20%)	9 (15%)	12 (16%)	10 (17%)	59 (16%)
Total	**58**	**54**	**51**	**61**	**76**	**60**	**360**

For prevalent patients (Figure 11.5), a very different pattern is seen, with the great majority of children and adolescents with a functioning transplant. This reflects the relatively high rate of transplantation among children.

Figure 11.5

Modality of Treatment for all Patients in Australia and New Zealand < 20 Years of Age at 31st December

Current Treatment	Year						
	2004	2005	2006	2007	2008	2009	Total
Haemodialysis	55 (15%)	46 (12%)	43 (11%)	44 (12%)	49 (12%)	52 (13%)	289 (12%)
Peritoneal Dialysis	52 (14%)	44 (12%)	45 (12%)	61 (16%)	69 (17%)	68 (16%)	339 (15%)
Transplant	259 (71%)	282 (76%)	291 (77%)	276 (72%)	290 (71%)	296 (71%)	1694 (73%)
Total	**366**	**372**	**379**	**381**	**408**	**416**	**2322**

TRANSPLANT DEMOGRAPHICS

Figures 11.6-11.8 show the trends in paediatric transplantation over the 12- year period from 1998-2009. Live donor kidneys (living related and unrelated) mostly come from donors in the 35-44 year old age group. In contrast, the proportion of deceased donors aged < age 25 is higher than compared to living donors. There are no significant trends in the type of donor according to recipient age. The use of donor after cardiac death (DCD) kidneys in children and adolescents remains uncommon (~1%).

The time to first kidney transplant (Fig 11.8) has remained largely unchanged over this period.

Figure 11.6

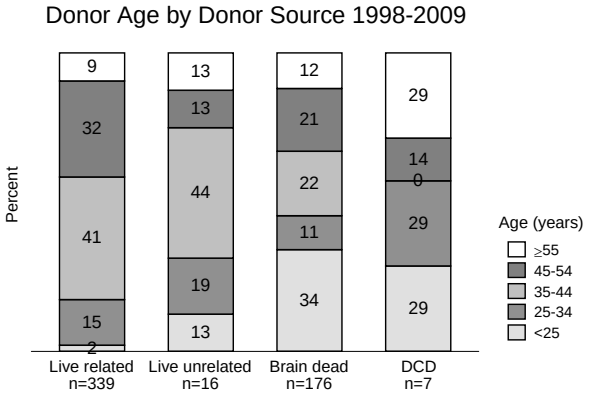


Figure 11.7

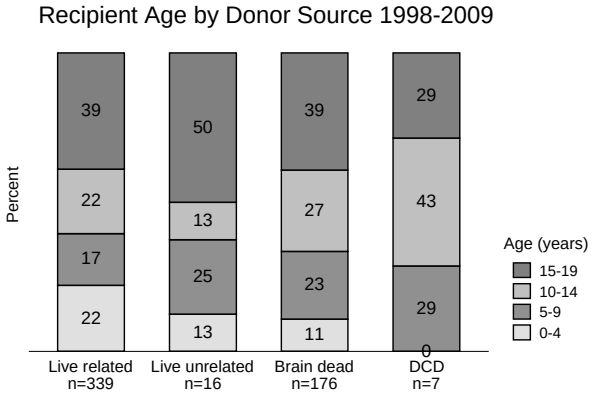
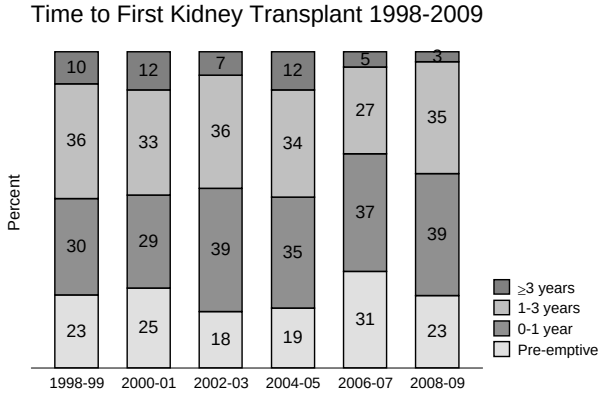


Figure 11.8



TRANSPLANT OUTCOMES

Graft and patient survival for grafts performed in Australia and New Zealand on recipients aged < 20 years, calculated by the Kaplan-Meier method, is shown in Figure 11.9. Unadjusted one, three and five year survival have remained stable over the past ten years.

Renal function at anytime post transplant has improved since the 1998-2000 cohort (Fig 11.10). There is little change in the rate of decline in renal function after the first year post transplant up to five years post-transplant.

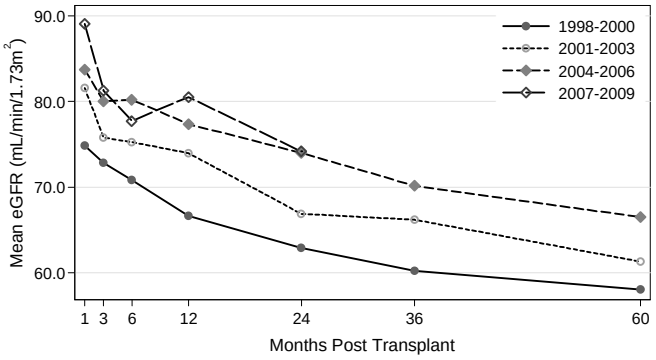
Figure 11.9

Recipient and Graft Survival
Recipients Aged < 20 Years 2000 - 2009
% [95% Confidence Interval]

Year	Survival			
	6 months	1 year	3 years	5 years
Recipient Survival				
2000-01 (n=81)	99 [92-100]	99 [92-100]	99 [92-100]	99 [92-100]
2002-03 (n=102)	93 [86-97]	91 [84-95]	90 [83-95]	90 [83-95]
2004-05 (n=107)	100	99 [93-100]	98 [93-100]	97 [91-99]
2006-07 (n=69)	100	100	99 [90-100]	-
2008-09 (n=104)	100	100	-	-
Graft Survival				
2000-01 (n=81)	98 [90-99]	96 [89-99]	91 [83-96]	88 [78-93]
2002-03 (n=102)	90 [83-95]	89 [81-94]	87 [79-92]	80 [71-87]
2004-05 (n=107)	97 [92-99]	96 [90-99]	90 [83-95]	82 [73-88]
2006-07 (n=69)	94 [85-98]	91 [82-96]	81 [69-88]	-
2008-09 (n=104)	95 [89-98]	95 [89-98]	-	-

Figure 11.10

Mean eGFR Over Time in Recipients Aged <15 Years



GFR estimated from serum creatinine using the Schwartz formula for children

Figure 11.11

Causes of Graft Failure 1998 - 2009

Reason for Failure	Age Groups (Years)				Total
	0-4	5-9	10-14	15-19	
Rejection - Acute	2 (11%)	2 (13%)	2 (6%)	5 (9%)	11 (9%)
Rejection - CAN	6 (32%)	5 (31%)	18 (58%)	19 (36%)	48 (40%)
Rejection - Hyperacute	1 (5%)	-	-	-	1 (1%)
Vascular rejection	1 (5%)	3 (19%)	-	4 (8%)	8 (7%)
Technical reasons	4 (21%)	-	5 (16%)	4 (8%)	13 (11%)
Recurrent disease	-	2 (13%)	2 (6%)	2 (4%)	6 (5%)
Non-compliance	1 (5%)	1 (6%)	1 (3%)	10 (19%)	13 (11%)
Death with function	3 (16%)	3 (19%)	-	6 (11%)	12 (10%)
Other	1 (5%)	-	3 (10%)	3 (6%)	7 (6%)
Total	**19**	**16**	**31**	**53**	**119**

IMMUNOSUPPRESSION

Tacrolimus continues to be the most commonly used calcineurin inhibitor (CNI) at induction and one year post-transplant. The proportion of patients on cyclosporin is higher in the five and ten year cohorts and reflects historical use of this agent. Within the 2004 cohort, 44% of patients were commenced on tacrolimus compared with 62% on tacrolimus at five years, indicating that a significant proportion of patients commenced on cyclosporin are subsequently switched to tacrolimus therapy.

Mycophenolate is the most commonly used antimetabolite at induction and long term use has increased over time, with only a small proportion of patients treated with azathioprine aside from the ten year cohorts.

The proportion of prednisolone-free patients at induction has returned to zero, reflecting a trend since 2005 for virtually universal use of prednisolone at induction. Similarly, there are appears to be a trend since 2005 for a decreasing proportion of steroid-free use in longer term transplants.

Figure 11.12

Calcineurin and mTOR Inhibitors at Induction Transplant Cohorts 1998-2009

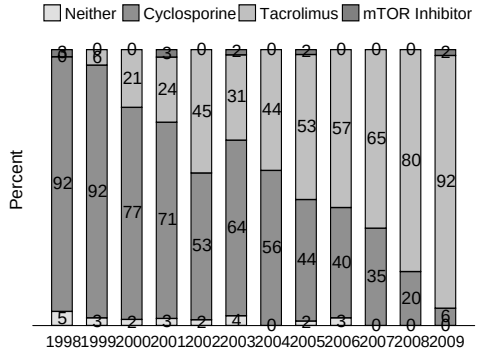


Figure 11.13

Calcineurin and mTOR Inhibitors at One Year Transplant Cohorts 1998-2008

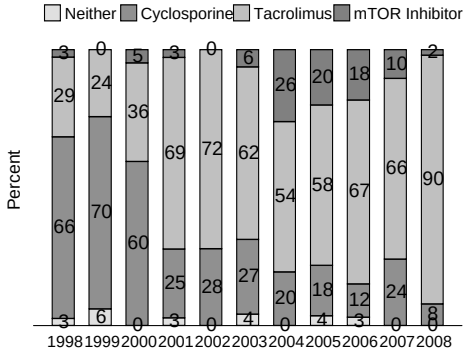


Figure 11.14

Calcineurin and mTOR Inhibitors at Five Years Transplant Cohorts 1998-2004

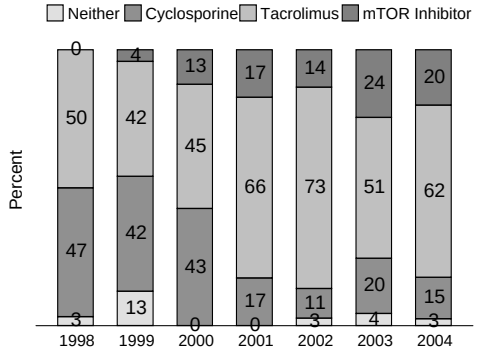
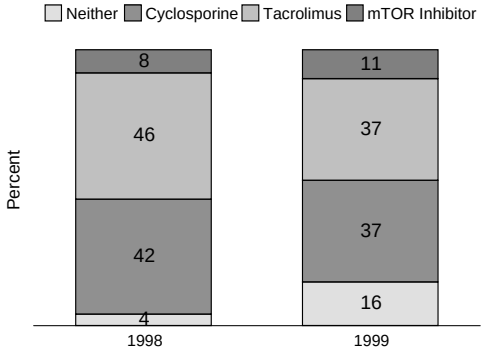


Figure 11.15

Calcineurin and mTOR Inhibitors at Ten Years Transplant Cohorts 1998-1999



IMMUNOSUPPRESSION

Figure 11.16

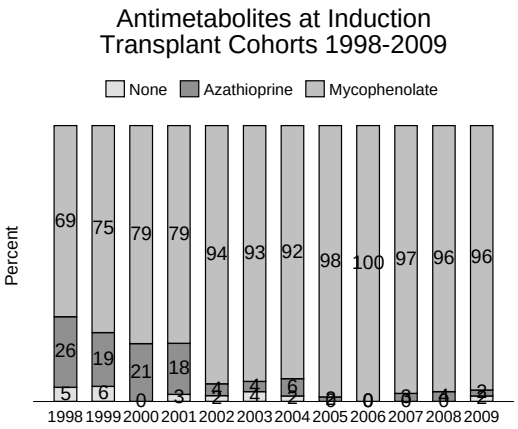


Figure 11.17

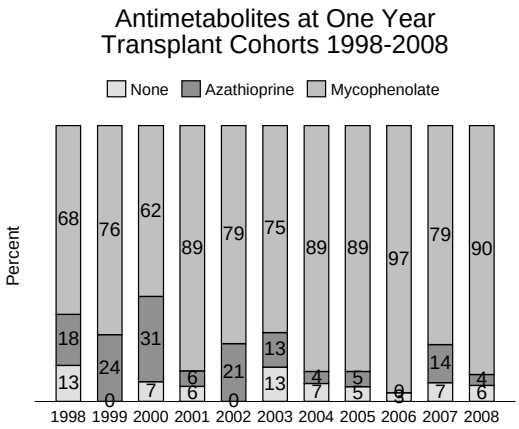


Figure 11.18

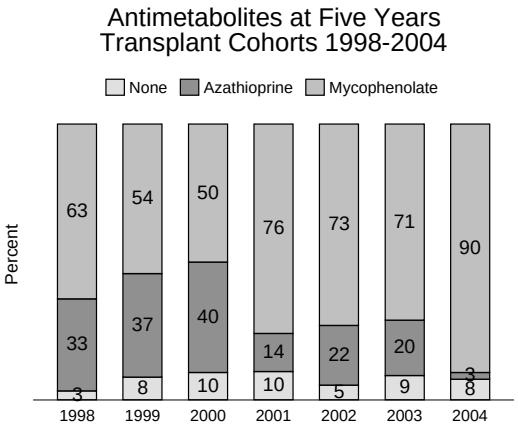


Figure 11.19

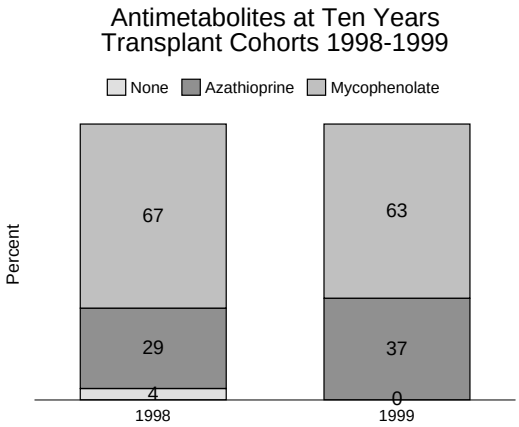
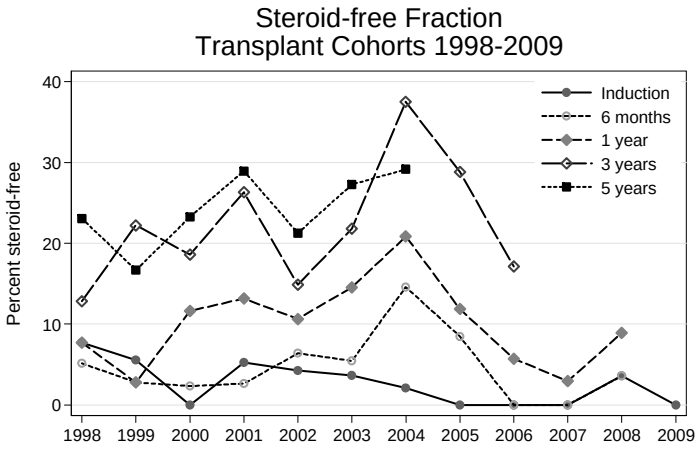


Figure 11.20



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 largely unchanged over the past five years (Fig 11.21). The incidence of rejection > 6 months post-transplant varies but on average is similar to the rate of rejection within the first six months. The use of renal biopsy to diagnose both early (< 6 months) and late (> 6 months) rejection appears to be increasing.

Figure 11.21

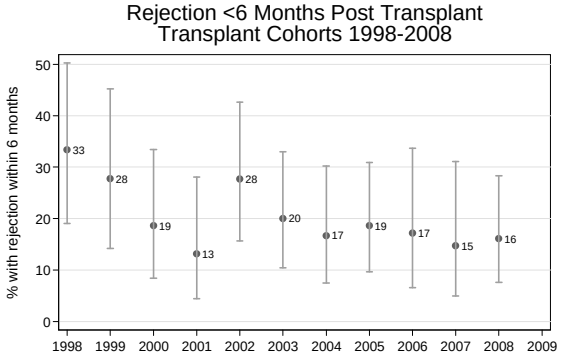


Figure 11.22

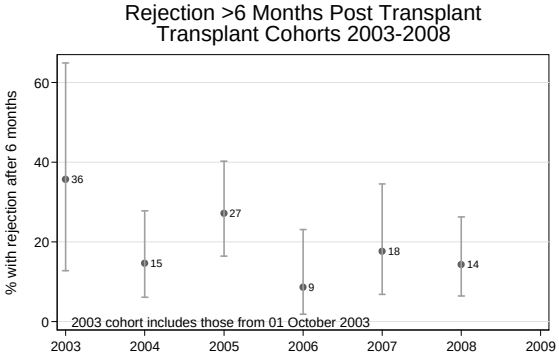


Figure 11.23

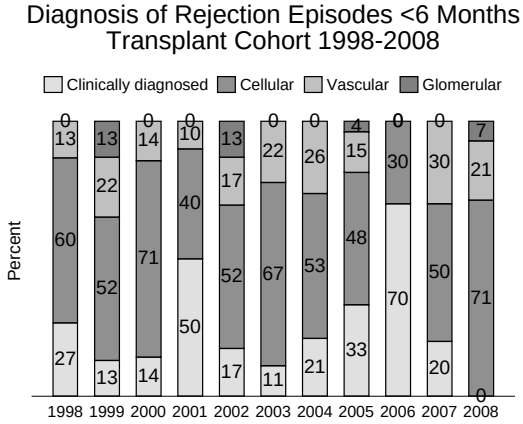


Figure 11.24