

# **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 provides a comprehensive analysis of kidney transplantation in children and adolescents in Australia and New Zealand - relative frequency of delivery compared with other forms of renal replacement therapy, recipient and donor characteristics, immunosuppressive use and patient and graft survival.

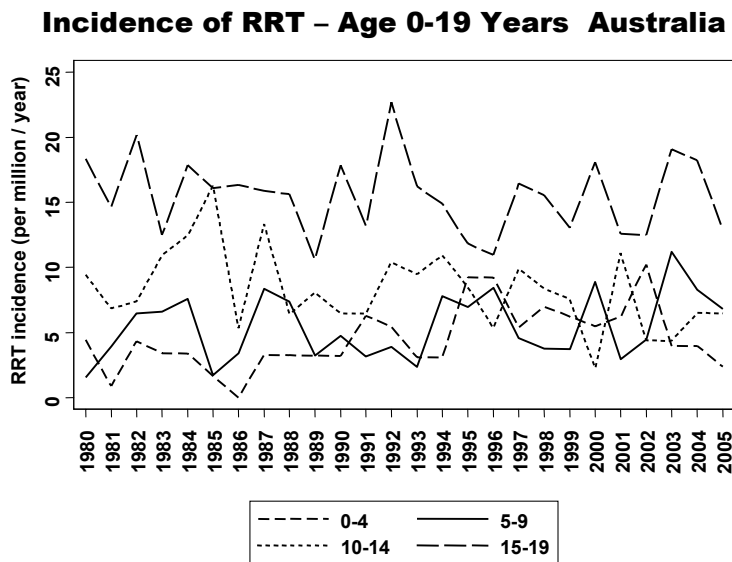
## INCIDENCE AND PREVALENCE OF ESKD IN CHILDREN AND ADOLESCENTS 1980 - 2005

### GENERAL OVERVIEW

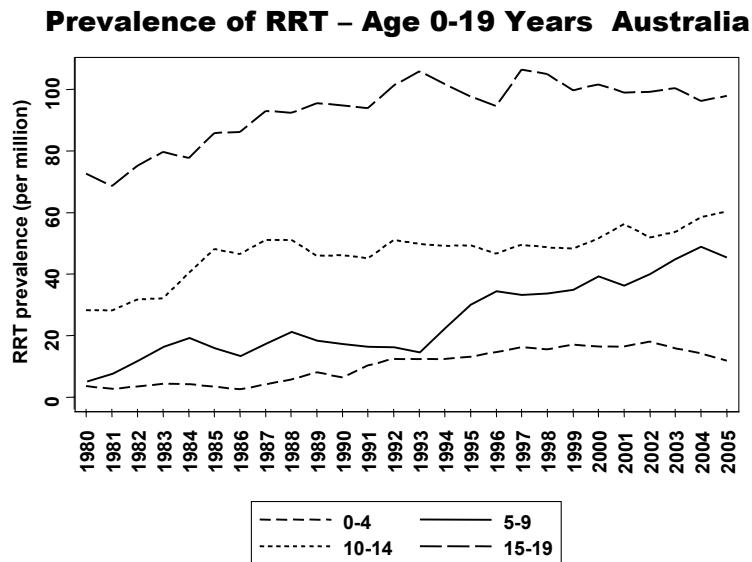
As shown in Figure 11.1 the incidence of children and adolescents developing ESKD and being treated with renal replacement therapy fluctuates from year to year, although there is no clear long-term trend.

In contrast prevalent numbers are gradually increasing across all age groups (Figure 11.2)

**Figure 11.1**



**Figure 11.2**



## CAUSES OF ESKD IN CHILDREN AND ADOLESCENTS 2000 - 2005

Overall, glomerulonephritis remains the most common cause of ESKD in children and adolescents (38 %) but causes vary significantly with age.

In young children hypoplasia/dysplasia is the most common cause, whereas among older children and adolescents reflux nephropathy is an important cause (Figure 11.3).

**Figure 11.3**

**Causes of End Stage Kidney Disease  
By Age Group 2000 - 2005**

Primary Renal Disease	Age Groups				Total
	0-4	5-9	10-14	15-19	
Glomerulonephritis	3 (6%)	15 (21%)	19 (28%)	74 (44%)	<b>111 (31%)</b>
Familial Glomerulonephritis	-	-	2 (3%)	10 (6%)	<b>12 (3%)</b>
Reflux Nephropathy	1 (2%)	6 (8%)	3 (4.5%)	32 (19%)	<b>42 (12%)</b>
Polycystic Kidney Disease	-	3 (4%)	3 (4.5%)	1 (<1%)	<b>7 (2%)</b>
Medullary Cystic Disease	1 (2%)	3 (4%)	5 (7%)	8 (5%)	<b>17 (5%)</b>
Posterior Urethral Valve	12 (24%)	6 (8%)	6 (9%)	6 (4%)	<b>30 (8%)</b>
Haemolytic Uraemic Syndrome	-	2 (3%)	1 (1%)	3 (2%)	<b>6 (2%)</b>
Hypoplasia/Dysplasia	14 (28%)	14 (20%)	10 (15%)	1 (<1%)	<b>39 (11%)</b>
Diabetes	-	-	-	1 (<1%)	<b>1 (1%)</b>
Cortical Necrosis	3 (6%)	2 (3%)	3 (4.5%)	4 (2%)	<b>12 (3%)</b>
Interstitial Nephritis	-	1 (1.5%)	-	6 (4%)	<b>7 (2%)</b>
Cystinosis	-	4 (6%)	3 (4.5%)	-	<b>7 (2%)</b>
Uncertain	1 (2%)	1 (1.5%)	4 (6%)	5 (3%)	<b>11 (3%)</b>
Miscellaneous/Other	15 (30%)	14 (20%)	9 (13%)	17 (10%)	<b>55 (15%)</b>
<b>Total</b>	<b>50 (100%)</b>	<b>71 (100%)</b>	<b>68 (100%)</b>	<b>168 (100%)</b>	<b>357 (100%)</b>

### MODALITY OF TREATMENT 2000 - 2005

The modality of the first renal replacement treatment is shown in Figure 11.4. Although the numbers are small and therefore fluctuate from year to year, around 15% of children receive a pre-emptive kidney transplant with the remainder split equally between peritoneal dialysis and haemodialysis.

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 11.4**

#### Modality of Initial Renal Replacement Therapy By Year of First Treatment, all Australia and New Zealand < 20 Years of Age at First Treatment

First Treatment	Year						Total
	2000	2001	2002	2003	2004	2005	
Haemodialysis	20 (36%)	27 (47%)	24 (38%)	28 (41%)	31 (53%)	24 (44%)	<b>154 (43%)</b>
Peritoneal Dialysis	24 (44%)	23 (40%)	34 (53%)	29 (43%)	22 (38%)	17 (32%)	<b>149 (42%)</b>
Transplant	11 (20%)	8 (14%)	6 (9%)	11 (16%)	5 (9%)	13 (24%)	<b>54 (15%)</b>
<b>Total</b>	<b>55 (100%)</b>	<b>58 (100%)</b>	<b>64 (100%)</b>	<b>68 (100%)</b>	<b>55 (100%)</b>	<b>54 (100%)</b>	<b>357 (100%)</b>

**Figure 11.5**

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

Current Treatment	Year						Total
	2000	2001	2002	2003	2004	2005	
Haemodialysis	47 (14%)	56 (16%)	51 (14%)	43 (12%)	54 (15%)	46 (12%)	<b>297 (14%)</b>
Peritoneal Dialysis	58 (17%)	59 (17%)	71 (20%)	69 (19%)	52 (14%)	44 (12%)	<b>353 (16%)</b>
Transplant	233 (69%)	230 (67%)	237 (66%)	256 (69%)	257 (71%)	282 (76%)	<b>1495 (69%)</b>
<b>Total</b>	<b>338 (100%)</b>	<b>345 (100%)</b>	<b>359 (100%)</b>	<b>368 (100%)</b>	<b>363 (100%)</b>	<b>372 (100%)</b>	<b>2145 (100%)</b>

**Figure 11.6**

**Paediatric Transplant Patients : Characteristics**

Cohort	No. of Patients	Male	Deceased Donor	First Tx	CMV Pos	EBV Pos
1996-1997	95	62%	42%	88%	42%	49%
1998-1999	75	65%	35%	92%	47%	50%
2000-2001	81	65%	35%	93%	37%	47%
2002-2003	102	54%	39%	93%	33%	56%
2004-2005	107	54%	36%	94%	39%	50%

Figures 11.6 -11.11 show the trends in paediatric transplants over the period 1996-2005.

There have been a decrease in male recipients and percentage of repeat transplants.

In recent cohorts, glomerulonephritis and renal hypoplasia/dysplasia have accounted for an increasing proportion of transplant recipients, while the proportion with reflux nephropathy have decreased.

Recent transplant recipients tend to be older. There were obvious trends in other characteristics.

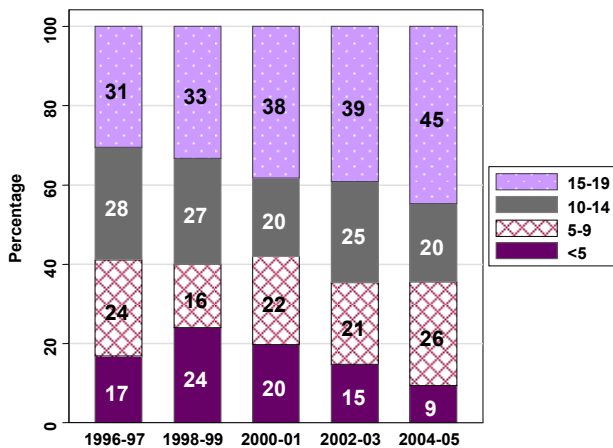
**Figure 11.7**

**Paediatric Transplant Patients Causes of End Stage Renal Disease**

ESRD	1996-7	1998-9	2000-1	2002-3	2004-5
Glomerulonephritis	19%	11%	17%	29%	24%
Reflux nephropathy	25%	27%	20%	14%	14%
Congenital renal hypoplasia/dysplasia	11%	16%	26%	18%	29%
Medullary cystic disease	28%	14%	3%	34%	21%
Haemolytic uraemic syndrome	30%	20%	15%	20%	15%
Posterior urethral valves	19%	19%	11%	16%	35%
Other	23%	17%	18%	21%	21%
Uncertain	-	-	33%	33%	33%

**Figure 11.8**

**Age (Years) at Transplant 1996 - 2005**



**Figure 11.9**

**Donor Source 1996 - 2005**

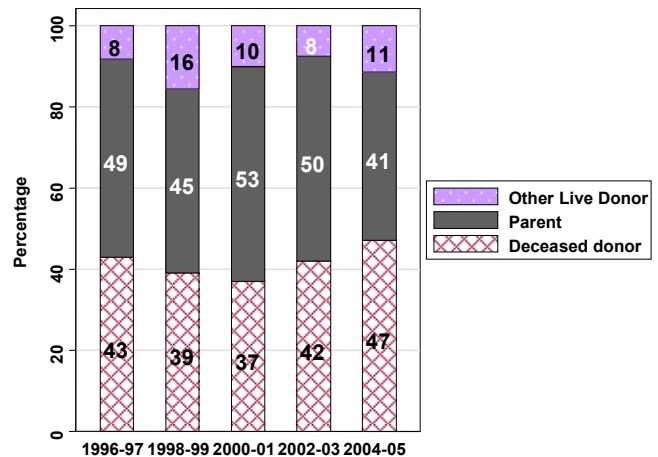




Figure 11.10

Number of HLA Mismatches 1996 - 2005

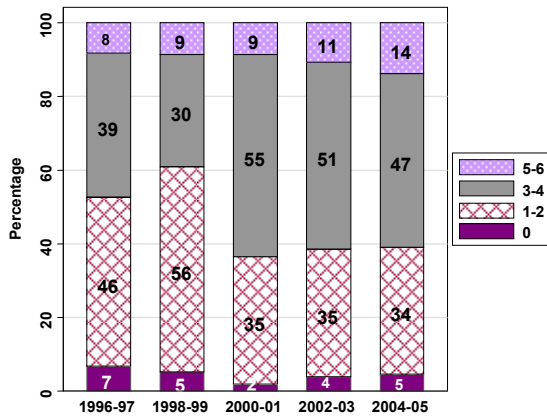


Figure 11.11

Time to First Kidney Transplant 1996 - 2005

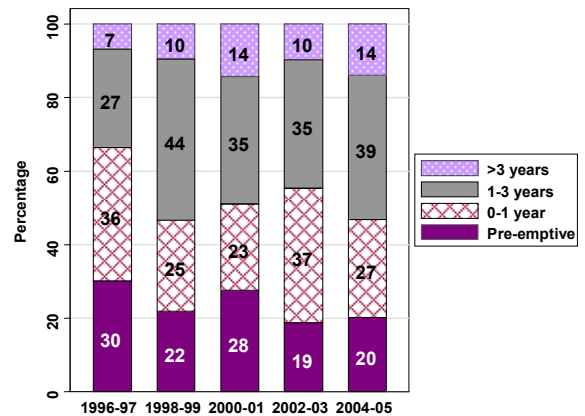


Figure 11.12

Paediatric Patients All Kidney Transplants  
Recipient and Graft Survival 1996 - 2005  
% [95% Confidence Interval]

Year of Transplant	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Recipient Survival</b>					
1996-1997	95	98 [92, 100]	97 [91, 99]	96 [89, 98]	94 [86, 97]
1998-1999	75	100 [-]	100 [-]	95 [86, 98]	95 [86, 98]
2000-2001	81	99 [92, 100]	99 [92, 100]	99 [92, 100]	99 [92, 100]
2002-2003	102	93 [86, 97]	91 [84, 95]	90 [83, 95]	-
2004-2005	107	100 [-]	100 [-]	-	-
<b>Graft Survival</b>					
1996-1997	95	91 [83, 95]	90 [81, 94]	81 [72, 88]	71 [61, 79]
1998-1999	75	95 [86, 98]	95 [86, 98]	80 [69, 87]	72 [60, 81]
2000-2001	81	98 [91, 99]	96 [89, 99]	91 [83, 96]	88 [78, 93]
2002-2003	102	90 [83, 95]	89 [81, 94]	87 [78, 92]	-
2004-2005	107	97 [92, 99]	97 [92, 99]	-	-

Figures 11.12 - 11.14

Recipient and graft survival rates have fluctuated over the period.

Three year recipient survival have remained above 90% and graft survival above 80%.

Figure 11.13

Patient Survival

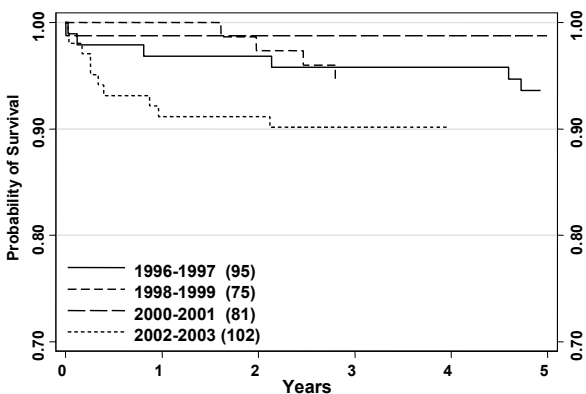
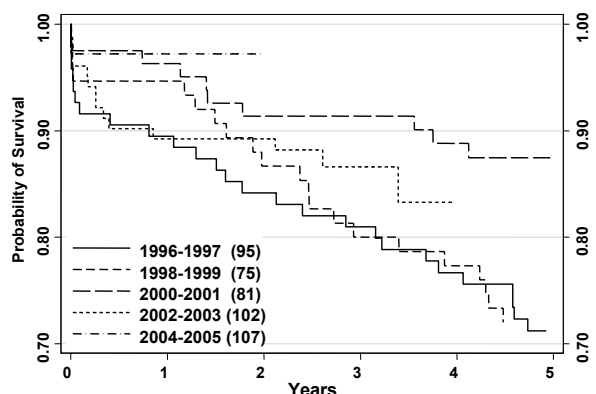


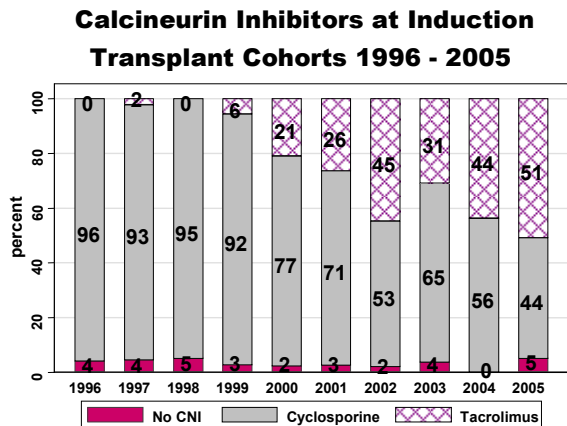
Figure 11.14

Graft Survival



### Calcineurin Inhibitor Use in Paediatric Transplant Patients 1996 - 2005

Figure 11.15



Figures 11.15 - 11.26

Tacrolimus is now the most commonly used calcineurin inhibitor (CNI) at induction and its dominance increases with time post-transplant.

The proportion of prednisolone free patients at induction has steadily decreased, while that at one year has been increasing since the 1999 cohort.

The proportion of CNI-free patients at one year have been increasing since the 2002 cohort.

For patients remaining on CNI and/or prednisolone, mean dose has changed little over the period.

Figure 11.16

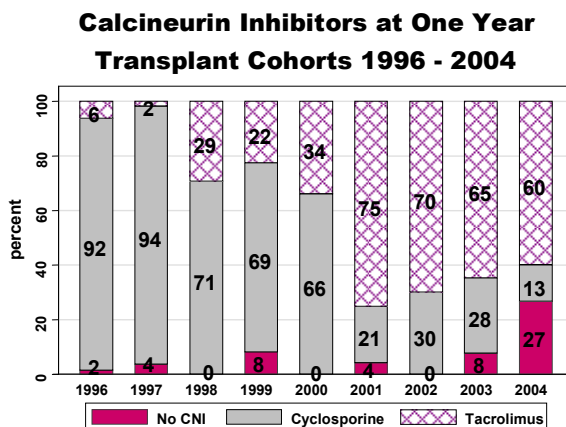
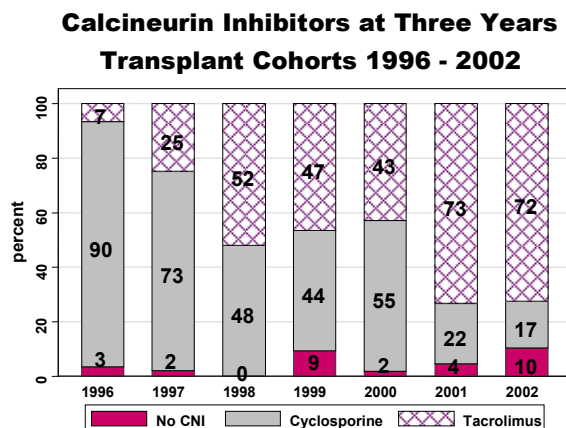


Figure 11.17





**Figure 11.18**

**Paediatric Transplant Patients  
Immunosuppressive Use At Induction**

Transplant Cohort	No. of Patients	CNI-Free	Pred-Free	Mean CyA Dose *	Mean Pred Dose **
1996	74	4.1%	8.0%	11.8 [10.3, 13.4]	1.0 [0.8, 1.2]
1997	59	3.4%	11.1%	9.5 [8.1, 10.9]	1.0 [0.8, 1.2]
1998	60	6.7%	7.7%	10.0 [8.3, 11.6]	0.9 [0.7, 1.1]
1999	55	0.0%	5.6%	11.1 [9.3, 13.0]	1.0 [0.7, 1.3]
2000	58	3.5%	0.0%	10.0 [8.7, 11.4]	0.9 [0.7, 1.1]
2001	50	4.0%	5.3%	10.7 [8.7, 12.7]	0.9 [0.7, 1.1]
2002	62	3.2%	4.3%	11.2 [8.8, 13.6]	0.9 [0.7, 1.1]
2003	69	2.9%	3.6%	11.8 [10.2, 13.4]	0.9 [0.7, 1.1]
2004	46	0.0%	2.1%	9.8 [8.3, 11.3]	0.8 [0.7, 1.0]
2005	41	2.4%	0.0%	11.7 [9.5, 13.9]	1.0 [0.8, 1.1]

\* mg/kg/day - excludes Cya-free patients      \*\* mg/kg/day - excludes Prednisolone-free patients

**Figure 11.19**

**Paediatric Transplant Patients  
Immunosuppressive Use At Six Months**

Transplant Cohort	No. of Patients	CNI-Free	Pred-Free	Mean CyA Dose *	Mean Pred Dose **
1996	64	1.6%	0.0%	7.1 [6.2, 8.0]	0.2 [0.2, 0.3]
1997	55	3.6%	4.7%	5.4 [4.7, 6.2]	0.3 [0.2, 0.3]
1998	58	0.0%	5.3%	5.7 [4.7, 6.7]	0.3 [0.2, 0.3]
1999	49	4.1%	3.0%	6.7 [5.2, 8.2]	0.2 [0.2, 0.3]
2000	56	3.6%	2.4%	6.2 [4.9, 7.4]	0.2 [0.2, 0.3]
2001	49	4.1%	2.7%	5.9 [4.2, 7.5]	0.2 [0.2, 0.3]
2002	60	0.0%	7.0%	7.5 [5.2, 9.7]	0.2 [0.2, 0.2]
2003	65	10.8%	6.1%	4.8 [3.2, 6.3]	0.2 [0.2, 0.3]
2004	45	6.7%	15.2%	6.2 [ 3.6, 8.8]	0.2 [0.2, 0.2]

\* mg/kg/day - excludes Cya-free patients      \*\* mg/kg/day - excludes Prednisolone-free patients

**Figure 11.20**

**Paediatric Transplant Patients  
Immunosuppressive Use At One Year**

Transplant Cohort	No. of Patients	CNI-Free	Pred-Free	Mean CyA Dose *	Mean Pred Dose **
1996	64	1.6%	14.0%	6.2 [5.5, 6.9]	0.2 [0.2, 0.2]
1997	54	3.7%	2.4%	4.9 [4.2, 5.7]	0.2 [0.2, 0.2]
1998	58	0.0%	7.9%	5.7 [4.8, 6.7]	0.2 [0.2, 0.2]
1999	49	8.2%	3.0%	5.7 [4.6, 6.9]	0.2 [0.2, 0.3]
2000	56	0.0%	11.9%	5.8 [4.7, 6.8]	0.2 [0.1, 0.2]
2001	48	4.2%	13.9%	5.2 [2.7, 7.6]	0.2 [0.2, 0.2]
2002	60	0.0%	11.6%	5.4 [3.7, 7.1]	0.2 [0.1, 0.2]
2003	65	7.7%	16.7%	4.8 [2.8, 6.7]	0.2 [0.1, 0.2]
2004	45	26.7%	21.7%	5.4 [3.1, 7.7]	0.1 [0.1, 0.2]

\* mg/kg/day - excludes Cya-free patients      \*\* mg/kg/day - excludes Prednisolone-free patients



**Figure 11.21**
**Paediatric Transplant Patients  
Immunosuppressive Use At Three Years**

Transplant Cohort	No. of Patients	CNI-Free	Pred-Free	Mean CyA Dose *	Mean Pred Dose **
1996	60	3.3%	23.1%	4.8 [4.2, 5.3]	0.2 [0.1, 0.2]
1997	48	2.1%	8.1%	4.1 [3.3, 4.9]	0.1 [0.1, 0.2]
1998	48	0.0%	16.1%	4.5 [3.2, 5.8]	0.1 [0.1, 0.2]
1999	43	9.3%	27.6%	5.0 [3.5, 6.6]	0.1 [0.1, 0.2]
2000	56	1.8%	19.5%	4.2 [3.4, 5.0]	0.1 [0.1, 0.1]
2001	45	4.4%	31.3%	5.2 [2.2, 8.2]	0.1 [0.1, 0.2]
2002	58	10.3%	16.7%	3.4 [2.8, 3.9]	0.1 [0.1, 0.2]

\* mg/kg/day - excludes Cya-free patients  
\*\* mg/kg/day - excludes Prednisolone-free patients

**Figure 11.22**
**Paediatric Transplant Patients  
Immunosuppressive Use At Five Years**

Transplant Cohort	No. of Patients	CNI-Free	Pred-Free	Mean CyA Dose *	Mean Pred Dose **
1996	53	1.9%	27.3%	4.1 [3.4, 4.7]	0.1 [0.1, 0.2]
1997	42	4.8%	19.4%	3.4 [2.7, 4.2]	0.1 [0.1, 0.2]
1998	46	0.0%	30.0%	3.2 [2.3, 4.1]	0.1 [0.1, 0.2]
1999	35	17.1%	25.0%	4.0 [2.3, 5.7]	0.1 [0.1, 0.1]
2000	56	8.9%	25.0%	3.8 [2.9, 4.8]	0.1 [0.1, 0.1]

\* mg/kg/day - excludes Cya-free patients  
\*\* mg/kg/day - excludes Prednisolone-free patients

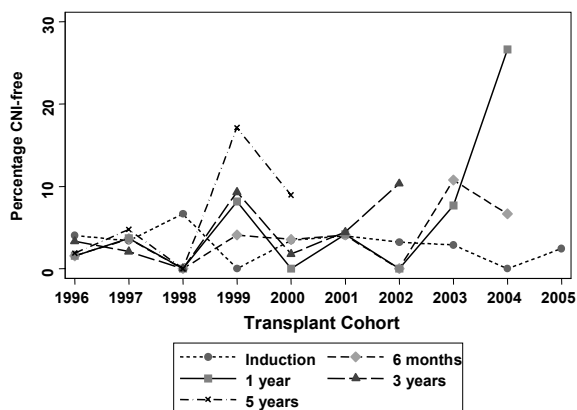
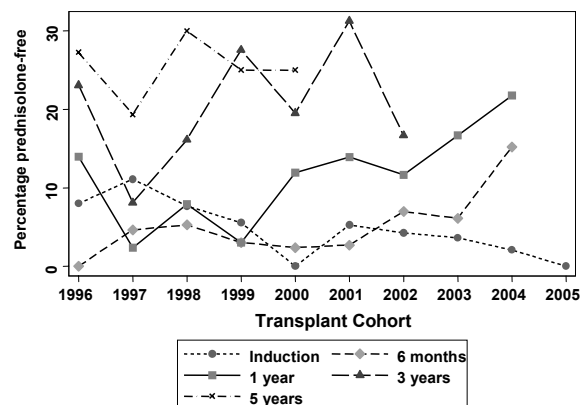
**Figure 11.23**
**CNI-Free Fraction  
Transplant Cohorts 1996 - 2005**

**Figure 11.24**
**Steroid-Free Fraction  
Transplant Cohorts 1996 - 2005**




Figure 11.25

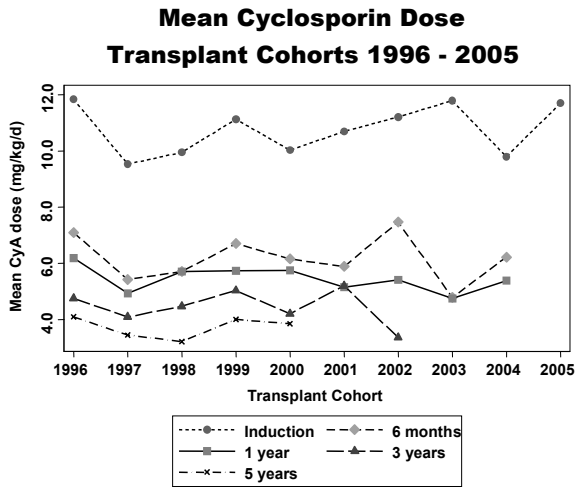


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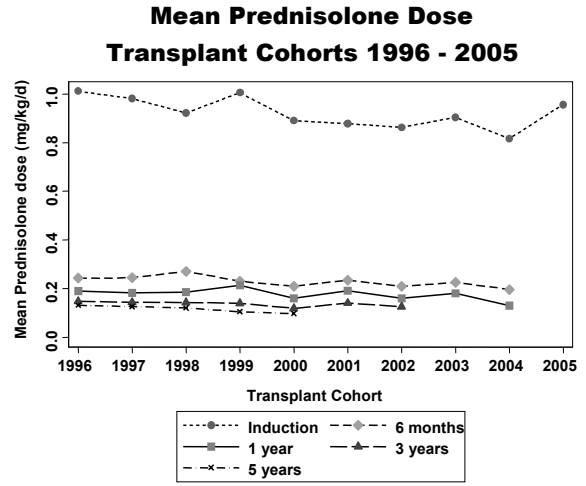


Figure 11.27

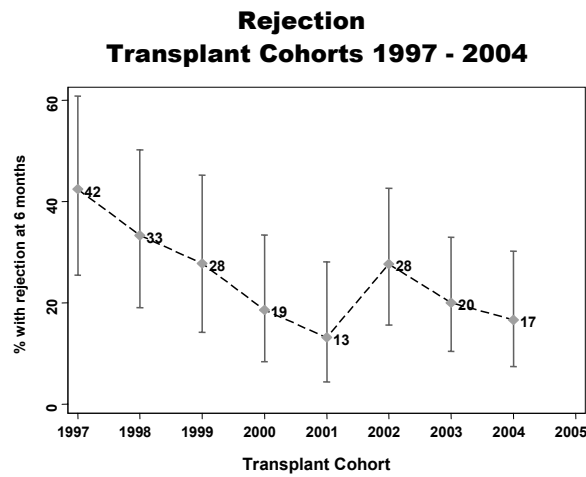
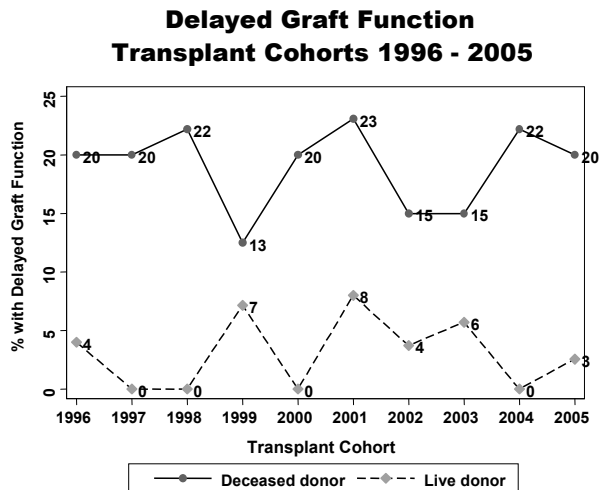
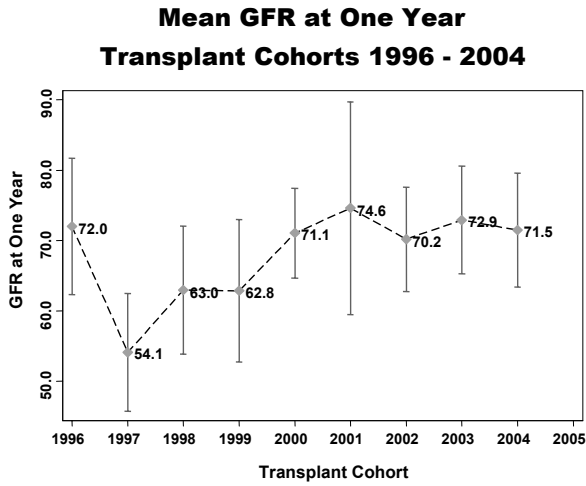


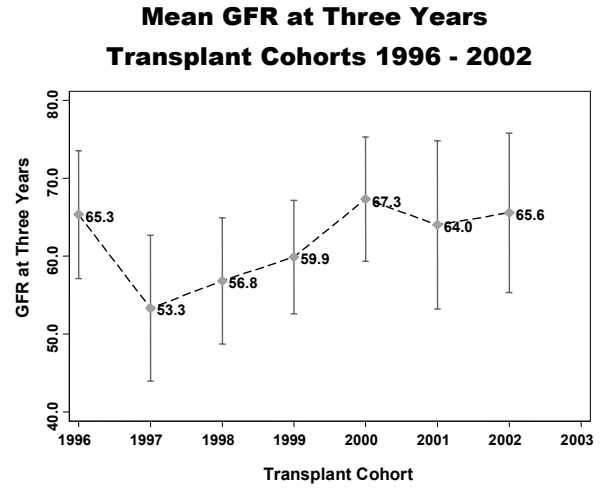
Figure 11.28



**Figure 11.29**



**Figure 11.30**



Figures 11.27- 11.30

The proportion of patients experiencing acute rejection(s), biopsy proven or diagnosed clinically in the first six months has steadily decreased, while the rates of delayed graft function (defined as requiring post transplant dialysis) have fluctuated.

Renal function at one and three years improved between the 1997 and 2000 cohorts, but has remained stable since then.

