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 - 2007**

**GENERAL OVERVIEW**

As shown in Figure 11.1, there is no long term trend in the incidence of children and adolescents developing ESKD and being treated with renal replacement therapy, although there are fluctuations from year-to-year. Prevalent numbers of treated ESKD have gradually increased across all age groups reflecting improved survival through increased duration of ESKD (Figure 11.2).

![Figure 11.1](image1.png)

*Incidence of RRT Per Million Population 0-19 Year Age Group*

![Figure 11.2](image2.png)

*Prevalence of RRT Per Million Population 0-19 Year Age Group*
CAUSES OF ESKD IN CHILDREN AND ADOLESCENTS 2002 - 2007

Overall, glomerulonephritis remains the most common cause of ESKD among children and adolescents (29%) but causes vary significantly with age. In young children, hypoplasia/dysplasia is the most common cause, while reflux nephropathy is a common cause of ESKD in adolescents.

Figure 11.3
Causes of End Stage Kidney Disease In Children and Adolescents 2002 - 2007

<table>
<thead>
<tr>
<th>Primary Renal Disease</th>
<th>0-4</th>
<th>5-9</th>
<th>10-14</th>
<th>15-19</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glomerulonephritis</td>
<td>4 (8%)</td>
<td>10 (16%)</td>
<td>21 (30%)</td>
<td>69 (41%)</td>
<td>104 (29%)</td>
</tr>
<tr>
<td>Familial Glomerulonephritis</td>
<td>-</td>
<td>-</td>
<td>2 (3%)</td>
<td>5 (3%)</td>
<td>7 (2%)</td>
</tr>
<tr>
<td>Reflux Nephropathy</td>
<td>-</td>
<td>2 (3%)</td>
<td>4 (6%)</td>
<td>31 (19%)</td>
<td>37 (10%)</td>
</tr>
<tr>
<td>Polycystic Kidney Disease</td>
<td>4 (8%)</td>
<td>4 (6%)</td>
<td>2 (3%)</td>
<td>-</td>
<td>10 (3%)</td>
</tr>
<tr>
<td>Medullary Cystic Disease</td>
<td>1 (2%)</td>
<td>3 (5%)</td>
<td>5 (7%)</td>
<td>9 (5%)</td>
<td>18 (5%)</td>
</tr>
<tr>
<td>Posterior Urethral Valve</td>
<td>11 (21%)</td>
<td>7 (11%)</td>
<td>5 (7%)</td>
<td>8 (5%)</td>
<td>31 (9%)</td>
</tr>
<tr>
<td>Haemolytic Uraemic Syndrome</td>
<td>2 (4%)</td>
<td>2 (3%)</td>
<td>2 (3%)</td>
<td>3 (2%)</td>
<td>9 (3%)</td>
</tr>
<tr>
<td>Hypoplasia / Dysplasia</td>
<td>16 (30%)</td>
<td>14 (22%)</td>
<td>14 (20%)</td>
<td>6 (4%)</td>
<td>50 (14%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cortical Necrosis</td>
<td>1 (2%)</td>
<td>2 (3%)</td>
<td>2 (3%)</td>
<td>3 (2%)</td>
<td>8 (2%)</td>
</tr>
<tr>
<td>Interstitial Nephritis</td>
<td>-</td>
<td>1 (2%)</td>
<td>-</td>
<td>5 (3%)</td>
<td>6 (2%)</td>
</tr>
<tr>
<td>Cystinosis</td>
<td>-</td>
<td>3 (5%)</td>
<td>2 (3%)</td>
<td>-</td>
<td>5 (1%)</td>
</tr>
<tr>
<td>Uncertain</td>
<td>1 (2%)</td>
<td>1 (2%)</td>
<td>3 (4%)</td>
<td>8 (5%)</td>
<td>13 (4%)</td>
</tr>
<tr>
<td>Miscellaneous / Other</td>
<td>13 (25%)</td>
<td>15 (23%)</td>
<td>9 (13%)</td>
<td>20 (12%)</td>
<td>57 (16%)</td>
</tr>
<tr>
<td>Total</td>
<td>53 (100%)</td>
<td>64 (100%)</td>
<td>71 (100%)</td>
<td>167 (100%)</td>
<td>355 (100%)</td>
</tr>
</tbody>
</table>

MODALITY OF TREATMENT 2002 - 2007

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 15% of children and adolescents receive pre-emptive kidney transplants with the remainder split almost equally between haemodialysis and peritonitis dialysis.

Figure 11.4
Modality of Initial Renal Replacement Therapy By Year of First Treatment - Australia and New Zealand < 20 Years of Age at First Treatment

<table>
<thead>
<tr>
<th>Current Treatment</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemodialysis</td>
<td>24 (38%)</td>
<td>28 (41%)</td>
<td>31 (54%)</td>
<td>24 (44%)</td>
<td>23 (45%)</td>
<td>24 (41%)</td>
<td>154 (43%)</td>
</tr>
<tr>
<td>Peritoneal Dialysis</td>
<td>34 (53%)</td>
<td>29 (43%)</td>
<td>22 (38%)</td>
<td>18 (33%)</td>
<td>18 (35%)</td>
<td>26 (44%)</td>
<td>147 (41%)</td>
</tr>
<tr>
<td>Transplant</td>
<td>6 (9%)</td>
<td>11 (16%)</td>
<td>5 (9%)</td>
<td>13 (24%)</td>
<td>10 (20%)</td>
<td>9 (15%)</td>
<td>54 (15%)</td>
</tr>
<tr>
<td>Total</td>
<td>64 (100%)</td>
<td>68 (100%)</td>
<td>58 (100%)</td>
<td>55 (100%)</td>
<td>51 (100%)</td>
<td>59 (100%)</td>
<td>355 (100%)</td>
</tr>
</tbody>
</table>
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 31-December*

<table>
<thead>
<tr>
<th>Current Treatment</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemodialysis</td>
<td>51 (14%)</td>
<td>43 (12%)</td>
<td>55 (15%)</td>
<td>47 (13%)</td>
<td>43 (11%)</td>
<td>43 (11%)</td>
<td>282 (13%)</td>
</tr>
<tr>
<td>Peritoneal Dialysis</td>
<td>71 (20%)</td>
<td>69 (19%)</td>
<td>52 (14%)</td>
<td>44 (12%)</td>
<td>45 (12%)</td>
<td>60 (16%)</td>
<td>341 (15%)</td>
</tr>
<tr>
<td>Transplant</td>
<td>237 (66%)</td>
<td>258 (70%)</td>
<td>260 (71%)</td>
<td>282 (76%)</td>
<td>290 (77%)</td>
<td>274 (73%)</td>
<td>1601 (72%)</td>
</tr>
<tr>
<td>Total</td>
<td>359 (100%)</td>
<td>370 (100%)</td>
<td>367 (100%)</td>
<td>373 (100%)</td>
<td>377 (100%)</td>
<td>2224 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

**TRANSPLANT DEMOGRAPHICS**

Figures 11.6 - 11.9 show the trends in paediatric transplants over the period 1996-2007. Recent transplant recipients tend to be older. 2006-2007 saw an increase in the proportion of parental live donors and pre-emptive transplants.
Recipient and graft survival rates have fluctuated over the period. Three year recipient survival have remained above 90% and graft survival above 80%.

**Figure 11.10**

<table>
<thead>
<tr>
<th>Year</th>
<th>Recipient Survival</th>
<th>Graft Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996-1997 n=95</td>
<td>98 [92, 99]</td>
<td>91 [83, 95]</td>
</tr>
<tr>
<td>1998-1999 n=75</td>
<td>100 [0, 0]</td>
<td>95 [86, 98]</td>
</tr>
<tr>
<td>2000-2001 n=81</td>
<td>99 [92, 100]</td>
<td>95 [86, 98]</td>
</tr>
<tr>
<td>2002-2003 n=102</td>
<td>93 [86, 97]</td>
<td>90 [83, 95]</td>
</tr>
<tr>
<td>2004-2005 n=107</td>
<td>100 [0, 0]</td>
<td>99 [93, 100]</td>
</tr>
<tr>
<td>2006-2007 n=69</td>
<td>100 [0, 0]</td>
<td>100 [0, 0]</td>
</tr>
</tbody>
</table>

**Figure 11.11**

Recipient Survival

**Figure 11.12**

Graft Survival

**Figure 11.13**

Causes of Graft Failure 1996 - 2007

<table>
<thead>
<tr>
<th>Reason for Failure</th>
<th>Age Groups (Years)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-4</td>
<td>5-9</td>
</tr>
<tr>
<td>Rejection - Acute</td>
<td>4 (21%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Rejection - CAN</td>
<td>4 (21%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Rejection - Hyperacute</td>
<td>1 (5%)</td>
<td>-</td>
</tr>
<tr>
<td>Vascular rejection</td>
<td>5 (5%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>Technical reasons</td>
<td>3 (16%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Recurrent disease</td>
<td>-</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Non-compliance</td>
<td>1 (5%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>Death with function</td>
<td>4 (21%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (5%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>20 (100%)</td>
</tr>
</tbody>
</table>

Chronic allograft nephropathy is the most common cause of graft failure in recipients aged <20 years at the time of transplant. Acute rejection is also an important cause of graft failure in young children (aged <4 years) while non-compliance with drug therapy is a main cause in older children (aged 15-19 years).
Tacrolimus is now the most commonly used calcineurin inhibitor (CNI) at induction and its dominance increases with time-post transplant.

Mycophenolate is the most commonly used antimetabolite, with almost all patients receiving it at induction. Its use does decrease with time-post transplant in all but the 1996 and 1997 cohorts.

The proportion of prednisolone-free patients at induction has stabilised at zero and those at 6 months and 1 year have been decreasing since the 2004 cohort. On the other hand, the proportion of patients without prednisolone at 3 years has been increasing since the 2002 cohort.
Figure 11.18

Antimetabolites at Induction
Transplant Cohorts 1996-2007

Figure 11.19

Antimetabolites at One Year
Transplant Cohorts 1996-2006

Figure 11.20

Antimetabolites at Five Years
Transplant Cohorts 1996-2002

Figure 11.21

Antimetabolites at Ten Years
Transplant Cohorts 1996-1997

Figure 11.22

Steroid-free Fraction
Transplant Cohorts 1996-2007
The proportion of patients experiencing least one episode of acute rejection, biopsy proven or clinically diagnosed in the first six months is stabilising. The proportion of biopsy proven episodes in the first six months fluctuates but has been declining since 2003.

Renal function at anytime post transplant has improved since the 1996-1998 cohort. There is little change in the rate of decline in renal function post transplant.