



## **CHAPTER 6**

# **PERITONEAL DIALYSIS**

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## STOCK AND FLOW

### AUSTRALIA

In 2003, continuous ambulatory peritoneal dialysis was used to treat 14% of all dialysis patients (16% in 2002), and automated peritoneal dialysis 9% (8% in 2002). Together, these accounted for 70% of all home dialysis, a figure which has been stable for a number of years (fig 6.1). Of the 17,523 patients, 4% had had at least five years of continuous peritoneal dialysis (fig 6.2).

The proportion of all home dialysis patients on peritoneal dialysis in each State ranged from 60% (New South Wales), to 97% (Northern Territory) (fig 6.1).

The prevalence of automated peritoneal dialysis increased 19%, from 612 patients in 2002 to 726 patients in 2003.

In relation to age, the proportion of all dialysis patients (65-74 years and 75-84 years) using peritoneal dialysis was 27% and 23% (27% and 25% respectively in 2002); range 16% (>= 85 years) to 89% (0-14 years) (fig 6.9).

The annual stock and flow of patients during the period 1999-2003 is shown in Figures 6.3 and 6.4.

**Figure 6.1**

**Proportion (%) Peritoneal Dialysis of all Home Patients 1999 - 2003**

State	1999	2000	2001	2002	2003
Queensland	86%	84%	84%	82%	80%
New South Wales	58%	58%	59%	59%	60%
Aust. Capital Territory	75%	75%	67%	74%	72%
Victoria	71%	72%	73%	73%	72%
Tasmania	88%	88%	80%	79%	87%
South Australia	79%	83%	83%	80%	90%
Northern Territory	100%	100%	96%	97%	97%
Western Australia	87%	90%	88%	87%	87%
<b>Australia</b>	<b>70%</b>	<b>70%</b>	<b>70%</b>	<b>69%</b>	<b>70%</b>
<b>New Zealand</b>	<b>79%</b>	<b>78%</b>	<b>78%</b>	<b>77%</b>	<b>77%</b>

There were 794 new peritoneal dialysis patients in the calendar year 2003, an increase of 2% compared to a decrease of 6% the previous year. There were 482 (61%) who started with peritoneal dialysis, (25% of all new dialysis patients in 2003) and 312 (39%) who previously had haemodialysis or a failed transplant (fig 6.3).

New patients over the age of 65 years decreased 2%, from 363 to 354 in 2003. There was also a decrease last year of 3% (363 from 375 patients) after an increase of 6% in 2001.

There was a large increase in the 25-34 year age group of 117% (52 patients compared to 24 in 2002). There were increases of 3% in the 0-14 and 15-24 year age groups, 4% in the 35-44 year age group, whilst there was a 12% decrease in the 45-54 year age group from 125 to 110 patients. The 55-64 year age group remained steady.

There were 289 deaths (334 in 2002), (15.9 deaths per 100 patient years; 11% of patients at risk) (fig 3.8). For more detail see Appendix II at Website ([www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm](http://www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm)).

One hundred and twelve patients received a transplant in 2003 compared to 141 in 2002; 6% of all patients treated, 11% of patients <65 years treated during the year (fig 6.3). Five patients >=65 years were transplanted.

Permanent transfer (>12 months) to haemodialysis was similar to last year, 360 (19%) and 356 (20%) in 2002. Most transfers to haemodialysis were permanent (360/443) (fig 6.3).

The primary renal disease of new patients to peritoneal dialysis remained similar to previous years (fig 6.8).

**Figure 6.2**

**Continuous Period of Peritoneal Dialysis at 31 March 2004**

	Months													
	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-60	61-72	73-84	85-96	97-108	>=109
<b>Australia</b>														
1st Treatment 14,277 Pts	4047	2757	1945	1453	1167	766	584	425	557	293	149	76	29	29
All Treatments 17,523 Pts	5240	3415	2349	1765	1362	905	680	492	643	345	163	88	35	41
<b>New Zealand</b>														
1st Treatment 4,014 Pts	788	629	549	470	382	306	269	152	224	108	49	48	17	23
All Treatments 4,740 Pts	997	758	655	538	442	347	302	171	247	122	61	50	20	30

**Figure 6.3**
**Stock and Flow of Peritoneal Dialysis Patients  
1999 - 2003**

	1999	2000	2001	2002	2003
<b>Australia</b>					
<b>Patients new to PD</b>	750	785	830	780	794
First Dialysis Treatment	414	426	484	489	482
Previous Dialysis (HD)	326	339	335	275	289
Failed Transplant	10	20	11	16	23
<b>Transplanted</b>	92	122	110	141	112
<b>Deaths</b>	309	289	312	334	289
Never Transplanted	293	280	301	325	278
Previous Transplant	16	9	11	9	11
<b>Permanent Transfers Out (&gt;12 months)</b>	319	350	360	356	360
<b>Temporary Transfers (&lt;12 months)</b>	151	123	125	90	83
Patients Dialysing at 31 December	1678	1736	1807	1785	1823
Patients Dialysing at Home 31 December	1623	1702	1766	1745	1793
% of all Home Dialysis Patients	70%	70%	70%	69%	70%
<b>New Zealand</b>					
<b>Patients new to PD</b>	264	263	282	292	260
First Dialysis Treatment	177	142	180	162	153
Previous Dialysis (HD)	81	114	95	124	102
Failed Transplant	6	7	7	6	5
<b>Transplanted</b>	41	41	37	43	37
<b>Deaths</b>	98	139	135	123	131
Never Transplanted	93	138	132	115	125
Previous Transplant	5	1	3	8	6
<b>Permanent Transfers Out (&gt;12 months)</b>	84	85	77	68	104
<b>Temporary Transfers (&lt;12 months)</b>	55	65	35	32	28
Patients Dialysing at 31 December	671	681	716	770	769
Patients Dialysing at Home 31 December	665	677	708	764	766
% of all Home Dialysis Patients	79%	78%	78%	77%	77%

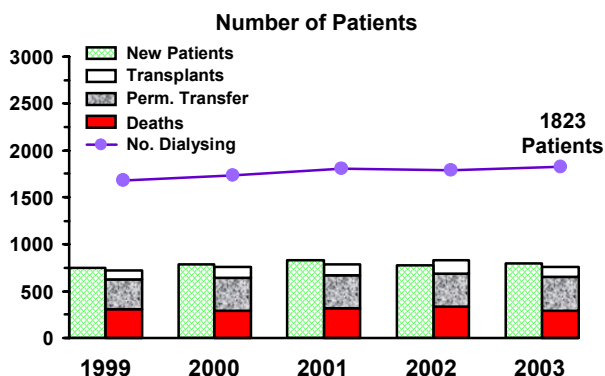
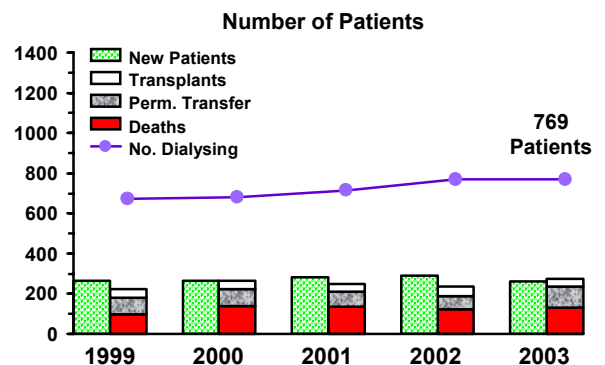
**Figure 6.4**
**Stock and Flow of Peritoneal Dialysis Patients  
Australia 1999 - 2003**

**Figure 6.5**
**Stock and Flow of Peritoneal Dialysis Patients  
New Zealand 1999 - 2003**




Figure 6.6

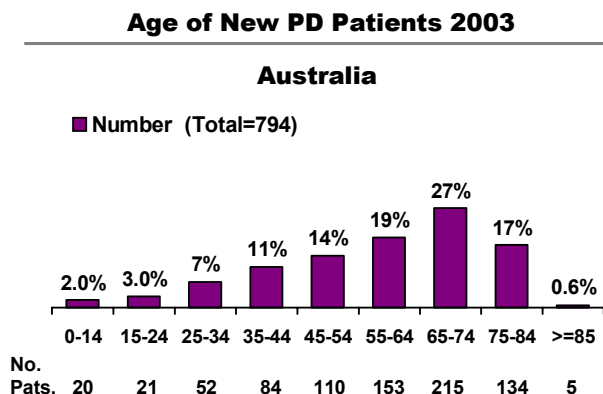


Figure 6.7

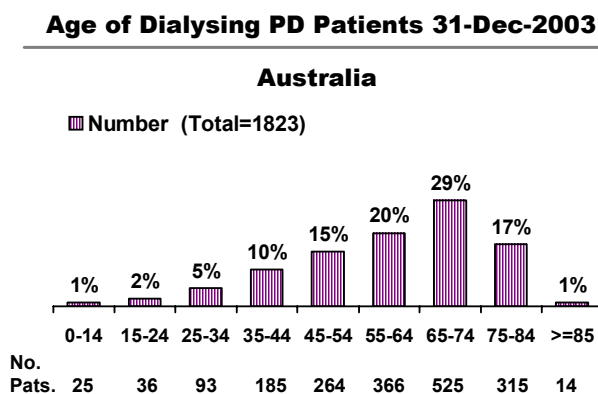


Figure 6.8

**AUSTRALIA**

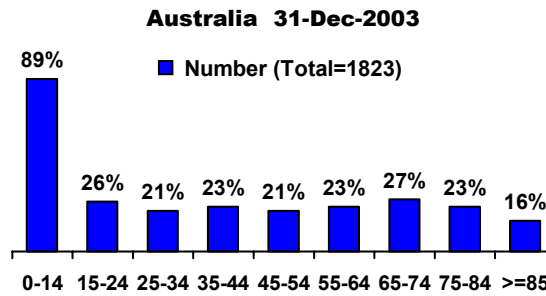
**Stock and Flow of Peritoneal Dialysis by Age Groups 1999 - 2003**

Age Groups	1999	2000	2001	2002	2003
<b>New Patients *</b>					
00-14 years	16 (2%)	15 (2%)	13 (2%)	17 (2%)	20 (2%)
15-24 years	18 (2%)	26 (3%)	18 (2%)	18 (2%)	21 (3%)
25-34 years	39 (5%)	60 (8%)	44 (5%)	24 (3%)	52 (7%)
35-44 years	75 (10%)	67 (8%)	81 (10%)	81 (10%)	84 (11%)
45-54 years	123 (16%)	121 (15%)	116 (14%)	125 (16%)	110 (14%)
55-64 years	132 (18%)	177 (23%)	183 (22%)	152 (20%)	153 (19%)
65-74 years	243 (33%)	210 (27%)	234 (28%)	230 (30%)	215 (27%)
75-84 years	102 (13%)	103 (13%)	136 (17%)	127 (16%)	134 (17%)
>=85 years	2 (<1%)	6 (1%)	5 (<1%)	6 (1%)	5 (<1%)
<b>Total</b>	<b>750 (100%)</b>	<b>785 (100%)</b>	<b>830 (100%)</b>	<b>780 (100%)</b>	<b>794 (100%)</b>
<b>Patients Dialysing</b>					
00-14 years	23 (1%)	25 (1%)	22 (1%)	23 (1%)	25 (1%)
15-24 years	44 (2%)	51 (3%)	42 (2%)	43 (3%)	36 (2%)
25-34 years	96 (6%)	114 (7%)	106 (6%)	82 (5%)	93 (5%)
35-44 years	158 (10%)	150 (9%)	183 (10%)	183 (10%)	185 (10%)
45-54 years	282 (17%)	282 (16%)	256 (14%)	257 (14%)	264 (15%)
55-64 years	339 (20%)	355 (20%)	383 (21%)	362 (20%)	366 (20%)
65-74 years	499 (30%)	512 (30%)	522 (29%)	528 (30%)	525 (29%)
75-84 years	230 (14%)	235 (14%)	281 (16%)	289 (16%)	315 (17%)
>=85 years	7 (<1%)	12 (<1%)	12 (<1%)	18 (1%)	14 (1%)
<b>Total</b>	<b>1678 (100%)</b>	<b>1736 (100%)</b>	<b>1807 (100%)</b>	<b>1785 (100%)</b>	<b>1823 (100%)</b>
<b>Primary Renal Disease *</b>					
Glomerulonephritis	220 (29%)	219 (28%)	213 (26%)	225 (29%)	231 (29%)
Analgesic Nephropathy	60 (8%)	54 (7%)	50 (6%)	35 (4%)	33 (4%)
Hypertension	72 (10%)	103 (13%)	123 (15%)	120 (15%)	125 (16%)
Polycystic Disease	34 (5%)	42 (5%)	26 (3%)	43 (6%)	38 (5%)
Reflux Nephropathy	25 (3%)	40 (5%)	26 (3%)	24 (3%)	29 (3%)
Diabetic Nephropathy	219 (29%)	205 (26%)	242 (29%)	208 (27%)	204 (26%)
Miscellaneous	70 (9%)	69 (9%)	89 (11%)	72 (9%)	77 (10%)
Uncertain	50 (7%)	53 (7%)	61 (7%)	53 (7%)	57 (7%)
<b>Total</b>	<b>750 (100%)</b>	<b>785 (100%)</b>	<b>830 (100%)</b>	<b>780 (100%)</b>	<b>794 (100%)</b>

\* New patients receiving first peritoneal dialysis treatment

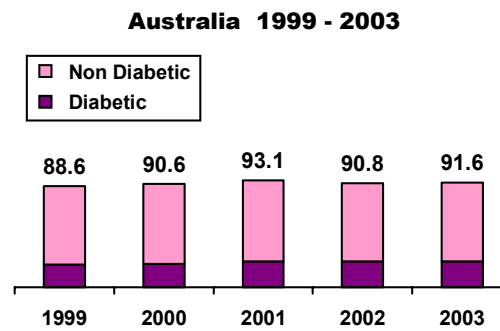
**Figure 6.9**

**PD Patients (%) of all Prevalent Dialysis**



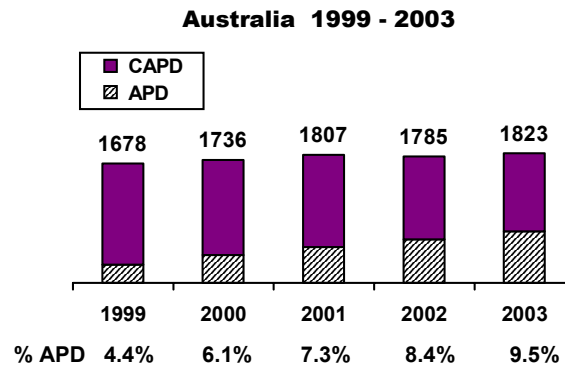
**Figure 6.10**

**Number (Per Million) Prevalent PD Patients**



**Figure 6.11**

**Number of Prevalent APD/CAPD Patients**



**Figure 6.12**

**Number (Per Million) Prevalent APD Patients**

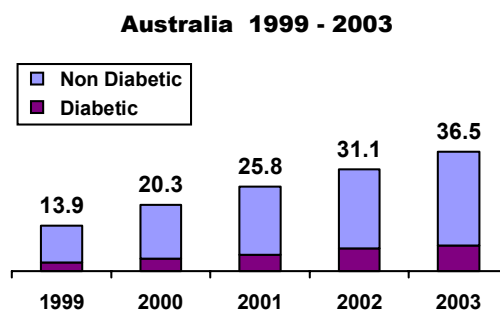




Figure 6.13

**PD Patients (%) of all Prevalent Dialysis**

New Zealand 31-Dec-2003

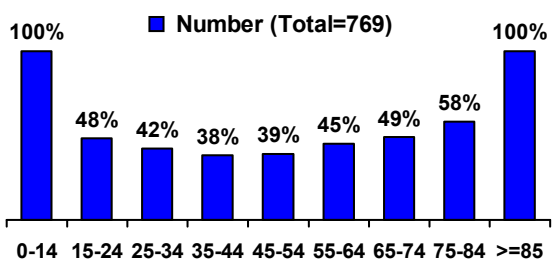


Figure 6.14

**Number (Per Million) Prevalent PD Patients**

New Zealand 1999 - 2003

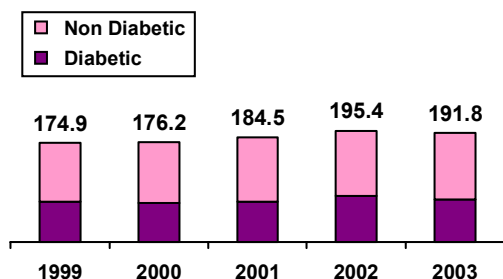


Figure 6.15

**Number of Prevalent APD/CAPD Patients**

New Zealand 1999 - 2003

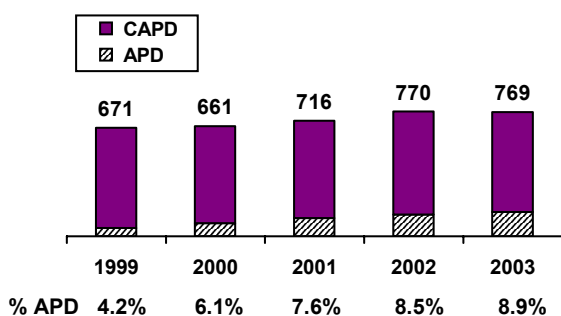
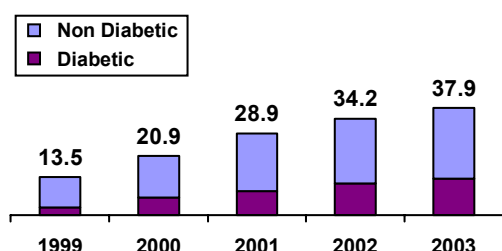


Figure 6.16

**Number (Per Million) Prevalent APD Patients**

New Zealand 1999 - 2003



**NEW ZEALAND**

The annual stock and flow of patients during the period 1999 to 2003 is shown in Figures 6.3 and 6.5. Of the 4,740 patients treated since 1978, 769 (16%) were alive at 31 December 2003, 283 (6%) had more than five years continuous treatment (fig 6.1).

Peritoneal dialysis accounted for 45% of all dialysis patients, and 77% of all patients dialysing at home. Automated peritoneal dialysis accounted for 20% of all peritoneal dialysis in 2003, compared with 18% in 2002, and 16% in 2001.

The age distribution of prevalent peritoneal dialysis patients is shown in Figures 6.18 and 6.19.

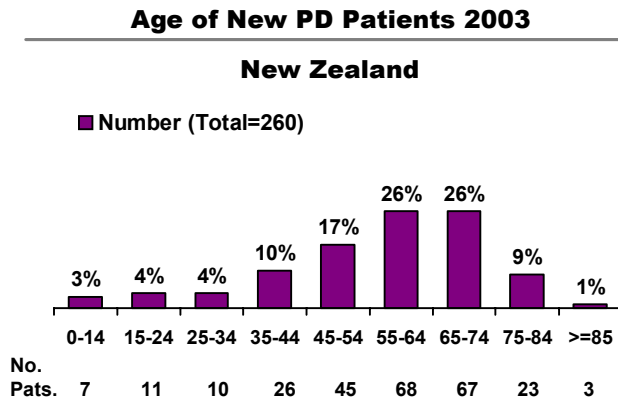
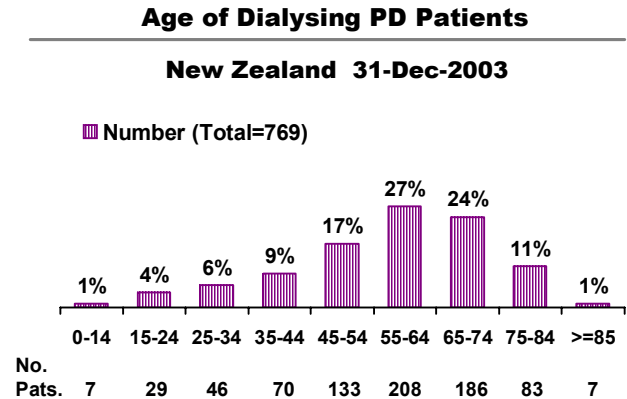
There were 260 new peritoneal dialysis patients in the calendar year 2003 (a decrease of 11%, 292 patients) from 2002 and 282 patients in 2001. For 59%, peritoneal dialysis was the initial dialysis treatment (fig 6.17 and 6.19). For more detail see Appendix III at Website ([www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm](http://www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm)).

There were 131 deaths amongst prevalent peritoneal dialysis patients in 2003 (123 in 2002) 16.9 deaths per 100 patient years, (12.4% of patients at risk; 3.9% 25-44 years, 11.2% 45-64 years, 17.5% 65-84 years) (fig 3.10). For more detail see Appendix III at Website ([www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm](http://www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm)).

Thirty seven patients were transplanted in 2003 (43 in 2002), 5% of patients dialysed, 8% of patients <65 years treated during the year (fig 6.2). No patients >=65 years were transplanted.

The most common primary renal disease of new patients to peritoneal dialysis was diabetic nephropathy (37%) followed by glomerulonephritis (25%).

The proportion of patients in each group treated with peritoneal dialysis ranged from 38% (35-44 years), 39% (45-54 years) to 100% (0-14 years and >=85 years) (fig 6.13).

**Figure 6.17**

**Figure 6.18**

**Figure 6.19**
**New Zealand**
**Stock and Flow of Peritoneal Dialysis by Age Groups 1999 - 2003**

Age Groups	1999	2000	2001	2002	2003
<b>New Patients *</b>					
00-14 years	5 (2%)	6 (2%)	6 (2%)	9 (3%)	7 (3%)
15-24 years	5 (2%)	4 (1%)	12 (4%)	5 (2%)	11 (4%)
25-34 years	11 (4%)	13 (5%)	16 (5%)	23 (8%)	10 (4%)
35-44 years	22 (8%)	24 (9%)	30 (10%)	26 (9%)	26 (10%)
45-54 years	56 (21%)	49 (19%)	49 (17%)	61 (21%)	45 (17%)
55-64 years	78 (30%)	81 (31%)	72 (26%)	76 (26%)	68 (26%)
65-74 years	61 (23%)	56 (22%)	71 (26%)	69 (24%)	67 (26%)
75-84 years	24 (9%)	29 (11%)	24 (9%)	21 (7%)	23 (9%)
>=85 years	2 (1%)	1 (<1%)	2 (1%)	2 (<1%)	3 (1%)
<b>Total</b>	<b>264 (100%)</b>	<b>263 (100%)</b>	<b>282 (100%)</b>	<b>292 (100%)</b>	<b>260 (100%)</b>
<b>Patients Dialysing</b>					
00-14 years	8 (1%)	6 (1%)	10 (2%)	12 (2%)	7 (1%)
15-24 years	18 (3%)	18 (2%)	25 (3%)	25 (3%)	29 (4%)
25-34 years	39 (6%)	38 (6%)	42 (6%)	50 (6%)	46 (6%)
35-44 years	70 (10%)	66 (10%)	66 (9%)	74 (10%)	70 (9%)
45-54 years	136 (20%)	135 (20%)	131 (18%)	130 (17%)	133 (17%)
55-64 years	188 (28%)	203 (30%)	200 (28%)	221 (29%)	208 (27%)
65-74 years	164 (24%)	155 (23%)	170 (24%)	178 (23%)	186 (24%)
75-84 years	44 (7%)	56 (8%)	65 (9%)	71 (9%)	83 (11%)
>=85 years	4 (1%)	4 (<1%)	7 (1%)	9 (1%)	7 (1%)
<b>Total</b>	<b>671 (100%)</b>	<b>681 (100%)</b>	<b>716 (100%)</b>	<b>770 (100%)</b>	<b>769 (100%)</b>
<b>Primary Renal Disease *</b>					
Glomerulonephritis	52 (20%)	60 (23%)	75 (27%)	72 (25%)	64 (25%)
Analgesic Nephropathy	1 (<1%)	0 (0%)	0 (0%)	2 (<1%)	0 (0%)
Hypertension	33 (13%)	39 (15%)	39 (14%)	19 (7%)	30 (12%)
Polycystic Disease	15 (6%)	5 (2%)	14 (5%)	10 (3%)	9 (3%)
Reflux Nephropathy	8 (3%)	12 (4.5%)	9 (3%)	10 (3%)	11 (4%)
Diabetic Nephropathy	114 (43%)	105 (40%)	112 (40%)	138 (47%)	97 (37%)
Miscellaneous	21 (8%)	29 (11%)	21 (7%)	25 (9%)	27 (10%)
Uncertain	20 (7%)	13 (4.5%)	12 (4%)	16 (5%)	22 (9%)
<b>Total</b>	<b>264 (100%)</b>	<b>263 (100%)</b>	<b>282 (100%)</b>	<b>292 (100%)</b>	<b>260 (100%)</b>

\* New patients receiving first peritoneal dialysis treatment



**BMI AT FIRST TREATMENT**

There has been considerable interest in recent years in the distribution of BMI and the relationship of BMI with outcomes on dialysis. The latter relationship is different among Australian and New Zealand patients to the rest

of the world, with higher BMI associated with higher rates of technique failure and death in Australia and New Zealand. Ref: McDonald SP, Collins JF, Johnson DW, J Am Soc Nephrol 2003 14:2894 -2901.

**Figure 6.20**

**Patient Body Mass Index at First Treatment 1999 - 2003**

Year	BMI	Age Groups				Total
		20-34	35-54	55-74	>=75	
<b>Australia</b>						
1999	<20	6 (32%)	13 (13%)	20 (9%)	5 (8%)	<b>44 (11%)</b>
	20-24.9	7 (37%)	45 (45%)	71 (33%)	28 (44%)	<b>151 (38%)</b>
	25-29.9	4 (21%)	28 (28)	91 (43%)	22 (34%)	<b>145 (37%)</b>
	>=30	2 (11%)	15 (15%)	31 (15%)	9 (14%)	<b>57 (14%)</b>
	<b>Total</b>	<b>19 (100%)</b>	<b>101 (100%)</b>	<b>213 (100%)</b>	<b>64 (100%)</b>	<b>397 (100%)</b>
2000	<20	12 (28%)	9 (10%)	15 (7%)	5 (8%)	<b>41 (10%)</b>
	20-24.9	19 (44%)	34 (37%)	88 (42%)	33 (52%)	<b>174 (42%)</b>
	25-29.9	8 (19%)	30 (33%)	62 (29%)	16 (25%)	<b>116 (28%)</b>
	>=30	4 (9%)	19 (21%)	47 (22%)	9 (14%)	<b>79 (19%)</b>
	<b>Total</b>	<b>43 (100%)</b>	<b>92 (100%)</b>	<b>212 (100%)</b>	<b>63 (100%)</b>	<b>410 (100%)</b>
2001	<20	5 (21%)	10 (9%)	20 (8%)	10 (11%)	<b>45 (10%)</b>
	20-24.9	13 (54%)	37 (34%)	89 (36%)	41 (46%)	<b>180 (39%)</b>
	25-29.9	4 (17%)	40 (37%)	99 (40%)	27 (31%)	<b>170 (36%)</b>
	>=30	2 (8%)	21 (19%)	39 (16%)	9 (10%)	<b>71 (15%)</b>
	<b>Total</b>	<b>24 (100%)</b>	<b>108 (100%)</b>	<b>247 (100%)</b>	<b>87 (100%)</b>	<b>466 (100%)</b>
2002	<20	6 (38)	5 (5%)	20 (8%)	14 (14%)	<b>45 (10%)</b>
	20-24.9	7 (44%)	39 (35%)	86 (36%)	50 (50%)	<b>182 (39%)</b>
	25-29.9	2 (13%)	40 (36%)	83 (35%)	29 (29%)	<b>154 (33%)</b>
	>=30	1 (6%)	27 (24%)	50 (21%)	8 (8%)	<b>86 (18%)</b>
	<b>Total</b>	<b>16 (100%)</b>	<b>111 (100%)</b>	<b>239 (100%)</b>	<b>101 (100%)</b>	<b>467 (100%)</b>
2003	<20	6 (19%)	8 (8%)	13 (6%)	8 (9%)	<b>35 (8%)</b>
	20-24.9	12 (39%)	44 (43%)	81 (34%)	34 (37%)	<b>171 (37%)</b>
	25-29.9	9 (29%)	33 (32%)	76 (32%)	40 (44%)	<b>158 (34%)</b>
	>=30	3 (10%)	18 (18%)	66 (28%)	10 (11%)	<b>97 (21%)</b>
	<b>Total</b>	<b>30 (100%)</b>	<b>103 (100%)</b>	<b>236 (100%)</b>	<b>92 (100%)</b>	<b>461 (100%)</b>
<b>New Zealand</b>						
1999	<20	0 (0%)	4 (7%)	4 (4%)	2 (12%)	<b>10 (6%)</b>
	20-24.9	3 (50%)	16 (29%)	28 (31%)	6 (35%)	<b>53 (31%)</b>
	25-29.9	1 (17%)	15 (27%)	38 (42%)	8 (47%)	<b>62 (37%)</b>
	>=30	2 (33%)	21 (38%)	21 (23%)	1 (6%)	<b>45 (27%)</b>
	<b>Total</b>	<b>6 (100%)</b>	<b>56 (100%)</b>	<b>91 (100%)</b>	<b>17 (100%)</b>	<b>170 (100%)</b>
2000	<20	0 (0%)	3 (9%)	3 (4%)	0 (0%)	<b>6 (5%)</b>
	20-24.9	2 (50%)	7 (21%)	22 (29%)	5 (25%)	<b>36 (27%)</b>
	25-29.9	1 (25%)	13 (38%)	24 (32%)	12 (60%)	<b>50 (37%)</b>
	>=30	1 (25%)	11 (32%)	27 (36%)	3 (15%)	<b>42 (31%)</b>
	<b>Total</b>	<b>4 (100%)</b>	<b>34 (100%)</b>	<b>76 (100%)</b>	<b>20 (100%)</b>	<b>134 (100%)</b>
2001	<20	2 (17%)	1 (2%)	3 (3%)	1 (6%)	<b>7 (4%)</b>
	20-24.9	6 (50%)	14 (27%)	28 (30%)	10 (63%)	<b>58 (34%)</b>
	25-29.9	2 (17%)	19 (37%)	39 (42%)	4 (25%)	<b>64 (37%)</b>
	>=30	2 (17%)	18 (35%)	23 (25%)	1 (6%)	<b>44 (25%)</b>
	<b>Total</b>	<b>12 (100%)</b>	<b>52 (100%)</b>	<b>93 (100%)</b>	<b>16 (100%)</b>	<b>173 (100%)</b>
2002	<20	2 (20%)	6 (14%)	3 (4%)	0 (0%)	<b>11 (7%)</b>
	20-24.9	2 (20%)	10 (23%)	22 (27%)	5 (31%)	<b>39 (26%)</b>
	25-29.9	4 (40%)	7 (16.)	31 (38%)	7 (44%)	<b>49 (33%)</b>
	>=30	2 (20%)	20 (47%)	26 (32%)	4 (25%)	<b>52 (34%)</b>
	<b>Total</b>	<b>10 (100%)</b>	<b>43 (100%)</b>	<b>82 (100%)</b>	<b>16 (100%)</b>	<b>151 (100%)</b>
2003	<20	1 (17%)	2 (4%)	3 (4%)	2 (9%)	<b>8 (6%)</b>
	20-24.9	1 (17%)	15 (33%)	17 (24%)	7 (32%)	<b>40 (28%)</b>
	25-29.9	3 (50%)	11 (24%)	28 (39%)	7 (32%)	<b>49 (34%)</b>
	>=30	1 (17%)	17 (38%)	23 (32%)	6 (27%)	<b>47 (32%)</b>
	<b>Total</b>	<b>6 (100%)</b>	<b>45 (100%)</b>	<b>71 (100%)</b>	<b>22 (100%)</b>	<b>144 (100%)</b>



**PERITONITIS**

Australian median peritonitis free survival has increased to 19.2 months overall, with 30% of patients completely free of peritonitis at three years. In New Zealand the survival time was 16.4 months (25% of patients) free of peritonitis at three years (fig 6.21). As noted in previous reports there is a strong association between ethnicity and peritonitis free survival (fig 6.23).

The median survival peritonitis for Australian home automated peritoneal dialysis patients was 21.5 months, and was 18.7 months for New Zealand home automated peritoneal dialysis patients.

The independent predictors of time to first peritonitis episode were higher BMI, diabetes mellitus, age, indigenous race, cigarette smoking, presence of coronary

artery disease, presence of chronic lung disease and earlier year of commencement of peritoneal dialysis. (McDonald SP, Collins JF, Rumpsfeld M, Johnson DW. Perit Dial Int. 2004; 24:340-346.)

Peritonitis survivals are calculated from first peritoneal dialysis (ignoring all earlier treatments) to date of first peritonitis episode. If there were no episodes of peritonitis then calculation censored at change of treatment from peritoneal dialysis to haemodialysis or transplantation. Peritoneal dialysis includes automated peritoneal and continuous ambulatory peritoneal dialysis. Excluded are patients who had peritonitis before commencing peritoneal dialysis.

**Figure 6.21**

**First PD Treatment to First Episode of Peritonitis Related to Age at Entry 1999 to 31-Dec-2003**

Survival	Age Groups						All
	00-14	15-34	35-54	55-64	65-74	>=75	
<b>Australia</b>	<b>n=81</b>	<b>n=321</b>	<b>n=989</b>	<b>n=798</b>	<b>n=1136</b>	<b>n=626</b>	<b>n=3951</b>
3 months	74 + 5.0 (52)	90 + 1.7 (273)	88 + 1.1 (804)	88 + 1.2 (651)	85 + 1.1 (879)	85 + 1.5 (472)	87 + 0.6 (3131)
6 months	62 + 5.8 (36)	81 + 2.3 (199)	78 + 1.4 (618)	77 + 1.6 (497)	75 + 1.4 (678)	75 + 1.8 (367)	76 + 0.7 (2395)
9 months	52 + 6.3 (22)	73 + 2.8 (143)	69 + 1.6 (487)	69 + 1.8 (405)	67 + 1.5 (537)	67 + 2.0 (287)	68 + 0.8 (1881)
1 year	44 + 6.7 (16)	66 + 3.1 (104)	62 + 1.7 (379)	62 + 1.9 (322)	60 + 1.6 (421)	61 + 2.2 (227)	61 + 0.9 (1469)
2 years	33 + 7.5 (5)	45 + 3.9 (45)	44 + 2.0 (149)	43 + 2.2 (119)	41 + 1.9 (162)	41 + 2.6 (76)	42 + 1.0 (556)
3 years	-	35 + 4.4 (18)	30 + 2.4 (40)	32 + 2.5 (45)	28 + 2.1 (59)	30 + 3.1 (18)	30 + 1.2 (182)
<b>N. Zealand</b>	<b>n=34</b>	<b>n=113</b>	<b>n=389</b>	<b>n=376</b>	<b>n=324</b>	<b>n=131</b>	<b>n=1367</b>
3 months	73 + 7.7 (24)	90 + 2.8 (100)	85 + 1.8 (318)	84 + 1.9 (303)	85 + 2.0 (255)	87 + 3.0 (106)	85 + 1.0 (1106)
6 months	57 + 8.7 (17)	79 + 4.0 (77)	71 + 2.4 (240)	71 + 2.4 (233)	73 + 2.6 (201)	78 + 3.8 (81)	72 + 1.2 (849)
9 months	54 + 8.9 (13)	72 + 4.4 (62)	64 + 2.5 (202)	61 + 2.6 (184)	64 + 2.8 (157)	71 + 4.3 (67)	64 + 1.4 (685)
1 year	54 + 8.9 (10)	63 + 5.0 (44)	57 + 2.7 (162)	55 + 2.8 (153)	56 + 3.0 (118)	61 + 4.8 (52)	57 + 1.4 (539)
2 years	-	39 + 5.9 (16)	38 + 2.9 (64)	37 + 2.9 (62)	40 + 3.4 (44)	37 + 5.4 (18)	38 + 1.6 (206)
3 years	-	-	26 + 3.2 (17)	24 + 3.1 (20)	25 + 3.8 (15)	27 + 5.8 (7)	25 + 1.8 (62)

% Survival ± S.E. and Numbers at risk

**Figure 6.22**

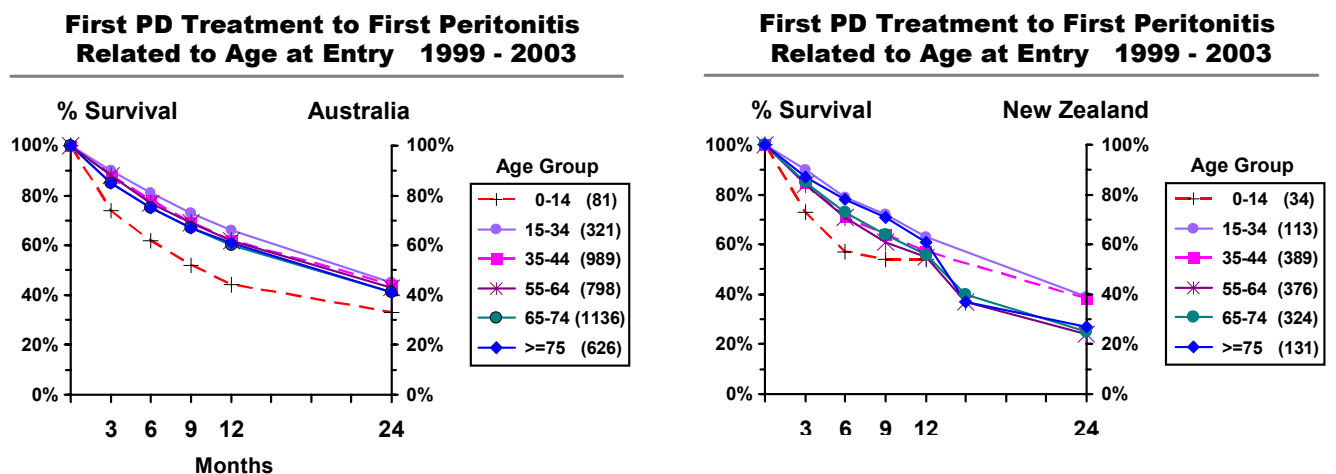




Figure 6.23

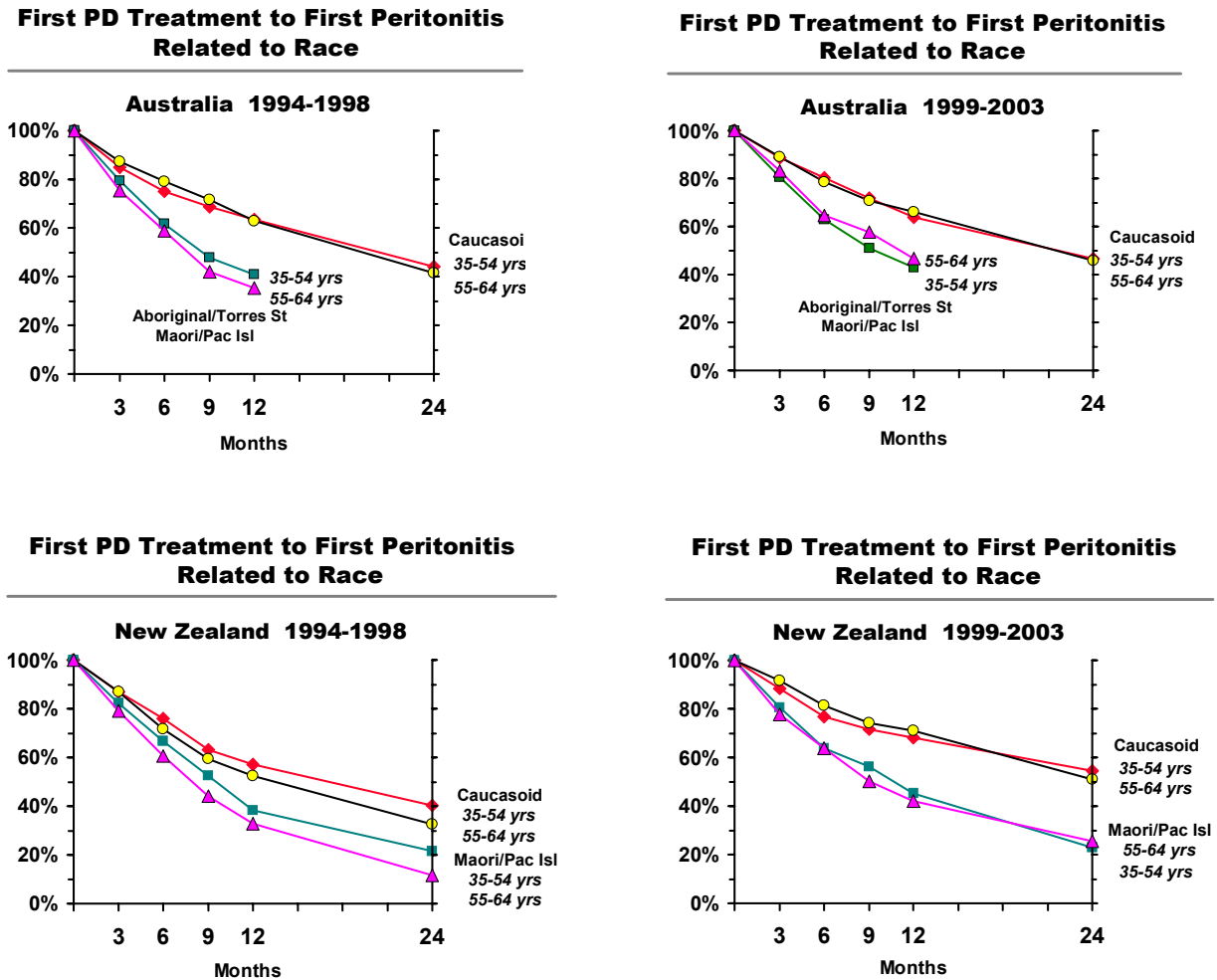


Figure 6.24

**First Home APD Treatment to First Episode of Peritonitis Related to Age at Entry 1999 to 31-Dec-2003**

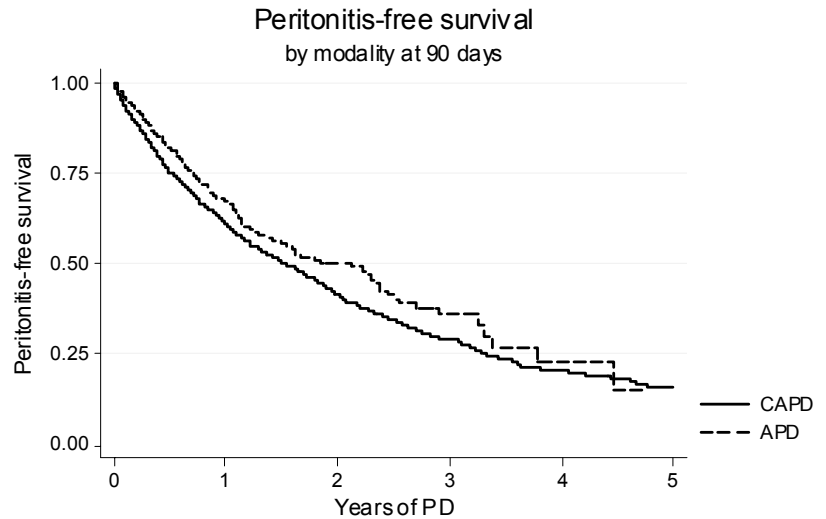
Survival	Age Groups						All
	00-14	15-34	35-54	55-64	65-74	>=75	
<b>Australia</b>	<b>n=56</b>	<b>n=161</b>	<b>n=365</b>	<b>n=239</b>	<b>n=317</b>	<b>n=170</b>	<b>n=1308</b>
1 month	84 ± 5.0 (46)	98 ± 1.1 (155)	95 ± 1.1 (339)	97 ± 1.1 (226)	96 ± 1.1 (298)	98 ± 1.2 (161)	96 ± 1.0 (1225)
3 months	74 ± 5.9 (38)	88 ± 2.6 (129)	88 ± 1.7 (301)	90 ± 1.9 (200)	89 ± 1.8 (260)	90 ± 2.4 (138)	88 ± 0.9 (1066)
6 months	61 ± 6.9 (24)	76 ± 3.6 (87)	79 ± 2.2 (221)	83 ± 2.6 (157)	81 ± 2.3 (200)	84 ± 3.0 (105)	80 ± 1.2 (794)
9 months	56 ± 7.3 (18)	68 ± 4.1 (63)	70 ± 2.7 (162)	73 ± 3.1 (121)	73 ± 2.8 (151)	76 ± 3.7 (80)	71 ± 1.4 (595)
1 year	49 ± 7.9 (12)	63 ± 4.5 (46)	62 ± 3.0 (117)	67 ± 3.5 (90)	67 ± 3.0 (117)	70 ± 4.2 (62)	65 ± 1.5 (444)
2 years	32 ± 9.3 (3)	44 ± 5.6 (22)	43 ± 3.6 (41)	48 ± 4.4 (30)	49 ± 3.8 (40)	49 ± 5.5 (19)	46 ± 1.9 (155)
<b>N. Zealand</b>	<b>n=29</b>	<b>n=30</b>	<b>n=70</b>	<b>n=45</b>	<b>n=36</b>	<b>n=17</b>	<b>n=227</b>
1 month	90 ± 5.7 (26)	83 ± 6.8 (25)	94 ± 2.8 (66)	89 ± 4.7 (39)	92 ± 4.7 (32)	94 ± 5.9 (15)	91 ± 1.9 (203)
3 months	79 ± 7.6 (22)	76 ± 7.9 (20)	83 ± 4.6 (56)	86 ± 5.1 (37)	80 ± 6.8 (27)	81 ± 9.9 (12)	82 ± 2.6 (174)
6 months	61 ± 9.3 (16)	68 ± 8.9 (15)	75 ± 5.3 (42)	84 ± 5.6 (31)	70 ± 8.0 (18)	81 ± 9.9 (8)	73 ± 3.0 (130)
9 months	56 ± 9.6 (11)	68 ± 8.9 (14)	65 ± 6.1 (32)	77 ± 6.8 (19)	65 ± 8.7 (11)	59 ± 15.0 (5)	66 ± 3.4 (92)
1 year	56 ± 9.6 (8)	58 ± 10.0 (11)	65 ± 6.1 (30)	68 ± 8.5 (13)	59 ± 9.8 (10)	46 ± 16.5 (3)	62 ± 3.6 (75)

% Survival ± S.E. and Numbers at risk

**Figure 6.25**

Figure 6.25 illustrates the time to first peritonitis for those who began PD from 1-Jan-1999.

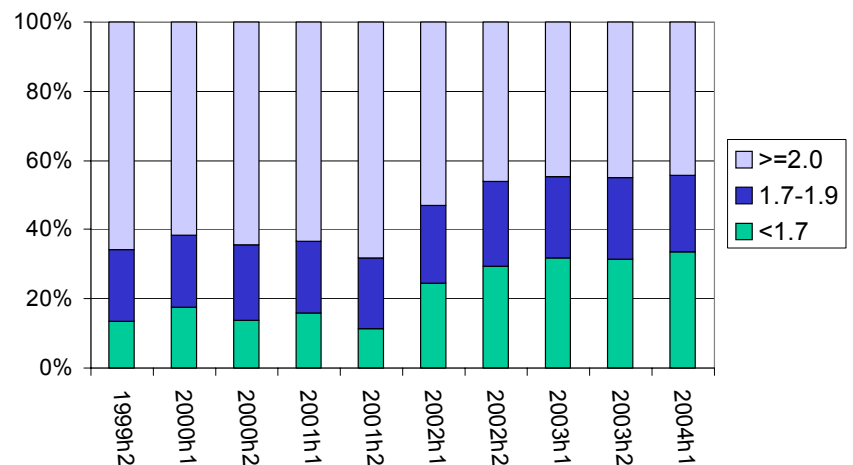
There is a slight but significant advantage to APD in the univariate analysis, but this is not significant ( $p=0.1$ ) when adjusted for age, gender, diabetes and indigenous race.



**Figure 6.26**

Dialysate Kt/V has been collected for 3 years (6 surveys). Over this time there has been a significant reduction in the mean weekly Kt/V.

Figure 6.26 shows the distribution of weekly Kt/V by the CARI-recommended categories of 1.7 and 2.0. This change in practice may reflect the release of significant studies (such as ADEMEX) examining the relationship between peritoneal dialysis adequacy and outcomes.





### TECHNIQUE FAILURE (CENSORED FOR DEATH OR TRANSPLANTATION)

**Figure 6.27**

**Causes of Technique Failure April 1998 to March 2001  
Excluding Death, Transplantation,  
Recovery of Renal Function**

Causes of Technique Failure	Australia		New Zealand	
	Primary	Secondary	Primary	Secondary
Recurrent/persistent peritonitis	286	8	87	3
Acute peritonitis	276	7	115	5
Tunnel/exit site infection	86	3	11	1
<b>Total Infective Complications</b>	<b>648 (32%)</b>	<b>18 (16%)</b>	<b>213 (40%)</b>	<b>9 (36%)</b>
Inadequate solute clearance	250	13	85	5
Inadequate fluid ultrafiltration	173	11	33	3
<b>Total Dialysis Failure</b>	<b>423 (21%)</b>	<b>24 (22%)</b>	<b>118 (22%)</b>	<b>8 (32%)</b>
Dialysate leak	137	22	44	7
Catheter block	27	1	5	-
Catheter fell out	8	-	1	-
Hernia	76	5	8	-
Abdominal pain	11	1	2	-
Abdominal surgery	58	4	16	-
Multiple adhesions	2	-	5	-
Haemoperitoneum	1	-	-	-
<b>Total Technical Failure</b>	<b>320 (16%)</b>	<b>33 (30%)</b>	<b>81 (15%)</b>	<b>7 (28%)</b>
Unable to manage self care	178	12	29	-
Patient preference	470	24	89	1
<b>Total Social Reasons</b>	<b>648 (32%)</b>	<b>36 (32%)</b>	<b>118 (22%)</b>	<b>1 (4%)</b>

In Australia, patient preference as a cause for transfer has risen from 470 (23%) in the era 1998-2001, to 647 (28%) in the era 2001-2004. In New Zealand the results were similar over the same period; 89 (17%) and 121 (19%) being recorded in the two epochs.

Ethnicity is also associated with the cause of technique failure. Infective reasons are attributed as the cause of technique failure for 51% of Aboriginal patients, compared to 27% of Caucasoids and 30% of Asians. Similarly in New Zealand, infective reasons are attributed as the cause of technique failure for 36% of Maori and 45% of Pacific Islanders, compared to 30% of Caucasians and 27% of Asians.

**Figure 6.28**

**Causes of Technique Failure April 2001 to March 2004  
Excluding Death, Transplantation,  
Recovery of Renal Function**

Causes of Technique Failure	Australia		New Zealand	
	Primary	Secondary	Primary	Secondary
Recurrent/persistent peritonitis	233	8	69	3
Acute peritonitis	319	6	102	-
Tunnel/exit site infection	61	3	11	-
<b>Total Infective Complications</b>	<b>613 (27%)</b>	<b>17 (15%)</b>	<b>182 (29%)</b>	<b>3 (21%)</b>
Inadequate solute clearance	374	13	138	4
Inadequate fluid ultrafiltration	167	12	75	-
<b>Total Dialysis Failure</b>	<b>541 (24%)</b>	<b>25 (23%)</b>	<b>213 (34%)</b>	<b>4 (29%)</b>
Dialysate leak	152	12	39	2
Catheter block	31	3	6	-
Catheter fell out	11	-	1	-
Hernia	58	3	10	-
Abdominal pain	6	3	6	-
Abdominal surgery	39	2	9	3
Multiple adhesions	-	-	1	-
Hydrothorax	4	-	-	-
Haemoperitoneum	2	-	-	-
<b>Total Technical Failure</b>	<b>303 (13%)</b>	<b>23 (21%)</b>	<b>72 (11%)</b>	<b>5 (36%)</b>
Unable to manage self care	180	10	43	-
Patient preference	647	35	121	2
<b>Total Social Reasons</b>	<b>827 (36%)</b>	<b>45 (41%)</b>	<b>164 (26%)</b>	<b>2 (14%)</b>

In contrast social reasons account for only 20% of failures in Australian Aborigines and in New Zealand 19% of Maori's and 21% of Pacific Islanders.

These failure rates related to infection correlate with the tendency towards earlier peritonitis in the indigenous populations (fig 6.29). The Aboriginal experience is examined in more detail in a recent manuscript (Lim WH, Nephrology (Carlton) 2004: 9:S126-8).

**Figure 6.29**
**Causes of Technique Failure April 1998 to March 2004**

Causes of Technique Failure	Diab.	Non Diab.	Race						Age Group		Total
			Asian	Abor./ Torres S.Isl.	Cauc.	Maori	Pac.Is.	Other	19-54	>=55	
<b>Australia</b>											
Infective	320 32%	941 28%	115 30%	197 51%	914 27%	5 28%	20 32%	10 31%	436 29%	802 29%	<b>1261</b> <b>29%</b>
Reduced Solute Clearance	113 11%	511 15%	60 16%	26 7%	522 15%	1 6%	9 15%	6 19%	254 17%	358 13%	<b>624</b> <b>14%</b>
Inadequate Ultrafiltration	90 9%	250 8%	21 5%	24 6%	286 8%	2 11%	4 6%	3 9%	118 8%	217 8%	<b>340</b> <b>8%</b>
Technical	111 11%	512 15%	32 8%	59 15%	520 15%	3 17%	6 10%	3 9%	212 14%	406 15%	<b>623</b> <b>14%</b>
Social	376 37%	1099 33%	159 41%	77 20%	1199 35%	7 39%	23 37%	10 31%	506 33%	943 35%	<b>1475</b> <b>34%</b>
<b>Total</b>	<b>1010</b>	<b>3313</b>	<b>387</b>	<b>383</b>	<b>3441</b>	<b>18</b>	<b>62</b>	<b>32</b>	<b>1526</b>	<b>2726</b>	<b>4323</b>
<b>New Zealand</b>											
Infective	164 34%	231 34%	22 27%	- -	143 30%	160 36%	69 45%	1 33%	134 29%	258 39%	<b>395</b> <b>34%</b>
Reduced Solute Clearance	99 21%	124 18%	15 18%	- -	78 16%	105 24%	25 16%	- -	104 23%	116 17%	<b>223</b> <b>19%</b>
Inadequate Ultrafiltration	51 11%	57 8%	5 6%	- -	56 12%	40 9%	6 4%	1 33%	43 9%	64 10%	<b>108</b> <b>9%</b>
Technical	58 12%	95 14%	16 19%	- -	68 14%	49 11%	20 13%	- -	63 14%	86 13%	<b>153</b> <b>13%</b>
Social	105 22%	177 26%	25 30%	- -	139 29%	85 19%	32 21%	1 33%	115 25%	141 21%	<b>282</b> <b>24%</b>
<b>Total</b>	<b>477</b>	<b>684</b>	<b>83</b>	<b>-</b>	<b>484</b>	<b>439</b>	<b>152</b>	<b>3</b>	<b>459</b>	<b>665</b>	<b>1161</b>



### ACHIEVED SOLUTE CLEARANCE

The median (interquartile range) total weekly Kt/V was 1.96 (1.62 to 2.32) for Australian patients and 1.79 (1.47 to 2.10) for New Zealand patients.

The corresponding values for total weekly creatinine clearances were 49.5 (40.3 to 62.1) and 51.1 (42.9 to 67.8) L/week/1.73 m<sup>2</sup>, respectively.

Total small solute clearances were not appreciably influenced by residual renal GFR (fig 6.30-6.32). However, higher prescribed dialysate volumes were more likely to be associated with a total weekly Kt/V in excess of 1.8.

Figure 6.30

#### Relationship of Residual GFR to Kt/V March 2004

	Residual GFR	Dialysate Kt/V	95% C.I
Aust	<= 1 ml / min (n=341)	2.09	(1.21 – 2.97)
	> 1 ml / min (n=918)	1.98	(0.73 – 3.23)
NZ	<= 1 ml / min (n=158)	2.08	(1.2 – 2.96)
	> 1 ml / min (n=395)	1.73	(0.65 – 2.81)

Figure 6.31

#### Kt/V Related to Volume of Dialysate Australia March 2004

Prescribed Dialysate Volume	Achieved Kt/V (Total)	
	<= 1.8	> 1.8
<= 56 L / week	220 (44%)	282 (56%)
>= 70 L / week	241 (33%)	480 (67%)
	461	762

Figure 6.32

#### Kt/V Related to Volume of Dialysate New Zealand March 2004

Prescribed Dialysate Volume	Achieved Kt/V (Total)	
	<= 1.8	> 1.8
<= 56 L / week	152 (68%)	72 (32%)
>= 70 L / week	150 (40%)	228 (60%)
	302	300

**PERITONEAL TRANSPORT STATUS**

Data was supplied for 2677 patients in Australia and 1041 patients in New Zealand: 73% of all new patients in Australia and 80% of all new patients in New Zealand. The proportion of Australian and New Zealand patients with high peritoneal transport status was 9%, similar to what has been reported in other patient populations. Diabetic status did not appreciably influence mean D/P creatinine ratios.

Survival rates of peritoneal dialysis patients by peritoneal transport status showed a significant difference in the PET groups for Australia ( $p < 0.01$ , fig 6.35). However, this was not reflected in New Zealand ( $p = \text{not significant}$ ).

The significant independent predictors of higher peritoneal transport status were older age, Maori and Pacific Islander racial origin and lower BMI. This has been explored in more depth (see Rumpsfeld M, McDonald SP, Purdie DM, Collins JF, Johnson DW. Am J Kidney Dis 2004: 43:492-501).

**Figure 6.33**

**PET D/P Creatinine at Four Hours  
New PD Patients from 1-Apr-99 to 31-Mar-04**

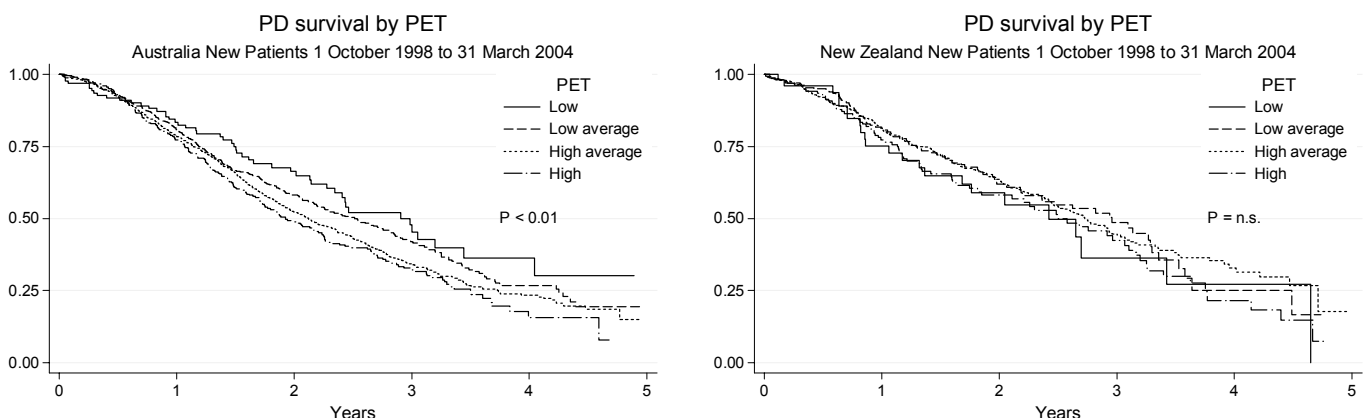
	Australia		New Zealand	
	Diabetic	Non Diabetic	Diabetic	Non Diabetic
Mean + 1 SD	0.83	0.83	0.843	0.84
Mean	0.70	0.70	0.71	0.70
Mean - 1 SD	0.57	0.57	0.59	0.56

**Figure 6.34**

**Peritoneal Transport Status  
New PD Patients 1-Apr-1999 to 31-Mar-2004**

	Australia		New Zealand	
	Diabetic	Non Diabetic	Diabetic	Non Diabetic
High ( $\geq 0.81$ )	68 (10%)	173 (9%)	38 (9%)	50 (8%)
High Average (0.65-0.80)	369 (53%)	1114 (56%)	274 (63%)	370 (61%)
Low Average (0.50-0.64)	246 (35%)	650 (33%)	111 (26%)	164 (27%)
Low ( $< 0.50$ )	14 (2%)	43 (2%)	13 (3%)	21 (4%)

**Figure 6.35**



### PERITONITIS REGISTRY 1-OCT-2003 TO 31-MAR-2004

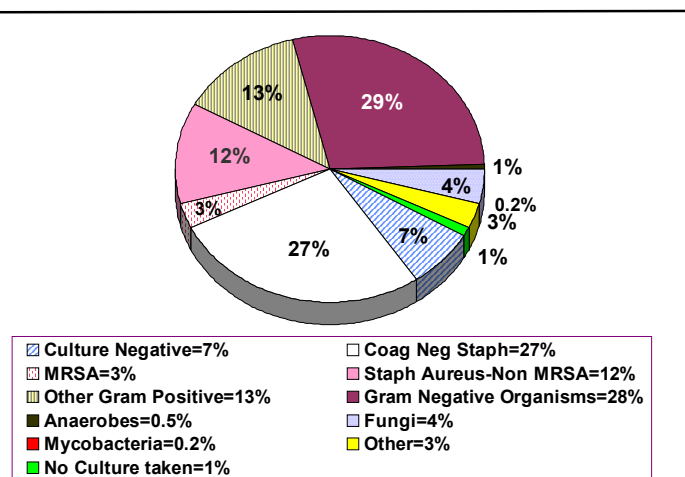
The Australian Peritonitis Registry began to collect data from participating units on 1 October 2003 and data presented here cover the period 1 October 2003 to 31 March 2004. The aim of this Registry was to address the requests from the Australian PD community for more detailed national level data about the causes and treatment of peritonitis. This Registry is restricted to Australia; a more extensive peritonitis registry has been conducted in New Zealand for some years.

Among patients who received treatment with peritoneal dialysis in Australia there were 558 episodes of peritonitis available for analysis among 420 people.

The distribution of organisms isolated at initial culture is shown in Figure 6.36. For 60 patients there was a second organism isolated and for five patients three organisms were isolated.

Figure 6.36

**Primary Organism for all Peritonitis Episodes  
Australia 1-Oct-2003 to 31-Mar-2004**



### TREATMENT PATTERNS

The antibiotics used in the initial treatment regimens are shown below. Use of one (single) antibiotic was reported as the initial treatment in 20%; two antibiotics were used in 69% of cases and three antibiotics in 10% of cases. Vancomycin-containing regimens were used in 33% of cases of peritonitis and 75% of regimens included an aminoglycoside.

However, there is substantial variation between States with respect to the proportion of episodes of peritonitis treated with a regimen containing an aminoglycoside and even more variation in the use of vancomycin-containing regimens, shown in Figure 6.37. Whether the antibiotics were administered intravenously or intraperitoneally is not collected.

Figure 6.37

**Initial Antibiotic Regimens by State  
1-Oct-2003 to 31-Mar-2004**

