

## CHAPTER 6

# PERITONEAL DIALYSIS

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## STOCK AND FLOW

### AUSTRALIA

Automated peritoneal dialysis was used to treat 12.5% of all dialysis patients in 2009, the same as for 2008 and continuous ambulatory peritoneal dialysis 8.5% (9.5% in 2008). Together, these accounted for 69% of all home dialysis, a figure which has remained stable for the past number of years (Figure 6.1). Of the 25,011 patients who have ever received peritoneal dialysis, 4% had experienced at least five years of continuous peritoneal dialysis (Figure 6.2).

The proportion of all home dialysis patients on peritoneal dialysis in each State ranged from 47% in the (Australian Capital Territory), to 93% (South Australia) (Figure 6.1).

The prevalence of automated peritoneal dialysis increased only 1.6% in 2009 (1293 patients), after increases of 11% in 2008 (1273 patients), 16% in 2007 (1151 patients) and 21% in 2006 (991 patients).

The annual stock and flow of patients during the period 2005-2009 is shown in Figures 6.3 and 6.4.

There were 862 new peritoneal dialysis patients in the calendar year 2009, a decrease of 13% from last year following an increase of 11% (995 patients) in 2008. There were 565 patients (66%) who started renal replacement therapy with peritoneal dialysis, (24% of all new dialysis patients in 2009) and 297 (34%) who previously had haemodialysis or a failed transplant (Figure 6.3).

New patients over the age of 65 years decreased 6%, from 405 to 379 in 2009, following an increase of 13% in 2008 (Figure 6.8).

There were decreases in most of the age groups in 2009 except the 0-14 year group which increased (50%) and the ≥ 85 years (42%). The decreases were in the groups 35-44 years (30%), 45-54 years (29%), 15-24 years (19%), 75-84 years (15%), 55-64 years (13%) and 65-74 years (3%).

The proportion of patients in each group treated with peritoneal dialysis ranged from 14% (≥ 85 years), 19% (75-84 years) to 36% (15-24 years) and 76% (0-14 years) (Figure 6.9).

There were 308 deaths in 2009 compared to 293 in 2008.

For more detail see Appendix II at our website ([www.anzdata.org.au/v1/report\\_2010.html](http://www.anzdata.org.au/v1/report_2010.html)).

There were 154 peritoneal dialysis patients who received a transplant in 2009 compared to 176 in 2007; this was 7% of all patients treated and 12% of patients <65 years treated during the year (Figure 6.3). Thirteen patients ≥ 65 years were transplanted.

Permanent transfer to haemodialysis in 2009 occurred in 569 patients (26%) and 594 patients (27%) in 2008. (Figure 6.3).

The number of new patients to peritoneal dialysis with diabetic nephropathy as a primary renal disease decreased 20% in 2009, following a 16% increase in 2008; this group comprised 30% of all new peritoneal dialysis patients compared to 33% in 2008.

There was an 8% decrease in glomerulonephritis in 2009 (239 patients) compared to an increase of 12% (260 patients) from 2007 to 2008 (Figure 6.8).

Figure 6.1

Proportion (%) Peritoneal Dialysis of all Home Dialysis Patients 2005 - 2009

State	2005	2006	2007	2008	2009
Queensland	74.9%	72.1%	69.9%	67.9%	66.4%
New South Wales	60.1%	62.3%	62.8%	66.6%	66.7%
ACT	73.1%	65.0%	59.6%	48.9%	47.3%
Victoria	69.6%	68.8%	66.3%	66.6%	66.4%
Tasmania	73.5%	80.9%	86.8%	83.3%	82.8%
South Australia	87.9%	92.3%	95.3%	94.6%	92.6%
Northern Territory	86.1%	65.0%	66.7%	62.7%	54.8%
Western Australia	89.8%	89.0%	89.5%	89.0%	86.4%
<b>Australia</b>	69.1%	69.3%	69.0%	69.9%	69.1%
<b>New Zealand</b>	70.5%	70.2%	69.3%	69.6%	68.0%

Figure 6.2

Continuous Period of Peritoneal Dialysis 1963 - 2009

	Months													
	0-<6	6-11	12-17	18-23	24-29	30-35	36-41	42-47	48-59	60-71	72-83	84-95	96-107	≥108
<b>Australia</b>														
Ist Treatment (n=20,682)	6176	3743	2726	2082	1607	1070	839	654	814	452	241	141	63	74
All Treatments (n=25,011)	7760	4603	3292	2482	1861	1247	984	751	934	515	266	156	69	91
<b>New Zealand</b>														
Ist Treatment (n=5,585)	1055	864	699	640	516	418	364	248	373	177	93	65	36	37
All Treatments (n=6,619)	1333	1039	846	748	610	480	413	277	406	201	108	72	41	45

Figure 6.3

 Stock and Flow of Peritoneal Dialysis Patients  
2005 - 2009

State	2005	2006	2007	2008	2009
<b>Australia</b>					
<b>Patients new to PD</b>	833	1005	895	995	862
First Dialysis Treatment	479	582	587	655	565
Previous Dialysis (HD)	345	405	287	308	274
Failed Transplant	9	18	21	32	23
<b>Transplanted</b>	124	136	142	176	154
<b>Deaths</b>	275	290	296	293	308
Never Transplanted	269	282	292	279	298
Previous Transplant	6	8	4	14	10
<b>Transfer to Haemodialysis</b>	517	542	532	594	569
Patients Dialysing (PD) at 31 December	1860	2047	2135	2237	2177
Patients Dialysing (PD) at Home 31 December	1835	2015	2109	2200	2157
% of all Home Dialysis Patients	69%	69%	69%	70%	69%
<b>New Zealand</b>					
<b>Patients new to PD</b>	252	297	241	273	276
First Dialysis Treatment	148	159	131	152	195
Previous Dialysis (HD)	101	127	104	115	78
Failed Transplant	3	11	6	6	3
<b>Transplanted</b>	35	23	37	28	35
<b>Deaths</b>	148	152	120	124	126
Never Transplanted	143	149	113	117	124
Previous Transplant	5	3	7	7	2
<b>Transfer to Haemodialysis</b>	132	137	149	150	133
Patients Dialysing (PD) at 31 December	718	766	745	762	790
Patients Dialysing (PD) at Home 31 December	713	758	741	757	785
% of all Home Dialysis Patients	71%	70%	69%	70%	68%

Figure 6.4

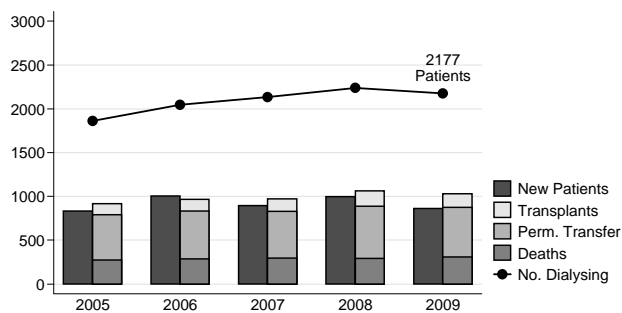
 Stock and Flow of Peritoneal Dialysis Patients  
Australia 2005-2009


Figure 6.5

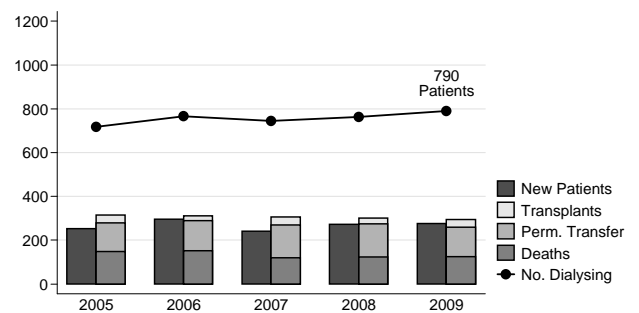
 Stock and Flow of Peritoneal Dialysis Patients  
New Zealand 2005-2009




Figure 6.6

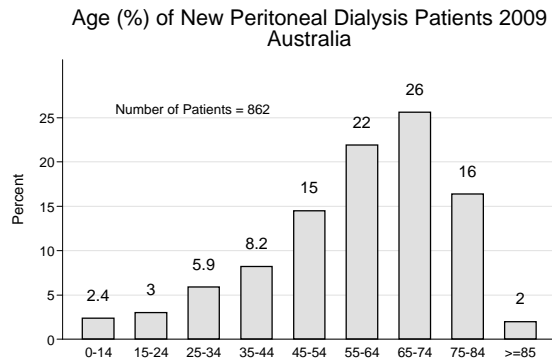


Figure 6.7

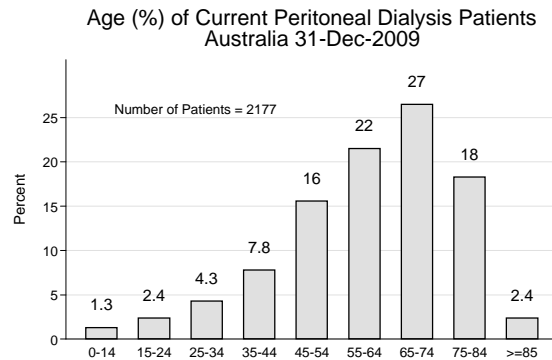


Figure 6.8

Australia

Stock and Flow of Peritoneal Dialysis by Age Groups 2005 - 2009

Age Groups	2005	2006	2007	2008	2009
<b>New Patients *</b>					
00-14 years	10 (1%)	16 (2%)	22 (2%)	14 (1%)	21 (2%)
15-24 years	20 (2%)	20 (2%)	18 (2%)	32 (3%)	26 (3%)
25-34 years	43 (5%)	60 (6%)	43 (5%)	51 (5%)	51 (6%)
35-44 years	89 (11%)	96 (10%)	95 (11%)	101 (10%)	71 (8%)
45-54 years	113 (14%)	170 (17%)	160 (18%)	176 (18%)	125 (15%)
55-64 years	190 (23%)	217 (22%)	198 (22%)	216 (22%)	189 (22%)
65-74 years	214 (26%)	249 (25%)	201 (22%)	227 (23%)	221 (26%)
75-84 years	141 (17%)	168 (17%)	150 (17%)	166 (17%)	141 (16%)
≥ 85 years	13 (2%)	9 (1%)	8 (1%)	12 (1%)	17 (2%)
<b>Total</b>	<b>833 (100%)</b>	<b>1005 (100%)</b>	<b>895 (100%)</b>	<b>995 (100%)</b>	<b>862 (100%)</b>
<b>Patients Dialysing</b>					
00-14 years	18 (1%)	22 (1%)	34 (2%)	28 (1%)	28 (1%)
15-24 years	29 (2%)	27 (1%)	25 (1%)	47 (2%)	52 (2%)
25-34 years	67 (4%)	86 (4%)	76 (4%)	83 (4%)	93 (4%)
35-44 years	182 (10%)	191 (9%)	201 (9%)	185 (8%)	169 (8%)
45-54 years	263 (14%)	310 (15%)	338 (16%)	371 (17%)	339 (16%)
55-64 years	422 (23%)	464 (23%)	479 (22%)	504 (23%)	469 (22%)
65-74 years	498 (27%)	529 (26%)	547 (26%)	551 (25%)	576 (26%)
75-84 years	355 (19%)	385 (19%)	403 (19%)	421 (19%)	399 (18%)
≥ 85 years	26 (1%)	33 (2%)	32 (1%)	47 (2%)	52 (2%)
<b>Total</b>	<b>1860 (100%)</b>	<b>2047 (100%)</b>	<b>2135 (100%)</b>	<b>2237 (100%)</b>	<b>2177 (100%)</b>
<b>Primary Renal Disease *</b>					
Glomerulonephritis	205 (25%)	266 (26%)	232 (26%)	260 (26%)	239 (28%)
Analgesic Nephropathy	31 (4%)	26 (3%)	17 (2%)	28 (3%)	12 (1%)
Hypertension	116 (14%)	137 (14%)	131 (15%)	118 (12%)	143 (17%)
Polycystic Disease	52 (6%)	53 (5%)	50 (6%)	66 (7%)	52 (6%)
Reflux Nephropathy	29 (3%)	43 (4%)	29 (3%)	40 (4%)	38 (4%)
Diabetic Nephropathy	274 (33%)	324 (32%)	283 (32%)	327 (33%)	262 (30%)
Miscellaneous	70 (8%)	106 (11%)	95 (11%)	79 (8%)	78 (9%)
Uncertain	56 (7%)	50 (5%)	58 (6%)	77 (8%)	38 (4%)
<b>Total</b>	<b>833 (100%)</b>	<b>1005 (100%)</b>	<b>895 (100%)</b>	<b>995 (100%)</b>	<b>862 (100%)</b>

\* New patients receiving first peritoneal dialysis treatment

Figure 6.9

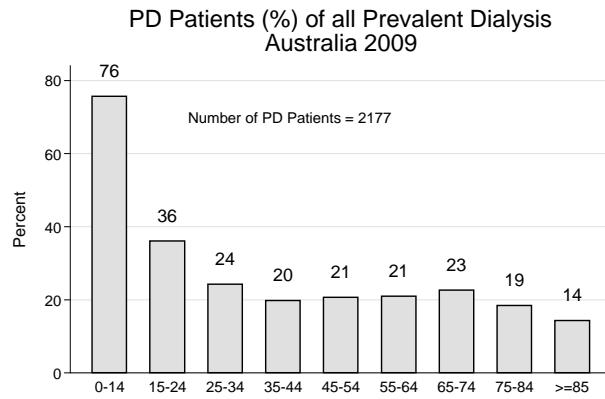


Figure 6.10

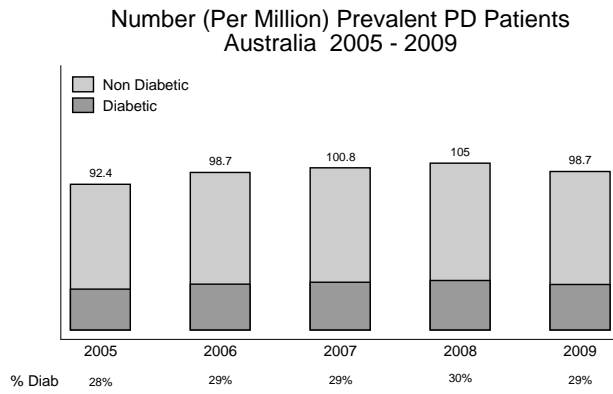


Figure 6.11

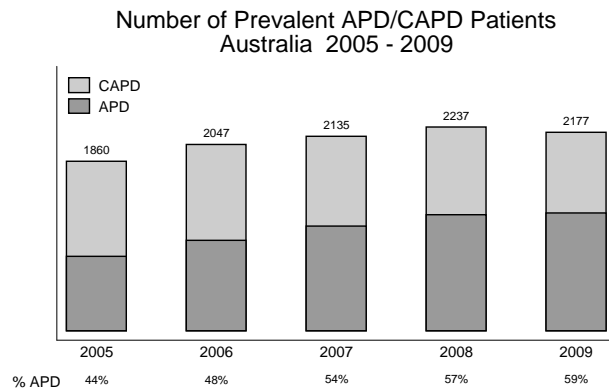
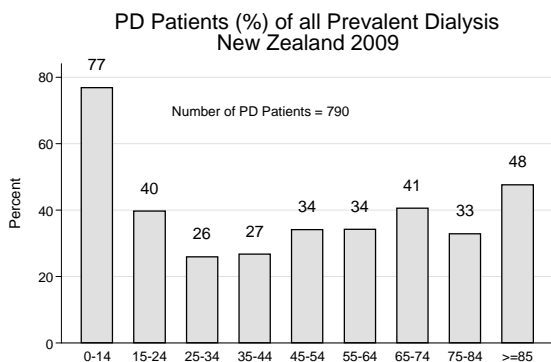




Figure 6.12



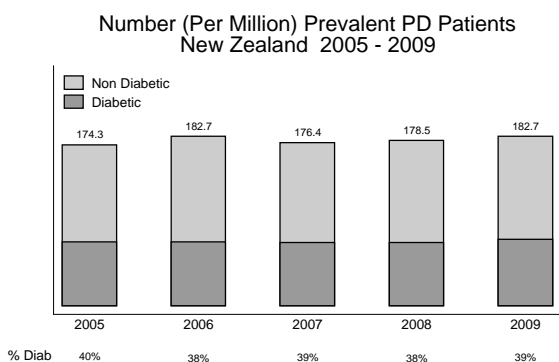
NEW ZEALAND

The annual stock and flow of patients during the period 2005 to 2009 is shown in Figures 6.3 and 6.5. Of the 6,619 patients treated since 1965, 790 (12%) were alive at 31st December, 2009 and 467 (7%) had more than five years continuous treatment (Figure 6.2).

Peritoneal dialysis accounted for 35% of all dialysis patients and 68% of all patients dialysing at home. A substantially lower proportion of patients used automated PD than in Australia. Forty two percent of all peritoneal dialysis in 2009 was automated compared with 38% in 2008 and 33% in 2007.

The age distribution of prevalent peritoneal dialysis patients is shown in Figures 6.16 and 6.17.

Figure 6.13



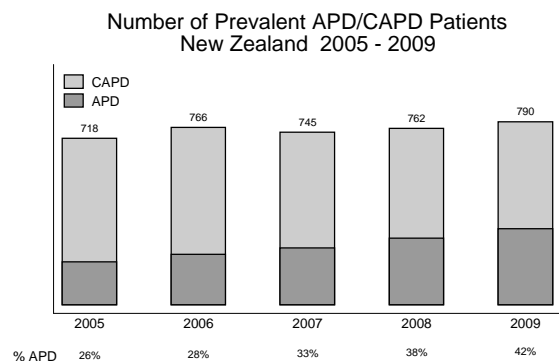
There were 276 new peritoneal dialysis patients in calendar year 2009, a decrease of 1% from 2008 (273 patients), after an increase of 13% from 2007 (241 patients). For 71%, peritoneal dialysis was the initial dialysis treatment compared to 56% in 2008 (Figures 6.15 and 6.17).

There were 126 deaths amongst prevalent peritoneal dialysis patients in 2009 compared to 124 in 2008. (Figure 3.11).

For more detail see Appendix III at our website ([www.anzdata.org.au/v1/report\\_2010.html](http://www.anzdata.org.au/v1/report_2010.html)).

There were 35 patients transplanted in 2009 (28 in 2008), 4% of patients dialysed; 6% of patients <65 years treated during the year (Figure 6.3). Four patients ≥ 65 years were transplanted.

Figure 6.14



The most common primary renal disease of new patients to peritoneal dialysis was diabetic nephropathy (45%), an increase of 8% from 2008, followed by glomerulonephritis (21%) and hypertension (13%).

The proportion of patients in each group treated with peritoneal dialysis ranged from 26% (25-34 years), 27% (35-64 years) to 48% (≥ 85 years) and 77% (0-14 years) (Figure 6.12).

Figure 6.15

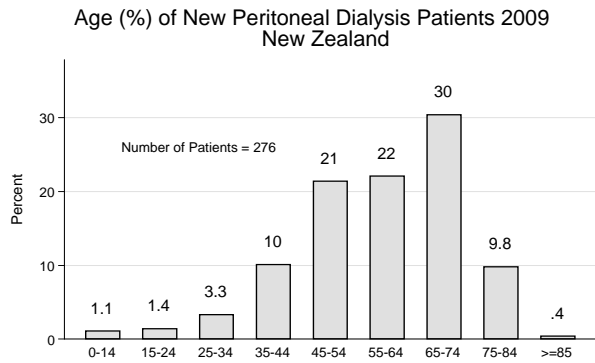


Figure 6.16

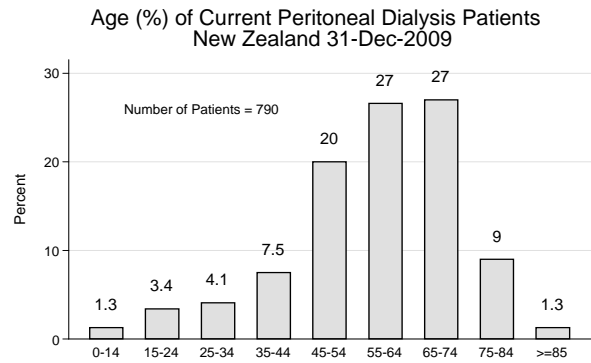


Figure 6.17

New Zealand

Stock and Flow of Peritoneal Dialysis by Age Groups 2005 - 2009

Age Groups	2005	2006	2007	2008	2009
<b>New Patients *</b>					
00-14 years	5 (2%)	4 (1%)	5 (2%)	10 (4%)	3 (1%)
15-24 years	3 (1%)	16 (5%)	5 (2%)	13 (5%)	4 (1%)
25-34 years	8 (3%)	11 (4%)	18 (7%)	11 (4%)	9 (3%)
35-44 years	17 (7%)	30 (10%)	21 (9%)	21 (8%)	28 (10%)
45-54 years	44 (17%)	59 (20%)	43 (18%)	55 (20%)	59 (21%)
55-64 years	75 (30%)	70 (24%)	74 (31%)	77 (28%)	61 (22%)
65-74 years	74 (29%)	66 (22%)	54 (22%)	69 (25%)	84 (30%)
75-84 years	24 (10%)	39 (13%)	18 (7%)	17 (6%)	27 (10%)
≥ 85 years	2 (1%)	2 (1%)	3 (1%)	-	1 (<1%)
<b>Total</b>	<b>252 (100%)</b>	<b>297 (100%)</b>	<b>241 (100%)</b>	<b>273 (100%)</b>	<b>276 (100%)</b>
<b>Patients Dialysing</b>					
00-14 years	9 (1%)	8 (1%)	8 (1%)	13 (2%)	10 (1%)
15-24 years	14 (2%)	21 (3%)	23 (3%)	28 (4%)	27 (3%)
25-34 years	31 (4%)	35 (5%)	36 (5%)	30 (4%)	32 (4%)
35-44 years	58 (8%)	69 (9%)	64 (9%)	62 (8%)	59 (7%)
45-54 years	115 (16%)	130 (17%)	120 (16%)	142 (19%)	158 (20%)
55-64 years	182 (25%)	185 (24%)	195 (26%)	209 (27%)	210 (27%)
65-74 years	201 (28%)	198 (26%)	186 (25%)	185 (24%)	213 (27%)
75-84 years	99 (14%)	112 (15%)	99 (13%)	80 (10%)	71 (9%)
≥ 85 years	9 (1%)	8 (1%)	14 (2%)	13 (2%)	10 (1%)
<b>Total</b>	<b>718 (100%)</b>	<b>766 (100%)</b>	<b>745 (100%)</b>	<b>762 (100%)</b>	<b>790 (100%)</b>
<b>Primary Renal Disease *</b>					
Glomerulonephritis	57 (23%)	67 (23%)	55 (23%)	63 (23%)	57 (21%)
Analgesic Nephropathy	1 (<1%)	1 (<1%)	-	2 (1%)	-
Hypertension	30 (12%)	43 (14%)	26 (11%)	36 (13%)	31 (11%)
Polycystic Disease	13 (5%)	25 (8%)	11 (5%)	12 (4%)	18 (7%)
Reflux Nephropathy	7 (3%)	10 (3%)	9 (4%)	4 (1%)	5 (2%)
Diabetic Nephropathy	112 (44%)	115 (39%)	106 (44%)	115 (42%)	124 (45%)
Miscellaneous	22 (9%)	23 (8%)	27 (11%)	27 (10%)	31 (11%)
Uncertain	10 (4%)	13 (4%)	7 (3%)	14 (5%)	10 (4%)
<b>Total</b>	<b>252 (100%)</b>	<b>297 (100%)</b>	<b>241 (100%)</b>	<b>273 (100%)</b>	<b>276 (100%)</b>

\* New patients receiving first peritoneal dialysis treatment



### PERITONEAL DIALYSIS FLUIDS

At the end of 2009, 28% of CAPD and 43% of APD patients were receiving Icodextrin in Australia. These proportions were lower for CAPD, 18% and higher for APD, 61% in New Zealand. There was also considerable variation between States in Icodextrin usage rates with the highest rates seen in the Northern Territory for CAPD and Tasmania for APD. Low GDP fluids (whether lactate or bicarbonate based fluids) were used infrequently in 2009, 0-5%, with a slightly higher percentage of lactate based fluids compared with bicarbonate based.

Figure 6.18

Icodextrin Usage by Modality Type - December 2009						
Modality Type	Australia			New Zealand		
	No	Yes	Total	No	Yes	Total
<b>CAPD</b>	638 (72.25%)	245 (27.75%)	883	379 (81.51%)	86 (18.49%)	465
<b>APD</b>	739 (57.20%)	553 (42.80%)	1292	127 (38.96%)	199 (61.04%)	326
<b>Total</b>	<b>1377</b> <b>(63.31%)</b>	<b>798</b> <b>(36.69%)</b>	<b>2175</b>	<b>506</b> <b>(63.97%)</b>	<b>285</b> <b>(36.03%)</b>	<b>791</b>

Figure 6.19

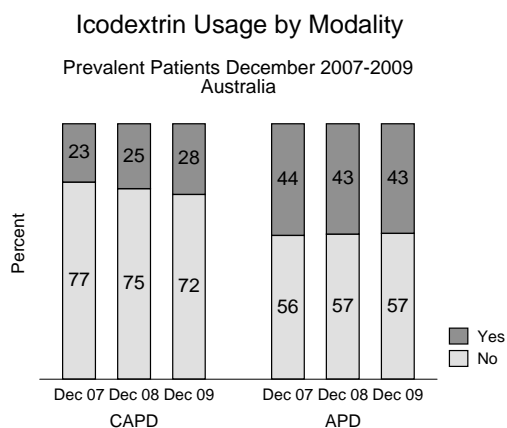


Figure 6.20

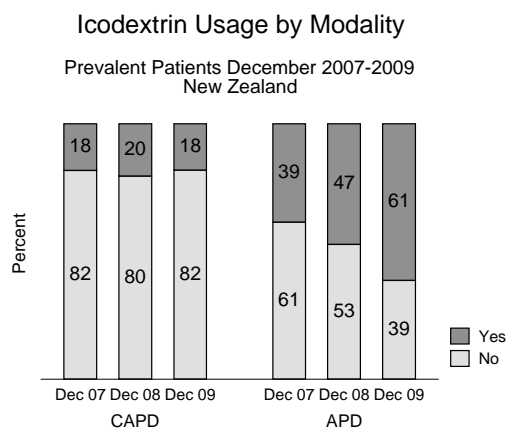
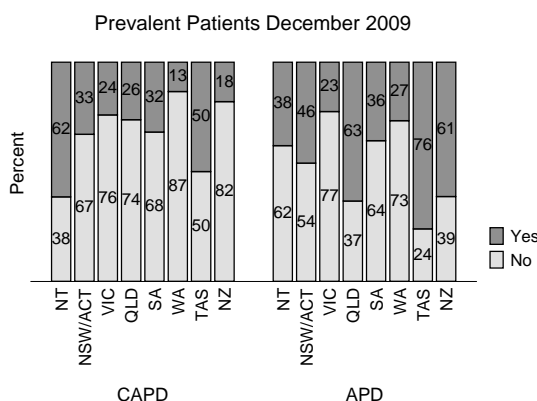


Figure 6.21

### Icodextrin Usage by State and New Zealand





PERITONEAL DIALYSIS FLUIDS

Figure 6.22

Low GDP - Lactate Usage by Modality Type - December 2009

Modality Type	Australia			New Zealand		
	No	Yes	Total	No	Yes	Total
<b>CAPD</b>	839 (95.02%)	44 (4.98%)	883	465 (100.00%)	-	465
<b>APD</b>	1245 (96.36%)	47 (3.64%)	1292	313 (96.31%)	12 (3.69%)	325
<b>Total</b>	<b>2084</b> <b>(95.82%)</b>	<b>91</b> <b>(4.18%)</b>	<b>2175</b>	<b>778</b> <b>(98.48%)</b>	<b>12</b> <b>(1.52%)</b>	<b>790</b>

Figure 6.23

Low GDP - Lactate Usage by Modality

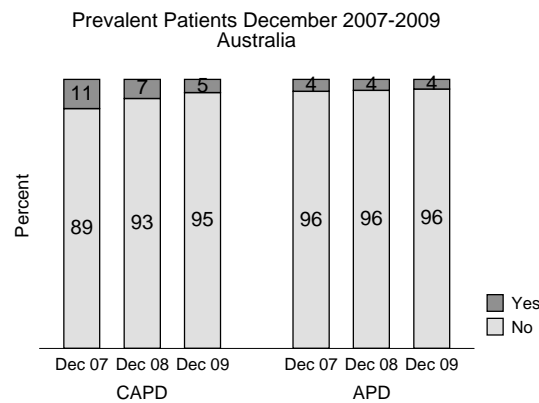
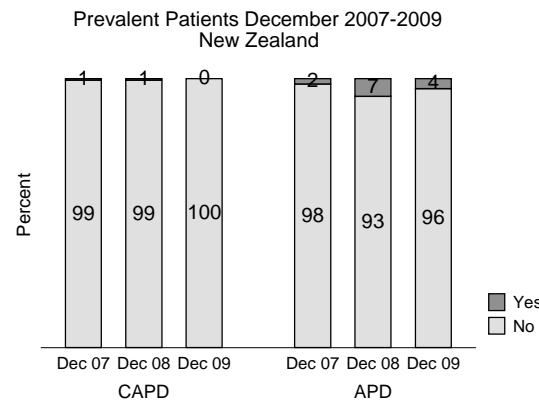


Figure 6.24

Low GDP - Lactate Usage by Modality





PERITONEAL DIALYSIS FLUIDS

Figure 6.25

Low GDP - Bicarb Usage by Modality Type - December 2009

Modality Type	Australia			New Zealand		
	No	Yes	Total	No	Yes	Total
<b>CAPD</b>	868 (98.30%)	15 (1.70%)	883	459 (98.71%)	6 (1.29%)	465
<b>APD</b>	1271 (98.37%)	21 (1.63%)	1292	317 (97.54%)	8 (2.46%)	325
<b>Total</b>	<b>2139</b> <b>(98.34%)</b>	<b>36</b> <b>(1.66%)</b>	<b>2175</b>	<b>776</b> <b>(98.23%)</b>	<b>14</b> <b>(1.77%)</b>	<b>790</b>

Figure 6.26

Low GDP - Bicarb Usage by Modality

Prevalent Patients December 2007-2009  
Australia

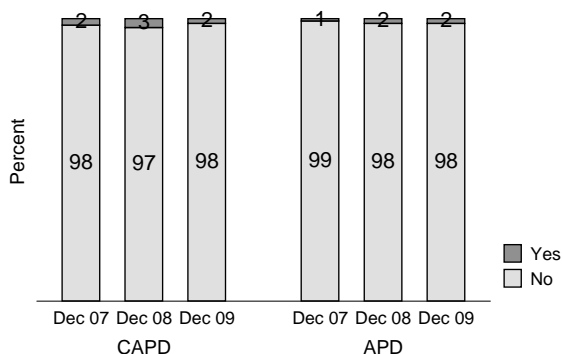
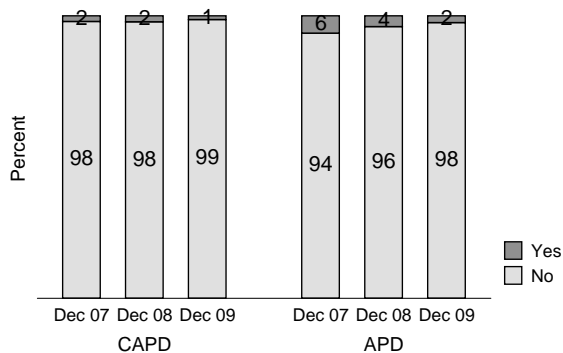


Figure 6.27

Low GDP - Bicarb Usage by Modality

Prevalent Patients December 2007-2009  
New Zealand



## OUTCOMES AMONG PERITONEAL DIALYSIS PATIENTS

Figure 6.28

Peritoneal Dialysis at 90 Days Patient Survival Censored for Transplant % [95% Confidence Interval]					
Year of Starting	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Australia</b>					
1998-2000	1758	92 [91, 94]	86 [85, 88]	59 [57, 61]	40 [37, 42]
2001-2003	1939	94 [92, 95]	87 [85, 89]	61 [58, 63]	40 [38, 43]
2004-2006	1955	94 [93, 95]	89 [88, 91]	65 [63, 67]	46 [42, 49]
2007-2009	2076	96 [95, 97]	91 [90, 92]	67 [62, 72]	-
<b>New Zealand</b>					
1998-2000	642	96 [94, 97]	89 [86, 91]	58 [54, 62]	36 [32, 40]
2001-2003	663	92 [90, 94]	84 [81, 87]	56 [52, 60]	36 [32, 39]
2004-2006	635	95 [92, 96]	89 [86, 91]	62 [58, 66]	41 [36, 46]
2007-2009	611	95 [93, 97]	89 [86, 92]	72 [64, 79]	-

### Methods

Survivals are calculated using the Kaplan-Meier technique. Patients are followed from the 90th day after first treatment for those on peritoneal dialysis at that time point and not transplanted during those first 90 days.

Patients are censored at first transplant and at most recent follow up regardless of dialysis modality changes.

### Patient Survival

On univariate analyses, there has been some slight improvement in PD patient survival in Australia at six months and one, three and five years from 1998.

In New Zealand PD patient survival has been unchanged up to 2005, but has improved for the 2007-2009 cohort (Figures 6.28 - 6.30).

Diabetic PD patients had lower patient survival at all time points in both Australia and New Zealand (Figures 6.31 - 6.33).

As expected PD patient survival is closely related to age (Figures 6.34 - 6.36).

Figure 6.29

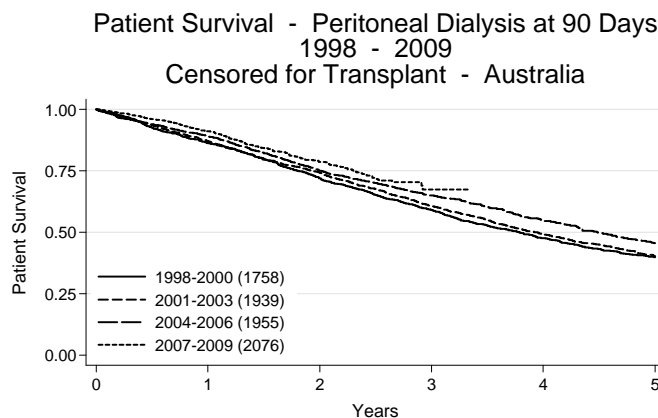


Figure 6.30

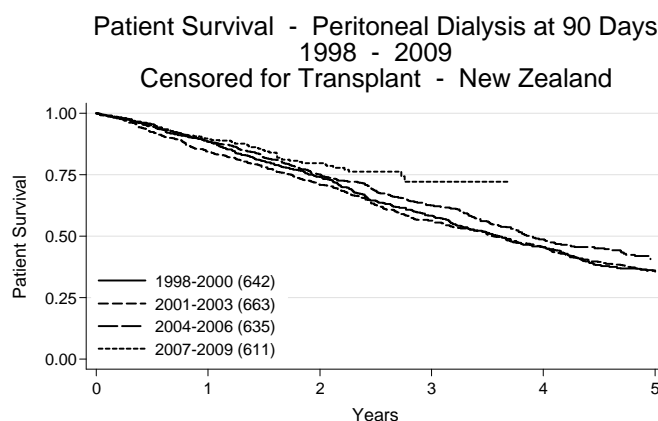




Figure 6.31

Peritoneal Dialysis at 90 Days  
Patient Survival - Diabetic / Non Diabetic  
Censored for Transplant Commenced 1998 - 2009  
% [95% Confidence Interval]

	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Australia</b>					
Non Diabetic	5445	95 [94, 95]	90 [89, 91]	66 [65, 68]	47 [45, 49]
Diabetic	2283	92 [91, 93]	85 [84, 87]	54 [52, 57]	33 [30, 35]
<b>New Zealand</b>					
Non Diabetic	1449	95 [93, 96]	89 [87, 90]	65 [62, 68]	45 [42, 49]
Diabetic	1102	94 [93, 95]	86 [84, 88]	55 [51, 58]	30 [27, 33]

Figure 6.32

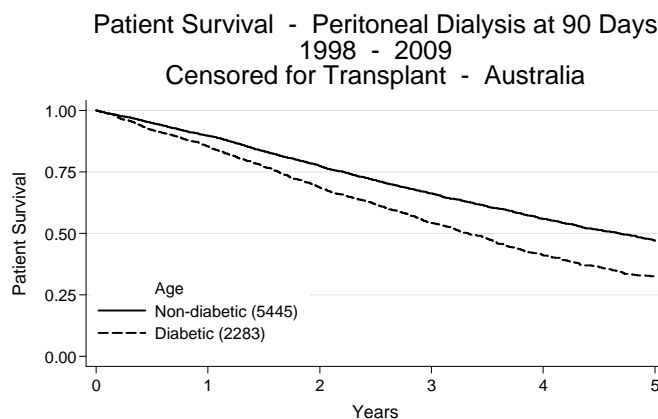


Figure 6.33

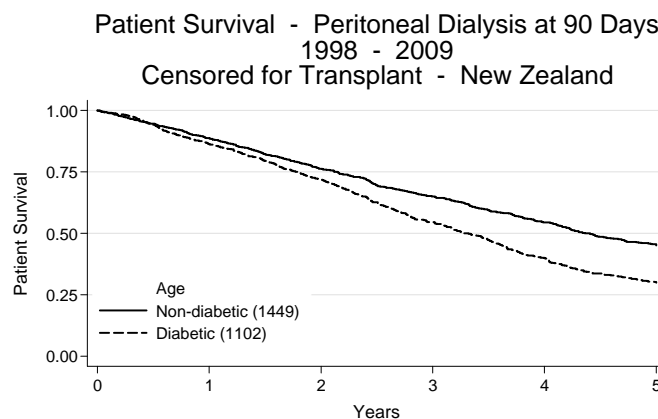


Figure 6.34

Peritoneal Dialysis at 90 Days Patient Survival - By Age Group Censored for Transplant 1998 - 2009 % [95% Confidence Interval]					
Age Groups	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Australia</b>					
0-39 years	1076	99 [98, 99]	98 [96, 98]	88 [85, 90]	77 [72, 81]
40-59 years	2337	96 [95, 97]	93 [92, 94]	76 [74, 78]	61 [58, 64]
60-74 years	3002	93 [92, 94]	86 [85, 88]	58 [56, 59]	36 [33, 38]
>=75 years	1313	89 [87, 91]	78 [76, 80]	40 [37, 43]	18 [15, 20]
<b>New Zealand</b>					
0-39 years	311	99 [97, 100]	95 [92, 97]	85 [80, 90]	74 [66, 80]
40-59 years	933	96 [94, 97]	91 [89, 93]	67 [63, 70]	45 [41, 49]
60-74 years	1033	94 [92, 95]	85 [83, 88]	55 [51, 58]	30 [27, 33]
>=75 years	274	87 [82, 90]	76 [70, 81]	38 [32, 44]	19 [14, 25]

Figure 6.35

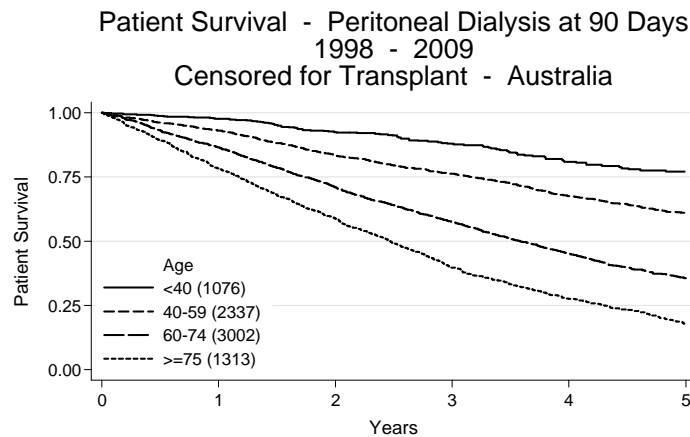
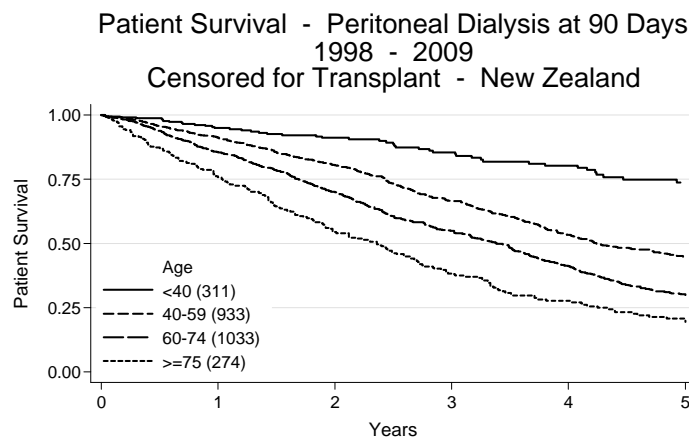


Figure 6.36





Figures 6.37 - 6.38 show survival curves for patients treated with peritoneal dialysis at day 90, adjusted to a median age of 62.6 years for Australia and 60.4 years for New Zealand; non diabetic primary renal disease; caucasoid race; female gender and no comorbid conditions (lung disease, coronary heart disease, peripheral vascular disease or cerebrovascular disease).

In Australia the patient survival continues to improve from 1998 (Figure 6.37).

In New Zealand there is an improvement in the 2007-2009 time period (Figure 6.38).

Figure 6.37

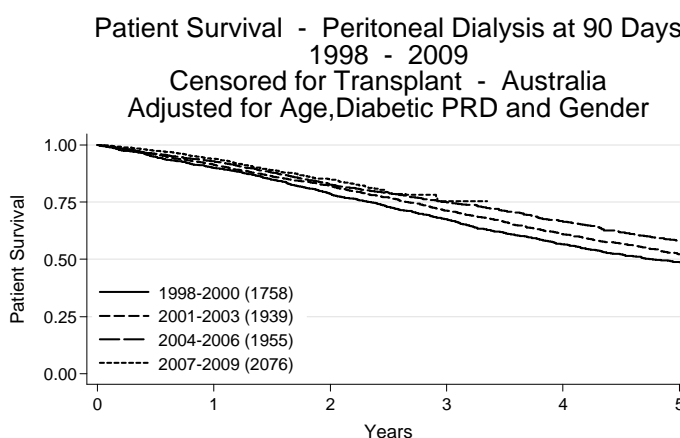
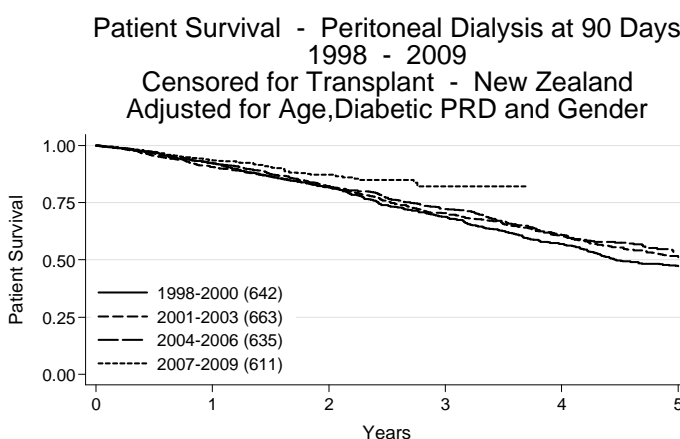


Figure 6.38



## PERITONEAL DIALYSIS TECHNIQUE SURVIVAL

Figure 6.39

Peritoneal Dialysis at 90 Days Technique Survival - Diabetic / Non Diabetic Censored for Transplant Commenced 1998 - 2009 % [95% Confidence Interval]					
	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Australia</b>					
Non Diabetic	5445	85 [83, 85]	71 [70, 73]	35 [33, 36]	16 [14, 17]
Diabetic	2283	81 [79, 83]	68 [66, 70]	25 [23, 27]	9 [7, 11]
<b>New Zealand</b>					
Non Diabetic	1449	88 [86, 89]	76 [74, 78]	42 [39, 45]	19 [16, 21]
Diabetic	1102	89 [87, 90]	76 [73, 78]	34 [31, 37]	11 [9, 13]

Figure 6.40

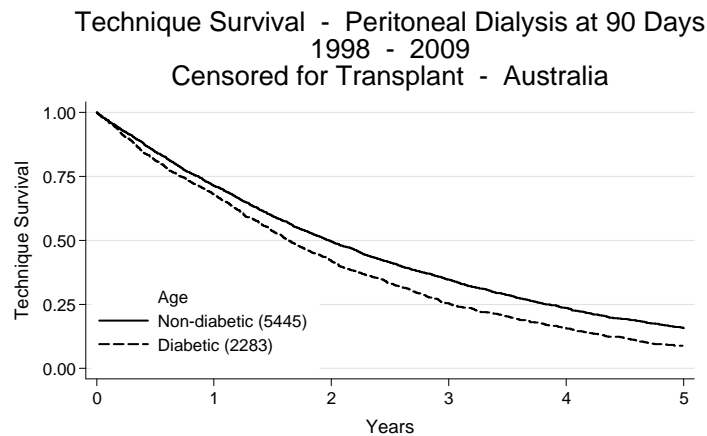


Figure 6.41

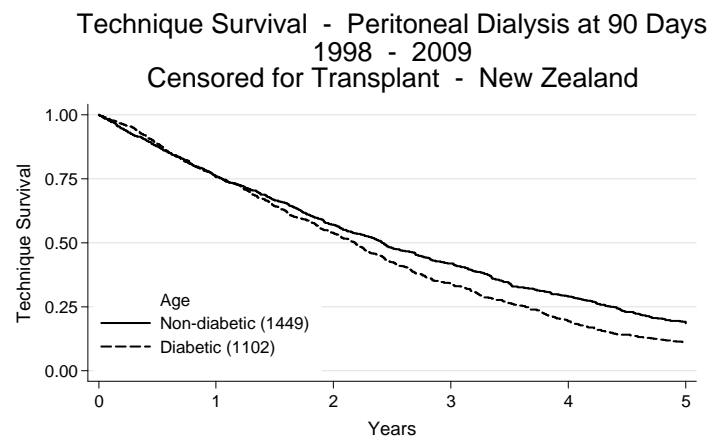




Figure 6.42

Peritoneal Dialysis at 90 Days Technique Survival - By Age Group Censored for Transplant 1998 - 2009 % [95% Confidence Interval]					
Age Groups	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Australia</b>					
0-39 years	1076	88 [86, 90]	76 [73, 79]	41 [37, 45]	26 [21, 31]
40-59 years	2337	85 [84, 87]	74 [72, 76]	37 [35, 40]	19 [17, 21]
60-74 years	3002	83 [81, 84]	69 [68, 71]	30 [28, 32]	12 [11, 13]
>=75 years	1313	79 [77, 82]	62 [59, 64]	22 [20, 25]	6 [4, 8]
<b>New Zealand</b>					
0-39 years	311	88 [86, 90]	76 [73, 79]	41 [37, 45]	26 [21, 31]
40-59 years	933	85 [84, 87]	74 [72, 76]	37 [35, 40]	19 [17, 21]
60-74 years	1033	83 [81, 84]	69 [68, 71]	30 [28, 32]	12 [11, 13]
>=75 years	274	79 [77, 82]	62 [59, 64]	22 [20, 25]	6 [4, 8]

Figure 6.43

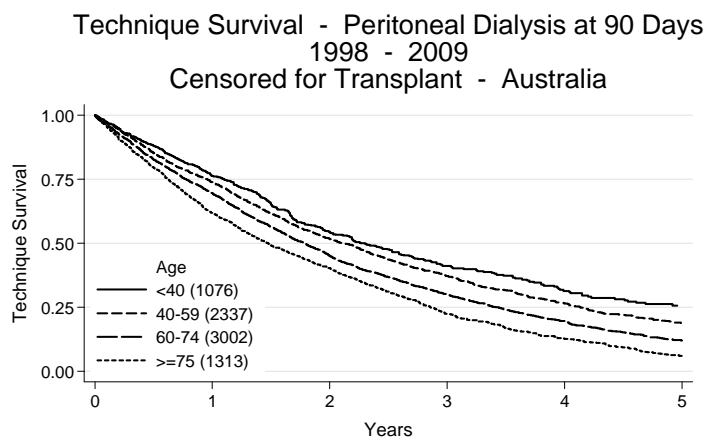
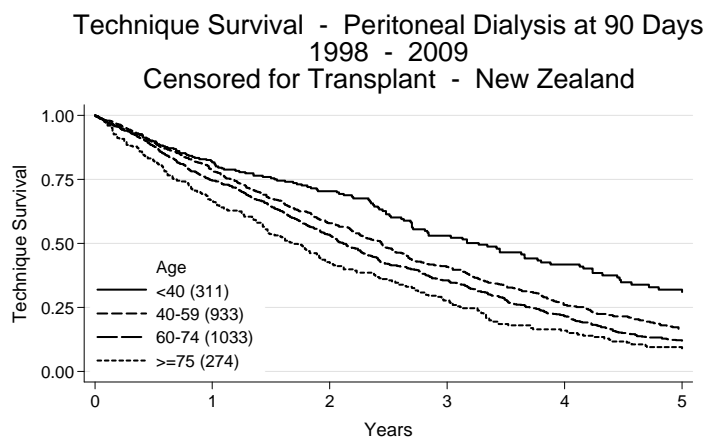


Figure 6.44





## TECHNIQUE FAILURE (CENSORED FOR DEATH OR TRANSPLANTATION)

In Australia, the most common primary cause of technique failure was a social reason (generally patient preference), rather than a technical cause. This accounted for 43% of transfers during 2008/2000 (Figure 6.45).

Infections (primarily peritonitis) were the second commonest cause, followed by inadequate dialysis and mechanical/technical complications.

In New Zealand, the most common primary cause of technique failure was also a “social reason”, which accounted for 34% of transfers during 2008/2009 and infections 27% (Figure 6.45).

Figure 6.45		
Causes of Technique Failure 1-Jan-2008 to 31-Dec-2009 Excluding Death, Transplantation, Recovery of Renal Function		
Causes of Technique Failure	Australia	New Zealand
Recurrent/persistent peritonitis	223	72
Acute peritonitis	310	77
Tunnel/exit site infection	41	8
<b>Total Infective Causes</b>	<b>574 (27%)</b>	<b>157 (27%)</b>
Inadequate solute clearance	221	92
Inadequate fluid ultrafiltration	88	51
Excessive fluid ultrafiltration	3	3
<b>Total Dialysis Failure</b>	<b>312 (14%)</b>	<b>146 (25%)</b>
Dialysate leak	75	21
Hydrothorax	6	-
Scrotal oedema	19	1
Catheter block	51	11
Catheter fell out	6	1
Hernia	72	15
Abdominal pain	13	7
Abdominal surgery	35	14
Other surgery	18	1
Haemoperitoneum	-	1
Sclerosing Peritonitis	-	2
Miscellaneous	59	9
Multiple Adhesions	1	2
<b>Total Technical Failure</b>	<b>355 (16%)</b>	<b>85 (14%)</b>
Unable to manage self care	120	33
Patient preference	795	167
Transfer outside Australia/NZ	10	2
<b>Total Social Reasons</b>	<b>925 (43%)</b>	<b>202 (34%)</b>



## PERITONITIS

Australian median time to first peritonitis was 19.2 months overall, with 29% of patients completely free of peritonitis at three years. In New Zealand the time was 15.7 months (24% of patients free of peritonitis at three years), (Figure 6.46). As noted in previous reports there is a strong association between ethnicity and peritonitis free survival (Figure 6.49).

The median peritonitis-free survival for home automated peritoneal dialysis patients was 21.0 months in Australia, and 12.8 months in New Zealand.

Patients are followed from the date of their first peritoneal dialysis until the date of their first episode of peritonitis regardless of changes in dialysis modality or transplant. Those who never had peritonitis are censored at transplant or change of dialysis modality.

Figure 6.46

First PD Treatment to First Episode of Peritonitis Related to Age at Entry 01-Jan-2005 to 31-Dec-2009							
Survival	Age Groups						All
	00-14	15-34	35-54	55-64	65-74	>=75	
<b>Australia</b>	<b>(n=83)</b>	<b>(n=364)</b>	<b>(n=1196)</b>	<b>(n=1010)</b>	<b>(n=1112)</b>	<b>(n=825)</b>	<b>(n=4590)</b>
3 months	83 [72, 89]	87 [83, 90]	86 [84, 88]	87 [85, 89]	87 [85, 89]	86 [84, 89]	87 [86, 88]
6 months	71 [60, 80]	77 [72, 81]	78 [76, 81]	79 [76, 81]	79 [76, 81]	78 [74, 81]	78 [77, 80]
9 months	61 [49, 72]	73 [68, 78]	71 [69, 74]	70 [67, 73]	71 [68, 74]	70 [66, 73]	71 [69, 72]
1 year	59 [46, 70]	68 [62, 73]	65 [62, 68]	64 [60, 67]	63 [60, 66]	62 [58, 66]	64 [62, 65]
2 years	39 [21, 56]	50 [42, 57]	46 [42, 49]	40 [36, 44]	44 [40, 48]	43 [39, 48]	44 [42, 46]
3 years	26 [7, 51]	28 [18, 39]	31 [26, 35]	27 [22, 32]	29 [24, 33]	28 [23, 34]	29 [26, 31]
<b>New Zealand</b>	<b>(n=27)</b>	<b>(n=98)</b>	<b>(n=377)</b>	<b>(n=357)</b>	<b>(n=347)</b>	<b>(n=133)</b>	<b>(n=1339)</b>
3 months	77 [56, 89]	84 [74, 90]	88 [85, 91]	84 [79, 87]	86 [82, 90]	88 [81, 92]	86 [84, 88]
6 months	56 [34, 73]	75 [64, 83]	74 [69, 78]	73 [68, 77]	76 [71, 80]	80 [71, 86]	74 [72, 77]
9 months	40 [21, 60]	61 [50, 71]	64 [58, 69]	63 [58, 69]	66 [60, 71]	68 [59, 76]	64 [61, 67]
1 year	25 [8, 47]	58 [47, 68]	58 [53, 64]	59 [53, 64]	55 [49, 61]	62 [52, 71]	57 [54, 60]
2 years	-	46 [33, 58]	37 [31, 44]	39 [32, 45]	38 [32, 45]	34 [23, 45]	38 [34, 41]
3 years	-	22 [9, 38]	27 [21, 34]	26 [19, 34]	23 [16, 31]	20 [10, 31]	24 [21, 28]

% Survival [95% Confidence Interval]

Figure 6.47

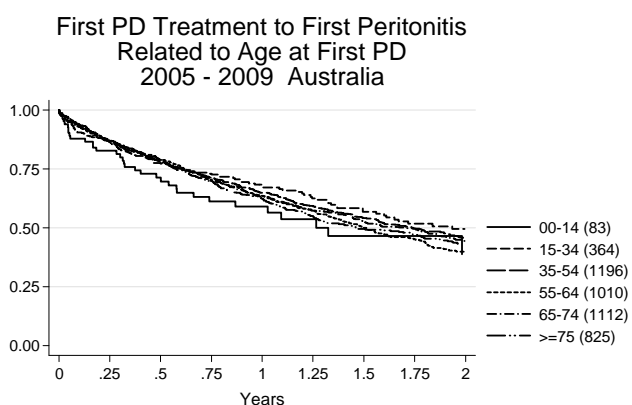


Figure 6.48

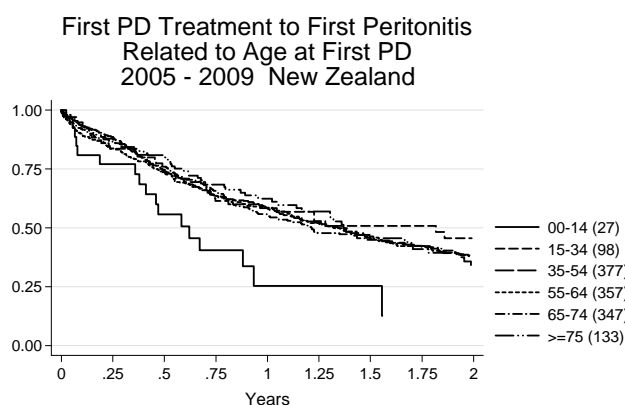


Figure 6.49

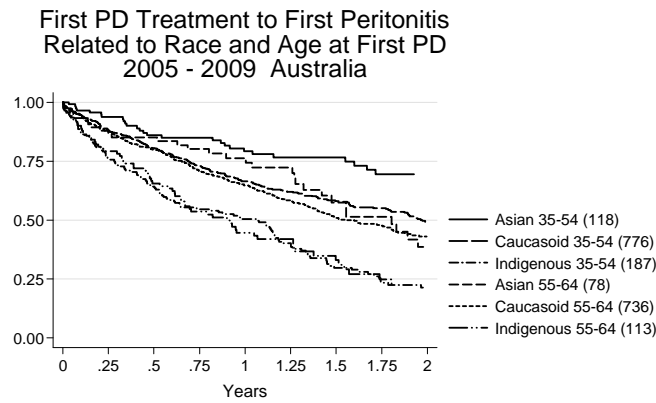
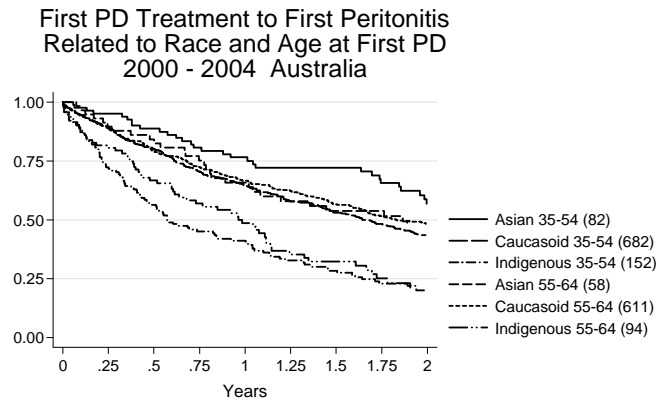


Figure 6.50

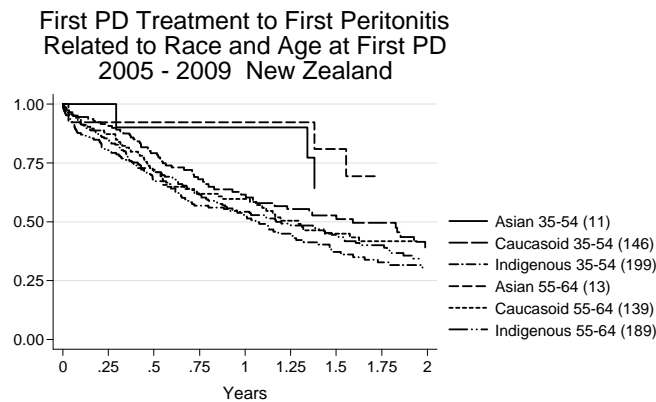
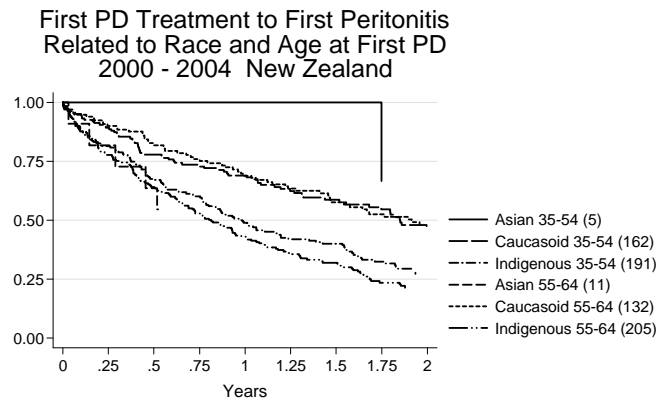




Figure 6.51

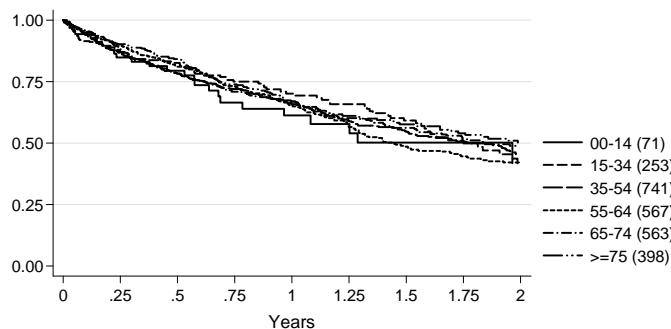
First Home APD Treatment to First Episode of Peritonitis  
Related to Age at Entry 01-Jan-2005 to 31-Dec-2009

Survival	Age Groups						All
	00-14	15-34	35-54	55-64	65-74	>=75	
<b>Australia</b>	<b>(n=71)</b>	<b>(n=253)</b>	<b>(n=741)</b>	<b>(n=567)</b>	<b>(n=563)</b>	<b>(n=398)</b>	<b>(n=2593)</b>
3 months	85 [73, 92]	87 [82, 91]	86 [84, 89]	90 [87, 92]	88 [85, 91]	90 [87, 93]	88 [87, 89]
6 months	79 [67, 88]	83 [77, 87]	78 [75, 81]	81 [77, 84]	78 [74, 82]	84 [79, 87]	80 [78, 82]
9 months	67 [52, 78]	75 [68, 80]	72 [68, 75]	73 [69, 77]	71 [67, 75]	74 [69, 79]	72 [70, 74]
1 year	61 [46, 73]	70 [63, 76]	66 [62, 70]	65 [60, 69]	67 [62, 71]	67 [61, 72]	66 [64, 68]
2 years	42 [22, 60]	42 [32, 52]	45 [40, 50]	42 [36, 47]	48 [43, 54]	50 [43, 57]	46 [43, 48]
3 years	21 [2, 54]	34 [23, 45]	33 [27, 39]	29 [22, 36]	33 [27, 40]	32 [23, 41]	32 [29, 35]
<b>New Zealand</b>	<b>(n=24)</b>	<b>(n=63)</b>	<b>(n=145)</b>	<b>(n=107)</b>	<b>(n=90)</b>	<b>(n=44)</b>	<b>(n=473)</b>
3 months	83 [60, 93]	83 [70, 90]	85 [78, 90]	85 [77, 91]	89 [81, 94]	86 [71, 93]	86 [82, 89]
6 months	58 [35, 76]	77 [63, 86]	75 [66, 81]	79 [69, 85]	76 [64, 84]	70 [53, 82]	75 [70, 79]
9 months	46 [23, 66]	56 [41, 68]	63 [54, 71]	70 [59, 78]	65 [53, 75]	54 [36, 69]	62 [57, 67]
1 year	29 [9, 53]	49 [34, 62]	55 [45, 64]	57 [46, 68]	54 [41, 65]	43 [26, 59]	52 [47, 57]
2 years	-	34 [19, 50]	39 [28, 49]	37 [24, 49]	33 [20, 46]	16 [5, 34]	33 [27, 39]
3 years	-	20 [7, 37]	27 [16, 40]	22 [9, 38]	11 [1, 33]	16 [5, 34]	21 [14, 27]

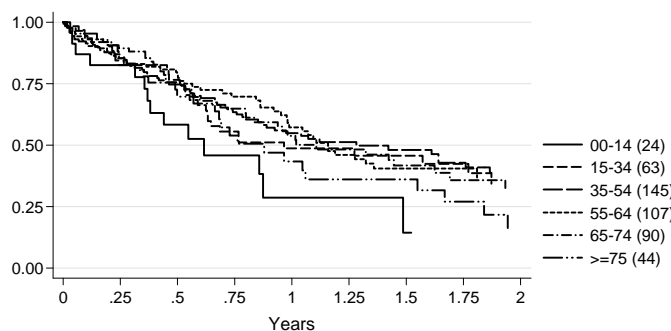
% Survival [95% Confidence Interval]

Figure 6.52

First Home APD Treatment to First Peritonitis  
Related to Age at First Home APD  
2005 - 2009 Australia



First Home APD Treatment to First Peritonitis  
Related to Age at First Home APD  
2005 - 2009 New Zealand



## AUSTRALIAN PERITONITIS REGISTRY 1-OCT-2003 TO 31-DEC-2009

This section contains details of the organism and treatment for episodes of peritonitis within Australia collected by ANZDATA.

Similar information for patients in New Zealand is collected separately by the New Zealand Peritonitis Registry (reported separately).

During 2009, the number of episodes of peritonitis remained similar to previous years (shown in Figure 6.53).

Figure 6.53	
Number of Peritonitis Episodes	
Year	Frequency
2003	250 (3 months data only)
2004	1,196
2005	1,072
2006	1,117
2007	1,254
2008	1,369
2009	1,340
<b>Total</b>	<b>7,598</b>

Rates of peritonitis have fluctuated, although there has been no clear trend over the past five years (2004-2009) (Figure 6.54).

Figure 6.54

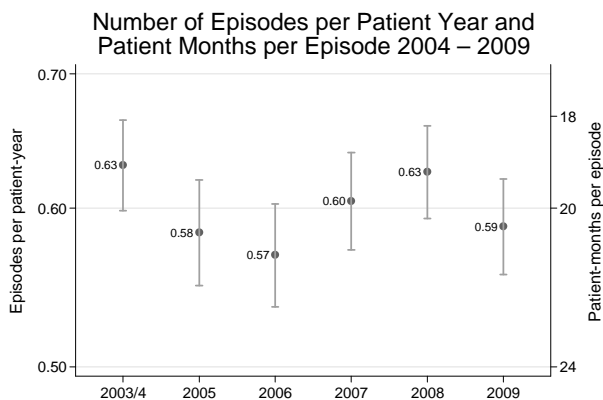
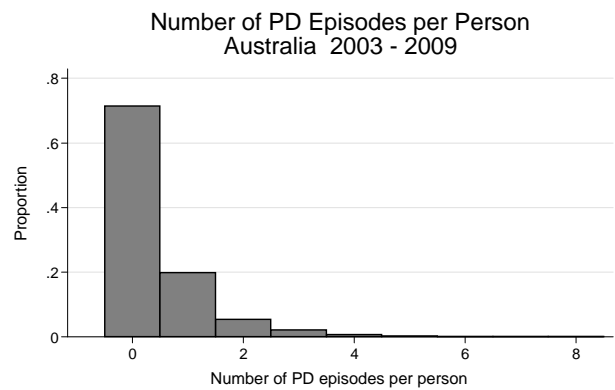


Figure 6.55

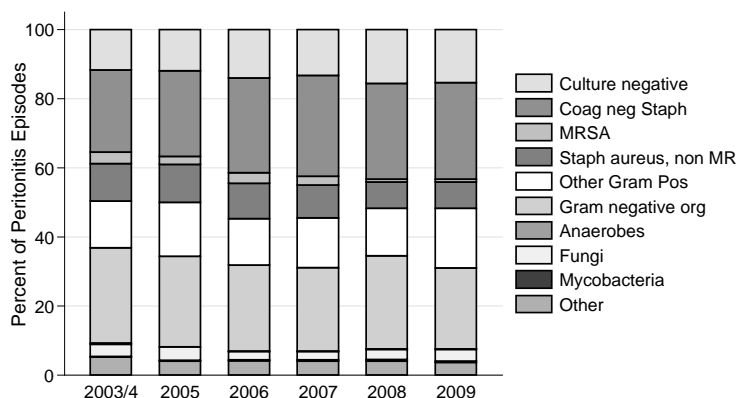




There has been a gradual trend over this time towards a lower proportion of episodes attributable to gram negative organisms and non-MRSA *S. aureus*, with a greater proportion of culture negative episodes (Figure 6.56). The Registry does not collect data on use of prior antibiotics or laboratory techniques which might influence the rate of culture negative peritonitis.

Figure 6.56

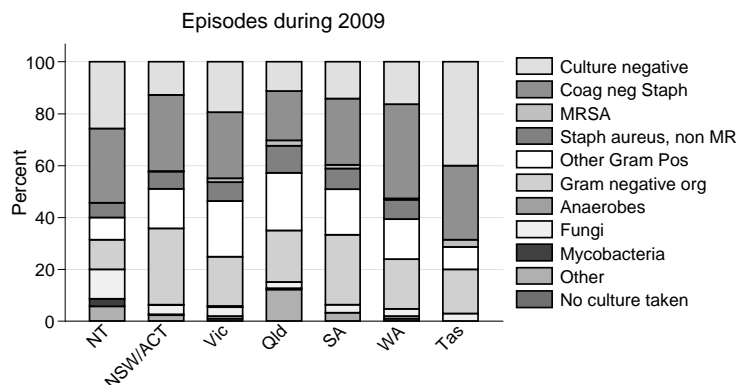
Distribution of Organisms Causing Peritonitis  
Australia



There remains quite widespread variation in the major organisms reported between the different states in Australia (Figure 6.57). We do not collect data about variation in prophylaxis, patient selection processes or PD training or other factors which might account for part or all of this variation.

Figure 6.57

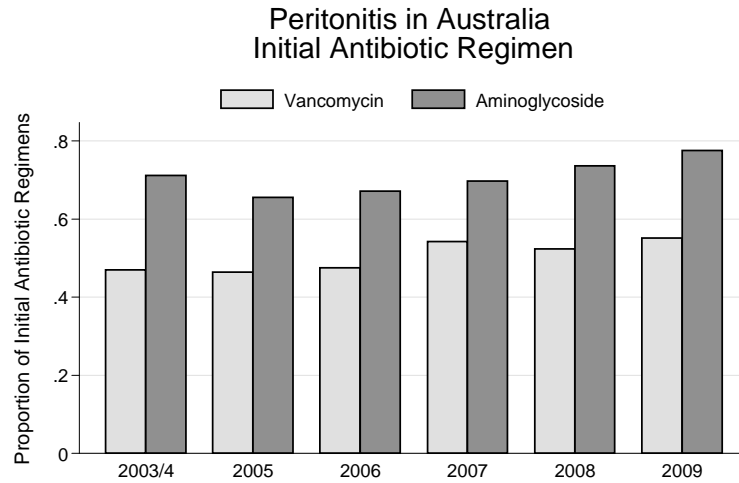
Distribution of Organisms Causing Peritonitis  
Australian States



## ANTIBIOTIC TREATMENT

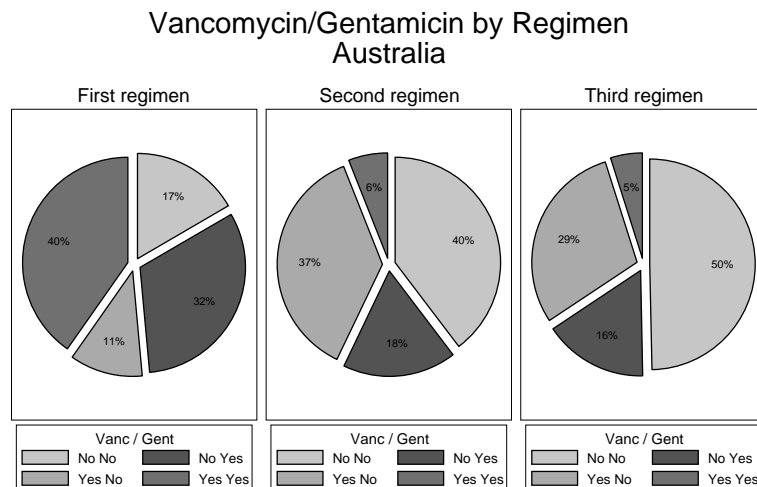
The proportion of episodes which were treated with an aminoglycoside-containing initial regimen has increased slightly over the period 2006-2009, as has the proportion treated with a regimen containing vancomycin is slowly increasing (Figure 6.58).

Figure 6.58



Among episodes of peritonitis treated during 2009, the proportion of those who received vancomycin in the initial or second antibiotic regimen is shown in Figure 6.59.

Figure 6.59



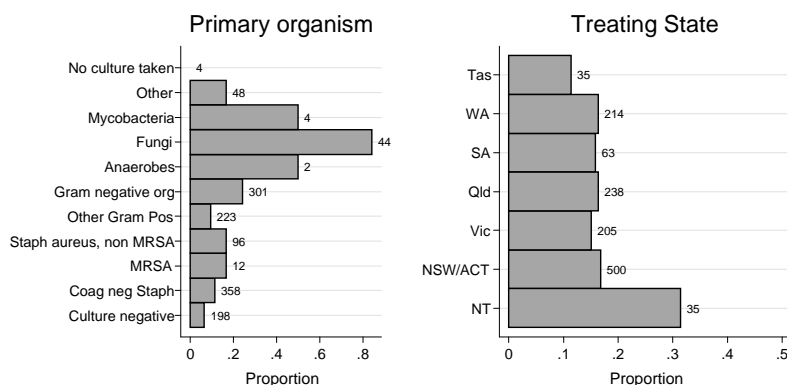


### OUTCOMES

There is a strong relationship between the type of organism and the rate of transfer to permanent haemodialysis. After fungal, mycobacterial or gram negative peritonitis, there is a considerably higher rate.

Figure 6.60

#### Proportion of Episodes Resulting in Permanent Haemodialysis Transfer

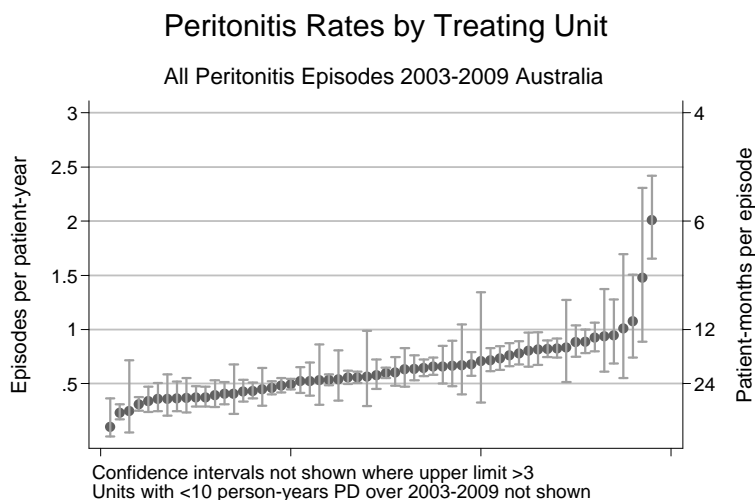


Values are total number of peritonitis episodes reported 1/1/09-31/12/09

### RATES OF PERITONITIS ACROSS INDIVIDUAL UNITS

Figure 6.61 shows the peritonitis rates for all units in Australia over the period 1st October, 2003 to 31st December 2009. Only units who averaged at least ten patient-years of peritonitis treatment per year over that period are included. There is substantial variation in the rates between units.

Figure 6.61





As demonstrated in Figure 6.62 there remains over a threefold variation in peritonitis rates between units. There are a number of individual characteristics which predict the occurrence of peritonitis, including older age, diabetes, cigarette smoking (but not centre size) and Aboriginal racial origin. These are covered in greater detail in a manuscript in Peritoneal Dialysis International (Ghali et al Perit Dial Inter 2011: In Press). Similarly, there remains considerable variation between units (Figure 6.62), and between States (Figure 6.63).

Figure 6.62

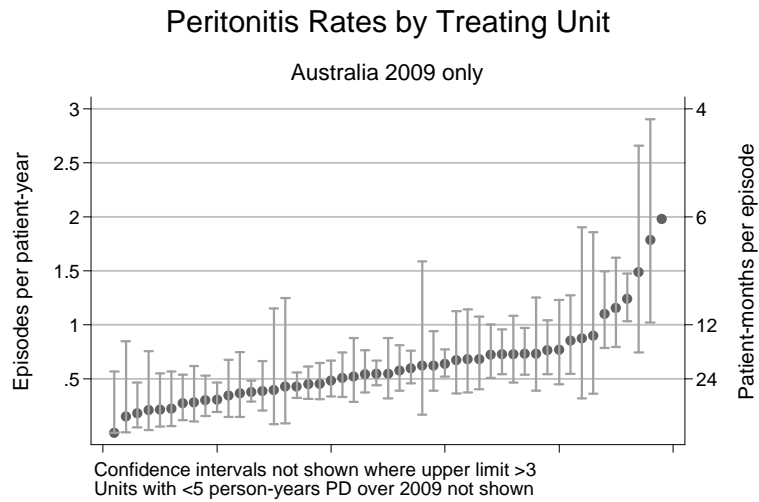
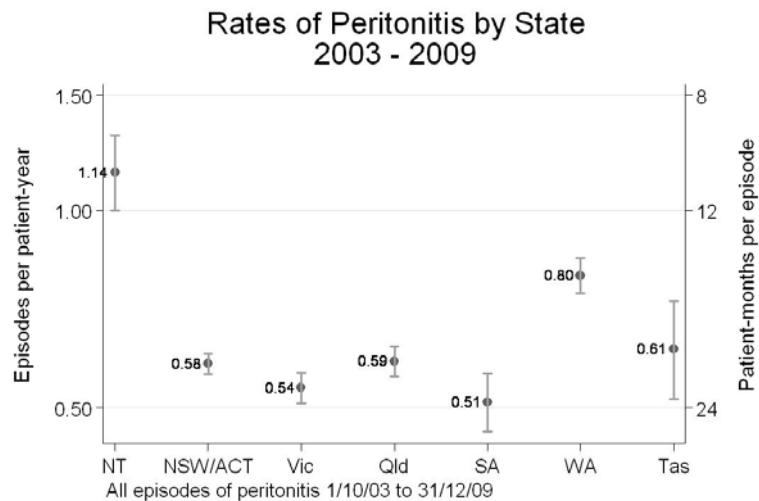


Figure 6.63





### HAEMOGLOBIN

In Australia, at the end of 2009, haemoglobin was between 110-119 in 28% of PD patients, <110 g/L in 37%, higher than in previous years, and >140 g/L in 4%, which is lower than previous years.

In New Zealand, the corresponding percentages are very similar - 28%, 39% and 4% respectively.

Figure 6.65 shows the Hb levels in PD patients with proven or likely coronary artery disease or not.

Figure 6.64

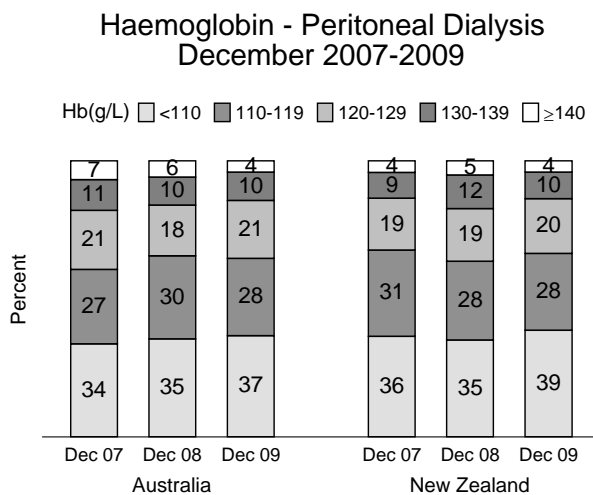
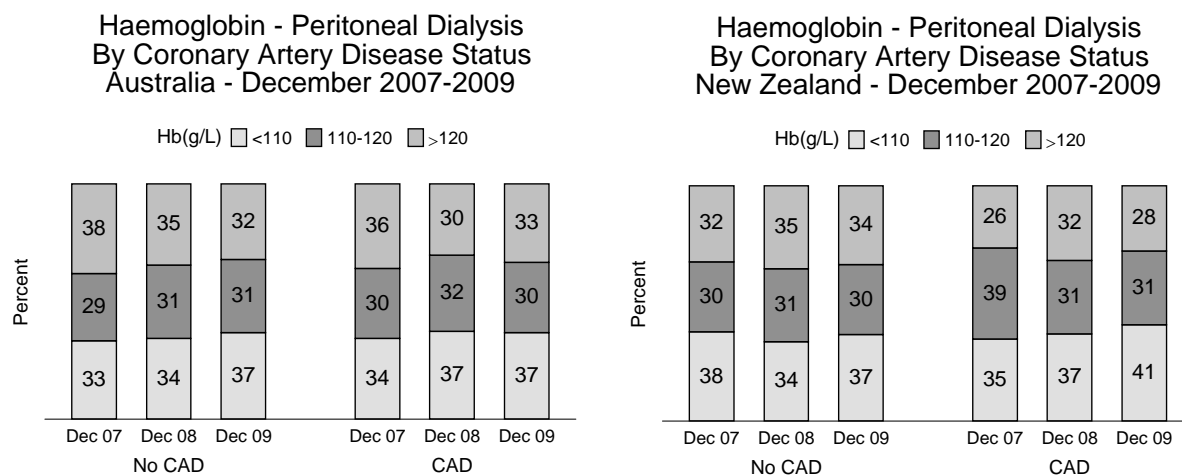


Figure 6.65



## HAEMOGLOBIN IN PERITONEAL DIALYSIS PATIENTS BY TREATING CENTRE

Figures 6.66 - 6.69

These figures show the median haemoglobin (with inter-quartile range) for individual centres, arranged from lowest to highest (Figures 6.66 and 6.67). Also shown are the proportion of patients in each centre with a haemoglobin of 110-129 g/L (Figures 6.68 and 6.69).

In Australia, median haemoglobin for each centre ranged from 108 to 124 g/L for peritoneal dialysis patients and in New Zealand 107-125 g/L.

The proportion of patients in Australia with a haemoglobin of 110-129 g/L in each centre ranged from 30% to 76% for peritoneal dialysis patients and for New Zealand 31% to 67%. This large variation probably may reflect differences in practices, protocols and patient case-mix among centres.

Figure 6.66

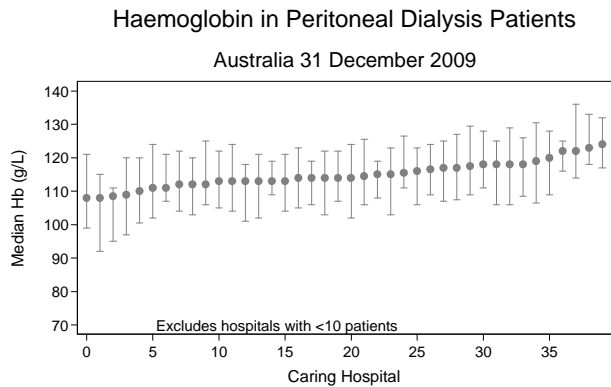


Figure 6.67

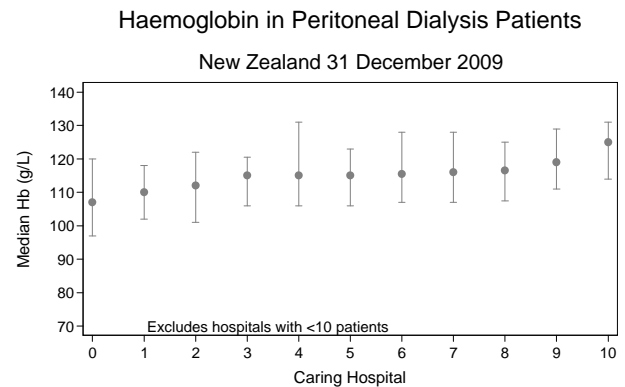


Figure 6.68

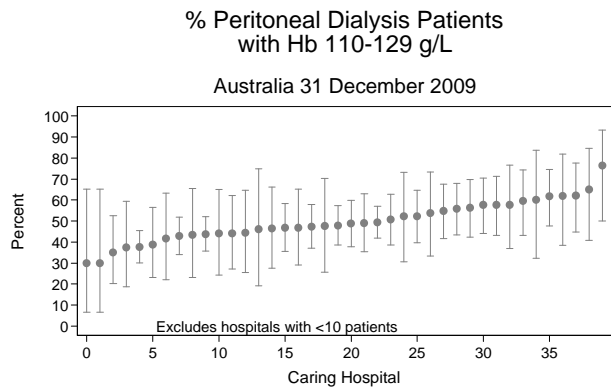
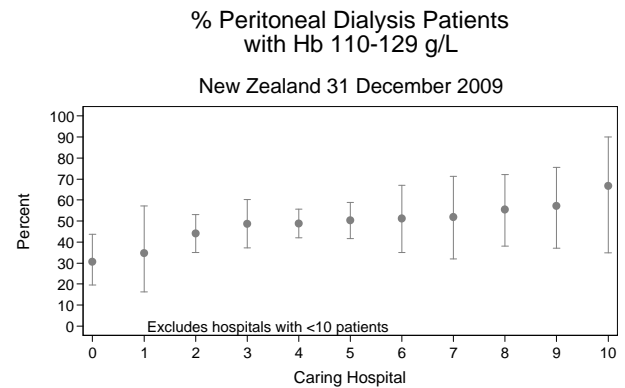


Figure 6.69





## FERRITIN AND TRANSFERRIN SATURATION

Figures 6.70 - 6.71

In Australia and New Zealand the proportions of peritoneal dialysis patients with ferritin < 200 mcg/L have slightly increased to 17% in Australia and 15% in New Zealand, while those with ferritin ≥ 500 mcg/L are 26% in Australia and 25% in New Zealand.

In both Australia and New Zealand, distributions of transferrin saturation have been unchanged for the past three years, although in 2009 there was a slight decrease in the proportion of peritoneal dialysis patients with transferrin saturation < 20% in Australia to 30%.

Figure 6.70

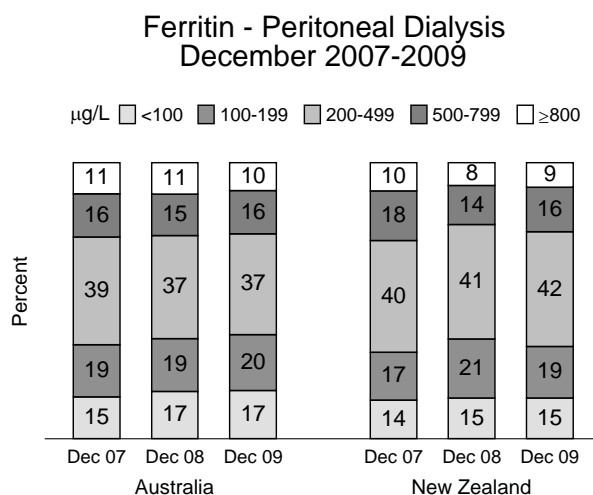
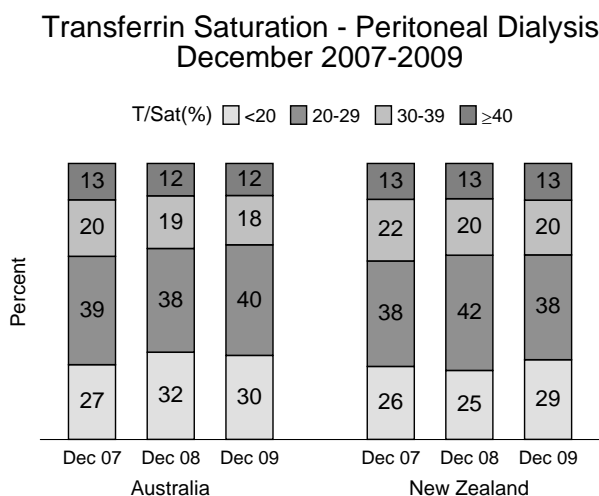


Figure 6.71



## FERRITIN BY TREATING CENTRE

Figures 6.72 - 6.75

These figures show the proportions of patients in each centre with ferritin between 200-500 mcg/L and transferrin saturation of >20% respectively, as recommended by the CARI guidelines.

In Australia, the proportions of patients with ferritin within this range in each centre varied widely between 08-60% for peritoneal dialysis patients. Similarly large variations between centres were seen for transferrin saturation, between 36-100%. Again, this large variation may reflect differences in practices, protocols and patient case-mix among centres.

In New Zealand, the corresponding figures for ferritin were between 08-51% for peritoneal dialysis patients and for transferrin saturation between 43-79%. In both countries, significant proportions of patients did not have ferritin and transferrin saturation within the recommended ranges.

Figure 6.72

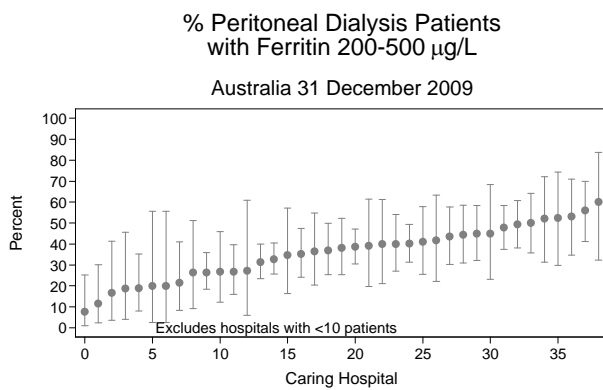


Figure 6.73

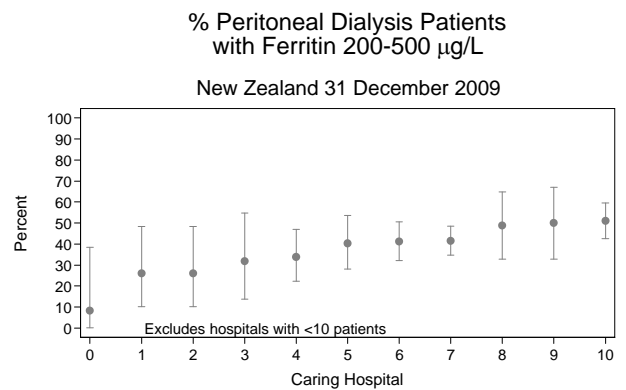


Figure 6.74

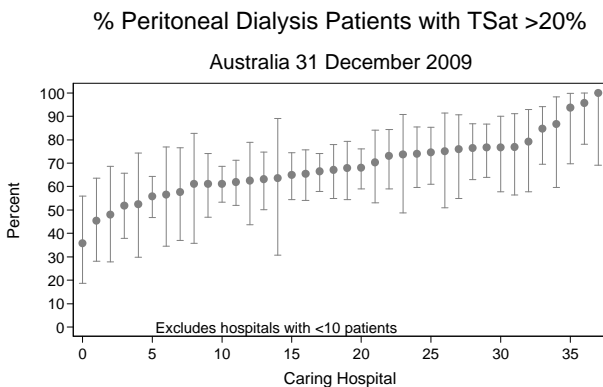
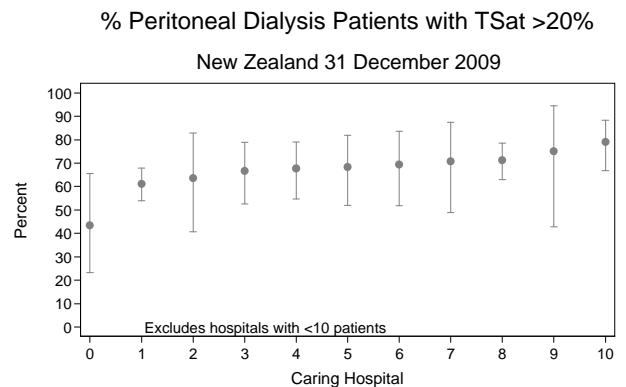


Figure 6.75



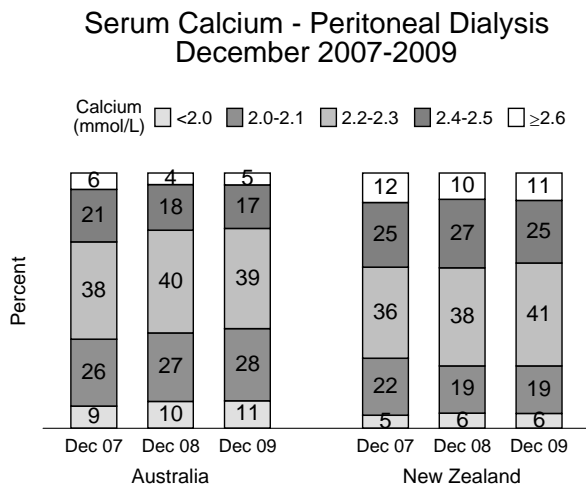


### SERUM CALCIUM

Figure 6.76

In both Australia and New Zealand the proportions of patients with proportions with serum calcium  $\geq 2.4$  mmol/L have decreased over the past three years, while those with  $< 2.2$  mmol/L have increased in Australia, but remained fairly stable in New Zealand.

Figure 6.76



### SERUM CALCIUM BY TREATING CENTRE

Figures 6.77 and 6.78 show the proportions of patients at each centre with serum calcium 2.1-2.4 mmol/L, as recommended by the CARI guidelines. Note however that the values in the guidelines were for corrected total calcium, while those in this report are for uncorrected total calcium.

In Australia, the proportions ranged widely between 30-84% for peritoneal dialysis patients, while in New Zealand the corresponding proportions were 42-70%.

Figure 6.77

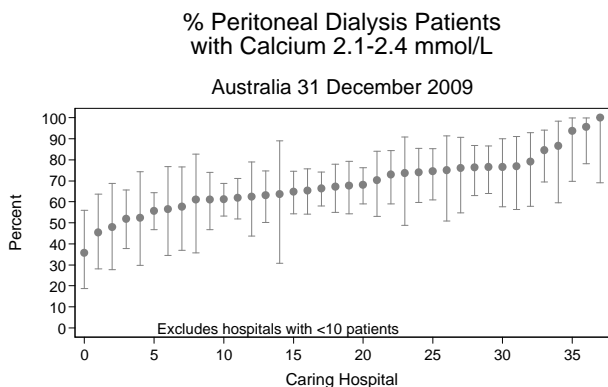
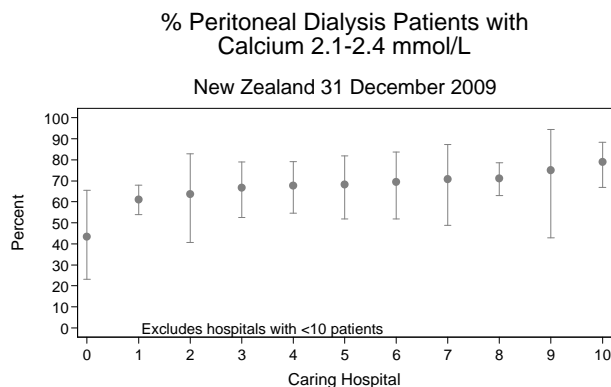


Figure 6.78



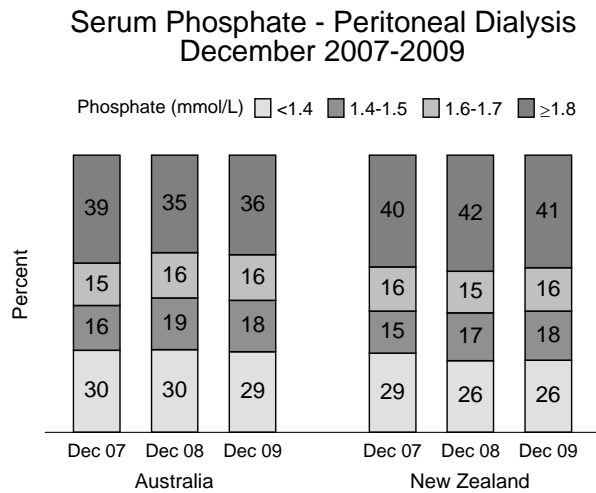
### SERUM PHOSPHATE

Figure 6.79

In Australia, serum phosphate has decreased slightly over the last three years (reflected in the size of the  $\geq 1.8$  mmol/L group).

In New Zealand, the proportions with serum phosphate  $\geq 1.8$  mmol/L have remained stable.

Figure 6.79



### SERUM PHOSPHATE BY TREATING CENTRE

Figures 6.80 - 6.81 show the proportions of patients at each centre with serum phosphate 0.8-1.6 mmol/L, as recommended by the CARI guidelines.

In Australia, the proportions ranged widely between 30-73% for peritoneal dialysis patients and in New Zealand, the corresponding proportions were 25-70%.

Figure 6.80

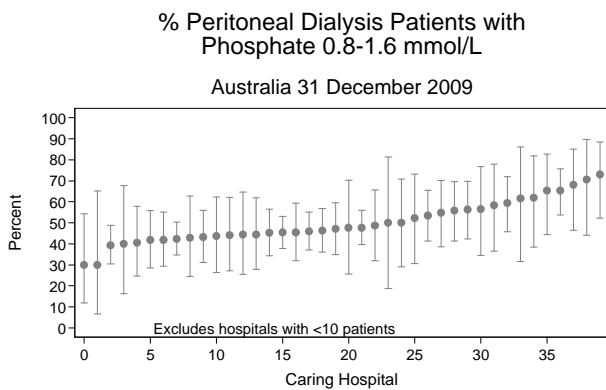
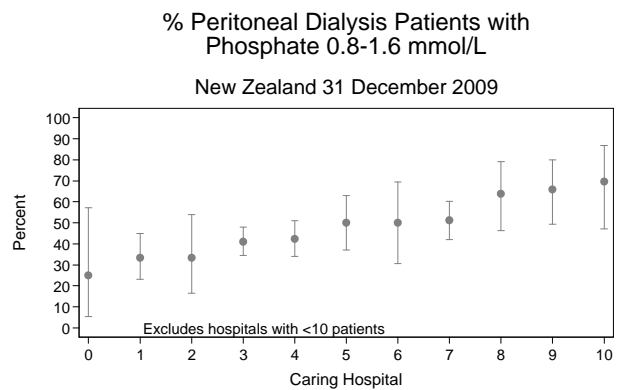


Figure 6.81





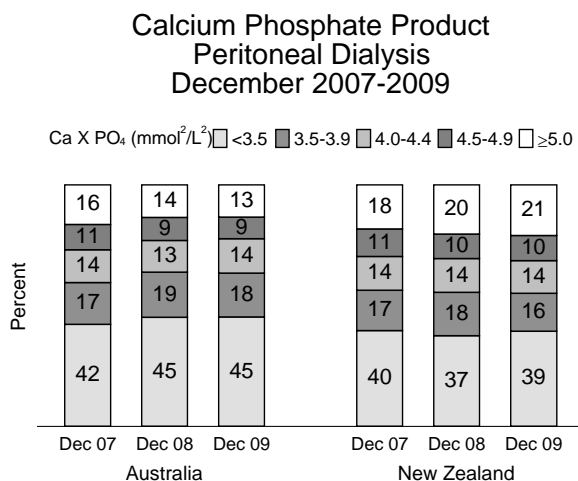
### CALCIUM-PHOSPHATE PRODUCT

Figure 6.82

In both Australia and New Zealand, calcium-phosphate product has continued to improve, with smaller proportions of patients with a product  $\geq 5.0 \text{ mmol}^2/\text{L}^2$ .

Overall, the proportion of people with high calcium-phosphate product was higher in New Zealand than Australia.

Figure 6.82



### CALCIUM-PHOSPHATE PRODUCT BY TREATING CENTRE

Figures 6.83 - 6.84 show the proportions of patients at each centre with calcium-phosphate product  $<4.0 \text{ mmol}^2/\text{L}^2$ , as recommended by the CARI guidelines.

In Australia, the proportions ranged widely between 40-82% for peritoneal dialysis patients while in New Zealand, the corresponding proportions were 33-83%.

Figure 6.83

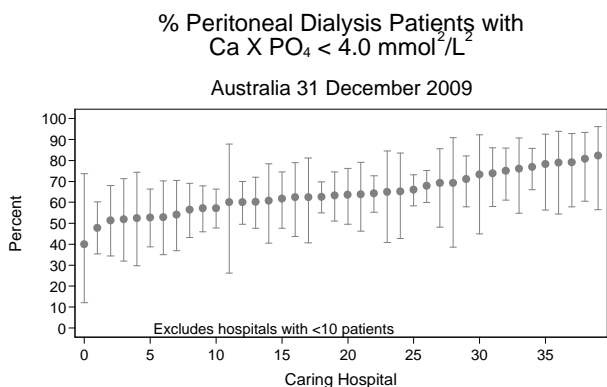


Figure 6.84

