

# CHAPTER 5

## HAEMODIALYSIS

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### Definitions

CARI guidelines	Caring for Australasians with Renal Impairment guidelines
Quotidian HD	≥ 5 HD treatments per week
Long Hour HD	≥ 6.5 hours per HD session
High Flux Dialyser	Ultrafiltration coefficient (kuf) >20 ml/hr/mmHg (as specified by the manufacturer)
AVF	Native vein arteriovenous fistula
AVG	Synthetic arteriovenous bridge graft
CVC	Central venous HD catheter (Includes both tunnelled and non-tunnelled unless otherwise stated)



## STOCK AND FLOW

### AUSTRALIA

The annual stock and flow of HD patients during the period 2003-2007 is shown in Figures 5.1, 5.2 and 5.3.

There were 7,536 patients (359 per million) receiving HD treatment at 31<sup>st</sup> December 2007, an increase of 5%; of these 30% were hospital based (33% in 2006), 57% were in satellite centres (55% in 2006) and 13% at home (12% in 2006).

The proportion of all HD patients who were using home HD in each State was 15% for New South Wales, 11% the ACT, 10% Queensland, 8% Victoria, 4% Tasmania and the Northern Territory, 2% Western Australia and 1% for South Australia. These proportions were lower among older people (Figure 5.6).

A total of 1,964 patients received HD for the first time during the year, a decrease of 5% from 2006. There was a 2% increase from 2005 to 2006 (2,022 to 2,066 patients) following a 17% increase from 2004 (1,729 patients).

The proportion of all HD patients in each age group is shown in Figure 5.8. There were 1,797 people  $\geq$  75 years receiving haemodialysis, including 215 people  $\geq$  85 years.

There were 405 transplant operations, a 5% decrease from 2006 (427 operations), representing 5% of all HD patients dialysing and 10% of those patients  $<$  65 years. There were 28 patients aged  $\geq$  65 years transplanted.

There were 1,158 deaths, at a rate of 15.7 deaths per 100 person-years (Figure 3.9).

For more detail regarding age and mode of HD in each State see Appendix II at the Website ([www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm](http://www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm)).

**Figure 5.1**

### Stock and Flow of Haemodialysis Patients 2003 - 2007

	2003	2004	2005	2006	2007
<b>Australia</b>					
<b>Patients new to HD</b>	1687	1729	2022	2066	1964
First Dialysis Treatment	1429	1454	1730	1779	1685
Previous Dialysis (PD)	228	238	258	255	259
Failed Transplant	30	37	34	32	20
<b>Transplanted</b>	372	437	415	427	405
<b>Deaths</b>	831	920	927	1036	1158
Never Transplanted	756	853	859	962	1079
Previous Transplant	75	67	68	74	79
<b>Permanent Transfers Out (&gt;12 months)</b>	189	218	279	365	374
<b>Temporary Transfers (12 months)</b>	99	130	135	153	61
Patients Dialysing (HD) at 31 December	5878	6214	6774	7204	7536
Patients Dialysing (HD) at Home 31 December	779	801	819	892	942
% of all Home Dialysis (HD and PD) Patients	30%	31%	31%	31%	31%
<b>New Zealand</b>					
<b>Patients new to HD</b>	365	355	389	407	373
First Dialysis Treatment	299	275	301	327	305
Previous Dialysis (PD)	61	78	73	70	56
Failed Transplant	5	2	15	10	12
<b>Transplanted</b>	64	54	44	51	60
<b>Deaths</b>	133	153	150	181	175
Never Transplanted	116	142	136	166	165
Previous Transplant	17	11	14	15	10
<b>Permanent Transfers Out (&gt;12 months)</b>	90	87	98	133	131
<b>Temporary Transfers (&lt;12 months)</b>	20	26	17	42	21
Patients Dialysing (HD) at 31 December	947	1034	1160	1229	1323
Patients Dialysing (HD) at Home 31 December	240	264	296	317	320
% of all Home Dialysis (HD and PD) Patients	24%	26%	29%	29%	30%

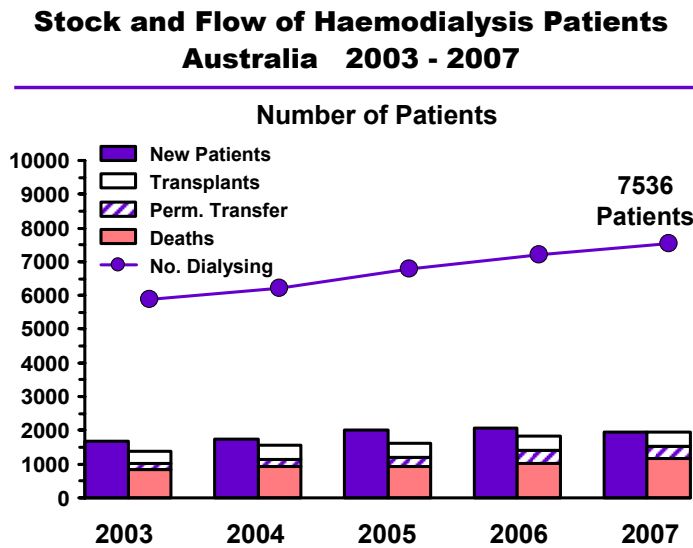
### NEW ZEALAND

The annual stock and flow of HD patients during the period 2003-2007 is shown in Figures 5.1, 5.4 and 5.5.

There were 1,323 patients (313 per million) receiving treatment at 31<sup>st</sup> December 2007, an 8% increase compared to 2006.

Hospital based HD remained the same as last year 46%, satellite HD increased from 28% to 29% in 2007, while home HD decreased from 26% in 2006 to 24% this year.

New Zealand is continued on page 5-6.

**Figure 5.2**

**Figure 5.3**

<b>Stock and Flow of Haemodialysis Patients Australia 2003 - 2007</b>					
<b>Number (%)</b>					
Age Groups	2003	2004	2005	2006	2007
<b>New Patients *</b>					
00-14 years	9 (<1%)	11 (<1%)	15 (<1%)	13 (<1%)	9 (<1%)
15-24 years	48 (3%)	46 (3%)	39 (2%)	34 (2%)	45 (2%)
25-34 years	90 (5%)	84 (5%)	106 (5%)	78 (4%)	94 (5%)
35-44 years	161 (10%)	167 (10%)	175 (9%)	197 (9%)	184 (10%)
45-54 years	279 (16%)	258 (15%)	315 (16%)	298 (14%)	303 (15%)
55-64 years	320 (19%)	346 (20%)	430 (21%)	455 (22%)	418 (21%)
65-74 years	413 (24%)	455 (26%)	527 (26%)	533 (26%)	479 (24%)
75-84 years	348 (21%)	333 (19%)	378 (19%)	413 (20%)	385 (20%)
>=85 years	19 (1%)	29 (2%)	37 (1%)	45 (2%)	47 (2%)
<b>Total</b>	<b>1687 (100%)</b>	<b>1729 (100%)</b>	<b>2022 (100%)</b>	<b>2066 (100%)</b>	<b>1964 (100%)</b>
<b>Patients Dialysing</b>					
00-14 years	3 (<1%)	6 (<1%)	7 (<1%)	7 (<1%)	5 (<1%)
15-25 years	101 (2%)	106 (2%)	96 (1%)	94 (1%)	98 (1%)
25-34 years	340 (6%)	340 (5%)	351 (5%)	301 (4%)	305 (4%)
35-44 years	610 (10%)	633 (10%)	667 (10%)	692 (10%)	731 (10%)
45-54 years	1000 (17%)	1038 (17%)	1106 (16%)	1142 (16%)	1201 (16%)
55-64 years	1224 (21%)	1290 (21%)	1425 (21%)	1562 (22%)	1595 (21%)
65-74 years	1465 (25%)	1491 (24%)	1626 (24%)	1754 (24%)	1804 (24%)
75-84 years	1060 (18%)	1196 (19%)	1350 (20%)	1468 (20%)	1582 (21%)
>=85 years	75 (1%)	114 (2%)	146 (2%)	184 (3%)	215 (3%)
<b>Total</b>	<b>5878 (100%)</b>	<b>6214 (100%)</b>	<b>6774 (100%)</b>	<b>7204 (100%)</b>	<b>7536 (100%)</b>
<b>Primary Renal Disease *</b>					
Glomerulonephritis	451 (27%)	445 (26%)	471 (23%)	463 (22%)	472 (24%)
Analgesic Nephropathy	68 (4%)	47 (3%)	57 (3%)	48 (2%)	44 (2%)
Hypertension	266 (16%)	232 (13%)	311 (15%)	309 (15%)	314 (16%)
Polycystic Disease	79 (5%)	97 (6%)	146 (7%)	133 (6%)	121 (6%)
Reflux Nephropathy	61 (4%)	55 (3%)	51 (3%)	62 (3%)	54 (3%)
Diabetic Nephropathy	443 (26%)	525 (30%)	635 (32%)	678 (33%)	616 (31%)
Miscellaneous	205 (12%)	207 (12%)	232 (11%)	258 (13%)	213 (11%)
Uncertain	114 (6%)	121 (7%)	119 (6%)	115 (6%)	130 (7%)
<b>Total</b>	<b>1687 (100%)</b>	<b>1729 (100%)</b>	<b>2022 (100%)</b>	<b>2066 (100%)</b>	<b>1964 (100%)</b>

\* New patients receiving first haemodialysis treatment



Figure 5.4

**Stock and Flow of Haemodialysis Patients  
New Zealand 2003 - 2007**

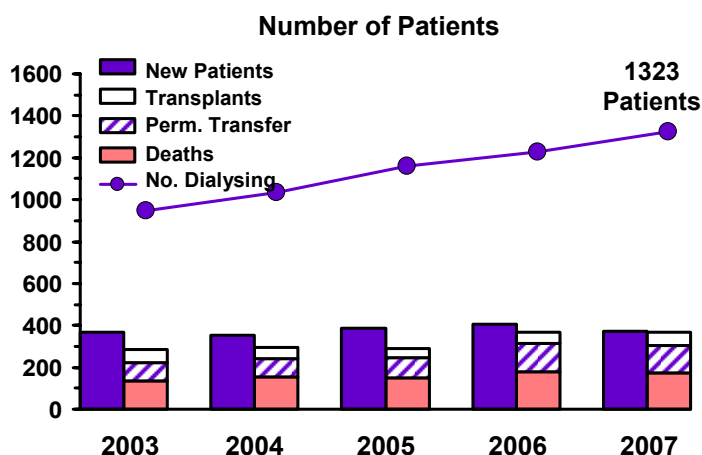


Figure 5.5

**Stock and Flow of Haemodialysis Patients New Zealand 2003 - 2007  
Number (%)**

Age Groups	2003	2004	2005	2006	2007
<b>New Patients *</b>					
00-14 years	- (-)	1 (<1%)	2 (<1%)	3 (<1%)	3 (1%)
15-24 years	21 (6%)	10 (3%)	13 (3%)	15 (4%)	20 (5%)
25-34 years	14 (4%)	23 (7%)	14 (4%)	30 (7%)	16 (4%)
35-44 years	38 (10%)	45 (12%)	44 (11%)	33 (8%)	45 (12%)
45-54 years	70 (19%)	78 (22%)	81 (21%)	91 (22%)	63 (17%)
55-64 years	93 (26%)	97 (27%)	118 (31%)	95 (23%)	95 (25%)
65-74 years	91 (25%)	70 (20%)	90 (23%)	95 (23%)	89 (24%)
75-84 years	38 (10%)	26 (7%)	23 (6%)	41 (11%)	38 (10%)
>=85 years	- (-)	5 (1%)	4 (1%)	4 (1%)	4 (1%)
<b>Total</b>	<b>365 (100%)</b>	<b>355 (100%)</b>	<b>389 (100%)</b>	<b>407 (100%)</b>	<b>373 (100%)</b>
<b>Patients Dialysing</b>					
00-14 years	- (-)	1 (<1%)	2 (<1%)	2 (<1%)	3 (<1%)
15-25 years	33 (3%)	33 (3%)	33 (3%)	32 (3%)	38 (3%)
25-34 years	64 (7%)	74 (7%)	82 (7%)	88 (7%)	79 (6%)
35-44 years	119 (12%)	139 (13%)	152 (13%)	150 (12%)	162 (12%)
45-54 years	214 (23%)	221 (21%)	245 (21%)	246 (20%)	261 (20%)
55-64 years	262 (28%)	287 (28%)	323 (28%)	344 (28%)	360 (27%)
65-74 years	194 (20%)	208 (20%)	242 (21%)	270 (22%)	299 (23%)
75-84 years	61 (6%)	68 (7%)	76 (7%)	88 (7%)	108 (8%)
>=85 years	- (-)	3 (<1%)	5 (<1%)	9 (<1%)	13 (1%)
<b>Total</b>	<b>947 (100%)</b>	<b>1034 (100%)</b>	<b>1160 (100%)</b>	<b>1229 (100%)</b>	<b>1323 (100%)</b>
<b>Primary Renal Disease *</b>					
Glomerulonephritis	87 (24%)	90 (26%)	98 (26%)	91 (22%)	87 (23%)
Analgesic Nephropathy	- (-)	1 (<1%)	- (-)	1 (<1%)	- (-)
Hypertension	39 (11%)	43 (12%)	39 (10%)	41 (10%)	43 (12%)
Polycystic Disease	14 (4%)	20 (5%)	29 (7%)	21 (5%)	14 (4%)
Reflux Nephropathy	3 (<1%)	12 (3%)	9 (2%)	7 (2%)	8 (2%)
Diabetic Nephropathy	157 (43%)	155 (43%)	160 (41%)	184 (45%)	159 (43%)
Miscellaneous	39 (11%)	18 (5%)	36 (9%)	33 (8%)	46 (12%)
Uncertain	26 (7%)	16 (5%)	18 (5%)	29 (7%)	13 (4%)
<b>Total</b>	<b>365 (100%)</b>	<b>355 (100%)</b>	<b>389 (100%)</b>	<b>407 (100%)</b>	<b>373 (100%)</b>

\* New patients receiving first haemodialysis treatment

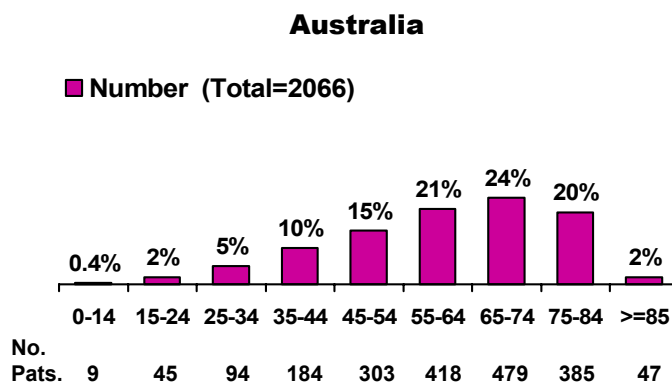
**Figure 5.6**

**Proportion (%) of Prevalent Patients aged  $\geq 65$  years Treated with Home Haemodialysis 2003 - 2007**

State	2003	2004	2005	2006	2007
Queensland	2%	2%	3%	4%	4%
New South Wales	7%	7%	6%	5%	5%
Australian Capital Territory	7%	5%	3%	4%	4%
Victoria	2%	2%	2%	2%	3%
Tasmania	-	-	1%	3%	3%
South Australia	<1%	2%	1%	-	-
Northern Territory	-	-	-	2%	2%
Western Australia	<1%	<1%	<1%	<1%	-
<b>Australia</b>	<b>4%</b>	<b>3%</b>	<b>3%</b>	<b>3%</b>	<b>3.5%</b>
<b>New Zealand</b>	<b>5%</b>	<b>5%</b>	<b>5%</b>	<b>6%</b>	<b>8%</b>

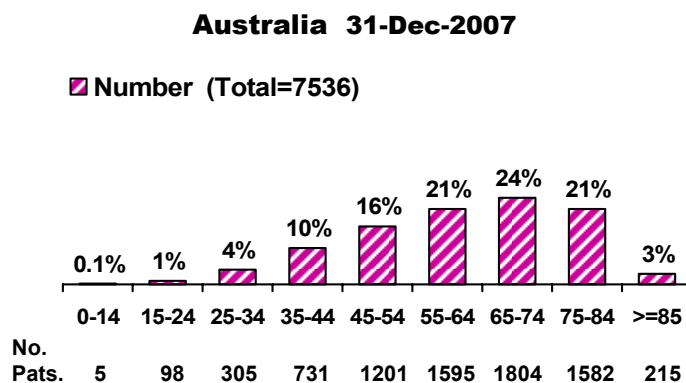
**Figure 5.7**

**Age of New Haemodialysis Patients 2007**



**Figure 5.8**

**Age of Current Haemodialysis Patients**





**NEW ZEALAND** (continued from page 5-2)

There were 373 patients who received HD for the first time, an 8% decrease in number from 2006 after an increase of 5% from 2005. Fifteen percent of these were previously dialysing with peritoneal dialysis, 3% failed transplants and 82% having their initial dialysis treatment.

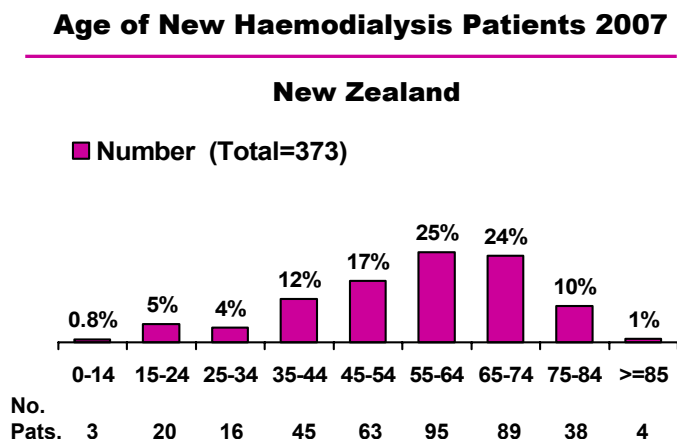
The modal age group was 55-64 years (25%), 10% were <35 years and 35% ≥ 65 years (Figures 5.5 and 5.9). The age distribution of the prevalent HD population ≥ 75 years (9%), was younger than in Australia (Figure 5.10).

Sixty HD patients received transplants in 2007 (57 in 2006), representing 5% of all HD patients dialysing and 6% of those patients < 65 years. Six patients ≥ 65 years were transplanted.

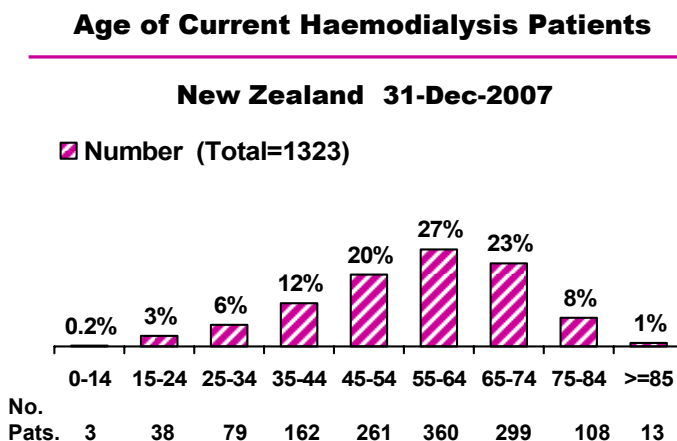
There were 175 deaths, a rate of 13.7 deaths per 100 person-years of treatment (Figure 3.11).

For more details see Appendix III at the Website  
 ([www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm](http://www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm)).

**Figure 5.9**



**Figure 5.10**



**AUSTRALIA**

The prescribed blood flow rate of 300 mls/minute or higher in 2007 of 76% has remained similar since 2003. Only 5% (377 patients) were prescribed less than 250 mls/minute.

Blood flow rates are lower in patients dialysing using central venous catheters than in those using AVFs or AVGs (Figure 5.12).

**NEW ZEALAND**

In December 2007, 64% of patients were prescribed 300 mls/minute or higher compared to 66% in December 2006 and 67% in December 2005. There were 7% using < 250 mls/minute, the same as last year compared to 10% in December 2005; many of these were receiving long hour HD.

**Figure 5.11**

<b>Blood Flow Rates (mls/minute) 2002 - December 2007</b>								
Country	No. Pts	Mls/Minute						
		<200	200-249	250-299	300-349	350-399	>400	
<b>Aust</b>	* December 2007	7536	<1%	5%	18%	53%	19%	4%
	* December 2006	7160	<1%	5%	19%	52%	19%	4%
	December 2005	6717	<1%	5%	19%	53%	18%	4%
	December 2004	6206	<1%	5%	18%	55%	18%	4%
	March 2004	5924	<1%	6%	18%	55%	17%	4%
	March 2003	5502	<1%	6%	18%	57%	16%	3%
	March 2002	5128	<1%	6%	20%	56%	15%	3%
<b>NZ</b>	December 2007	1323	<1%	7%	29%	41%	21%	2%
	December 2006	1207	<1%	7%	27%	44%	20%	2%
	December 2005	1134	<1%	9%	24%	43%	22%	2%
	December 2004	1031	1%	10%	25%	42%	20%	2%
	March 2004	938	<1%	8%	21%	45%	23%	3%
	March 2003	826	<1%	10%	23%	43%	23%	1%
	March 2002	761	<1%	15%	30%	37%	17%	1%

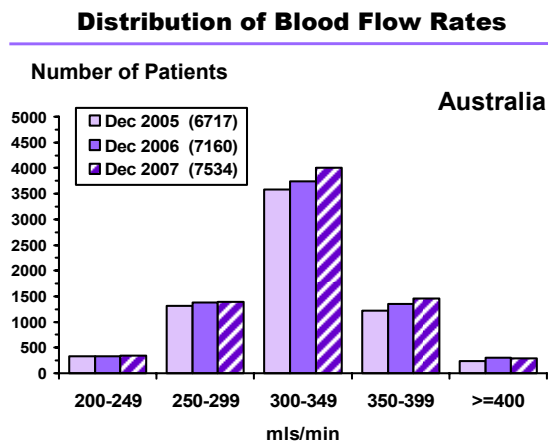
**Figure 5.12**

<b>Blood Flow Rate by Type of Access December 2007</b>						
Blood Flow Rate	Australia			New Zealand		
	AVF	AVG	CVC *	AVF	AVG	CVC
<200	20 (<1%)	-	16 (2%)	3 (<1%)	-	3 (1%)
200-249	191 (3%)	33 (4%)	116 (11%)	58 (6%)	6 (8%)	25 (8%)
250-299	942 (17%)	130 (16%)	319 (31%)	173 (19%)	35 (46%)	175 (52%)
300-349	3047 (53%)	492 (61%)	472 (46%)	398 (44%)	29 (38%)	111 (33%)
350-399	1230 (22%)	138 (17%)	96 (9%)	251 (28%)	6 (8%)	21 (6%)
>=400	279 (5%)	12 (2%)	1 (<1%)	29 (3%)	-	-
<b>Total</b>	<b>5709 (100%)</b>	<b>805 (100%)</b>	<b>1020 (100%)</b>	<b>912 (100%)</b>	<b>76 (100%)</b>	<b>335 (100%)</b>

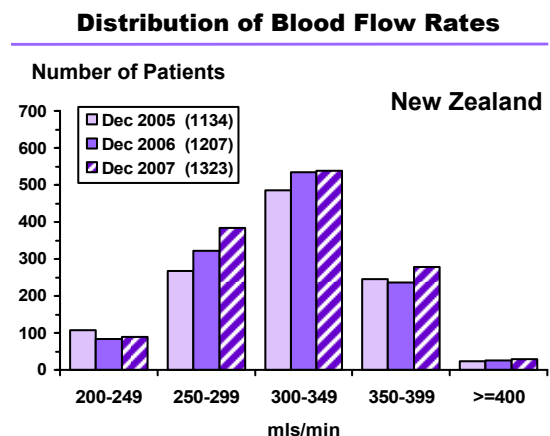
\* One patient having C.V.V. HD as at 31-Dec-2006 not included

\* Two patients having C.V.V. HD as at 31-Dec-2007 not included

**Figure 5.13**



**Figure 5.14**





**Figure 5.15**

**Duration and Number of Sessions Per Week  
December 2007**

Sessions Per week	Hours of Each Treatment					Total
	<4	4-4.4	4.5-4.9	5-5.4	>=5.5	
<b>Australia</b>						
<=3	334 (4%)	2932 (43%)	1324 (19%)	2041 (30%)	255 (4%)	<b>6886</b>
3.5-4.5	30 (6%)	59 (12%)	46 (9%)	85 (17%)	269 (55%)	<b>489</b>
>=5	94 (59%)	17 (11%)	4 (2%)	8 (5%)	36 (23%)	<b>159</b>
<b>Total</b>	<b>458 (6%)</b>	<b>3008 (40%)</b>	<b>1374 (18%)</b>	<b>2134 (28%)</b>	<b>560 (7%)</b>	<b>7534 *</b>
<b>New Zealand</b>						
<=3	40 (3%)	442 (36%)	283 (23%)	366 (30%)	88 (7%)	<b>1219</b>
3.5-4.5	9 (12%)	12 (16%)	6 (8%)	25 (32%)	25 (32%)	<b>77</b>
>=5	18 (67%)	3 (11%)	2 (7%)	3 (11%)	1 (4%)	<b>27</b>
<b>Total</b>	<b>67 (5%)</b>	<b>457 (34%)</b>	<b>291 (22%)</b>	<b>394 (30%)</b>	<b>114 (9%)</b>	<b>1323</b>

\* Two patients having C.V.V. HD as at 31-Dec-2007 not included

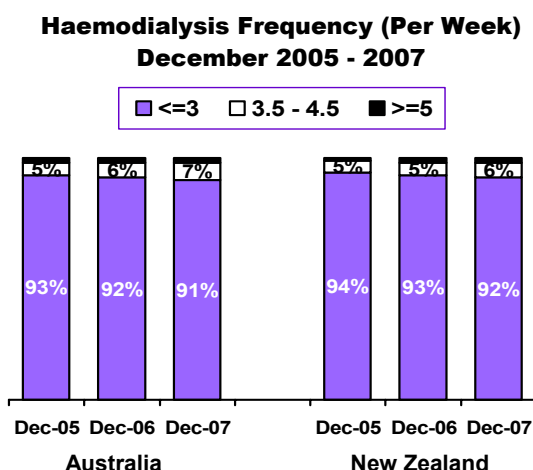
**FREQUENT AND LONG HAEMODIALYSIS**

While the proportions dialysing >3 times per week remains below 10%, it continues to increase, particularly in Australia. (Figures 5.15 - 5.23)

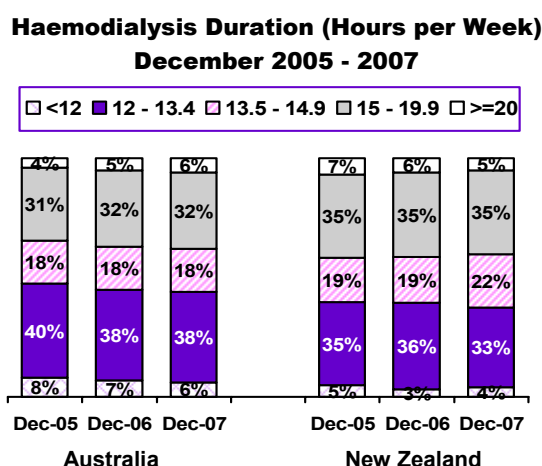
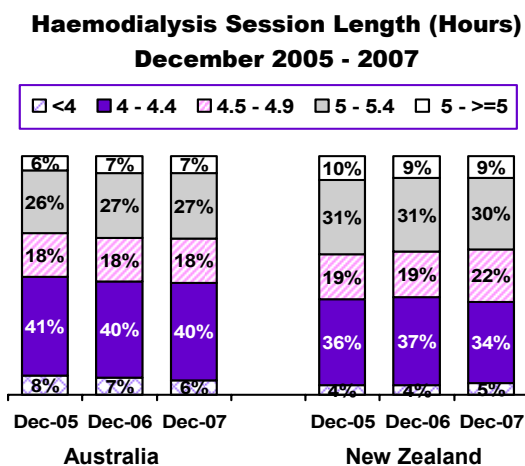
The proportions dialysing ≥ 4.5 hours per session is also increasing. As a result, the proportions dialysing more than the “standard” 12 hours per week have been increasing, particularly in Australia.

In 2007, 56% and 62% of HD patients were dialysing > 12 hours per week in Australia and New Zealand respectively.

**Figure 5.16**



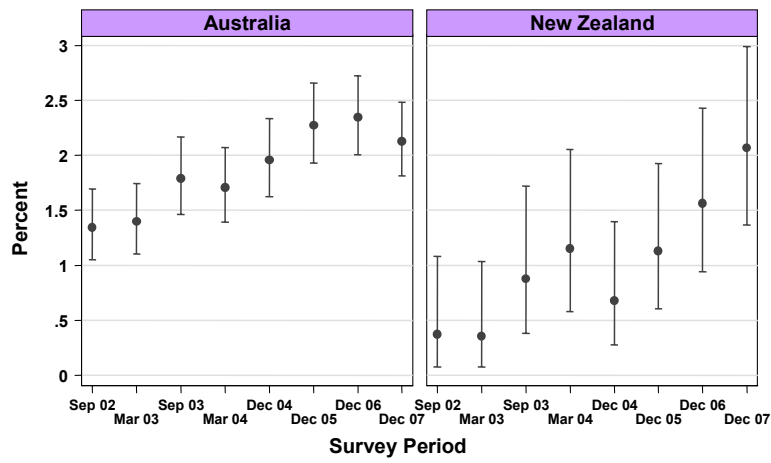
**Figure 5.18**





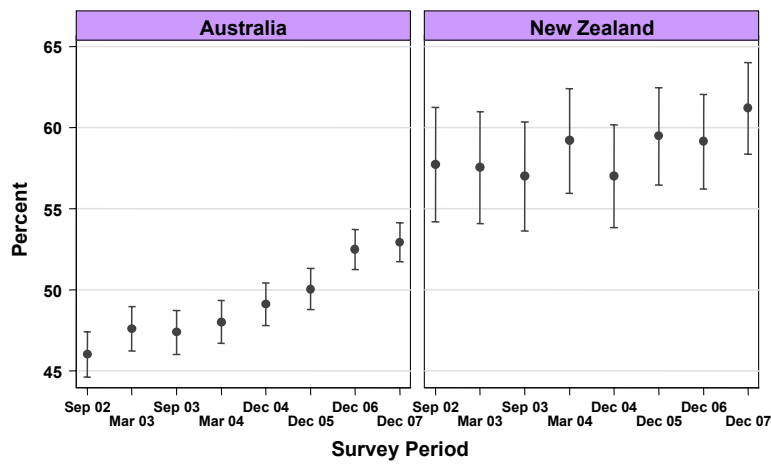
**Figure 5.19**

**Percentage of Patients  
Dialysing Five or More Days per Week**



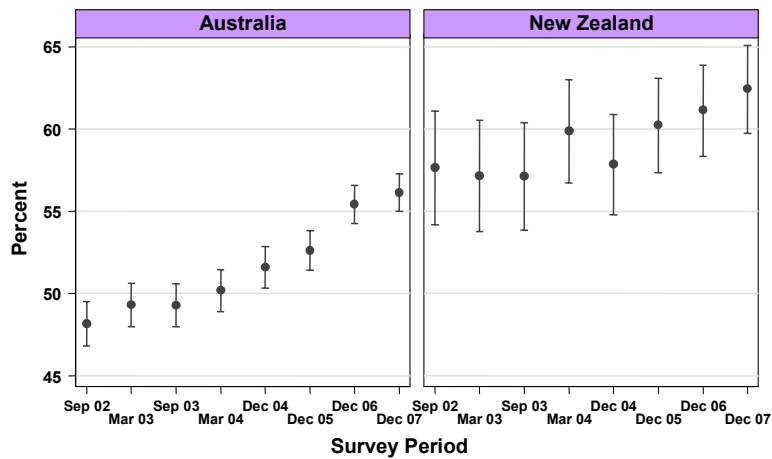
**Figure 5.20**

**Percentage of Patients  
Dialysing Three Days per Week  
Dialysing 4.5 Hours per Session or Longer**



**Figure 5.21**

**Percentage of Patients  
Dialysing >12 Hours per Week**



Dialysis frequency and session length vary among the Australian States. Patients in Queensland, Victoria and South Australia are more likely to dialyse more frequently, while patients in New South Wales/ACT and the Northern Territory tend to dialyse longer per session on average (Figures 5.22 - 5.25).

In most States there is a trend to longer hours (per week) over the three most recent surveys.

**Figure 5.22**

<b>Haemodialysis Percentage <math>\geq 5</math> Sessions per Week By Australian State and Country</b>								
	<b>Australia</b>							<b>New Zealand</b>
	<b>Qld</b>	<b>NSW/ACT</b>	<b>Vic</b>	<b>Tas</b>	<b>SA</b>	<b>NT</b>	<b>WA</b>	
Dec 04	39 (4%)	10 (<1%)	39 (2%)	2 (2%)	11 (3%)	4 (2%)	17 (3%)	7 (<1%)
Dec 05	54 (4%)	23 (2%)	48 (3%)	3 (2%)	10 (2%)	1 (<1%)	14 (2%)	14 (1%)
Dec 06	51 (4%)	33 (1%)	56 (3%)	3 (2%)	14 (3%)	3 (1%)	12 (2%)	20 (2%)
Dec 07	58 (4%)	25 (1%)	52 (3%)	1 (<1%)	9 (2%)	-	14 (2%)	27 (2%)

**Figure 5.23**

<b>Haemodialysis Percentage <math>\geq 4.5</math> Hours Per Session Three Session per Week By Australian State and Country</b>								
	<b>Australia</b>							<b>New Zealand</b>
	<b>Qld</b>	<b>NSW/ACT</b>	<b>Vic</b>	<b>Tas</b>	<b>SA</b>	<b>NT</b>	<b>WA</b>	
Dec 04	382 (40%)	1450 (76%)	539 (35%)	29 (25%)	95 (25%)	191 (79%)	143 (23%)	552 (57%)
Dec 05	477 (46%)	1536 (75%)	565 (35%)	34 (29%)	111 (25%)	236 (85%)	133 (21%)	632 (60%)
Dec 06	620 (57%)	1653 (76%)	575 (33%)	43 (39%)	116 (27%)	243 (84%)	150 (24%)	648 (59%)
Dec 07	677 (59%)	1665 (74%)	606 (34%)	46 (41%)	118 (27%)	276 (86%)	184 (27%)	729 (61%)

**Figure 5.24**

<b>Haemodialysis Percentage <math>&gt;12</math> Hours per Week By Australian State and Country</b>								
	<b>Australia</b>							<b>New Zealand</b>
	<b>Qld</b>	<b>NSW/ACT</b>	<b>Vic</b>	<b>Tas</b>	<b>SA</b>	<b>NT</b>	<b>WA</b>	
Dec 04	484 (44%)	1535 (76%)	650 (39%)	36 (30%)	132 (32%)	197 (79%)	171 (27%)	597 (58%)
Dec 05	600 (49%)	1657 (75%)	719 (40%)	46 (35%)	138 (29%)	237 (84%)	164 (25%)	696 (60%)
Dec 06	769 (60%)	1827 (76%)	753 (39%)	54 (44%)	143 (30%)	250 (83%)	186 (28%)	733 (61%)
Dec 07	845 (62%)	1880 (75%)	802 (40%)	55 (43%)	152 (32%)	272 (86%)	223 (31%)	825 (62%)

## OUTCOME AMONG HAEMODIALYSIS PATIENTS

In Australia, there has been little change in haemodialysis patient survival over time, after adjusting for age, diabetes status, sex, race and comorbidities.

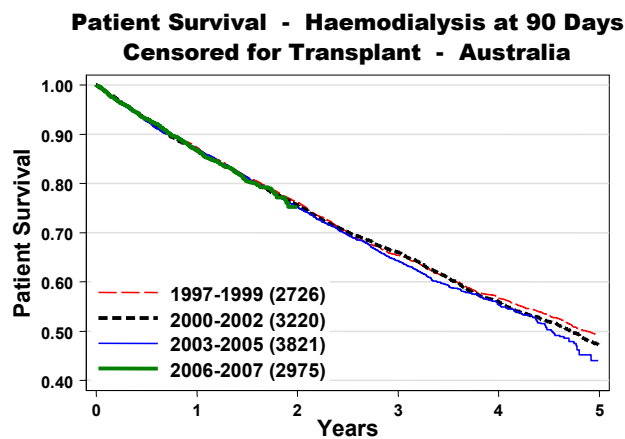
In New Zealand, recent cohorts have better survival.

In both countries, diabetes status and age have marked effects on haemodialysis patient survival. (Figures 5.25 - 5.35).

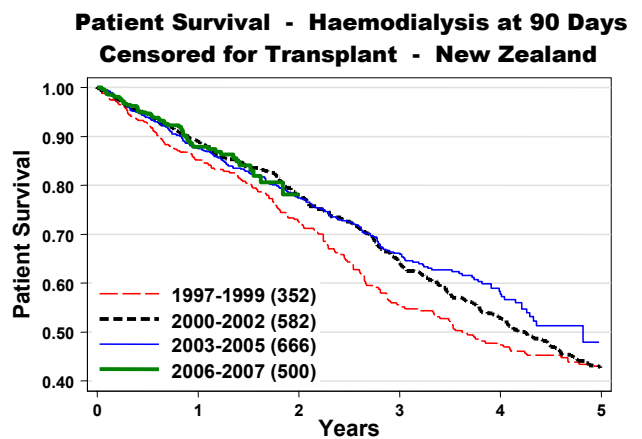
**Note: For all tables and graphs the times indicated are from the 90th day and not the first treatment.**

<b>Figure 5.25</b>					
<b>Haemodialysis at 90 Days Patient Survival Censored for Transplant 1997 - 2007</b>					
<b>% [95% Confidence Interval]</b>					
	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Australia</b>					
1997-1999	2726	93 [91, 93]	87 [86, 88]	65 [63, 67]	49 [47, 51]
2000-2002	3220	93 [92, 94]	87 [85, 88]	66 [64, 68]	47 [45, 49]
2003-2005	3821	93 [92, 93]	87 [86, 88]	64 [63, 66]	-
2006-2007	2975	93 [92, 94]	87 [85, 88]		
<b>New Zealand</b>					
1997-1999	352	92 [89, 94]	85 [81, 89]	55 [49, 61]	43 [37, 49]
2000-2002	582	95 [92, 96]	89 [86, 91]	64 [60, 68]	43 [38, 47]
2003-2005	666	94 [92, 96]	87 [85, 90]	66 [62, 70]	-
2006-2007	500	95 [92, 96]	88 [84, 91]		

**Figure 5.26**



**Figure 5.27**



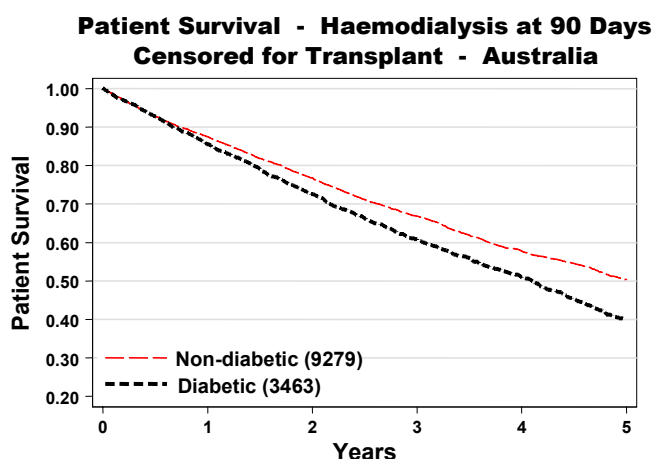


**Figure 5.28**

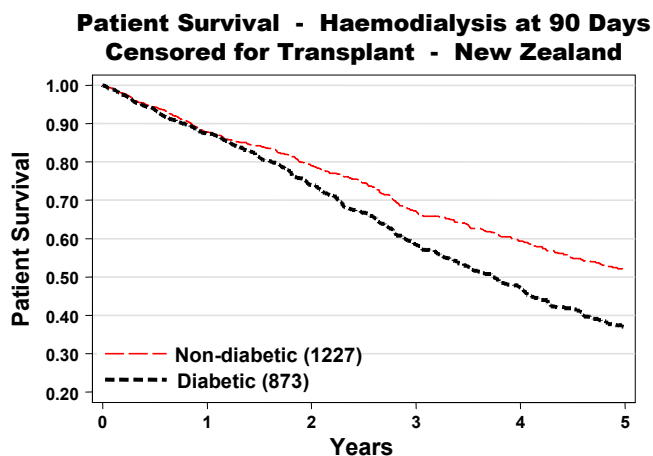
**Haemodialysis at 90 Days  
Patient Survival - Diabetic / Non Diabetic  
Censored for Transplant 1997 - 2007  
% [95% Confidence Interval]**

	Survival			
	6 months	1 year	3 years	5 years
<b>Australia</b>				
Non Diabetic (9279)	93 [92, 93]	87 [87, 88]	67 [66, 68]	50 [49, 52]
Diabetic (3463)	93 [92, 93]	86 [84, 87]	61 [59, 63]	40 [38, 42]
<b>New Zealand</b>				
Non Diabetic (1227)	94 [93, 95]	88 [86, 90]	67 [64, 70]	52 [48,56]
Diabetic (873)	94 [92, 95]	87 [85, 90]	58 [54, 62]	37 [32,41]

**Figure 5.29**



**Figure 5.30**

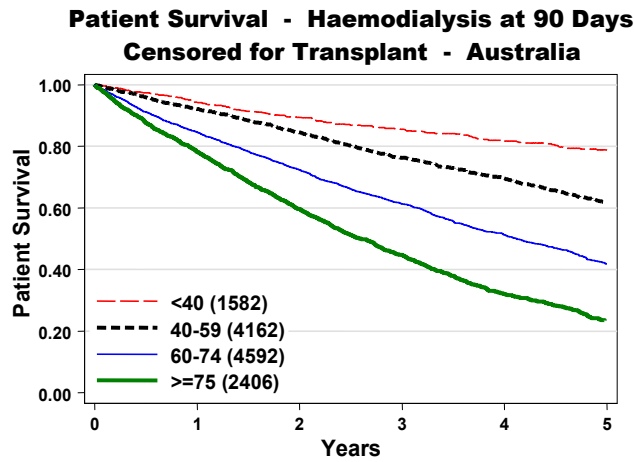


**Figure 5.31**

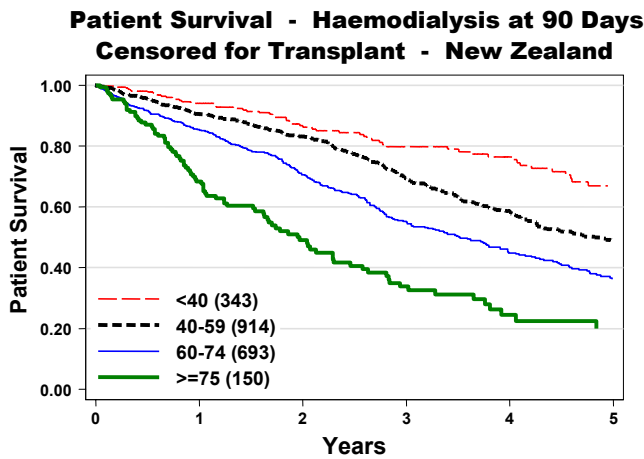
**Haemodialysis at 90 Days  
Patient Survival - By Age Group  
Censored for Transplant 1997 - 2007  
% [95% Confidence Interval]**

Age Groups	No. of Patients	Survival			
		6 months	1 year	3 years	5 years
<b>Australia</b>					
0-39 years	1582	97 [96, 98]	94 [93, 95]	86 [83, 88]	79 [76, 82]
40-59 years	4162	96 [95, 96]	92 [91, 93]	76 [75, 78]	62 [60, 64]
60-74 years	4592	91 [90, 92]	85 [83, 86]	61 [60, 63]	42 [40, 44]
75 and over	2406	88 [86, 89]	78 [76, 80]	45 [42, 47]	23 [21, 26]
<b>New Zealand</b>					
0-39 years	343	98 [95, 99]	94 [91, 96]	80 [73, 85]	67 [58, 74]
40-59 years	914	96 [94, 97]	90 [88, 92]	69 [65, 73]	49 [44, 54]
60-74 years	693	92 [89, 93]	85 [82, 88]	55 [50, 59]	36 [31, 41]
75 and over	150	87 [80, 92]	68 [60, 75]	34 [25, 43]	20 [12, 30]

**Figure 5.32**



**Figure 5.33**



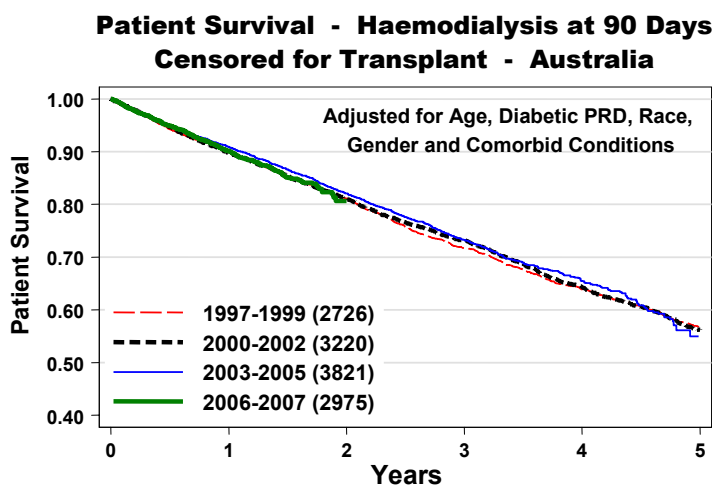


Figures 5.34 - 5.35.

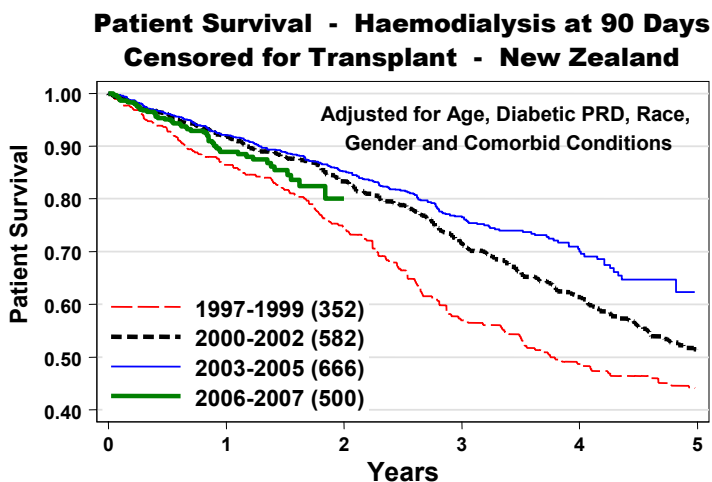
These figures show survival curves for patients treated with haemodialysis at day 90, adjusted to a median age of 62.4 years for Australia and 56.4 years for New Zealand; non-diabetic primary renal disease; caucasoid race; female gender and no comorbid conditions (lung disease, coronary artery disease, peripheral vascular disease or cerebrovascular disease).

Note x axis scale refers to time after day 90. PRD = Primary renal disease.

**Figure 5.34**



**Figure 5.35**



## MEMBRANE TYPE AND SURFACE AREAS

### AUSTRALIA

Figures 5.36 - 5.38.

Usage of low flux polysulfone dialysers continued to decrease (11% in December 2007 from 16% in 2006 and 19% in 2005), while use of high flux polysulphone remained at 7% in both 2007 and 2006, 9% in 2005 and 39% in 2004. High flux Polysulphone-Helixone increased to 39% in December 2007 from 34% in 2006 and 27% in 2005. High flux Polyamix increased to 20% this year from 16% in 2006 and 15% in 2005.

Seventy two percent of patients received dialysis with high flux dialysers (64% in 2006 and 57% in 2005). Use of haemophan continues to decrease; only four patients at December 2007.

Nine patients were receiving haemofiltration in NSW/ACT and 231 haemodiafiltration across all States and the ACT.

### NEW ZEALAND

Figures 5.36 and 5.38.

Haemophan decreased to just two patients in December 2007, while low flux polysulphone decreased to 38% from 48% in the past three years.

There were 29% (382 patients) reported as receiving dialysis with high flux dialysers in December 2007, an increase from 22% in 2006 and 20% in 2005.

No patients were receiving haemofiltration or haemodiafiltration.

Figure 5.36

Haemodialyser Membrane Types by Surface Area 31-Dec-2007							
Dialyser Membrane Type	Flux	Square Metres					Total
		<1.0	1.0-1.4	1.5-1.7	1.8-1.9	>1.9	
<b>Australia</b>							
Acrylonitrile SMSC	High	-	1	-	-	-	1
Cellulose Acetate	Low	-	-	1	-	3	4
Cellulose Triacetate	High	-	-	61	60	97	218
Diacetate	Low	-	-	11	-	110	121
Haemophan	Low	-	-	-	-	4	4
Polyamide Haemodiafilt.	High	-	-	-	-	1	1
Polyamix	High	-	40	609	-	846	1495
Polyamix	Low	-	81	659	-	368	1108
Polyethersulfone	High	-	-	4	75	175	254
Polysulphone	High	-	49	0	118	327	494
Polysulphone	Low	5	100	-	435	325	865
Polysulphone-Helixone	High	-	1184	-	1771	7	2962
Polysynthane	Low	-	-	3	-	4	7
<b>Total</b>		<b>5</b>	<b>1455</b>	<b>1348</b>	<b>2459</b>	<b>226</b>	<b>7534</b>
<b>New Zealand</b>							
Haemophan	Low	-	1	-	-	1	2
Polyamide Haemodiafilt.	High	-	-	-	-	1	1
Polyamix	High	-	2	26	-	152	180
Polyamix	Low	-	20	147	-	272	439
Polysulphone	High	-	2	-	198	-	200
Polysulphone	Low	3	14	-	256	227	500
Polysulphone-Helixone	High	-	1	-	-	-	1
<b>Total</b>		<b>3</b>	<b>40</b>	<b>173</b>	<b>454</b>	<b>653</b>	<b>1323</b>

Figure 5.37

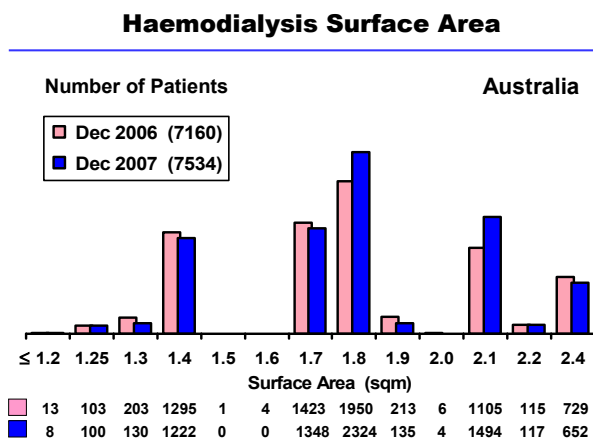
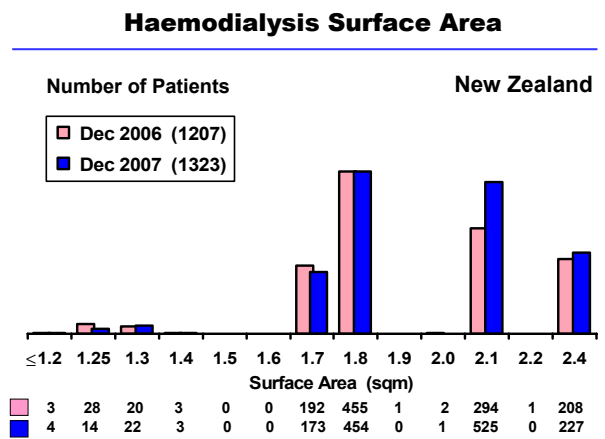


Figure 5.38





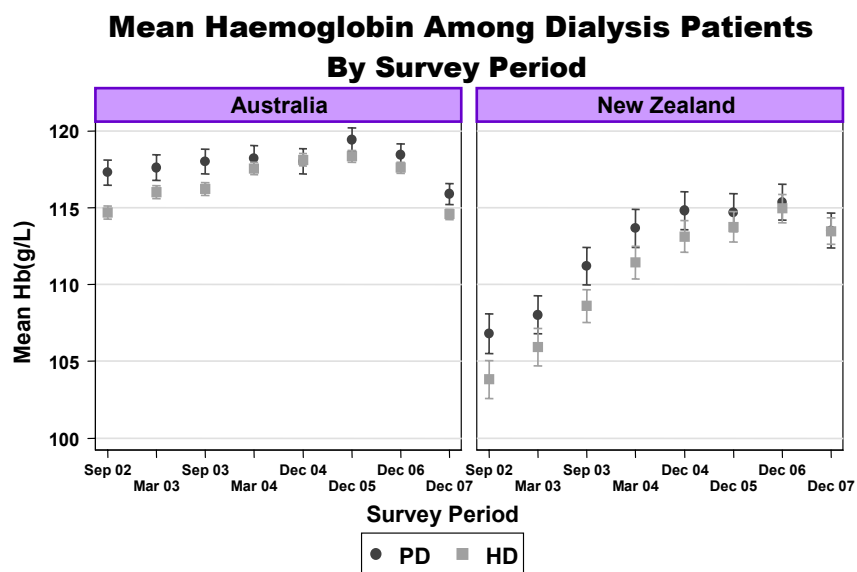
## ANAEMIA

In Australia, mean haemoglobin and erythropoietin agent usage has stabilised. Haemodialysis patients had higher erythropoietic agent usage and lower mean haemoglobin than peritoneal dialysis patients.

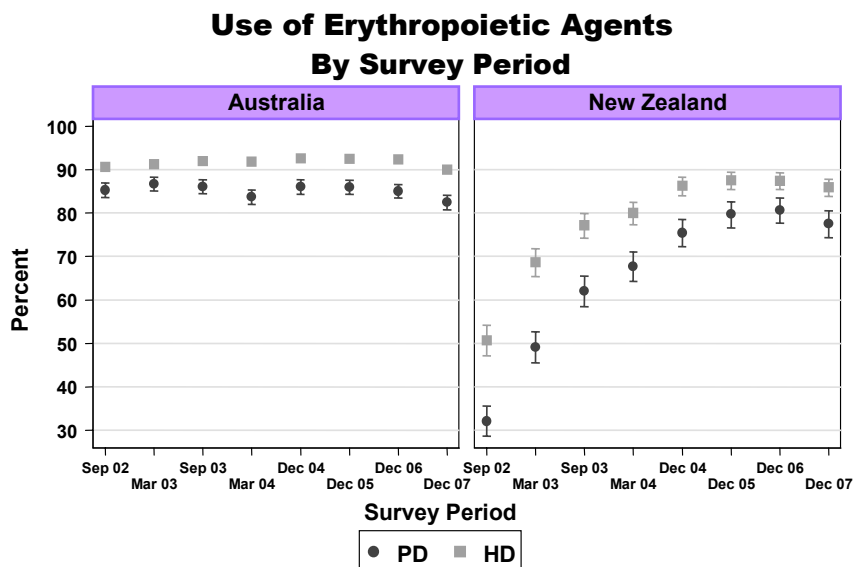
In New Zealand, mean haemoglobin has stabilised at about 115 g/L. The increase in erythropoietic agent usage has plateaued.

Figures 5.39 and 5.40 refer to all dialysis patients (PD and HD).

**Figure 5.39**



**Figure 5.40**





## HAEMOGLOBIN

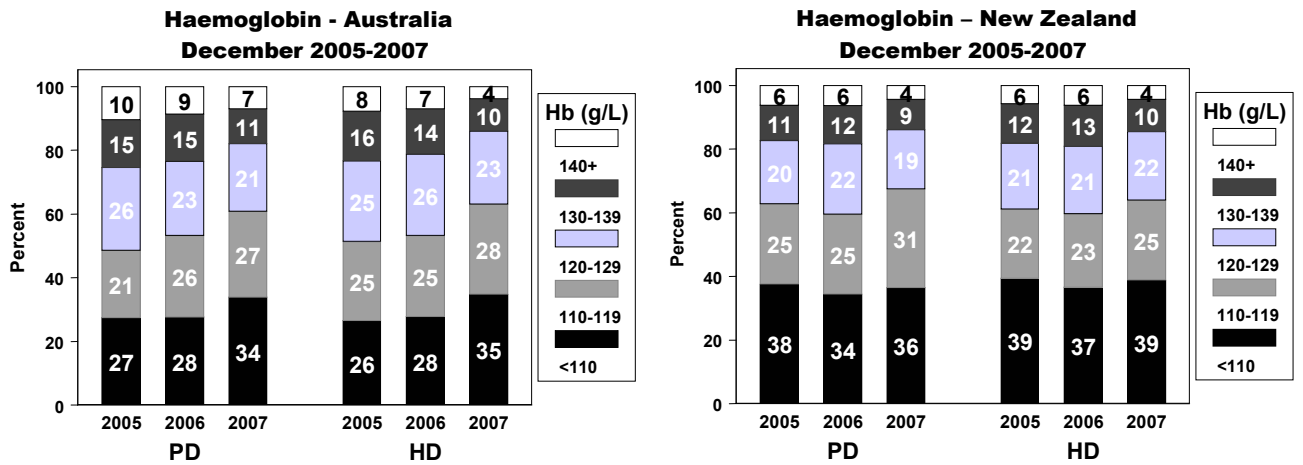
In Australia, haemoglobin was  $<110$  g/L in about 34% of dialysis patients, higher than in previous years and  $\geq 140$ g/L in about 5%, which is slightly lower than previous years.

In New Zealand, the corresponding percentages are about 38% and 4% respectively.

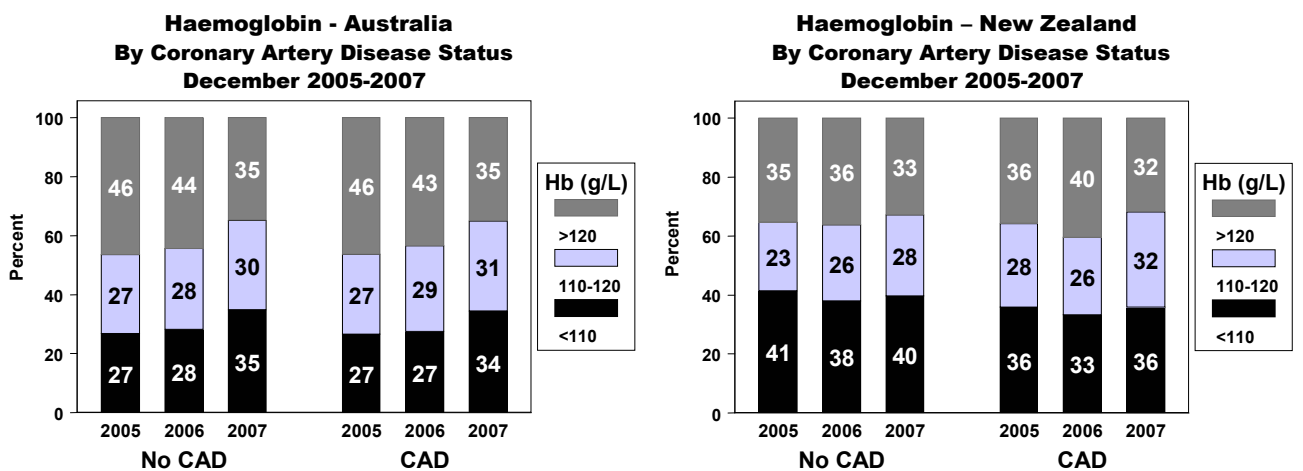
Figure 5.42 shows the proportion of patients with proven or likely cardiovascular disease achieving the clinical target of haemoglobin  $\leq 120$  g/L as recommended in the CARI guidelines. (<http://www.cari.org.au/Haemoglobin>, currently under revision).

Figures 5.41 and 5.42 refer to all dialysis patients (PD and HD).

**Figure 5.41**



**Figure 5.42**





## HAEMOGLOBIN IN DIALYSIS PATIENTS

Figures 5.43 - 5.50.

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

In Australia, median haemoglobin for each centre ranged from 106 to 127 g/L for haemodialysis patients and 108-131 g/L for peritoneal dialysis patients.

Corresponding figures for New Zealand were 105-118 g/L for haemodialysis patients and 99-119 g/L for peritoneal dialysis patients.

### HAEMODIALYSIS

Figure 5.43

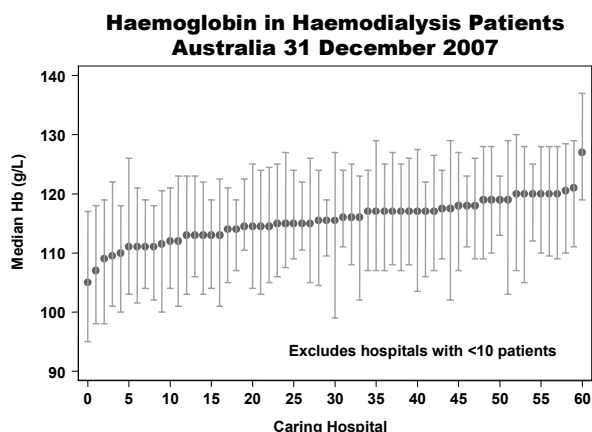


Figure 5.44

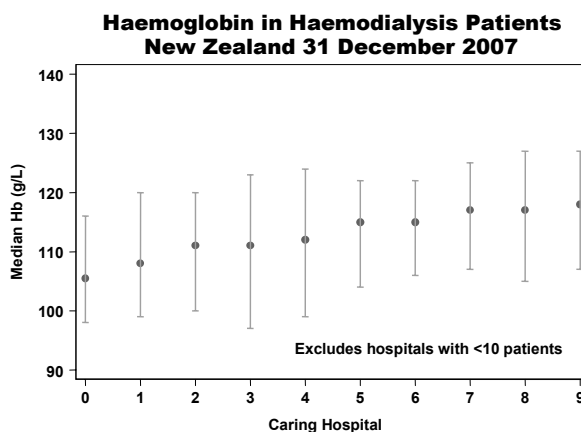


Figure 5.45

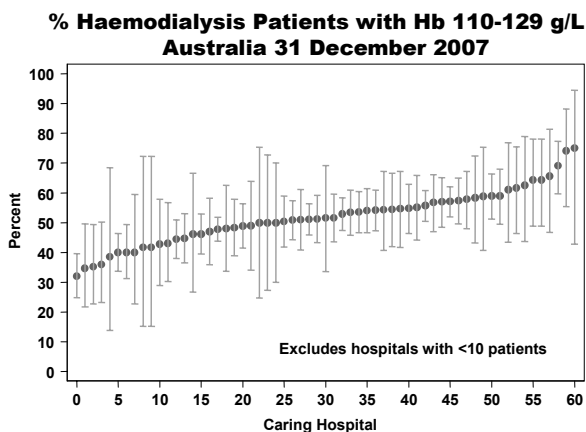
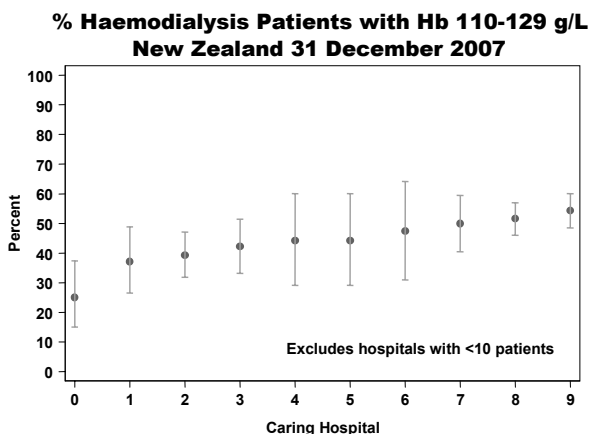


Figure 5.46



## HAEMOGLOBIN IN DIALYSIS PATIENTS

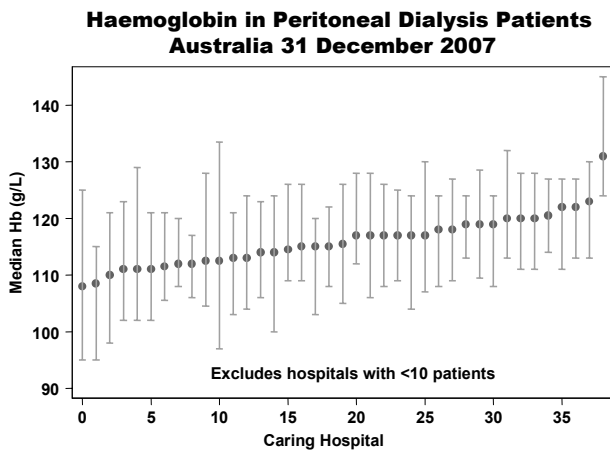
In Australia, the proportion of patients with a haemoglobin of 110-129 g/L in each centre ranged from 32% to 75% for haemodialysis patients and 22% to 73% for peritoneal dialysis patients.

This large variation probably reflects differences in practices, protocols and patient case-mix among centres.

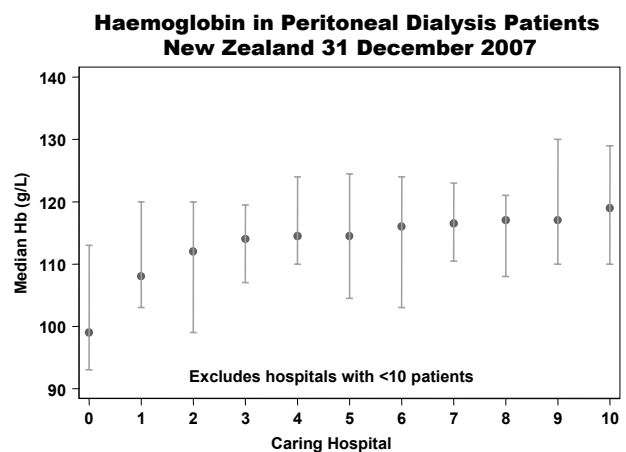
Corresponding figures for New Zealand were 25% to 56% for haemodialysis and 27% to 71% for peritoneal dialysis patients.

### PERITONEAL DIALYSIS

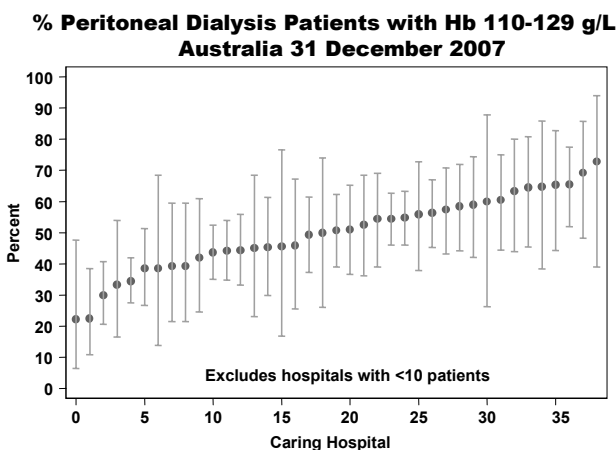
**Figure 5.47**



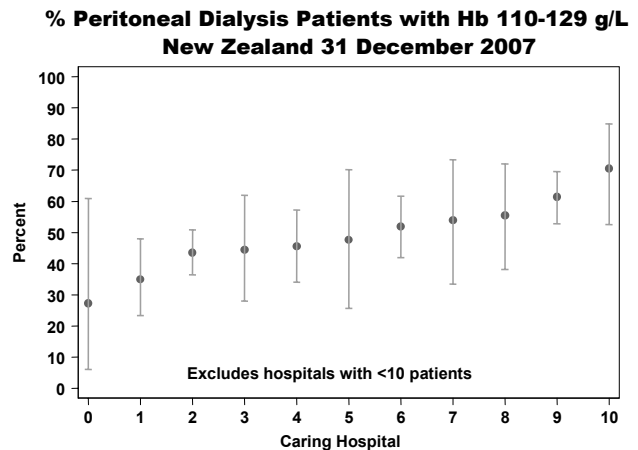
**Figure 5.48**



**Figure 5.49**



**Figure 5.50**





## FERRITIN AND TRANSFERRIN SATURATION

Figures 5.51 - 5.54.

In Australia, the proportions of peritoneal dialysis patients with ferritin <200 mcg/L have increased, while those with ferritin  $\geq$ 500 mcg/L have decreased. The corresponding proportions of haemodialysis patients have been stable.

In New Zealand, the proportions of patients with ferritin  $\geq$ 500 mcg/L have increased only in haemodialysis patients, while those <200 mcg/L have remained similar.

In both Australia and New Zealand, distributions of transferrin saturation have been unchanged for the past 3 years, although in 2007 there was an increase in the proportion of haemodialysis patients with transferrin saturation <20% in New Zealand.

Figure 5.51

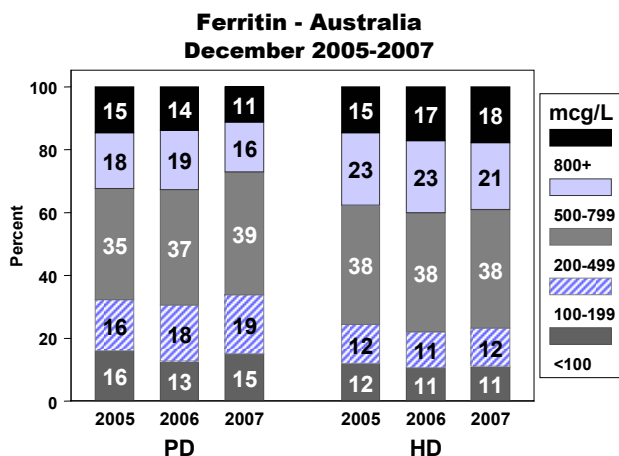


Figure 5.52

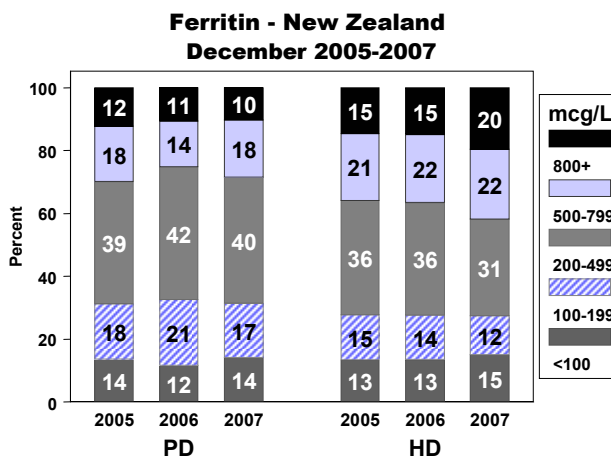


Figure 5.53

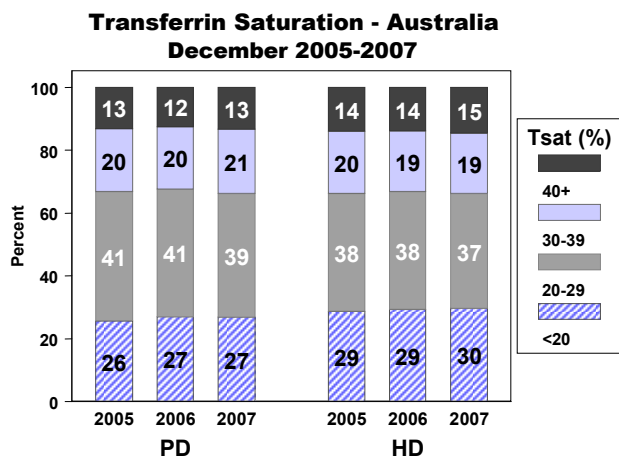
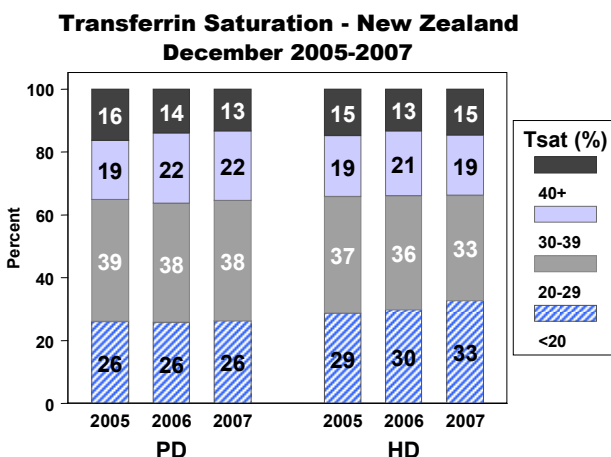


Figure 5.54



## FERRITIN BY TREATING CENTRE

Figures 5.55 - 5.62.

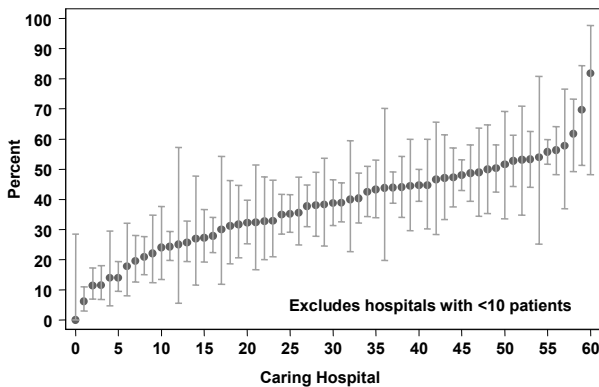
These figures show the proportions of patients in each centre with ferritin of 200-500 mcg/L and transferrin saturation of 30-40% respectively, as recommended by the CARI guidelines.

In Australia, the proportions of patients with ferritin within this range in each centre varied widely (0-83% for haemodialysis patients and 11-63% for peritoneal dialysis patients). Similarly large variations between centres were seen for transferrin saturation (31-91% for haemodialysis patients, 28-93% for peritoneal dialysis patients). Again, this large variation probably reflects differences in practices, protocols and patient case-mix among centres.

In New Zealand, the corresponding figures for ferritin were 19-45% for haemodialysis and 29-64% for peritoneal dialysis respectively. The corresponding figures for transferrin saturation were 45-81% for haemodialysis and 51-84% for peritoneal dialysis respectively. In both countries, significant proportions of patients did not have ferritin and transferrin saturation within the recommended ranges, even in the “best performing” centres.

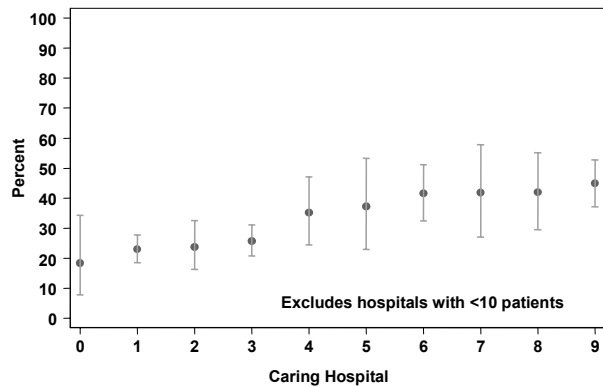
**Figure 5.55**

**% Haemodialysis Patients with Ferritin 200-500 mcg/L Australia 31 December 2007**



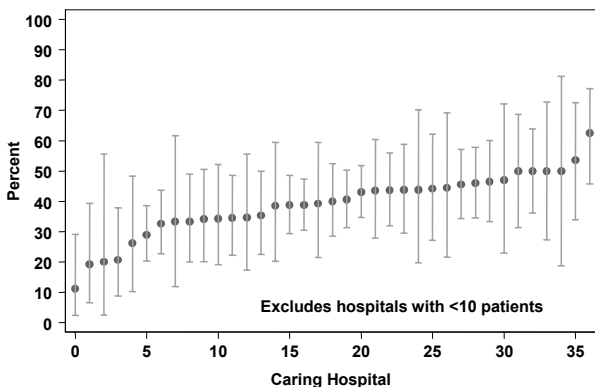
**Figure 5.56**

**% Haemodialysis Patients with Ferritin 200-500 mcg/L New Zealand 31 December 2007**



**Figure 5.57**

**% Peritoneal Dialysis Patients with Ferritin 200-500 mcg/L Australia 31 December 2007**



**Figure 5.58**

**% Peritoneal Dialysis Patients with Ferritin 200-500 mcg/L New Zealand 31 December 2007**

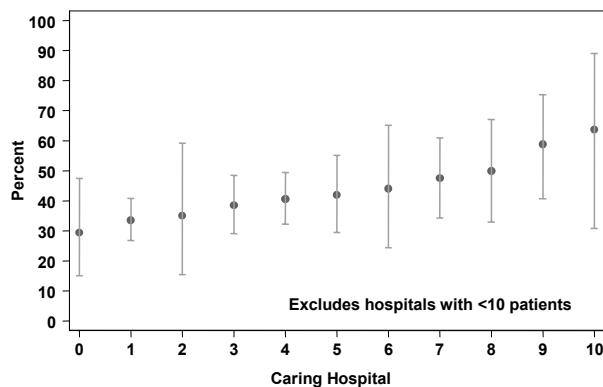




Figure 5.59

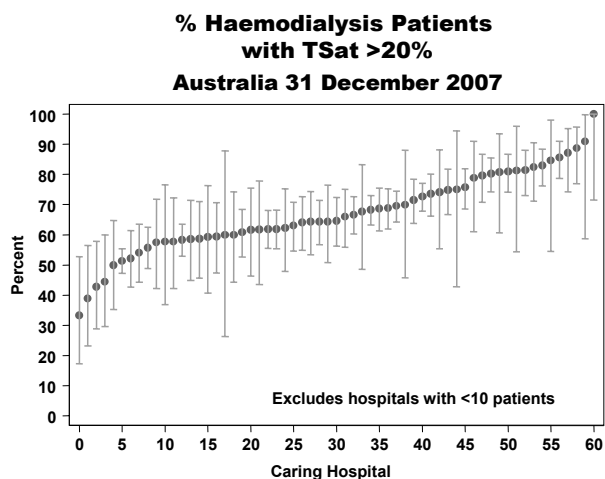


Figure 5.60

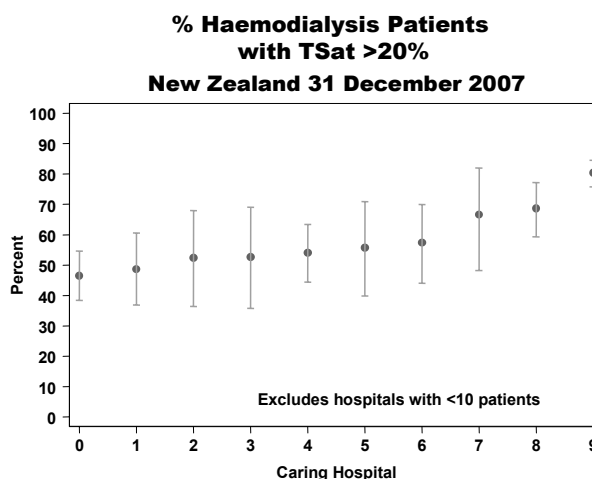


Figure 5.61

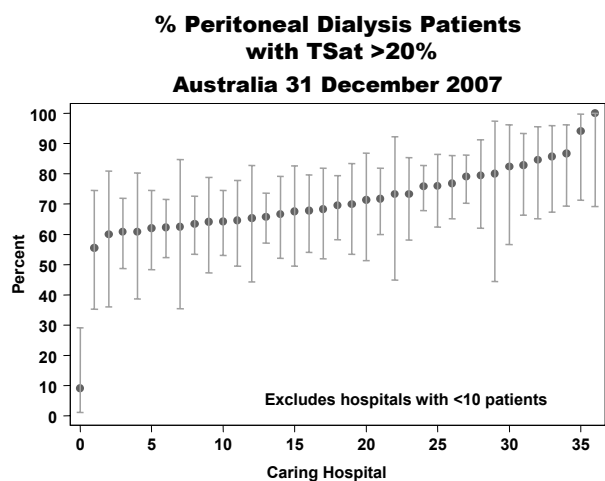
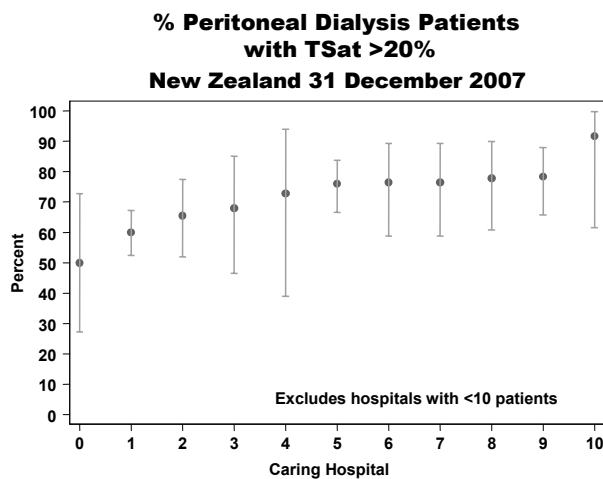


Figure 5.62



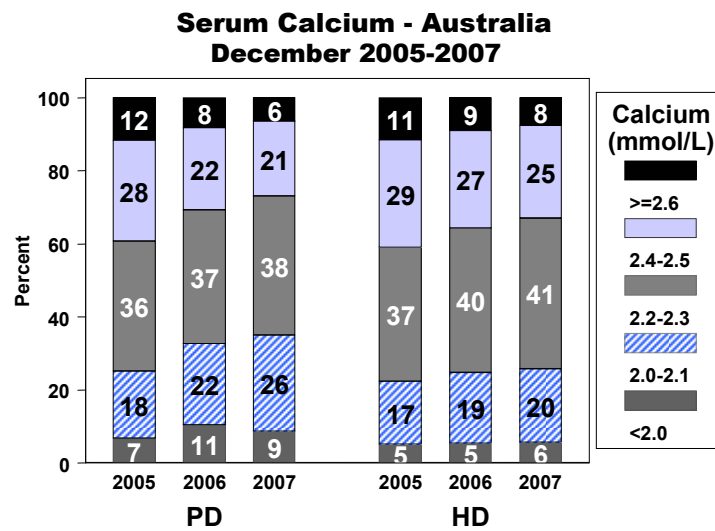
## SERUM CALCIUM

Figures 5.63 - 5.64.

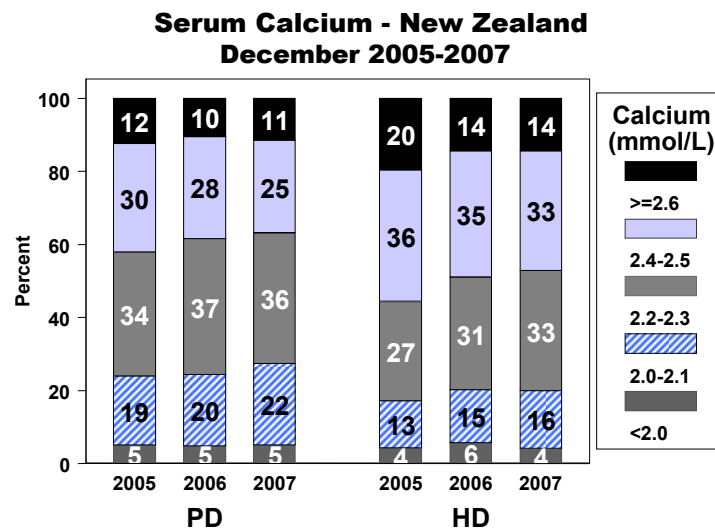
In both Australia and New Zealand the proportions of patients with proportions with serum calcium  $\geq 2.4$  mmol/L have decreased over the past three years, while those with  $< 2.2$  mmol/L have increased.

Haemodialysis patients tended to have higher serum calcium than peritoneal dialysis patients.

**Figure 5.63**



**Figure 5.64**





## SERUM CALCIUM BY TREATING CENTRE

Figures 5.65 to 5.68 show the proportions of patients at each centre with serum calcium 2.1-2.4 mmol/L, as recommended by the CARI guidelines.

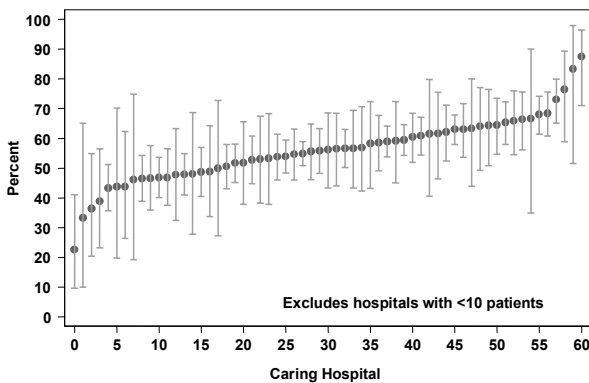
Note however that the values in the guidelines were for corrected total calcium, while those in this report are for uncorrected total calcium.

In Australia, the proportions ranged widely: 23-88% for haemodialysis patients and 36-72% for peritoneal dialysis patients.

In New Zealand, the corresponding proportions were 34-62% for haemodialysis patients and 38-64% for peritoneal dialysis patients.

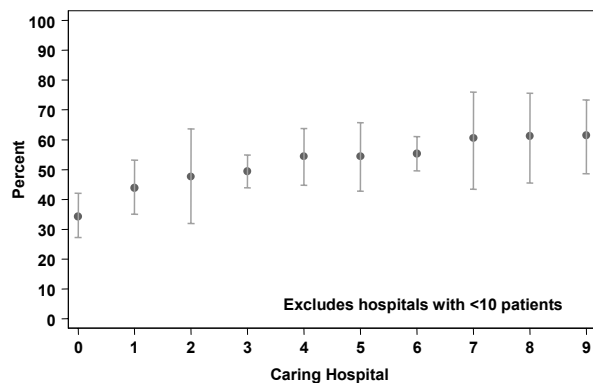
**Figure 5.65**

**% Haemodialysis Patients with Calcium 2.1-2.4 mmol/L  
Australia 31 December 2007**



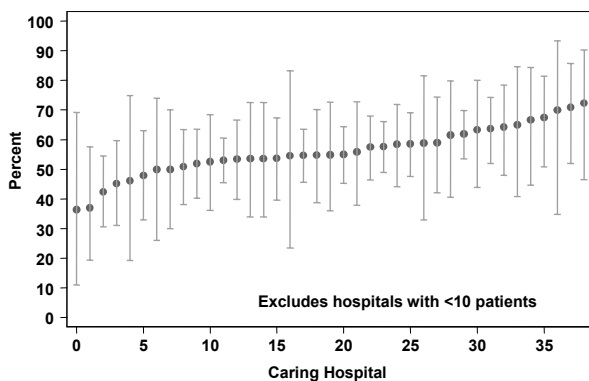
**Figure 5.66**

**% Haemodialysis Patients with Calcium 2.1-2.4 mmol/L  
New Zealand 31 December 2007**



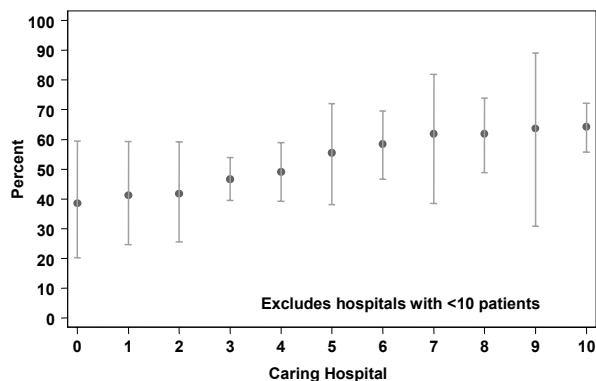
**Figure 5.67**

**% Peritoneal Dialysis Patients with Calcium 2.1-2.4 mmol/L  
Australia 31 December 2007**



**Figure 5.68**

**% Peritoneal Dialysis Patients with Calcium 2.1-2.4 mmol/L  
New Zealand 31 December 2007**





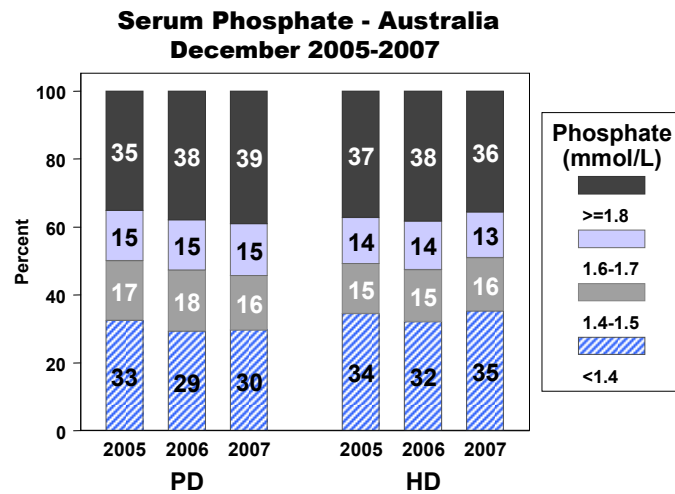
## SERUM PHOSPHATE

Figures 5.69 - 5.70.

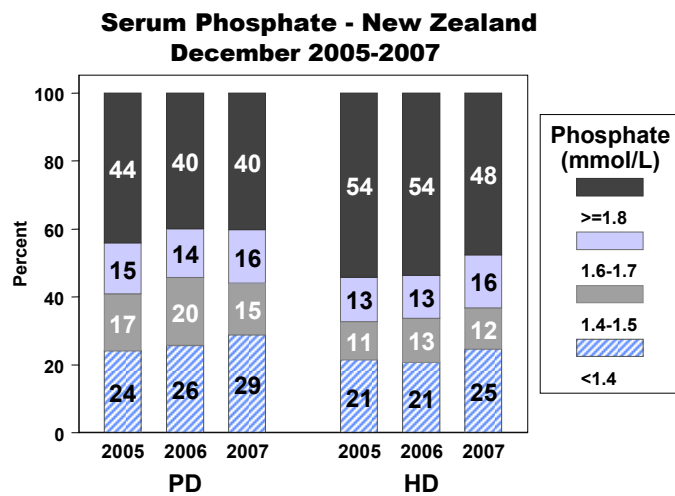
In Australia, serum phosphate concentrations have been stable, and did not differ between haemodialysis and peritoneal dialysis patients.

In New Zealand, the proportions with serum phosphate  $\geq 1.8$  mmol/L have decreased, and serum phosphate is higher in the haemodialysis group.

**Figure 5.69**



**Figure 5.70**





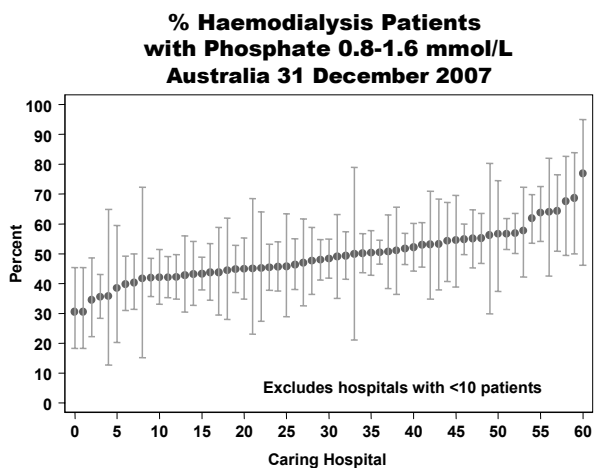
## SERUM PHOSPHATE BY TREATING CENTRE

Figures 5.71 - 5.74 show the proportions of patients at each centre with serum phosphate 0.8-1.6 mmol/L, as recommended by the CARI guidelines.

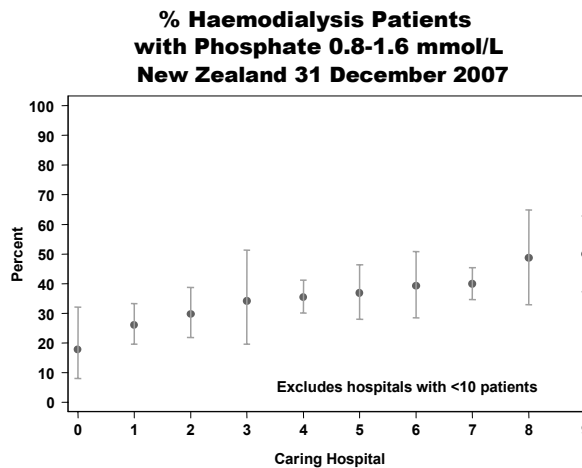
In Australia, the proportions ranged widely: 31-77% for haemodialysis patients and 24-72% for peritoneal dialysis patients.

In New Zealand, the corresponding proportions were 18-50% for haemodialysis patients and 19-59% for peritoneal dialysis patients.

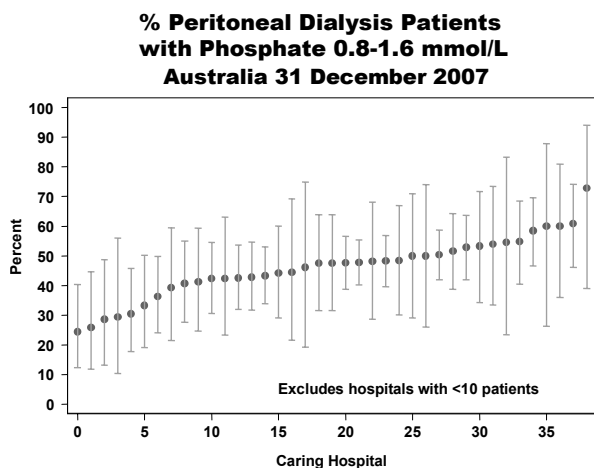
**Figure 5.71**



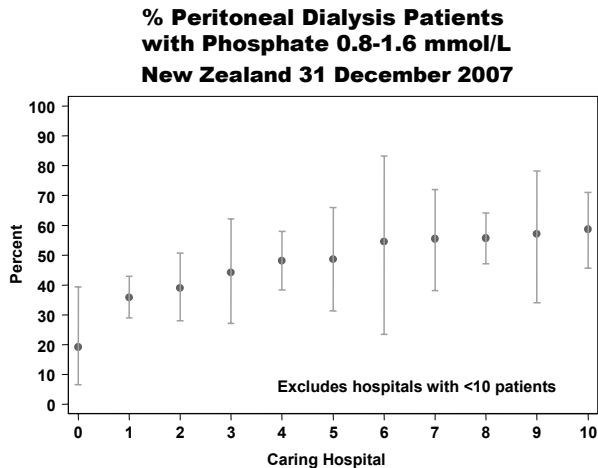
**Figure 5.72**



**Figure 5.73**



**Figure 5.74**



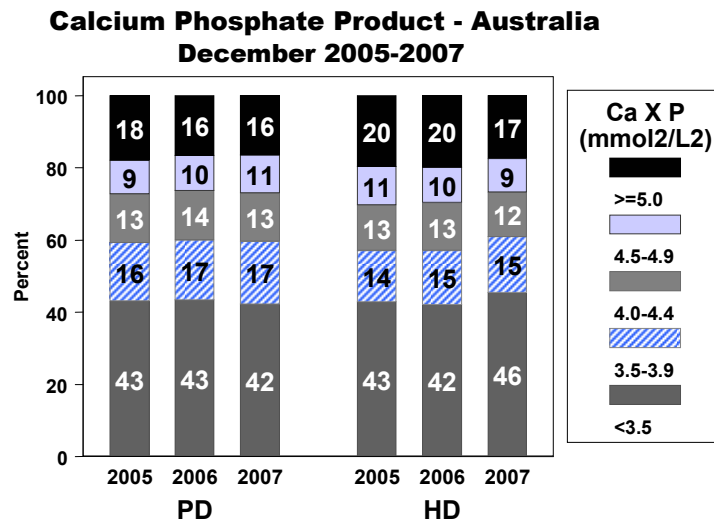
## CALCIUM-PHOSPHATE PRODUCT

Figures 5.75 - 5.76.

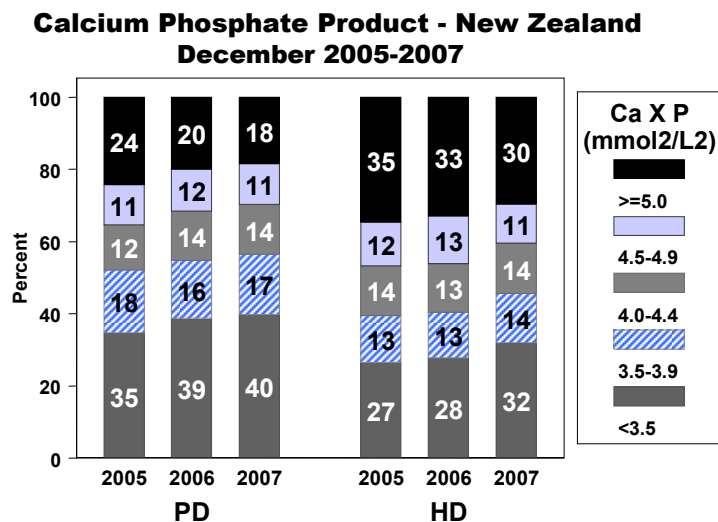
In both Australia and New Zealand, calcium-phosphate product has continued to improve, particularly in haemodialysis patients, with smaller proportions of patients with a product  $\geq 5.0$  mmol<sup>2</sup>/l<sup>2</sup>.

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

**Figure 5.75**



**Figure 5.76**





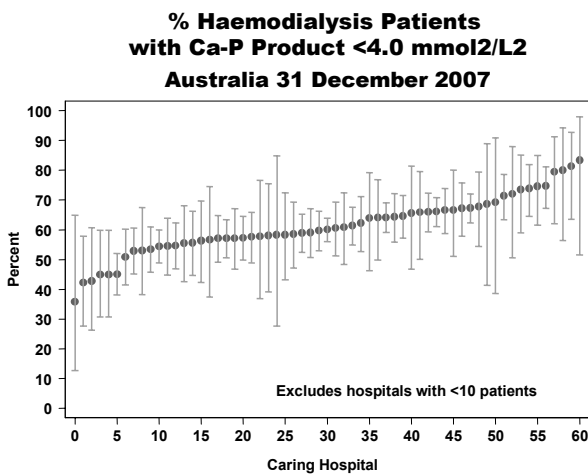
## CALCIUM-PHOSPHATE PRODUCT BY TREATING CENTRE

Figures 5.77 - 5.80 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.

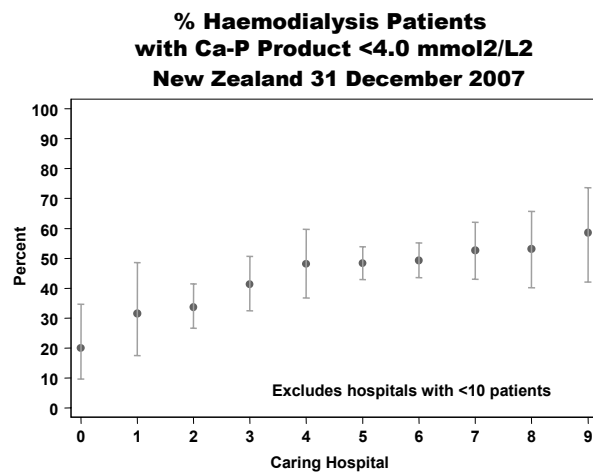
In Australia, the proportions ranged widely: 36-83% for haemodialysis patients and 39-82% for peritoneal dialysis patients.

In New Zealand, the corresponding proportions were 20-59% for haemodialysis patients and 19-69% for peritoneal dialysis patients.

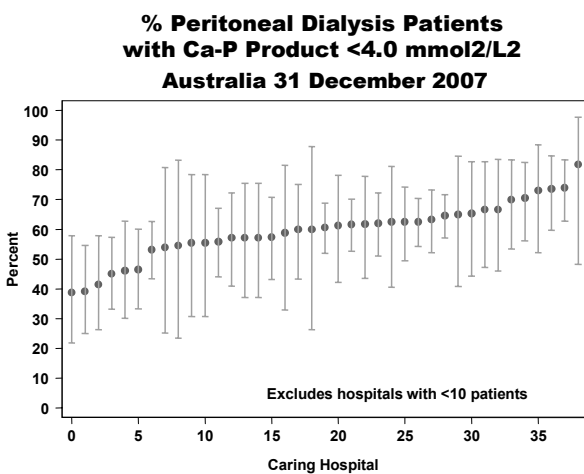
**Figure 5.77**



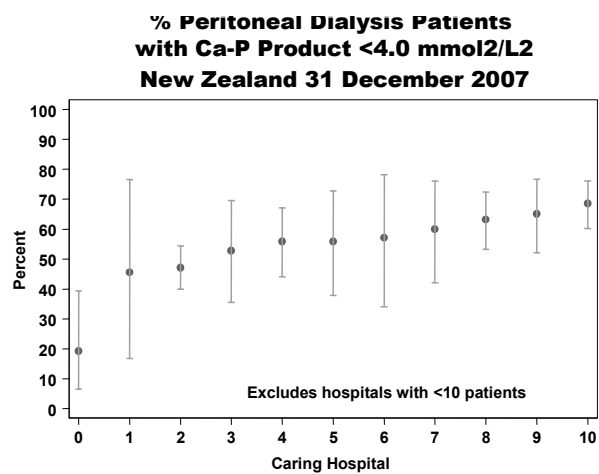
**Figure 5.78**



**Figure 5.79**



**Figure 5.80**



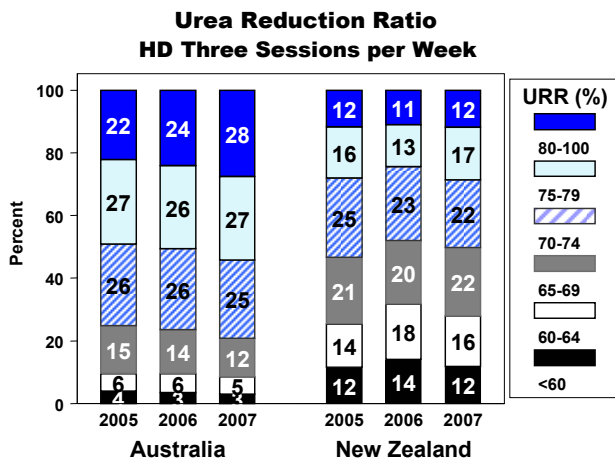
## UREA REDUCTION RATIO

Figures 5.81 and 5.83.

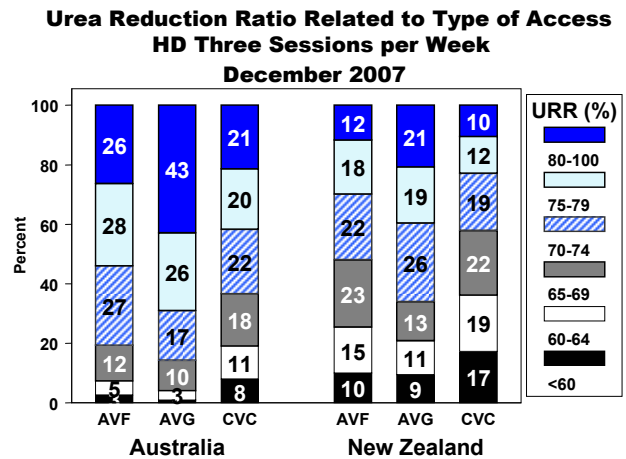
Distributions of URR values have been fairly stable over the past three years. About 9% and 28% of patients on haemodialysis three times a week have URR <65% in Australia and New Zealand respectively.

URR is highest in patients dialysing with an AV graft and lowest in those using catheters. Of those with URR < 65%, 27% in Australia and 34% in New Zealand had CVC access.

**Figure 5.81**



**Figure 5.82**



**Figure 5.83**

### Urea Reduction Ratio - Prevalent Patients Three Sessions per Week - December 2007

Hours per Session	Urea Reduction Ratio %		
	< 65	>=65	Total
<b>Australia</b>			
<4 hours	40 (14%)	242 (86%)	282 (100%)
4 hours	226 (9%)	2320 (91%)	2546 (100%)
>4-5 hours	221 (7%)	2798 (93%)	3019 (100%)
>5 hours	19 (12%)	145 (88%)	164 (100%)
<b>Total</b>	<b>506 (8%)</b>	<b>5505 (92%)</b>	<b>6011 (100%)</b>
<b>New Zealand</b>			
<4 hours	9 (33%)	18 (67%)	27 (100%)
4 hours	106 (29%)	264 (71%)	370 (100%)
>4-5 hours	143 (28%)	376 (72%)	519 (100%)
>5 hours	10 (23%)	34 (77%)	44 (100%)
<b>Total</b>	<b>268 (28%)</b>	<b>692 (72%)</b>	<b>960 (100%)</b>

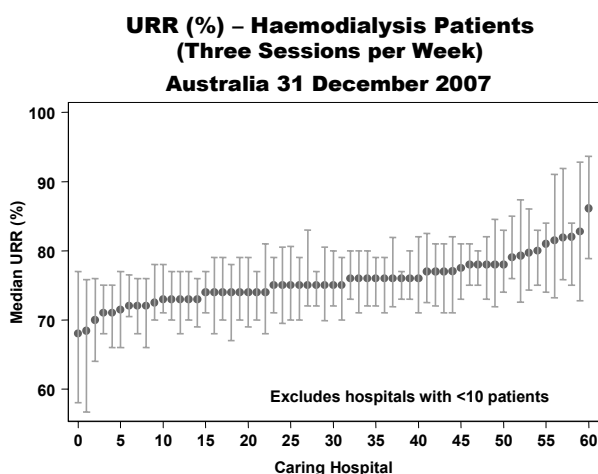


## UREA REDUCTION RATIO BY TREATING CENTRE

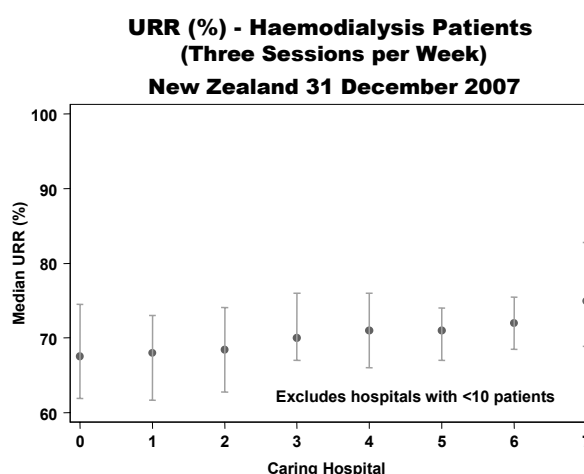
Figures 5.84 and 5.85 show the median URR in each hospital and Figures 5.86 and 5.87 show the proportions of haemodialysis patients dialysing three times per week in each hospital with URR > 70%, the target recommended by the CARI guidelines.

Median URR values in the respective countries did not vary greatly: 68-86% in Australia and 68-75% in New Zealand. However, the proportions with URR > 70% in each unit varied widely, from 42-97% in Australia and 41-69% in New Zealand.

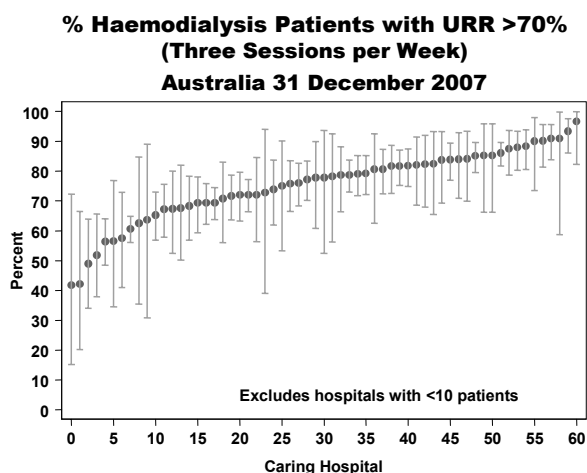
**Figure 5.84**



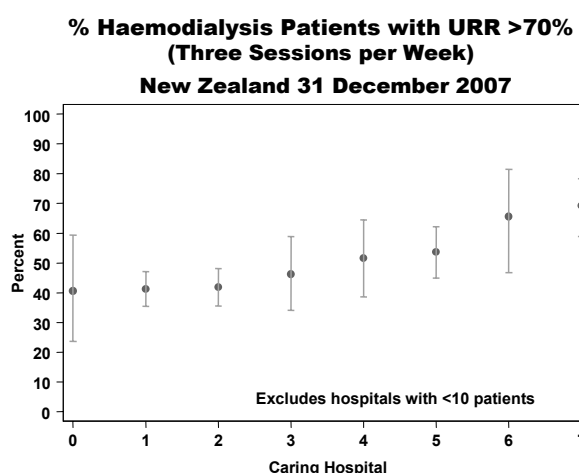
**Figure 5.85**



**Figure 5.86**



**Figure 5.87**



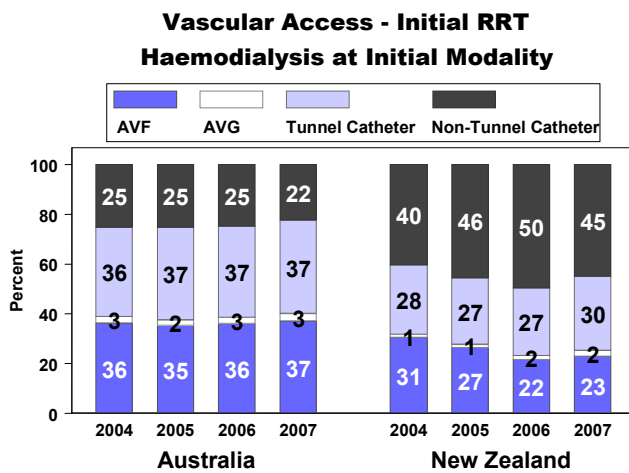
## VASCULAR ACCESS AT FIRST TREATMENT

Figures 5.88 to 5.91.

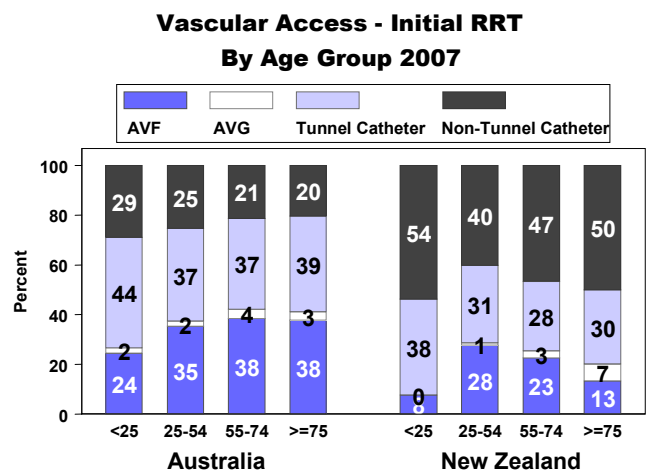
The decreasing trend in the proportion of patients starting haemodialysis with an AVF or AVG has stabilized at about 40% in Australia and at 25% in New Zealand.

Diabetic, female, young (age <25years) patients and patients who were first seen by nephrologists <3 months before starting haemodialysis (“late referrals”) were less likely to start with an AVF or AVG.

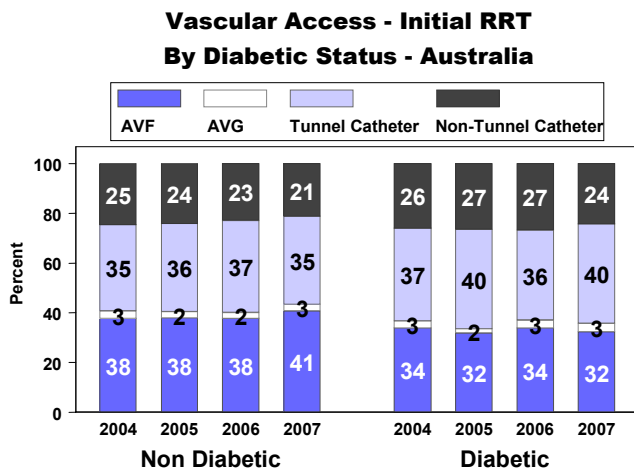
**Figure 5.88**



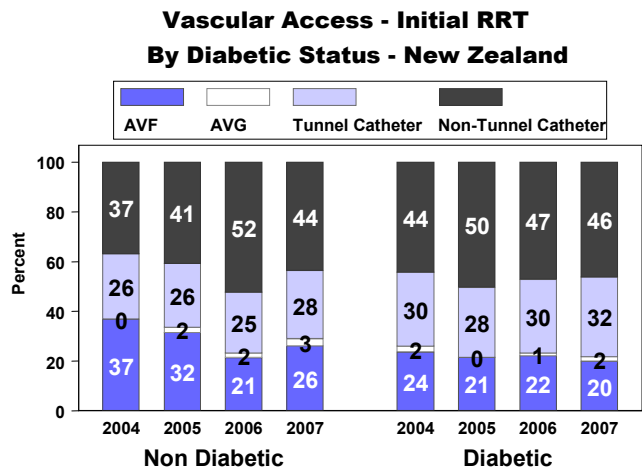
**Figure 5.89**



**Figure 5.90**



**Figure 5.91**





## VASCULAR ACCESS AT FIRST TREATMENT

Figure 5.92

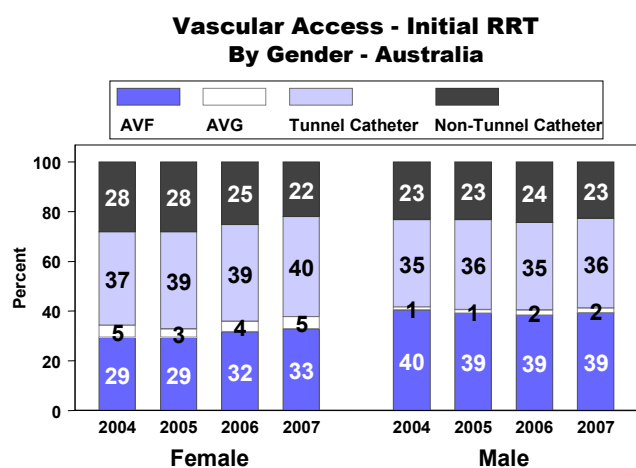


Figure 5.93

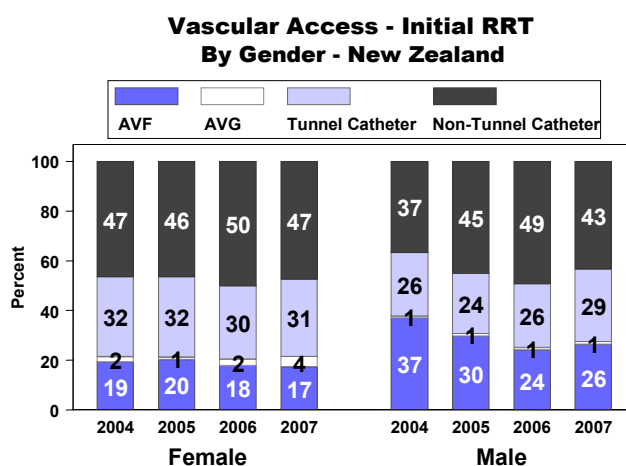


Figure 5.94

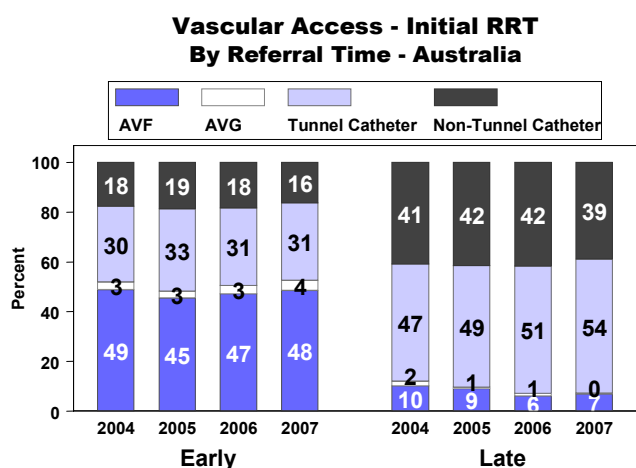
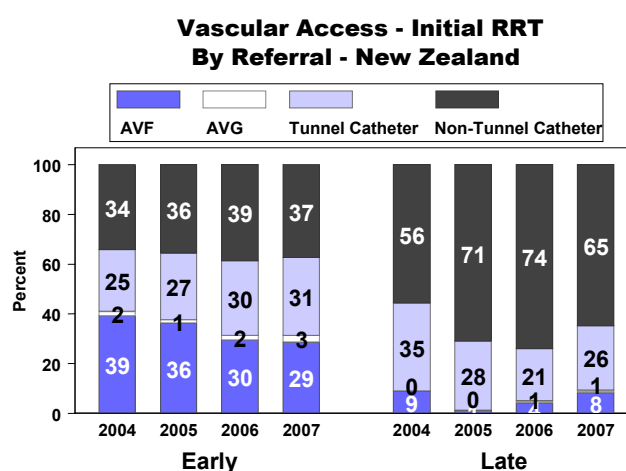


Figure 5.95





## VASCULAR ACCESS AT FIRST TREATMENT

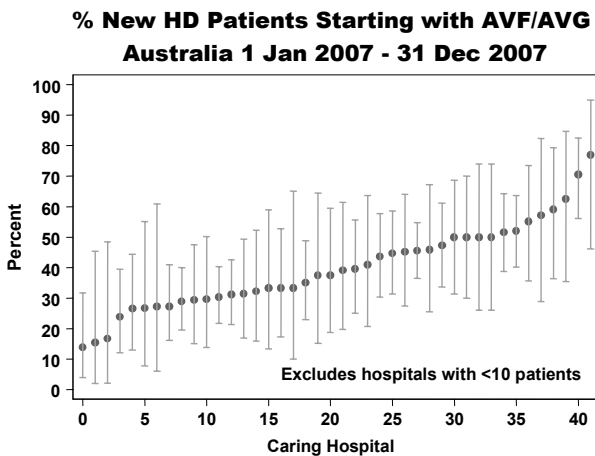
**Figure 5.96**

**Vascular Access at First Treatment  
Haemodialysis as Initial Modality 1-Jan-2004 to 31-Dec-2007**

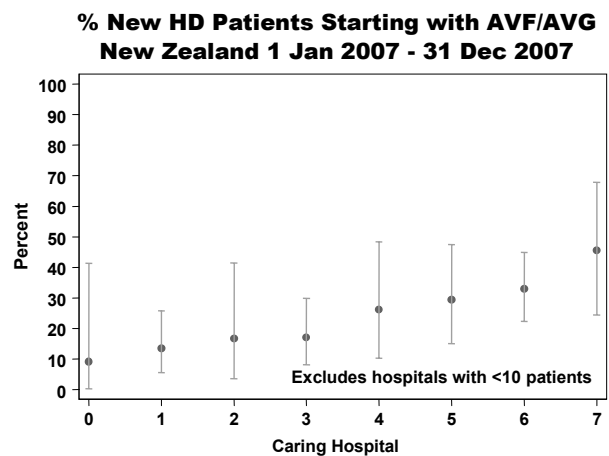
	2004		2005		2006		2007	
	AVF or AVG	CVC	AVF or AVG	CVC	AVF or AVG	CVC	AVF or AVG	CVC
<b>Australia</b>								
Queensland	116 (40%)	175 (60%)	128 (38%)	207 (62%)	135 (38%)	217 (62%)	143 (41%)	203 (59%)
NSW/ACT	148 (34%)	289 (66%)	187 (33%)	383 (67%)	184 (32%)	393 (68%)	193 (35%)	362 (65%)
Victoria	150 (43%)	201 (57%)	171 (44%)	218 (56%)	204 (48%)	222 (52%)	184 (46%)	216 (54%)
Tasmania	7 (32%)	15 (68%)	13 (43%)	17 (57%)	12 (30%)	28 (70%)	13 (39%)	20 (61%)
South Australia	58 (51%)	56 (49%)	73 (52%)	67 (48%)	70 (51%)	66 (49%)	64 (57%)	48 (43%)
Northern Territory	35 (44%)	44 (56%)	23 (28%)	59 (72%)	25 (34%)	49 (66%)	19 (33%)	39 (67%)
Western Australia	52 (32%)	108 (68%)	53 (29%)	130 (71%)	58 (33%)	116 (67%)	59 (33%)	122 (67%)
<b>New Zealand</b>								
	87 (32%)	188 (68%)	83 (28%)	218 (72%)	76 (23%)	251 (77%)	77 (25%)	228 (75%)

Figures 5.97 and 5.98 show the proportion of patients of each hospital starting haemodialysis with AVF/AVG, arranged from the lowest to the highest. In Australia, this ranged widely from 14-77%. The corresponding range in New Zealand was 9-45%. This wide variation probably reflects differences in practices, protocols, resources and patient case-mix among centres. However, the patient case-mix is unlikely to explain all of this variation.

**Figure 5.97**



**Figure 5.98**





## PREVALENT HAEMODIALYSIS ACCESS

Figures 5.99 - 5.104.

In both Australia and New Zealand, the proportions of patients dialysing with an AV graft are declining, while those dialysing with an AV fistulae are stable. The proportions dialysing with catheters have increased slightly.

Diabetic, female, young (age < 25 years) or old (age >=75 years) patients were less likely to be dialysing with an AVF or AVG.

Figure 5.99

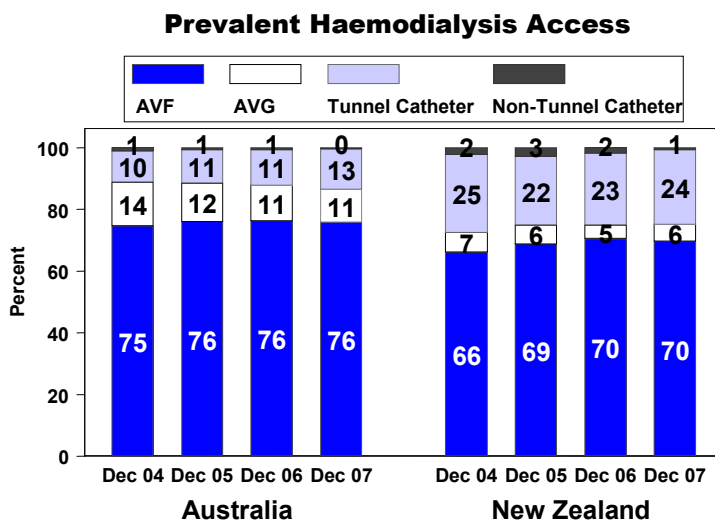
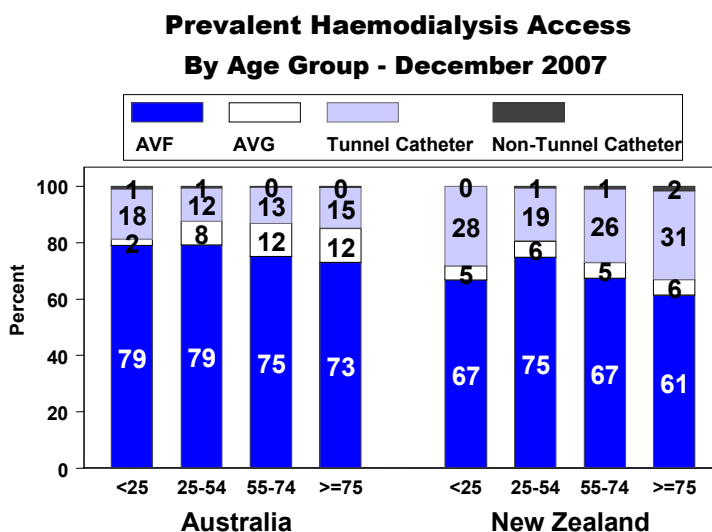


Figure 5.100



## PREVALENT HAEMODIALYSIS ACCESS

Figure 5.101

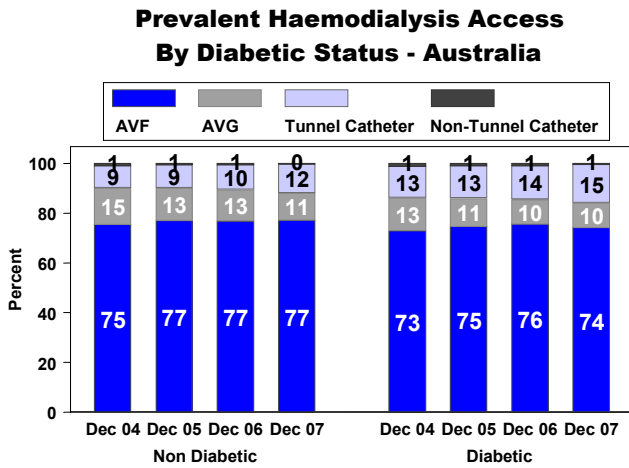


Figure 5.102

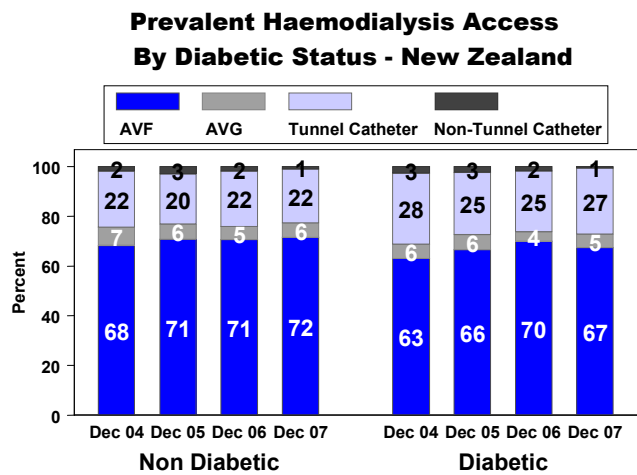


Figure 5.103

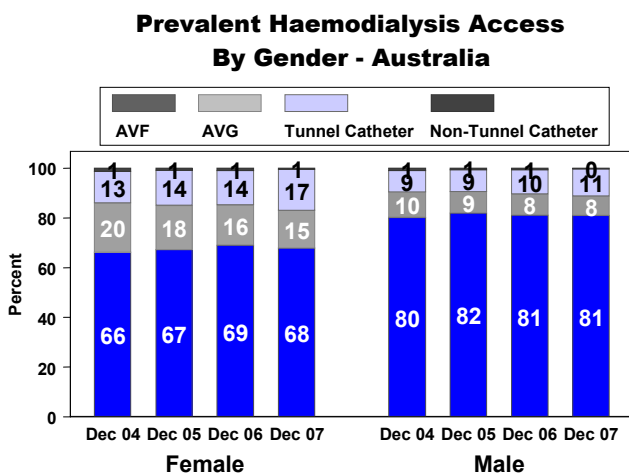
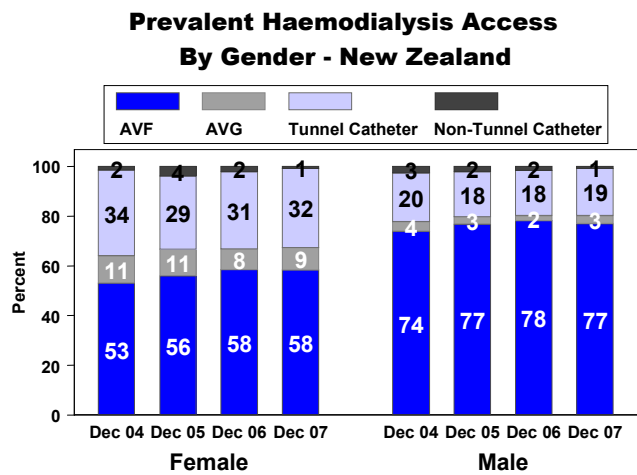


Figure 5.104





## PREVALENT HAEMODIALYSIS ACCESS

**Figure 5.105**

Prevalent Vascular Access at 31-Dec-2007								
	Dec 2004		Dec 2005		Dec 2006		Dec 2007	
	AVF or AVG	CVC	AVF or AVG	CVC	AVF or AVG	CVC	AVF or AVG	CVC
<b>Australia</b>								
Queensland	964 (88%)	131 (12%)	1093 (90%)	124 (10%)	1162 (90%)	126 (10%)	1223 (89%)	144 (11%)
NSW/ACT	1776 (88%)	250 (12%)	1948 (88%)	265 (12%)	2062 (86%)	336 (14%)	2127 (84%)	391 (16%)
Victoria	1536 (92%)	131 (8%)	1615 (90%)	176 (10%)	1736 (90%)	195 (10%)	1779 (89%)	223 (11%)
Tasmania	102 (85%)	18 (15%)	113 (86%)	18 (14%)	98 (79%)	26 (21%)	111 (87%)	16 (13%)
South Australia	389 (94%)	25 (6%)	449 (95%)	24 (5%)	444 (94%)	28 (6%)	431 (90%)	46 (10%)
Northern Territory	221 (89%)	27 (11%)	246 (88%)	35 (12%)	269 (88%)	36 (12%)	294 (90%)	34 (10%)
Western Australia	521 (81%)	124 (19%)	520 (78%)	149 (22%)	552 (81%)	133 (19%)	550 (77%)	167 (23%)
<b>New Zealand</b>								
	751 (73%)	283 (27%)	867 (75%)	293 (25%)	920 (75%)	309 (25%)	988 (75%)	335 (25%)

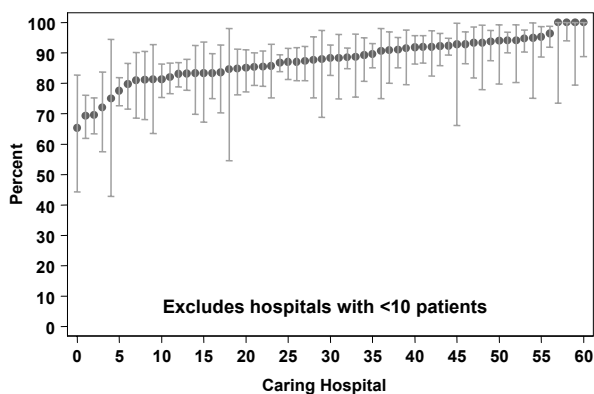
Figures 5.106 - 5.107 show the proportion of haemodialysis patients at each hospital dialysing with an AVF/AVG on 31st December, 2007, arranged from the lowest to the highest.

In Australia, the proportions varied widely from 65-100%. The corresponding range in New Zealand was 48-88%.

The error bars displayed show the 95% confidence intervals.

**Figure 5.106**

**% Prevalent HD Patients Dialysing with AVF/AVG  
Australia 31 December 2007**



**Figure 5.107**

**% Prevalent HD Patients Dialysing with AVF/AVG  
New Zealand 31 December 2007**

