CHAPTER 4

Haemodialysis

Reporting the incidence, prevalence and survival of haemodialysis patients in Australia and New Zealand; summarising dialysis prescriptions, laboratory results, dialysis adequacy, vascular access and rates of home haemodialysis treatment.

Contents

Executive Summary

There were 10,266 people in Australia and 1,927 people in New Zealand receiving haemodialysis at the time of the 31 December 2016 survey. Of the 2,359 in Australia, and 439 in New Zealand who commenced haemodialysis in 2016, approximately half were aged between 55-74 years. Survival of incident haemodialysis patients in both countries has not changed significantly in the past decade, and older age at commencement of dialysis was associated with poorer survival.

The major variation in haemodialysis prescription related to hours per week. In New Zealand, there were more thrice weekly haemodialysis patients receiving more than 12 hours of haemodialysis per week (73%) compared to Australia (just under 60%), and only a third of thrice weekly haemodialysis patients in South Australia and Western Australia received more than 12 hours per week. The use of haemodiafiltration, which was rare a decade ago, continued to increase in Australia (23%) but has plateaued at 19% in New Zealand. South Australia and Western Australia had the greatest proportion of patients receiving haemodiafiltration (34%) and Tasmania the lowest (2%). Future reports will contain more data around the use of haemodiafiltration.

Establishing permanent vascular access (arteriovenous fistula or graft) before commencement of haemodialysis continues to be challenging: 42% of Australian patients and 27% of New Zealand patients who commenced haemodialysis in 2016 had permanent vascular access when they started haemodialysis. Within Australian states, this varied from 33% to 57%, and by caring hospital from below 10% to almost 80%. For prevalent patients, the picture was much better: 86% of prevalent Australian patients and 74% of New Zealand patients had haemodialysis through permanent vascular access.

The proportion of patients undertaking haemodialysis at home also varied by country (Australia 13% compared to New Zealand 24%), by state within Australia (from 4.4% up to 14.4%), and by caring hospital (from 0% up to nearly 30% in Australian hospitals and from 10% to nearly 90% in New Zealand hospitals).

Suggested citation

ANZDATA Registry. 40th Report, Chapter 4: Haemodialysis. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2018. Available at: http://www.anzdata.org.au

Stock and Flow

Table 4.1 presents the stock and flow of haemodialysis patients in Australia and New Zealand over 2012-2016. The number of incident patients in Australia is growing slowly, whereas in New Zealand the number remains approximately constant. In both countries, the number of patients ceasing HD is lower than the number of incident patients, leading to strong growth in prevalent numbers,

Table 4.1 Stock and Flow of Haemodialysis Patients in Australia and New Zealand 2012-2016

		2012	2013	2014	2015	2016
Australia	**All patients who commenced HD**					
	First dialysis treatment or returning after renal recovery	1866	1848	1897	1878	1945
	Transfer from PD (no prior HD)	314	323	299	362	407
	Transfer from PD (prior HD)	162	197	178	190	165
	Failed Transplant (no prior HD)	41	39	38	45	25
	Failed Transplant (prior HD)	153	131	145	154	151
	Total	**2536**	**2538**	**2557**	**2629**	**2693**
	All patients who ceased HD					
	Received kidney transplant	533	543	556	553	639
	Transfer to PD	378	335	347	325	302
	Renal recovery	56	64	57	60	66
	Deaths	1266	1335	1360	1399	1445
	Total	**2233**	**2277**	**2320**	**2337**	**2452**
	Total patients on HD at 31 December	**9293**	**9547**	**9763**	**10041**	**10266**
	Patients on HD at home at 31 December (% of all HD patients)	**1099 (11.8%)**	**1140 (11.9%)**	**1179 (12.1%)**	**1188 (11.8%)**	**1119 (10.9%)**
New Zealand	**All patients who commenced HD**					
	First dialysis treatment or returning after renal recovery	341	363	352	316	332
	Transfer from PD (no prior HD)	80	67	89	99	101
	Transfer from PD (prior HD)	72	48	57	76	57
	Failed Transplant (no prior HD)	8	4	5	7	8
	Failed Transplant (prior HD)	14	19	25	15	16
	Total	**515**	**501**	**528**	**513**	**514**
	All patients who ceased HD					
	Received kidney transplant	45	59	67	76	93
	Transfer to PD	126	141	124	111	120
	Renal recovery	13	6	10	9	7
	Deaths	230	227	225	278	274
	Total	**414**	**433**	**426**	**474**	**494**
	Total patients on HD at 31 December	**1696**	**1763**	**1867**	**1909**	**1927**
	Patients on HD at home at 31 December (% of all HD patients)	**474 (27.9%)**	**479 (27.2%)**	**488 (26.1%)**	**483 (25.3%)**	**468 (24.3%)**

Figures 4.1-4.2 and Table 4.2 present the age distribution of incident and prevalent haemodialysis patients in Australia and New Zealand.

Figure 4.1.1 - Age (%) of Incident Haemodialysis Patients 2016 – Australia

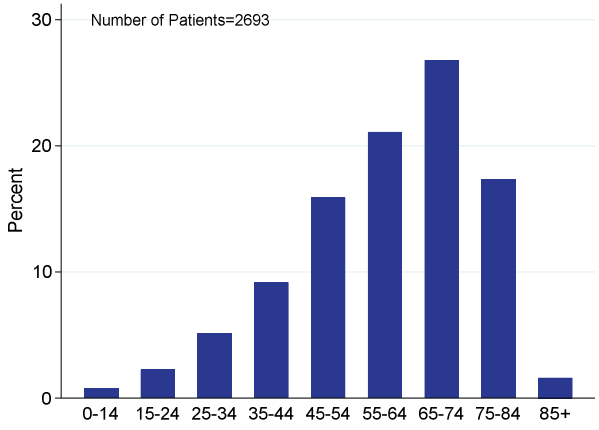


Figure 4.1.2 - Age (%) of Incident Haemodialysis Patients 2016 - New Zealand

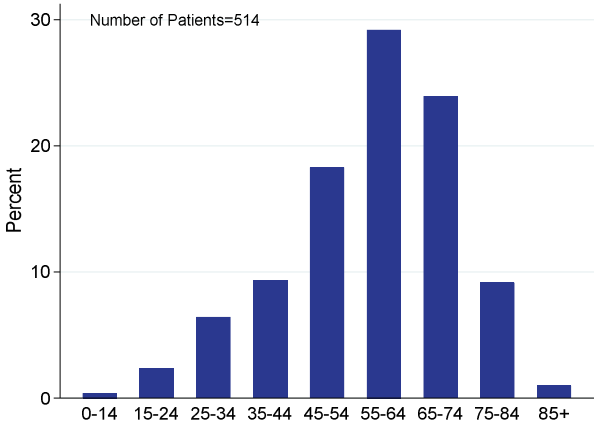


Figure 4.2.1 - Age (%) of Prevalent Haemodialysis Patients - Australia 31 Dec 2016

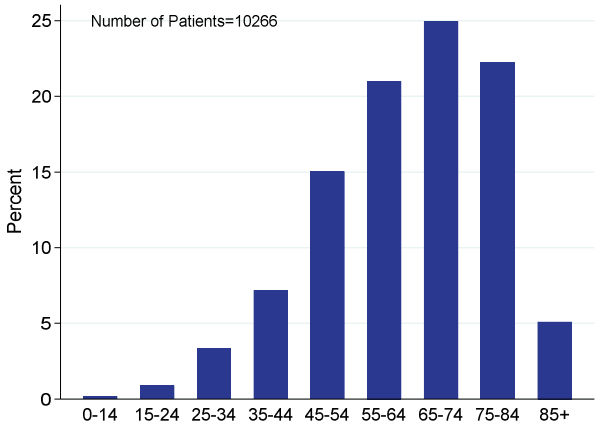


Figure 4.2.2 - Age (%) of Prevalent Haemodialysis Patients - New Zealand 31 Dec 2016

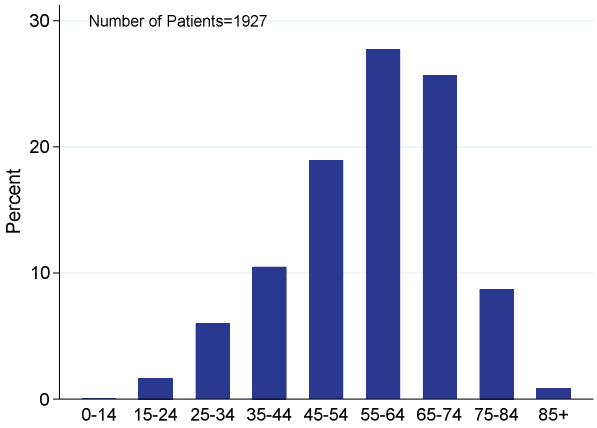


Table 4.2.1 Incident and Prevalent Haemodialysis Patients in Australia by Age Group 2012-2016

	Age Group	2012	2013	2014	2015	2016
Incident Patients	**00-14 years**	20 (1%)	19 (1%)	14 (1%)	10 (0%)	21 (1%)
	15-24 years	51 (2%)	61 (2%)	59 (2%)	50 (2%)	61 (2%)
	25-34 years	140 (6%)	121 (5%)	135 (5%)	127 (5%)	138 (5%)
	35-44 years	224 (9%)	227 (9%)	235 (9%)	237 (9%)	247 (9%)
	45-54 years	445 (18%)	417 (16%)	424 (17%)	433 (16%)	428 (16%)
	55-64 years	579 (23%)	576 (23%)	597 (23%)	564 (21%)	568 (21%)
	65-74 years	577 (23%)	620 (24%)	570 (22%)	694 (26%)	721 (27%)
	75-84 years	433 (17%)	444 (17%)	467 (18%)	462 (18%)	466 (17%)
	>=85 years	67 (3%)	53 (2%)	56 (2%)	52 (2%)	43 (2%)
	Total	**2536**	**2538**	**2557**	**2629**	**2693**
Prevalent Patients	**00-14 years**	10 (0%)	11 (0%)	8 (0%)	7 (0%)	17 (0%)
	15-24 years	110 (1%)	105 (1%)	107 (1%)	108 (1%)	92 (1%)
	25-34 years	304 (3%)	309 (3%)	336 (3%)	331 (3%)	345 (3%)
	35-44 years	729 (8%)	735 (8%)	744 (8%)	759 (8%)	739 (7%)
	45-54 years	1367 (15%)	1442 (15%)	1486 (15%)	1530 (15%)	1544 (15%)
	55-64 years	2033 (22%)	2030 (21%)	2072 (21%)	2104 (21%)	2157 (21%)
	65-74 years	2252 (24%)	2326 (24%)	2341 (24%)	2454 (24%)	2563 (25%)
	75-84 years	2043 (22%)	2133 (22%)	2174 (22%)	2228 (22%)	2285 (22%)
	>=85 years	445 (5%)	456 (5%)	495 (5%)	520 (5%)	524 (5%)
	Total	**9293**	**9547**	**9763**	**10041**	**10266**

Table 4.2.2 Incident and Prevalent Haemodialysis Patients in New Zealand by Age Group 2012-2016

	Age Group	2012	2013	2014	2015	2016
Incident Patients	00-14 years	6 (1%)	0 (0%)	3 (1%)	4 (1%)	2 (0%)
	15-24 years	24 (5%)	8 (2%)	16 (3%)	15 (3%)	12 (2%)
	25-34 years	25 (5%)	34 (7%)	41 (8%)	23 (4%)	33 (6%)
	35-44 years	52 (10%)	63 (13%)	47 (9%)	50 (10%)	48 (9%)
	45-54 years	98 (19%)	108 (22%)	104 (20%)	110 (21%)	94 (18%)
	55-64 years	154 (30%)	131 (26%)	147 (28%)	148 (29%)	150 (29%)
	65-74 years	114 (22%)	115 (23%)	135 (26%)	115 (22%)	123 (24%)
	75-84 years	42 (8%)	40 (8%)	34 (6%)	47 (9%)	47 (9%)
	>=85 years	0 (0%)	2 (0%)	1 (0%)	1 (0%)	5 (1%)
	Total	**515**	**501**	**528**	**513**	**514**
Prevalent Patients	00-14 years	2 (0%)	2 (0%)	2 (0%)	2 (0%)	1 (0%)
	15-24 years	45 (3%)	40 (2%)	37 (2%)	36 (2%)	32 (2%)
	25-34 years	98 (6%)	103 (6%)	119 (6%)	119 (6%)	115 (6%)
	35-44 years	172 (10%)	190 (11%)	187 (10%)	180 (9%)	202 (10%)
	45-54 years	346 (20%)	349 (20%)	380 (20%)	403 (21%)	365 (19%)
	55-64 years	482 (28%)	499 (28%)	509 (27%)	517 (27%)	534 (28%)
	65-74 years	373 (22%)	395 (22%)	451 (24%)	461 (24%)	494 (26%)
	75-84 years	163 (10%)	165 (9%)	162 (9%)	174 (9%)	168 (9%)
	>=85 years	15 (1%)	20 (1%)	20 (1%)	17 (1%)	16 (1%)
	Total	**1696**	**1763**	**1867**	**1909**	**1927**

Table 4.3 presents incident patients by primary renal disease. In both countries diabetic nephropathy is the leading cause of ESKD leading to haemodialysis.

Table 4.3.1 Incident Haemodialysis Patients in Australia by Primary Renal Disease 2012-2016

Primary Renal Disease*	2012	2013	2014	2015	2016
Diabetic Nephropathy	928 (37%)	914 (36%)	934 (37%)	980 (37%)	945 (35%)
Glomerulonephritis	580 (23%)	520 (20%)	569 (22%)	528 (20%)	554 (21%)
Hypertension	314 (12%)	341 (13%)	304 (12%)	333 (13%)	359 (13%)
Miscellaneous	135 (5%)	146 (6%)	156 (6%)	146 (6%)	152 (6%)
Polycystic Disease	80 (3%)	72 (3%)	67 (3%)	66 (3%)	68 (3%)
Reflux Nephropathy	377 (15%)	406 (16%)	358 (14%)	355 (14%)	384 (14%)
Uncertain	107 (4%)	116 (5%)	122 (5%)	119 (5%)	101 (4%)
Not Reported	15 (1%)	23 (1%)	47 (2%)	102 (4%)	130 (5%)
Total	**2536**	**2538**	**2557**	**2629**	**2693**

Table 4.3.2 Incident Haemodialysis Patients in New Zealand by Primary Renal Disease 2012-2016

Primary Renal Disease*	2012	2013	2014	2015	2016
Diabetic Nephropathy	243 (47%)	249 (50%)	274 (52%)	255 (50%)	256 (50%)
Glomerulonephritis	111 (22%)	104 (21%)	111 (21%)	103 (20%)	113 (22%)
Hypertension	49 (10%)	50 (10%)	43 (8%)	39 (8%)	37 (7%)
Miscellaneous	23 (4%)	24 (5%)	18 (3%)	25 (5%)	23 (4%)
Polycystic Disease	15 (3%)	11 (2%)	16 (3%)	9 (2%)	7 (1%)
Reflux Nephropathy	56 (11%)	49 (10%)	50 (9%)	65 (13%)	61 (12%)
Uncertain	14 (3%)	14 (3%)	9 (2%)	15 (3%)	12 (2%)
Not Reported	4 (1%)	0 (0%)	7 (1%)	2 (0%)	5 (1%)
Total	**515**	**501**	**528**	**513**	**514**

Survival

Table 4.4 and figure 4.3 present unadjusted haemodialysis patient survival by era and country, censored at transplantation. Survival for all incident renal replacement therapy (RRT) patients who were treated with haemodialysis at 90 days is reported. There has been very little change over eras. Figure 4.4 presents survival curves by era, adjusted for a number of demographic and clinical characteristics.

Table 4.4 Patient Survival by Era - Haemodialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

			Survival			
Country	Era	Number of Patients	6 Months	1 Year	3 Years	5 Years
Australia	2005-2007	4504	96 [95, 96]	90 [89, 91]	69 [67, 70]	51 [50, 53]
	2008-2010	4748	96 [95, 97]	91 [90, 91]	70 [69, 72]	53 [52, 55]
	2011-2013	5000	96 [96, 97]	91 [90, 91]	71 [70, 72]	54 [52, 55]
	2014-2016	4709	97 [96, 97]	92 [91, 93]	-	-
New Zealand	2005-2007	724	97 [95, 98]	92 [89, 94]	70 [66, 73]	51 [46, 55]
	2008-2010	823	96 [95, 97]	92 [90, 94]	73 [69, 76]	55 [51, 59]
	2011-2013	836	97 [95, 98]	93 [91, 95]	74 [71, 77]	55 [50, 59]
	2014-2016	792	97 [95, 98]	92 [89, 94]	-	-

Figure 4.3.1 - Patient Survival by Era - Haemodialysis at 90 Days - Australia 2005 - 2016 Censored for Transplant

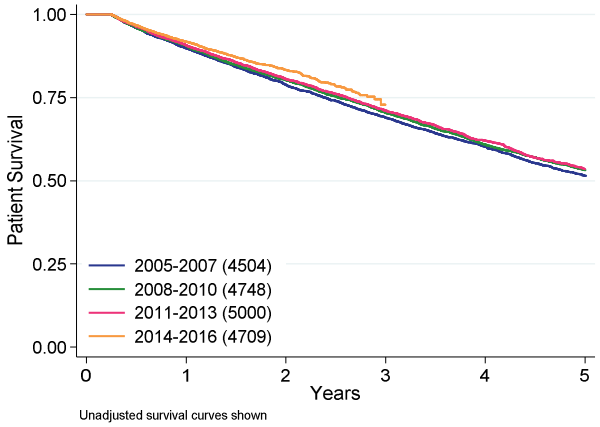


Figure 4.3.2 - Patient Survival by Era - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant

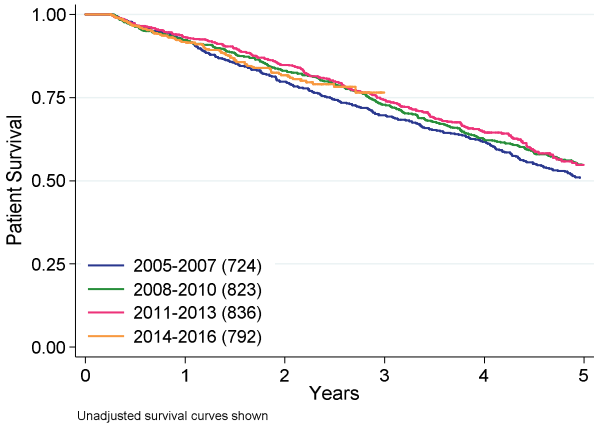


Figure 4.4.1 - Patient Survival by Era - Haemodialysis at 90 Days - Australia 2005 - 2016 Censored for Transplant Adjusted for Age, Ethnicity, Diabetic Nephropathy, Comorbidity and Gender

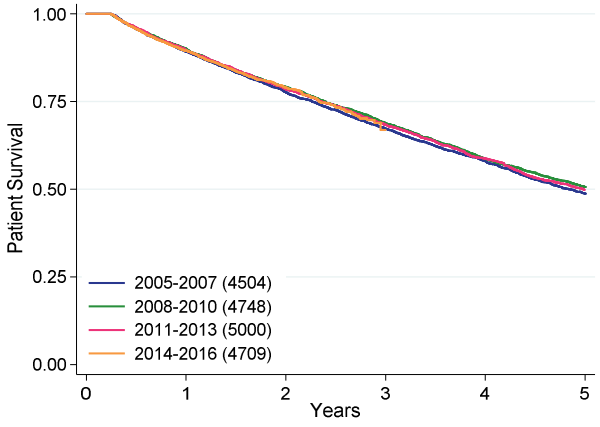


Figure 4.4.2 - Patient Survival by Era - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant Adjusted for Age, Ethnicity, Diabetic Nephropathy, Comorbidity and Gender

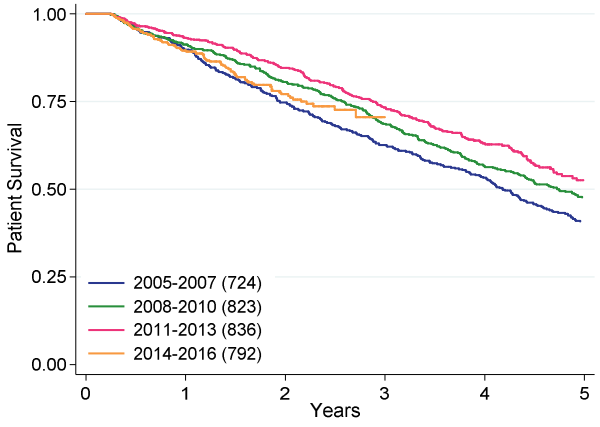


Table 4.5 and figure 4.5 present unadjusted patient survival stratified by age, and table 4.6 and figure 4.6 present the same data by diabetic status.

Table 4.5 Patient Survival by Age Group - Haemodialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Age Group years	Number of Patients	Survival			
			6 months	1 year	3 years	5 years
Australia	<40 years	1759	99 [98, 99]	96 [95, 97]	87 [85, 89]	79 [76, 82]
	40-59 years	5972	98 [98, 98]	95 [94, 95]	82 [80, 83]	68 [67, 70]
	60-74 years	6978	96 [95, 96]	90 [89, 90]	68 [67, 70]	51 [50, 53]
	>=75 years	4252	94 [93, 95]	85 [84, 86]	57 [55, 58]	34 [32, 36]
New Zealand	<40 years	385	99 [98, 100]	97 [95, 99]	86 [81, 90]	76 [69, 82]
	40-59 years	1338	97 [96, 98]	94 [93, 96]	80 [78, 83]	63 [59, 67]
	60-74 years	1157	96 [94, 97]	91 [89, 92]	66 [63, 69]	46 [42, 50]
	>=75 years	295	93 [90, 96]	82 [77, 87]	47 [40, 54]	21 [15, 27]

Figure 4.5.1 - Patient Survival by Age Group - Haemodialysis at 90 Days - Australia 2005 - 2016 Censored for Transplant

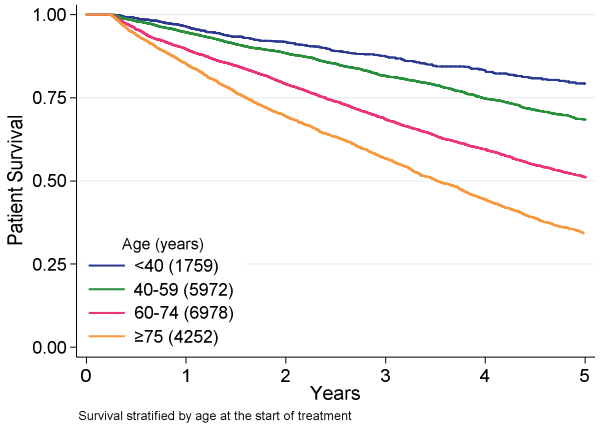


Figure 4.5.2 - Patient Survival by Age Group - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant

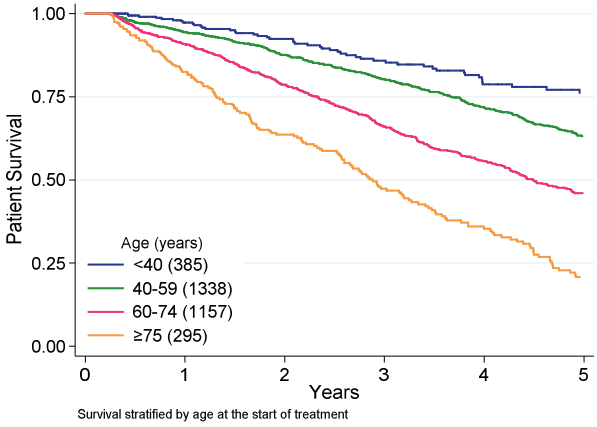


Table 4.6 Patient Survival by Diabetes - Haemodialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Diabetes	Number of Patients	Survival			
			6 months	1 year	3 years	5 years
Australia	Non diabetic	9544	96 [96, 97]	91 [90, 92]	73 [72, 74]	57 [56, 58]
	Diabetic	9417	96 [96, 97]	90 [90, 91]	68 [67, 70]	50 [49, 51]
New Zealand	Non diabetic	1293	96 [95, 97]	92 [91, 94]	75 [72, 78]	58 [54, 62]
	Diabetic	1882	97 [96, 98]	92 [91, 93]	71 [68, 73]	51 [48, 54]

Figure 4.6.1 - Patient Survival by Diabetes - Haemodialysis at 90 Days - Australia 2005 - 2016 Censored for Transplant

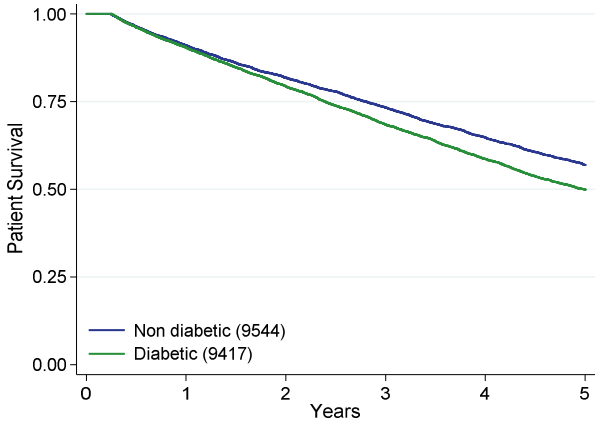


Figure 4.6.2 - Patient Survival by Diabetes - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant

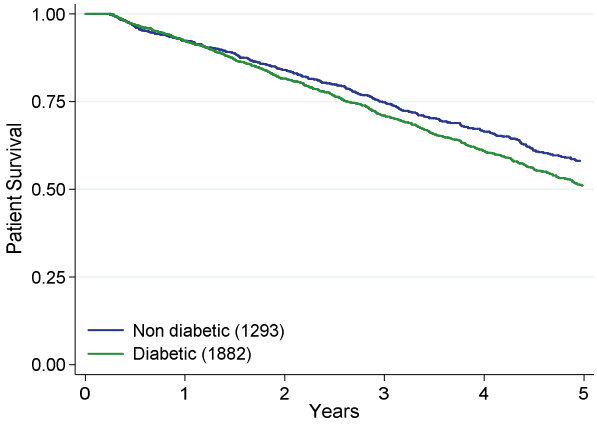


Figure 4.7 presents patient survival data for Australian haemodialysis patients by age, and by the presence of diabetes and/or cardiovascular disease. Figure 4.8 presents the same data for New Zealand.

Figure 4.7.1 - Patient Survival by Age Group - Haemodialysis at 90 Days - 2005 - 2016 Censored for Transplant - Australia No Diabetes and No Cardiovascular Disease

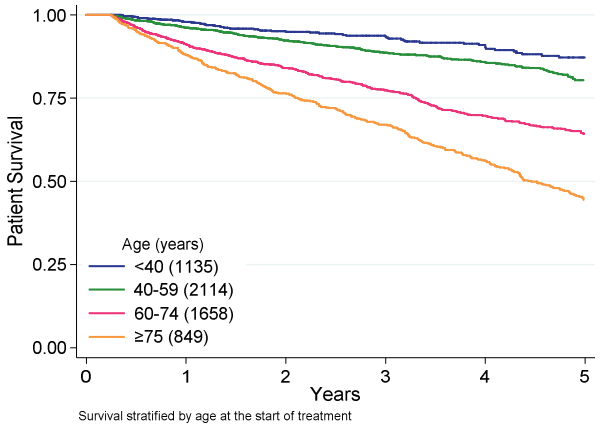


Figure 4.7.2 - Patient Survival by Age Group - Haemodialysis at 90 Days - 2005 - 2016 Censored for Transplant - Australia Diabetes but No Cardiovascular Disease

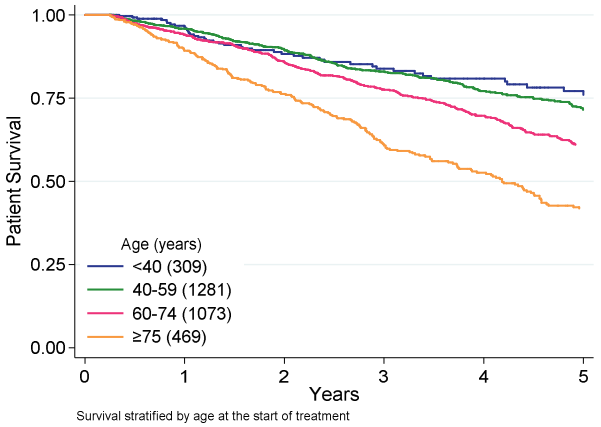


Figure 4.7.3 - Patient Survival by Age Group - Haemodialysis at 90 Days - Australia 2005 - 2016 - Censored for Transplant - Cardiovascular Disease but No Diabetes

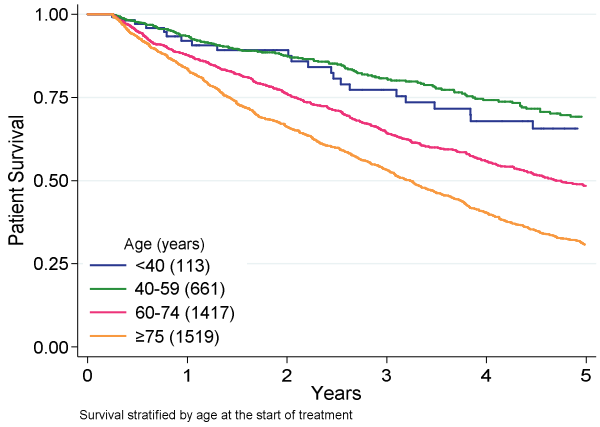


Figure 4.7.4 - Patient Survival by Age Group - Haemodialysis at 90 Days - Australia 2005 - 2016 Censored for Transplant - Both Diabetes and Cardiovascular Disease

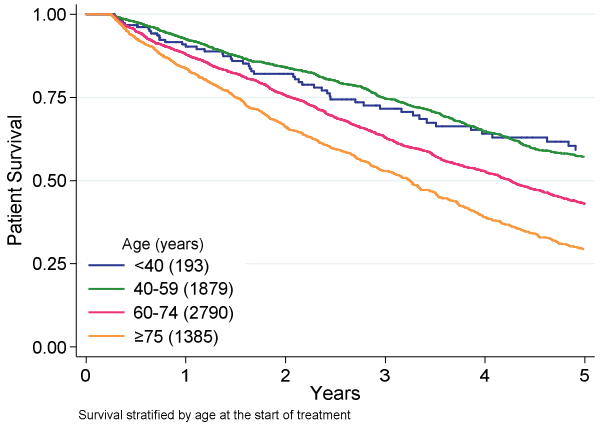


Figure 4.8.1 - Patient Survival by Age Group - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant - No Diabetes and No Cardiovascular Disease

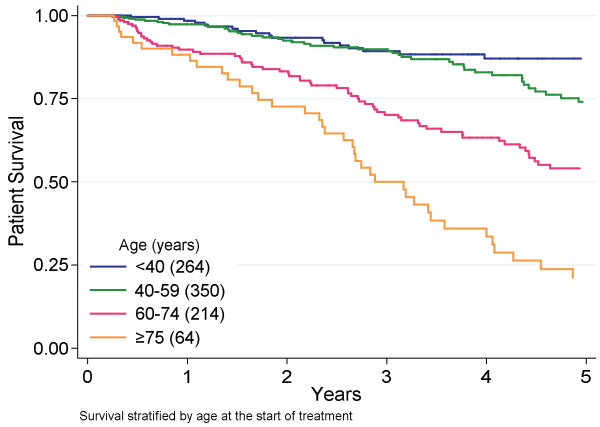


Figure 4.8.2 - Patient Survival by Age Group - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant - Diabetes but No Cardiovascular Disease

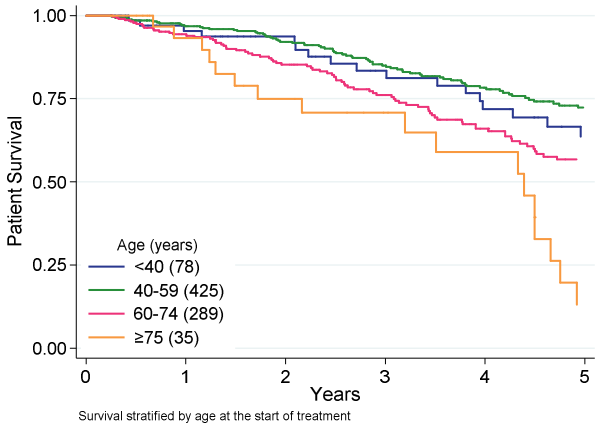


Figure 4.8.3 - Patient Survival by Age Group - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant - Cardiovascular Disease but No Diabetes

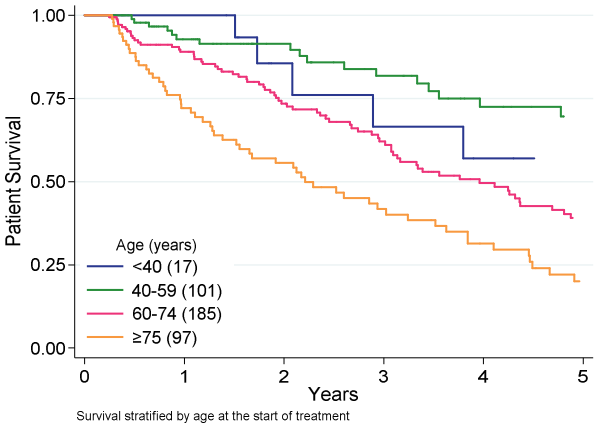
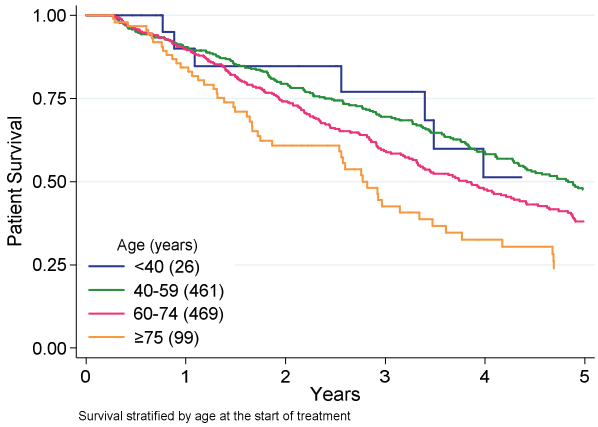


Figure 4.8.4 - Patient Survival by Age Group - Haemodialysis at 90 Days - New Zealand 2005 - 2016 Censored for Transplant - Both Diabetes and Cardiovascular Disease



Dialysis Prescription

Table 4.7 shows the blood flow rates by year and country. Flows of 300-349mL/min are the most common in each country. Table 4.8 presents the same data by vascular access type for 2016; the distribution of blood flow rates is similar within each type of access, although slightly lower rates are seen in patients dialysing with a central venous catheter (CVC). The overall distribution of blood flow rates over 2014-2016 is shown in figure 4.9.

Table 4.7 Blood Flow Rates (mL/minute) 2012-2016

Country	Year	Total Patients*	NR**	<200	200-249	250-299	300-349	350-399	400+
Australia	2012	9293	201 (2.2%)	26 (0.3%)	233 (2.5%)	1294 (13.9%)	5388 (58.0%)	1864 (20.1%)	287 (3.1%)
	2013	9543	136 (1.4%)	33 (0.3%)	222 (2.3%)	1318 (13.8%)	5672 (59.4%)	1916 (20.1%)	246 (2.6%)
	2014	9763	319 (3.3%)	26 (0.3%)	204 (2.1%)	1415 (14.5%)	5733 (58.7%)	1845 (18.9%)	221 (2.3%)
	2015	10037	492 (4.9%)	32 (0.3%)	215 (2.1%)	1438 (14.3%)	6003 (59.8%)	1662 (16.6%)	195 (1.9%)
	2016	**10266**	**752 (7.3%)**	**29 (0.3%)**	**175 (1.7%)**	**1466 (14.3%)**	**6173 (60.1%)**	**1531 (14.9%)**	**140 (1.4%)**
New Zealand	2012	1696	26 (1.5%)	4 (0.2%)	116 (6.8%)	385 (22.7%)	874 (51.5%)	258 (15.2%)	33 (1.9%)
	2013	1763	8 (0.5%)	3 (0.2%)	106 (6.0%)	400 (22.7%)	956 (54.2%)	256 (14.5%)	34 (1.9%)
	2014	1867	26 (1.4%)	0 (0.0%)	108 (5.8%)	412 (22.1%)	1016 (54.4%)	263 (14.1%)	42 (2.2%)
	2015	1909	66 (3.5%)	1 (0.1%)	107 (5.6%)	411 (21.5%)	1067 (55.9%)	230 (12.0%)	27 (1.4%)
	2016	**1927**	**40 (2.1%)**	**7 (0.4%)**	**120 (6.2%)**	**475 (24.6%)**	**976 (50.6%)**	**270 (14.0%)**	**39 (2.0%)**

** CVV HD Patients excluded from Total. ** Not Reported*

Table 4.8 Blood Flow Rate by Type of Access - December 2016

	Australia			New Zealand		
Blood Flow Rate	AVF	AVG	CVC	AVF	AVG	CVC
<200	10 (0.1%)	2 (0.4%)	17 (1.3%)	4 (0.3%)	0 (0.0%)	3 (0.6%)
200-249	113 (1.5%)	1 (0.2%)	59 (4.4%)	66 (5.0%)	4 (5.1%)	50 (10.0%)
250-299	950 (12.5%)	77 (14.9%)	429 (31.9%)	249 (19.0%)	32 (41.0%)	191 (38.3%)
300-349	5039 (66.1%)	339 (65.7%)	766 (56.9%)	697 (53.2%)	35 (44.9%)	243 (48.7%)
350-399	1362 (17.9%)	95 (18.4%)	72 (5.3%)	254 (19.4%)	7 (9.0%)	9 (1.8%)
400+	137 (1.8%)	2 (0.4%)	1 (0.1%)	37 (2.8%)	0 (0.0%)	1 (0.2%)
Total	**7621**	**516**	**1346**	**1310**	**78**	**499**

** CVV HD Patients excluded.*

*** Blood Flow Rate or Type of Access Not Reported for 795 Australian and 45 New Zealand patients.*

Figure 4.9.1 - Distribution of Blood Flow Rates - Prevalent Haemodialysis – Australia

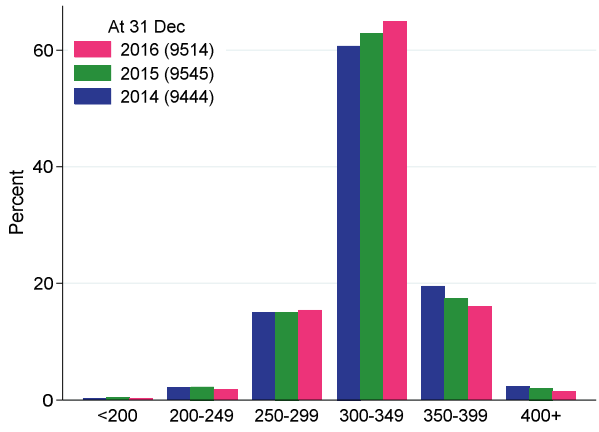


Figure 4.9.2 - Distribution of Blood Flow Rates - Prevalent Haemodialysis - New Zealand

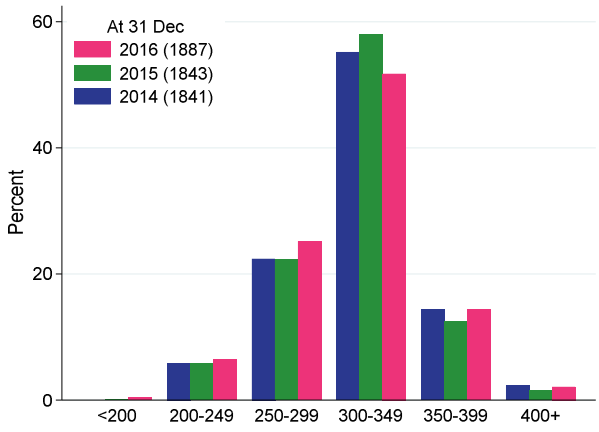


Table 4.9 shows the number of weekly sessions, and hours per session, at 31 December 2016. In each country the large majority are dialysing for 3 sessions per week, and for between 4-5 hours per session. Figure 4.10 shows the percentage of patients undertaking quotidian dialysis (>3 sessions per week OR >5 hours per session). Figures 4.11 and 4.12 show HD frequency and session length respectively over 2014-2016. Figure 4.13 combines sessions and session length to show the total number of weekly hours of HD over 2014-2016. New Zealand patients receive slightly more total hours of weekly HD compared with Australian patients.

Table 4.9 Duration and Number of Sessions per Week - December 2016

Country	Sessions per week	Hours of Each Treatment						
		<4	4	4.5	5	5.5	>5.5	Total
Australia	**<3**	35 (14.0%)	129 (51.6%)	48 (19.2%)	35 (14.0%)	0 (0.0%)	3 (1.2%)	**250**
	3	337 (3.9%)	3395 (39.7%)	2106 (24.6%)	2375 (27.8%)	145 (1.7%)	186 (2.2%)	**8544**
	3.1-4.9	33 (5.4%)	122 (20.0%)	45 (7.4%)	150 (24.5%)	20 (3.3%)	241 (39.4%)	**611**
	5+	41 (36.9%)	27 (24.3%)	1 (0.9%)	8 (7.2%)	1 (0.9%)	33 (29.7%)	**111**
	Total	**446 (4.7%)**	**3673 (38.6%)**	**2200 (23.1%)**	**2568 (27.0%)**	**166 (1.7%)**	**463 (4.9%)**	**9516**
New Zealand	**<3**	4 (23.5%)	4 (23.5%)	1 (5.9%)	7 (41.2%)	0 (0.0%)	1 (5.9%)	**17**
	3	37 (2.3%)	455 (28.1%)	444 (27.4%)	549 (33.9%)	65 (4.0%)	71 (4.4%)	**1621**
	3.1-4.9	8 (3.4%)	41 (17.5%)	34 (14.5%)	83 (35.5%)	8 (3.4%)	60 (25.6%)	**234**
	5+	8 (61.5%)	2 (15.4%)	0 (0.0%)	2 (15.4%)	0 (0.0%)	1 (7.7%)	**13**
	Total	**57 (3.0%)**	**502 (26.6%)**	**479 (25.4%)**	**641 (34.0%)**	**73 (3.9%)**	**133 (7.1%)**	**1885**

* Intermediate durations are rounded up, e.g. 4.25 is included in 4.5.

** Hours or number of sessions not reported for 750 Australian and 42 New Zealand patients.

Figure 4.10 - Haemodialysis Conventional/Quotidian - 2014-2016

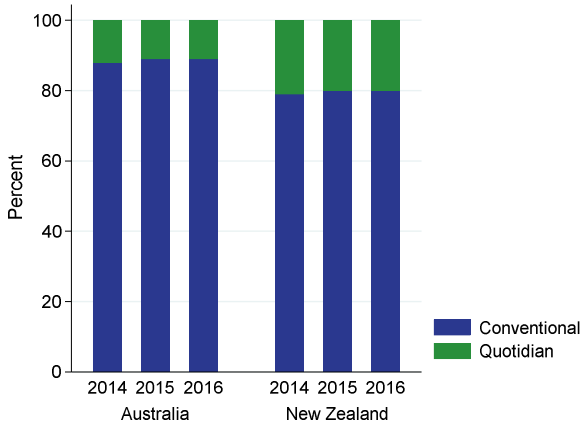


Figure 4.11 - Haemodialysis Frequency Per Week - 2014-2016

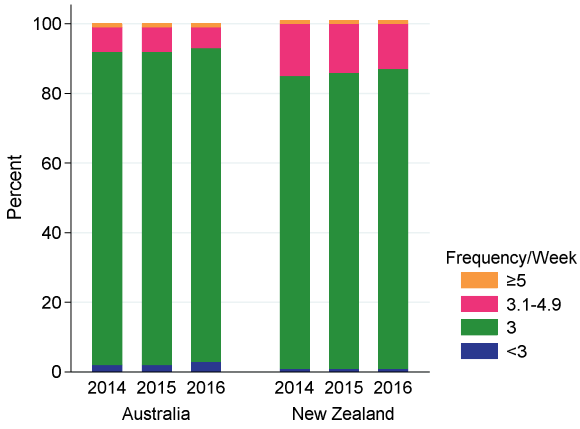


Figure 4.12 - Haemodialysis Session Length (Hours) - December 2014-2016

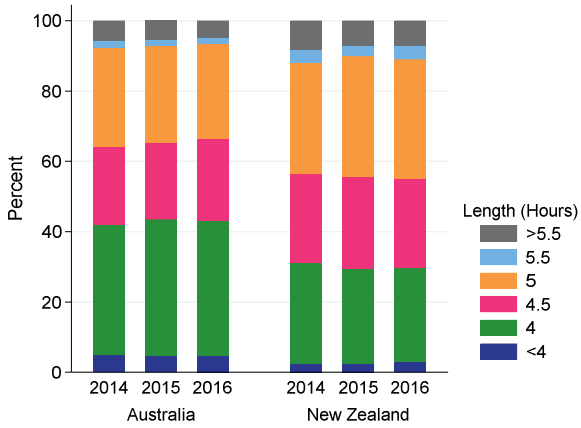
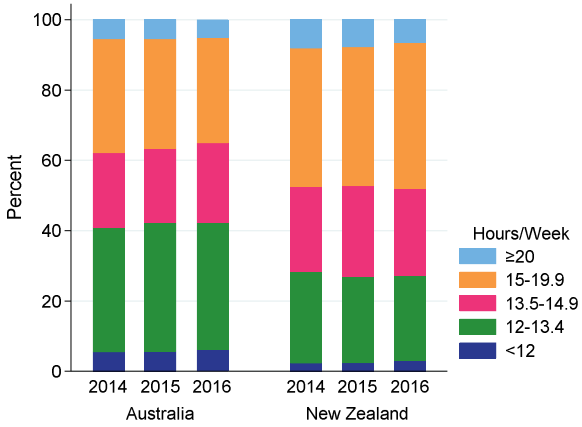


Figure 4.13 - Haemodialysis Duration (Hours Per Week) - December 2014-2016



Figures 4.14-4.16 show trends in dialysis prescription. The proportion of patients dialysing five days or more per week continues to fall in both countries. Amongst the patients dialysing three times per week, the previously increasing proportion dialysing 4.5 hours or longer seems to have plateaued as has the proportion dialysing >12 hours per week. Tables 4.10-4.12 present these same data for 2013-2016 by state and country.

Figure 4.14 - Percentage of HD Patients Dialysing Five or More Days Per Week

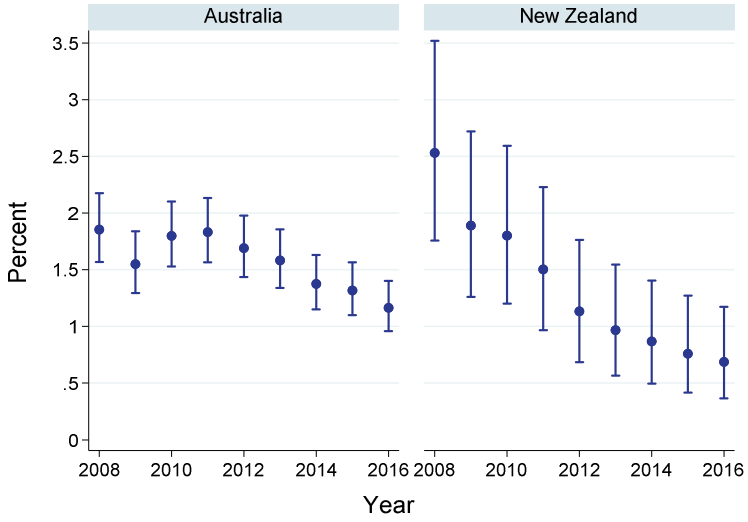


Figure 4.15 - Percentage of HD Patients Dialysing 3 Days Per Week Dialysing 4.5 Hours or Longer Per Session

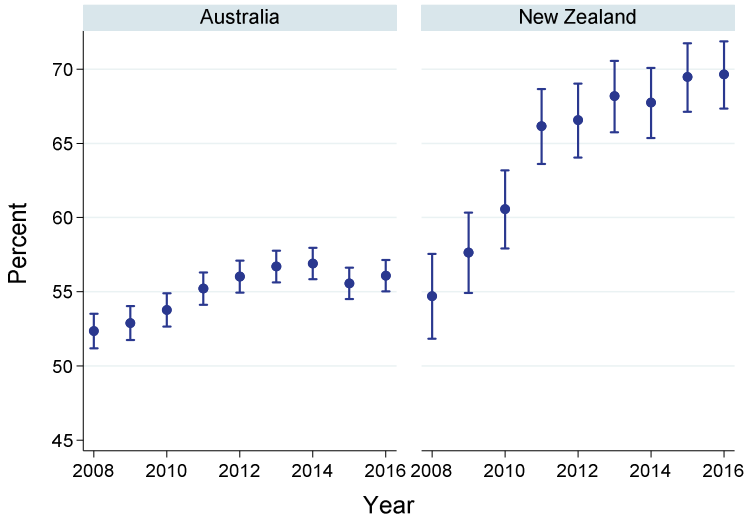


Figure 4.16 - Percentage of HD Patients Dialysing >12 hours Per Week

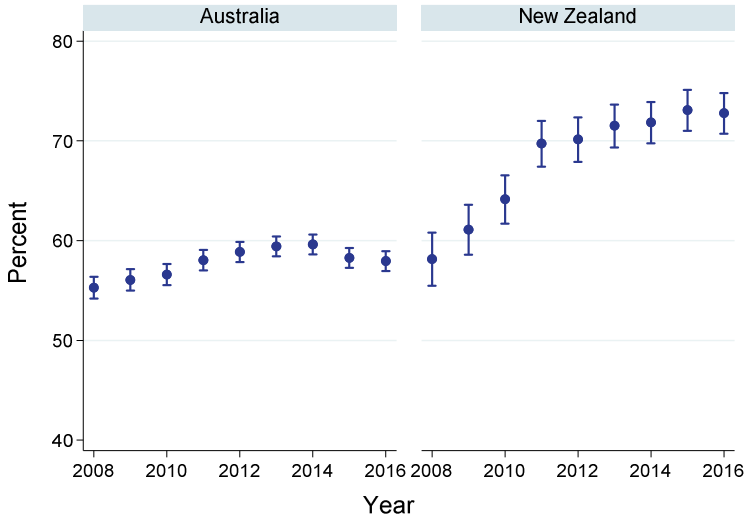


Table 4.10 Haemodialysis >=5 Sessions Per Week by Australian State and Country 2013-2016

	Australia							New Zealand
Year	QLD	NSW/ACT	VIC	TAS	SA	NT	WA	
2016	**40 (2.2%)**	**13 (0.4%)**	**42 (1.8%)**	**3 (1.7%)**	**6 (0.9%)**	**1 (0.2%)**	**6 (0.7%)**	**13 (0.7%)**
2015	47 (2.5%)	15 (0.5%)	42 (1.8%)	3 (1.5%)	7 (1.1%)	1 (0.2%)	11 (1.2%)	14 (0.8%)
2014	43 (2.4%)	19 (0.6%)	48 (2.0%)	3 (1.6%)	6 (1.0%)	2 (0.4%)	9 (1.0%)	16 (0.9%)
2013	52 (3.0%)	19 (0.6%)	54 (2.3%)	4 (2.3%)	4 (0.6%)	1 (0.2%)	15 (1.7%)	17 (1.0%)

Table 4.11 Haemodialysis >=4.5 Hours Per Session - Three Sessions Per Week by Australian State and Country 2013-2016

	Australia							New Zealand
Year	QLD	NSW/ACT	VIC	TAS	SA	NT	WA	
2016	**913 (56.9%)**	**1915 (69.0%)**	**1038 (50.7%)**	**101 (62.7%)**	**199 (31.4%)**	**422 (73.8%)**	**204 (27.3%)**	**1129 (69.6%)**
2015	912 (56.3%)	1954 (70.4%)	1029 (49.4%)	105 (64.8%)	179 (30.1%)	370 (72.5%)	214 (25.9%)	1088 (69.5%)
2014	877 (57.6%)	2049 (73.0%)	1036 (48.9%)	100 (62.9%)	171 (29.2%)	374 (73.8%)	223 (28.3%)	1044 (67.7%)
2013	910 (59.8%)	2067 (74.7%)	983 (46.2%)	99 (66.0%)	145 (25.2%)	343 (71.6%)	239 (29.3%)	1001 (68.2%)

Table 4.12 Haemodialysis >12 Hours Per Week by Australian State and Country 2013-2016

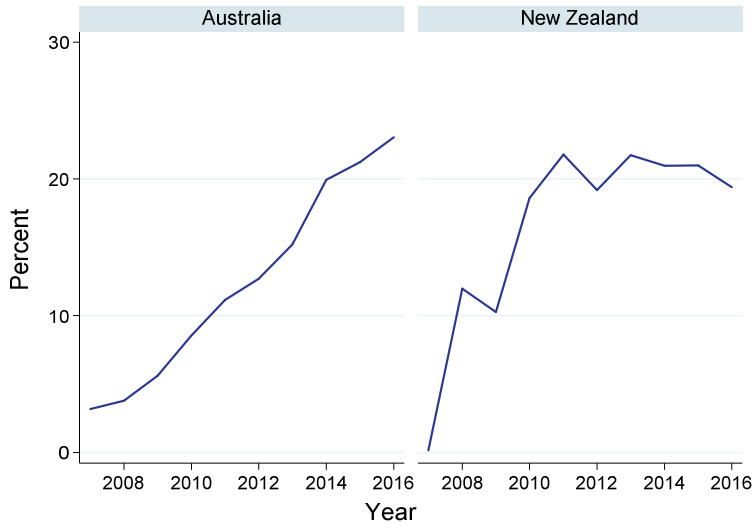
	Australia							New Zealand
Year	QLD	NSW/ACT	VIC	TAS	SA	NT	WA	
2016	1090 (59.4%)	2129 (68.1%)	1254 (54.5%)	119 (66.5%)	234 (34.7%)	428 (73.8%)	261 (31.8%)	1372 (72.8%)
2015	1096 (59.2%)	2188 (70.5%)	1263 (53.8%)	131 (67.5%)	218 (34.5%)	388 (73.6%)	287 (31.6%)	1347 (73.1%)
2014	1088 (61.2%)	2275 (73.3%)	1272 (53.5%)	128 (67.4%)	204 (33.0%)	382 (73.6%)	285 (32.9%)	1325 (71.9%)
2013	1095 (62.2%)	2322 (74.8%)	1230 (51.7%)	122 (68.9%)	174 (28.0%)	348 (71.9%)	303 (34.2%)	1256 (71.5%)

Table 4.13 shows the use of high-flux dialysis and haemodiafiltration by state and country in 2016. There are substantial differences across states and countries. Figure 4.17 shows the steady growth in the use of HDF in Australia, in contrast to New Zealand where there was rapid uptake of HDF but its use has been relatively constant (around 20%) since 2010.

Table 4.13 Number of Patients Receiving Standard Haemodialysis (and Membrane Type), Haemofiltration and Haemodiafiltration - December 2016

HD Modality	QLD	NSW/ ACT	VIC	TAS	SA	NT	WA	Australia	New Zealand
Haemodialysis	1454	2383	2156	175	437	537	746	7888	1534
High Flux	1398	2282	2056	167	433	519	589	7444	1328
Non-High Flux	7	4	5	8	1	3	0	28	185
Unreported	49	97	95	0	3	15	157	416	21
Haemofiltration	5	25	2	0	8	1	0	41	0
Haemodiafiltration	483	865	284	4	233	73	381	2323	369
Percent HDF of Total	24.9%	26.4%	11.6%	2.2%	34.4%	11.9%	33.8%	22.7%	19.4%
Total	**1942**	**3273**	**2442**	**179**	**678**	**611**	**1127**	**10252**	**1903**

Figure 4.17 - Use of Haemodiafiltration - Prevalent Haemodialysis Patients 2007-2016



Anaemia

Figure 4.18 shows the variation in Hb between treating hospitals; median Hb ranged from 102 to 123g/L in Australia and 104 to 114g/L in New Zealand.

Figure 4.18.1 - Haemoglobin in Haemodialysis Patients - Australia 31 December 2016

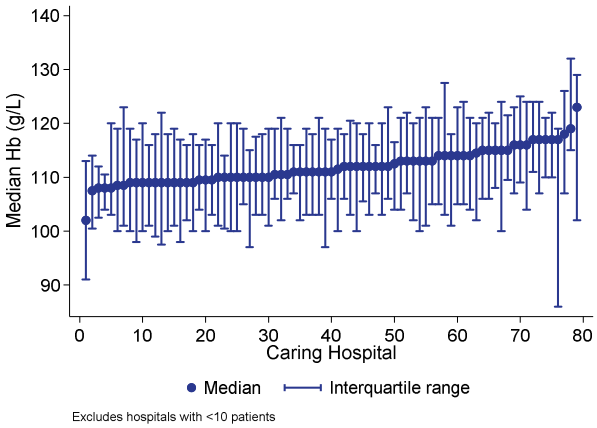


Figure 4.18.2 - Haemoglobin in Haemodialysis Patients - New Zealand 31 December 2016

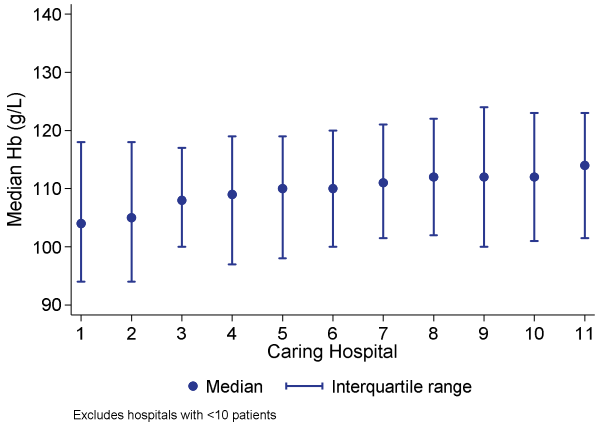


Figure 4.19 shows the proportion of patients with Hb between 110-129g/L; the proportion ranged from 31-76% in Australia and 32-47% in New Zealand.

Figure 4.19.1 - % Haemodialysis Patients with Hb 110-129 g/L - Australia 31 December 2016

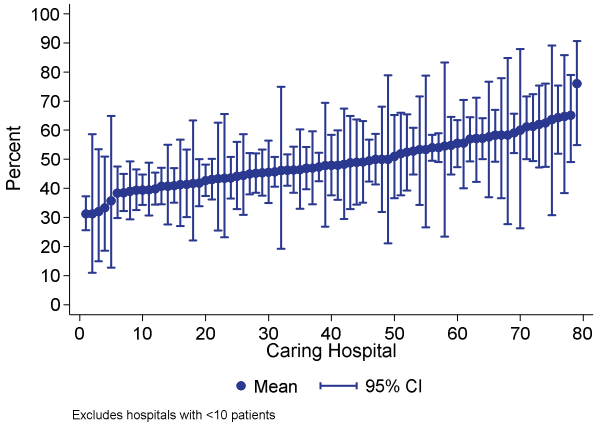
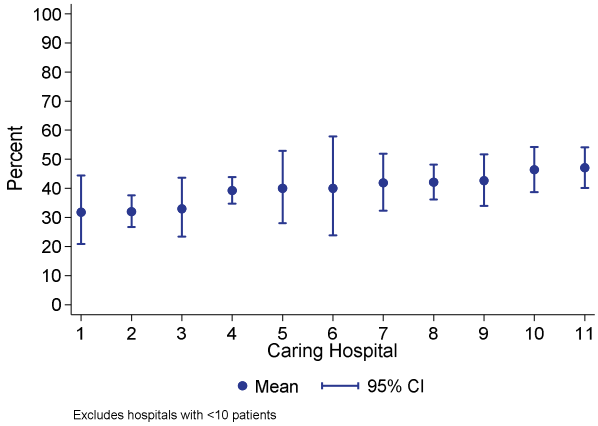


Figure 4.19.2 - % Haemodialysis Patients with Hb 110-129 g/L - New Zealand 31 December 2016



The proportion of patients with ferritin between 200-500µg/L ranged from 6-72% in Australia and 22-45% in New Zealand (figure 4.20). Figure 4.21 present equivalent data for transferrin saturation.

Figure 4.20.1 - % Haemodialysis Patients with Ferritin 200-500 {&mu}g/L - Australia 31 December 2016

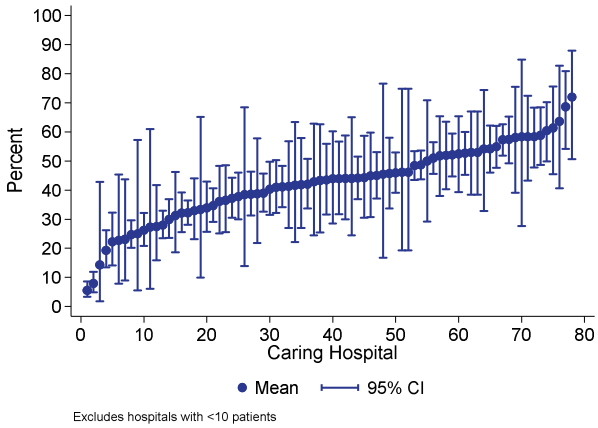


Figure 4.20.2 - % Haemodialysis Patients with Ferritin 200-500 {&mu}g/L - New Zealand 31 December 2016

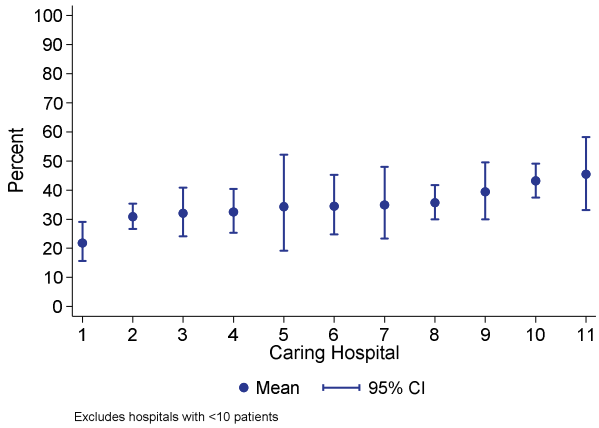


Figure 4.21.1 - % Haemodialysis Patients with TSat >20% - Australia 31 December 2016

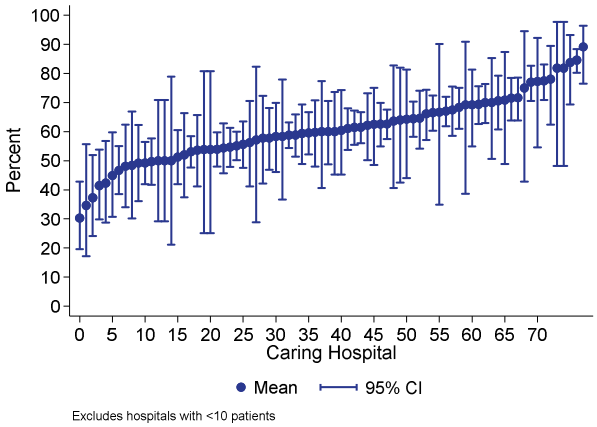
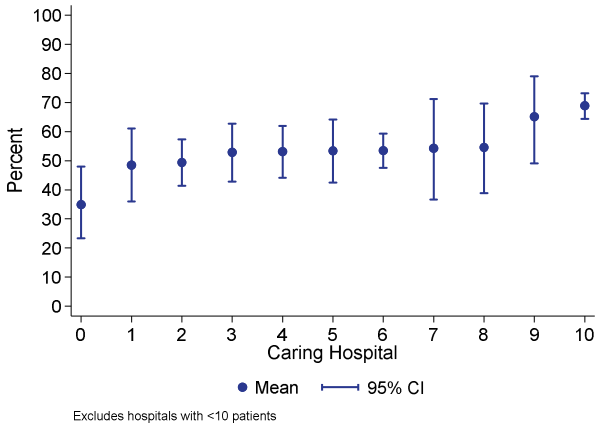


Figure 4.21.2 - % Haemodialysis Patients with TSat >20% - New Zealand 31 December 2016



Biochemistry

Figures 4.22 and 4.23 show the proportions of patients with calcium between 2.1-2.4mmol/L and phosphate between 0.8-1.6mmol/L respectively.

Figure 4.22.1 - % Haemodialysis Patients with Calcium 2.1-2.4 mmol/L - Australia 31 December 2016

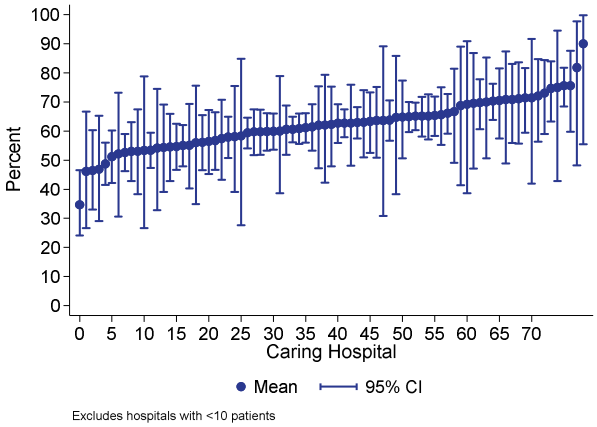


Figure 4.22.2 - % Haemodialysis Patients with Calcium 2.1-2.4 mmol/L - New Zealand 31 December 2016

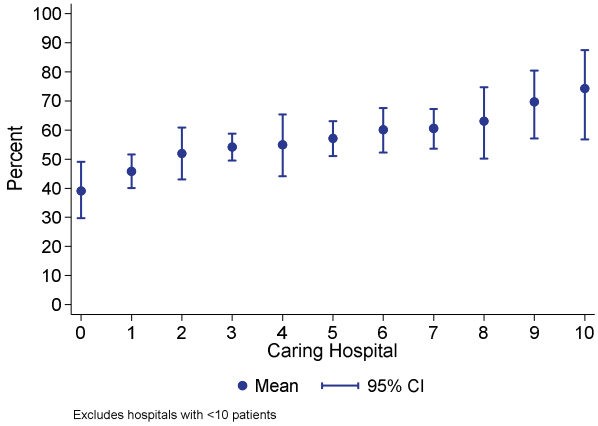


Figure 4.23.1 - % Haemodialysis Patients with Phosphate 0.8-1.6 mmol/L - Australia 31 December 2016

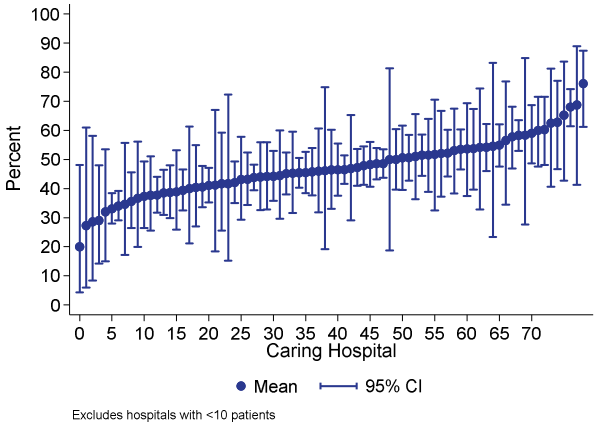
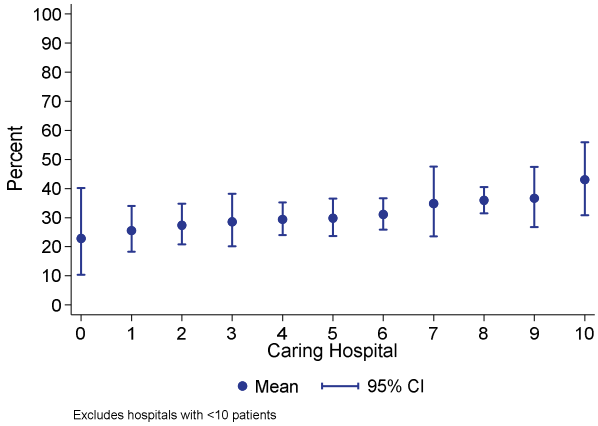


Figure 4.23.2 - % Haemodialysis Patients with Phosphate 0.8-1.6 mmol/L - New Zealand 31 December 2016



Dialysis Adequacy

Figure 4.24 shows the distribution of URR by country over 2014-2016; there is little change from year to year, and clearances are lower in New Zealand than in Australia. Figure 4.25 presents the 2016 data stratified by vascular access type.

Figure 4.24 - Urea Reduction Ratio - HD Three Sessions Per Week

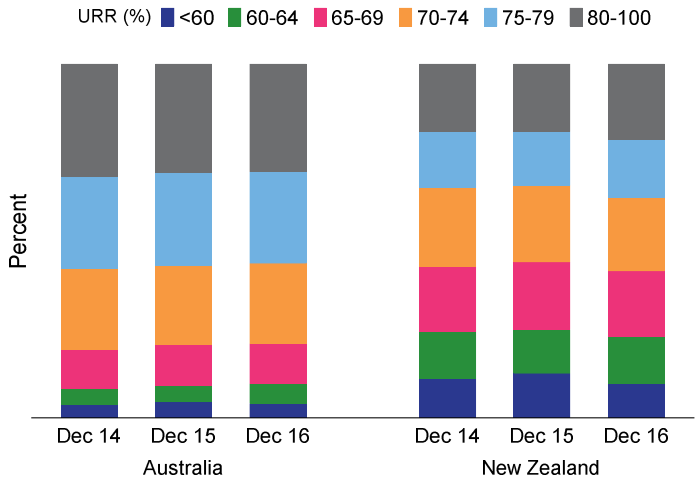


Figure 4.25 - Urea Reduction Ratio - Related to Type of Access, 2016 HD Three Sessions Per Week

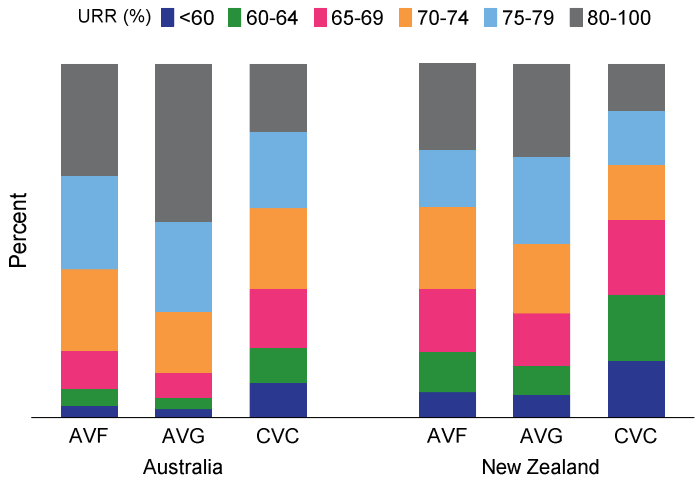


Table 4.14 presents URR by dialysis session duration. In general, as expected, the proportion of patients with a URR ≥70% typically increases with longer session duration.

Table 4.14 Urea Reduction Ratio - Prevalent Patients Three Sessions Per Week - December 2016

		Urea Reduction Ratio %		
	Hours per Session	**<=70**	**>70**	**Total**
Australia	**<4 hours**	97 (32.3%)	203 (67.7%)	300
	4 hours	752 (24.5%)	2312 (75.5%)	3064
	>4-5 hours	969 (23.5%)	3158 (76.5%)	4127
	>5 hours	65 (23.8%)	208 (76.2%)	273
	Total	**1883 (24.3%)**	**5881 (75.7%)**	**7764**
New Zealand	**<4 hours**	18 (51.4%)	17 (48.6%)	35
	4 hours	191 (48.8%)	200 (51.2%)	391
	>4-5 hours	361 (42.0%)	499 (58.0%)	860
	>5 hours	45 (40.5%)	66 (59.5%)	111
	Total	**615 (44.0%)**	**782 (56.0%)**	**1397**

Figure 4.26 shows the distribution of median URR by treating hospital for patients dialysing three times per week. In Australia the median ranged from 70-88%, and in New Zealand it ranged from 69-82%.

Figure 4.26.1 - Median URR in Haemodialysis Patients - Three Sessions Per Week Australia 31 December 2016

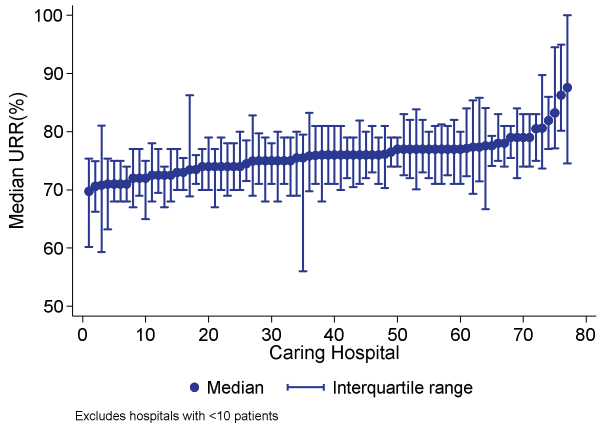


Figure 4.26.2 - Median URR in Haemodialysis Patients - Three Sessions Per Week New Zealand 31 December 2016

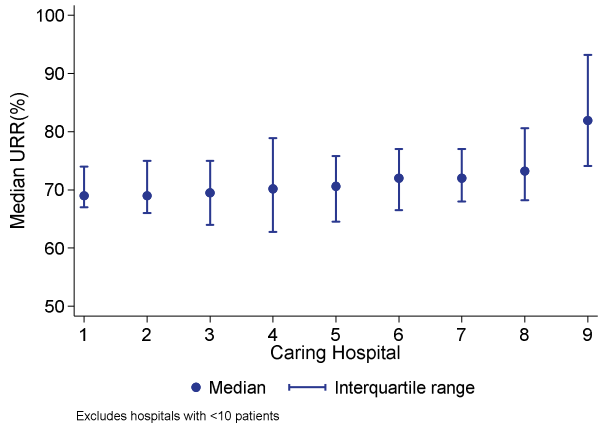


Figure 4.27 shows the proportion of patients with a URR >70%. In Australia this proportion ranged from 48-100%, and in New Zealand from 40-84%.

Figure 4.27.1 - % Haemodialysis Patients with URR>70% - Three Sessions Per Week Australia 31 December 2016

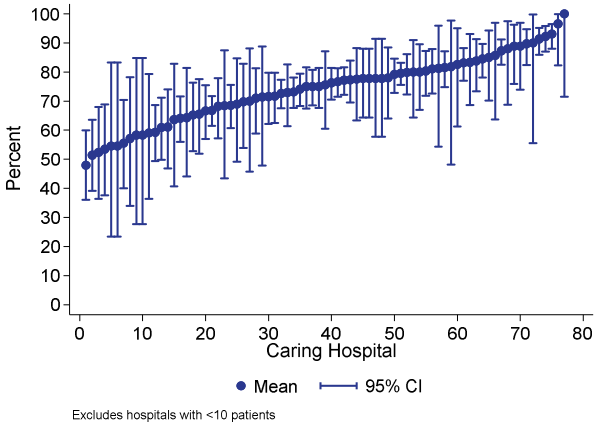
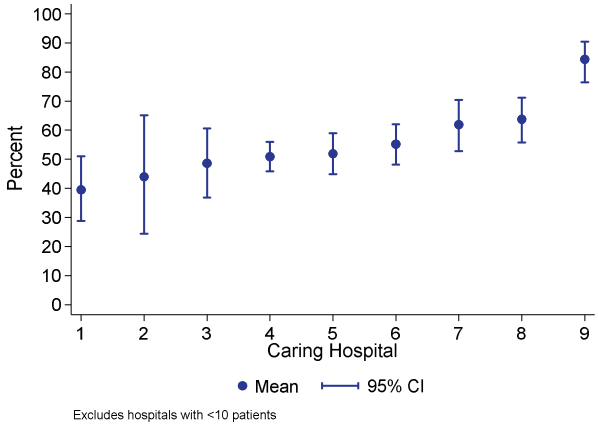


Figure 4.27.2 - % Haemodialysis Patients with URR>70% - Three Sessions Per Week New Zealand 31 December 2016



Vascular Access

Incident Patients

For figures 4.28 to 4.31 and table 4.15, the majority of patients commence haemodialysis as their first RRT with a catheter; tunnelled catheters are more common than non-tunnelled.Young (age <25 years) patients and those patients who were first seen by nephrologists <3 months before starting haemodialysis (“late referrals”) were less likely to start with an AVF or AVG.

ANZDATA does not collect information about indication for HD catheter usage, hence the reason that around half of non-late referred patients commenced with a central venous catheter is not known.

Figure 4.28 - Vascular Access - Initial RRT - Haemodialysis as Initial Modality

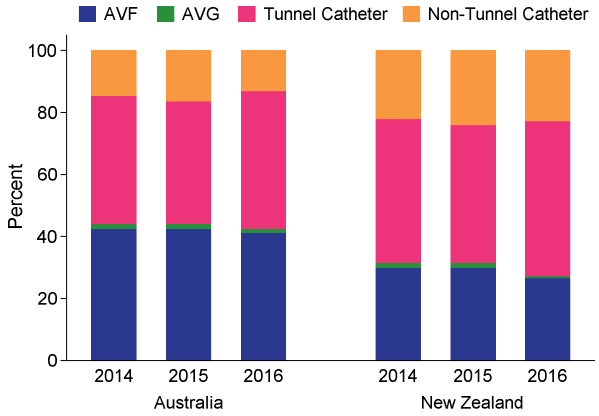


Figure 4.29 - Vascular Access - Initial RRT - By Age Group 2016

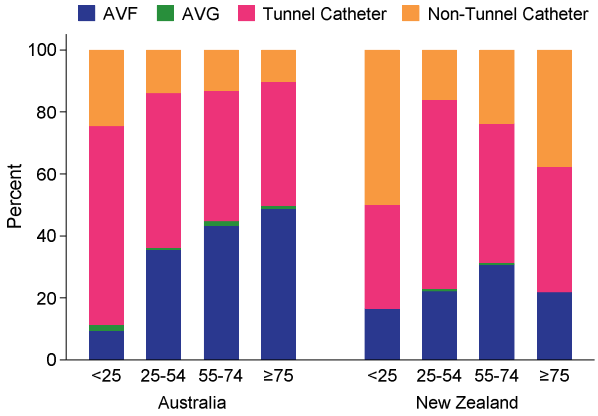


Figure 4.30.1 - Vascular Access - Initial RRT - By Gender - Australia

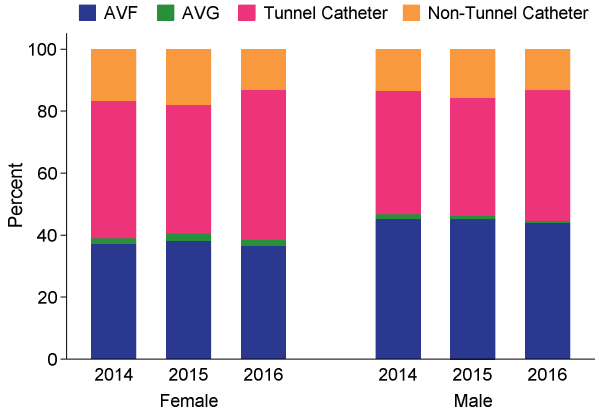


Figure 4.30.2 - Vascular Access - Initial RRT - By Gender - New Zealand

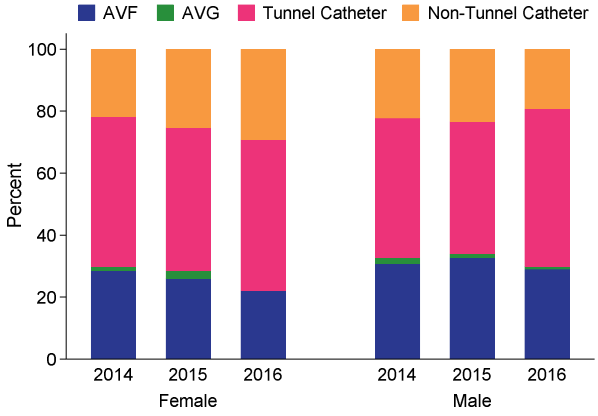


Figure 4.31.1 - Vascular Access - Initial RRT By Referral Time - Australia

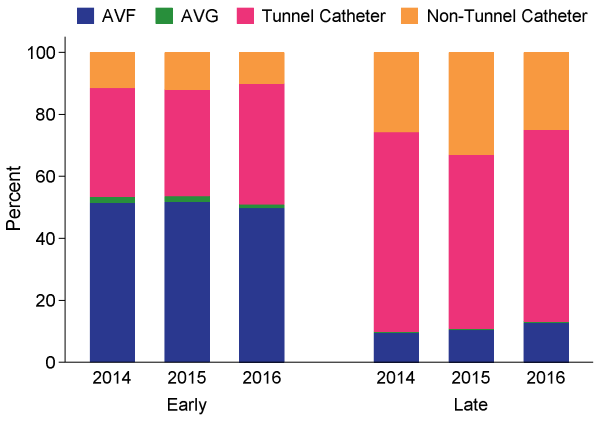


Figure 4.31.2 - Vascular Access - Initial RRT By Referral Time - New Zealand

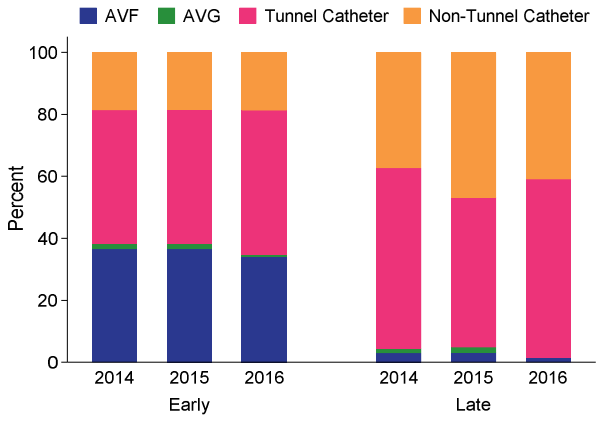


Table 4.15 Incident Vascular Access by Australian State and Country 2014-2016

	2014		2015		2016	
State/Country	AVF/AVG	CVC	AVF/AVG	CVC	AVF/AVG	CVC
Australia	**800 (44%)**	**1019 (56%)**	**800 (44%)**	**1014 (56%)**	**803 (42%)**	**1090 (58%)**
QLD	150 (46%)	175 (54%)	160 (47%)	181 (53%)	144 (42%)	195 (58%)
NSW/ACT	214 (39%)	329 (61%)	229 (42%)	312 (58%)	232 (40%)	342 (60%)
Vic	204 (46%)	244 (54%)	193 (45%)	237 (55%)	209 (46%)	245 (54%)
Tas	16 (44%)	20 (56%)	14 (37%)	24 (63%)	25 (57%)	19 (43%)
SA	83 (65%)	44 (35%)	79 (60%)	52 (40%)	79 (48%)	85 (52%)
NT	41 (38%)	68 (62%)	46 (39%)	73 (61%)	34 (46%)	40 (54%)
WA	92 (40%)	139 (60%)	79 (37%)	135 (63%)	80 (33%)	164 (67%)
New Zealand	**109 (32%)**	**235 (68%)**	**96 (32%)**	**207 (68%)**	**87 (27%)**	**233 (73%)**

Figure 4.32 shows the proportion of patients in each hospital starting haemodialysis as their first RRT with an AVF/AVG, arranged from the lowest to the highest. In Australia, this ranged widely from 8-79%. The corresponding range in New Zealand was 15-52%. This wide variation reflects differences in practices, protocols, resources and patient case-mix among centres.

Figure 4.32.1 - % Initial RRT HD Patients Starting with AVF/AVG - Australia 2016

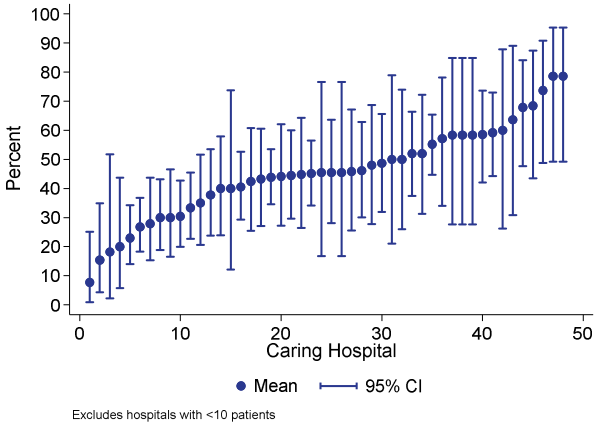
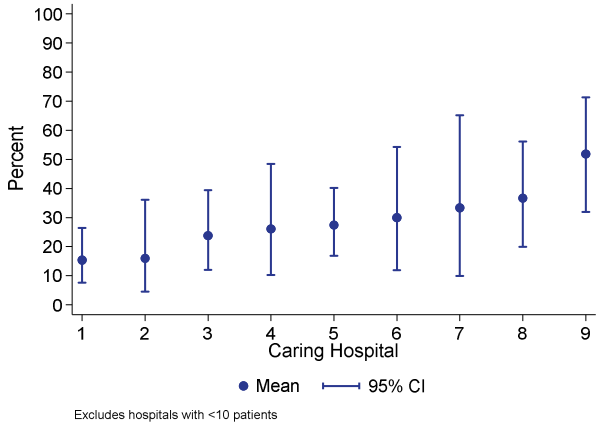


Figure 4.32.2 - % Initial RRT HD Patients Starting with AVF/AVG - New Zealand 2016



Prevalent Patients

Figures 4.33 to 4.36 and table 4.16, show dialysis access among prevalent (rather than incident) patients (those receiving haemodialysis at 31 December).In both Australia and New Zealand, the proportions of patients dialysing with AV grafts and fistulae at 31 December are stable. Female patients in both countries, young (age <25 years) in Australia and old (age ≥75 years) patients in New Zealand were less likely to be dialysing with an AVF or AVG. Patients on home haemodialysis have the highest rate of AVF use in both Australia and New Zealand.

Figure 4.33 - Prevalent Haemodialysis Access 2016

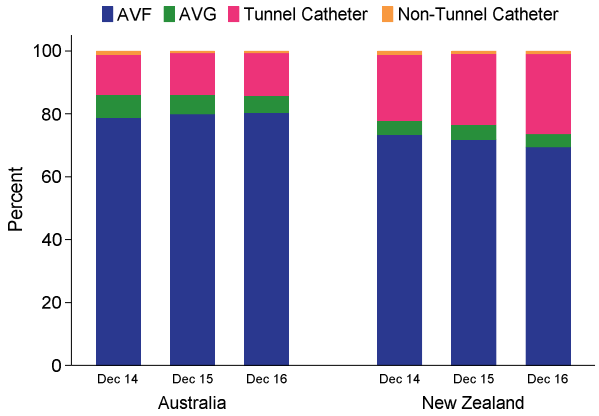


Figure 4.34 - Prevalent Haemodialysis Access - By Age Group 2016

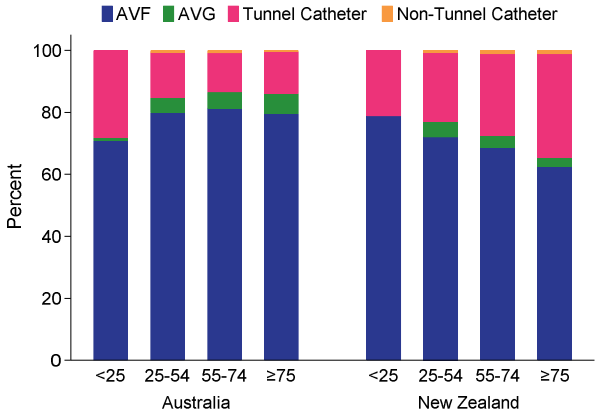


Figure 4.35.1 - Prevalent Haemodialysis Access - By Gender - Australia

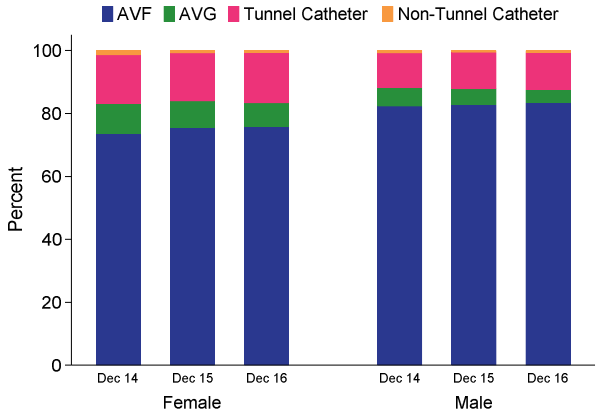


Figure 4.35.2 - Prevalent Haemodialysis Access - By Gender - New Zealand

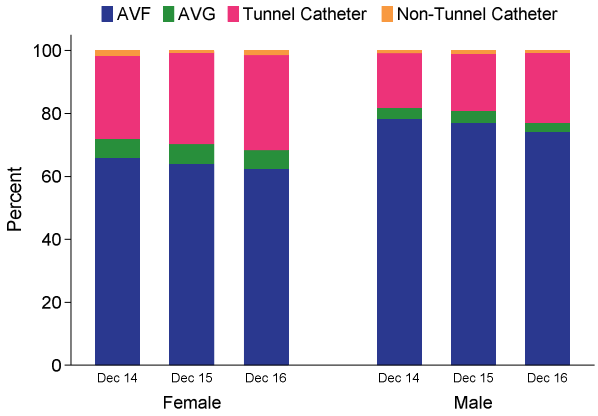


Figure 4.36 - Prevalent Haemodialysis Access - By Location 2016

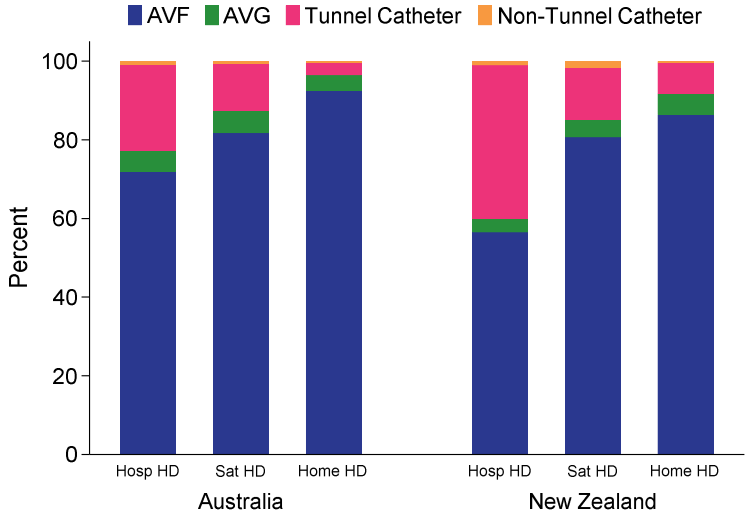


Table 4.16 Prevalent Vascular Access by Australian State and Country at 31 December 2016

	2014		2015		2016	
State/Country	AVF/AVG	CVC	AVF/AVG	CVC	AVF/AVG	CVC
Australia	**8130 (86%)**	**1303 (14%)**	**8212 (86%)**	**1307 (14%)**	**8137 (86%)**	**1346 (14%)**
QLD	1566 (88%)	209 (12%)	1618 (88%)	224 (12%)	1586 (87%)	247 (13%)
NSW/ACT	2608 (84%)	488 (16%)	2618 (85%)	469 (15%)	2639 (85%)	465 (15%)
Vic	2083 (88%)	292 (12%)	2048 (88%)	284 (12%)	1979 (86%)	317 (14%)
Tas	157 (83%)	33 (17%)	153 (79%)	41 (21%)	149 (83%)	30 (17%)
SA	580 (94%)	39 (6%)	577 (91%)	54 (9%)	607 (90%)	67 (10%)
NT	445 (86%)	75 (14%)	459 (87%)	66 (13%)	523 (90%)	58 (10%)
WA	691 (81%)	167 (19%)	739 (81%)	169 (19%)	654 (80%)	162 (20%)
New Zealand	1428 (78%)	408 (22%)	1405 (77%)	430 (23%)	1388 (74%)	499 (26%)

Figure 4.37 shows the proportion of haemodialysis patients at each state or hospital dialysing with an AVF/AVG on 31st December 2016, arranged from the lowest to the highest. In Australia, the hospital proportions varied widely from 70-100%. The corresponding range in New Zealand was 49-85%.

Figure 4.37.1 - % Prevalent HD Patients Dialysing with AVF/AVG - Australia 31 December 2016

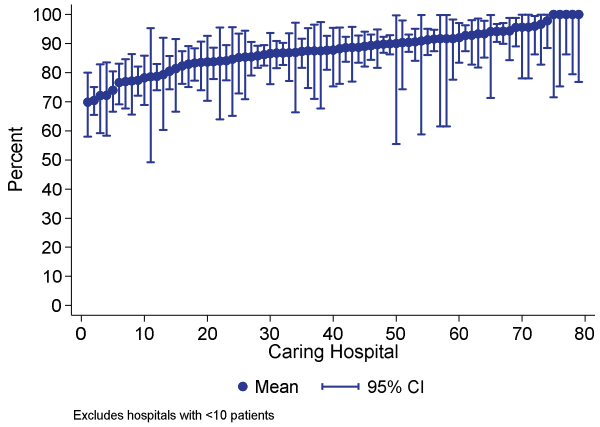
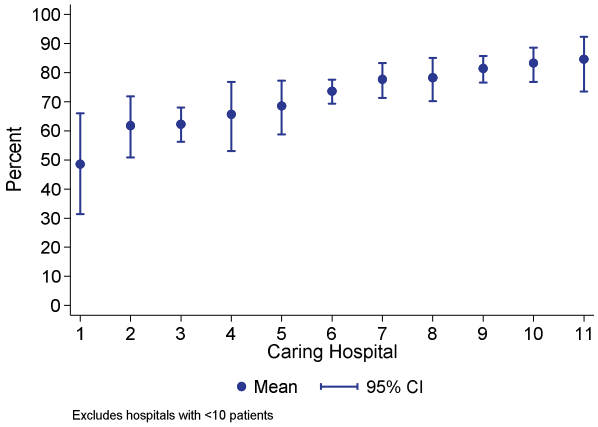


Figure 4.37.2 - % Prevalent HD Patients Dialysing with AVF/AVG - New Zealand 31 December 2016



Home Haemodialysis

The distribution of prevalent home haemodialysis patients by state is shown in table 4.17. The 2016 data are further stratified by age in figure 4.38, and the distribution of patients aged 65 and older is shown in table 4.18.

Table 4.17 Number (%) of Prevalent Haemodialysis Patients Treated with Home Haemodialysis 2012 - 2016

Country/State	2012	2013	2014	2015	2016
Australia	**1573 (14.3%)**	**1619 (14.3%)**	**1667 (14.3%)**	**1671 (14.0%)**	**1587 (13.0%)**
QLD	245 (14.5%)	270 (15.1%)	287 (15.7%)	282 (14.8%)	257 (13.2%)
NSW/ACT	513 (16.7%)	517 (16.3%)	497 (15.6%)	498 (15.5%)	471 (14.4%)
VIC	205 (8.7%)	200 (8.4%)	216 (9.0%)	216 (8.9%)	203 (8.3%)
TAS	16 (8.7%)	18 (10.2%)	25 (13.2%)	26 (13.4%)	21 (11.7%)
SA	22 (3.7%)	32 (5.1%)	33 (5.3%)	34 (5.2%)	30 (4.4%)
NT	34 (7.2%)	39 (8.0%)	46 (8.7%)	42 (7.2%)	41 (6.7%)
WA	64 (6.9%)	64 (7.0%)	75 (7.5%)	90 (8.6%)	96 (8.5%)
New Zealand	**474 (27.9%)**	**479 (27.2%)**	**488 (26.1%)**	**483 (25.3%)**	**468 (24.3%)**

Figure 4.38 - Home HD by Age Group - At 31 Dec 2016

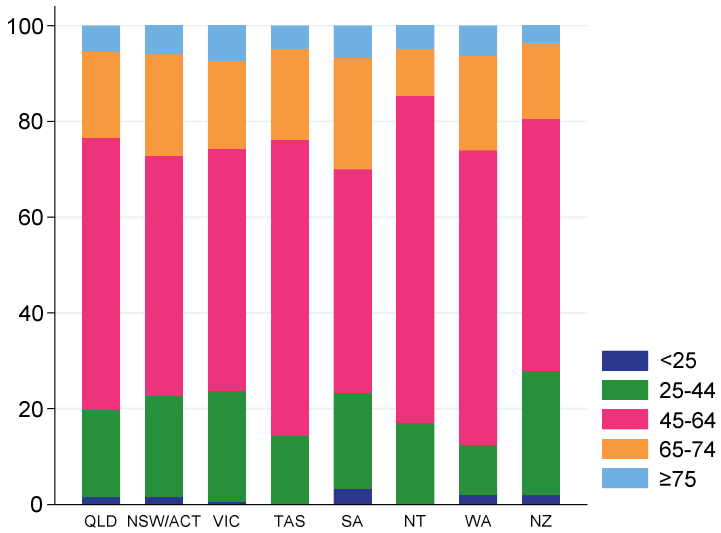


Table 4.18 Number (%) of Prevalent Haemodialysis Patients Aged >=65 Years Treated with Home Haemodialysis 2012 - 2016

Country/State	2012	2013	2014	2015	2016
Australia	**359 (6.8%)**	**348 (6.3%)**	**370 (6.6%)**	**373 (6.4%)**	**376 (6.2%)**
QLD	63 (7.5%)	66 (7.6%)	77 (8.7%)	73 (7.7%)	60 (6.2%)
NSW/ACT	120 (7.2%)	121 (6.9%)	124 (7.0%)	121 (6.7%)	128 (6.9%)
VIC	55 (4.1%)	50 (3.6%)	53 (3.8%)	53 (3.7%)	52 (3.5%)
TAS	6 (6.7%)	6 (7.0%)	7 (8.0%)	6 (6.2%)	5 (5.2%)
SA	11 (3.3%)	10 (2.8%)	5 (1.4%)	8 (2.2%)	9 (2.5%)
NT	3 (5.0%)	4 (6.1%)	6 (8.0%)	6 (6.0%)	6 (5.9%)
WA	15 (3.6%)	11 (2.7%)	14 (3.1%)	16 (3.5%)	25 (4.9%)
New Zealand	**86 (15.6%)**	**80 (13.8%)**	**84 (13.3%)**	**90 (13.8%)**	**91 (13.4%)**

The trends in the proportion treated with home HD in different age groups are illustrated in figure 4.39. In general home haemodialysis has become less common as a proportion of all haemodialysis patients, especially for younger patients.

Figure 4.39.1 - Home HD Percent of all HD by Age at 31 Dec 2016 – Australia

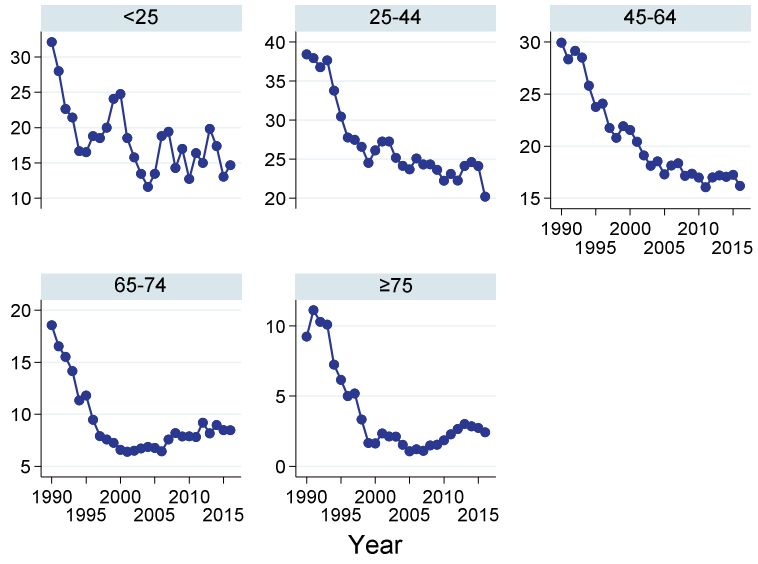
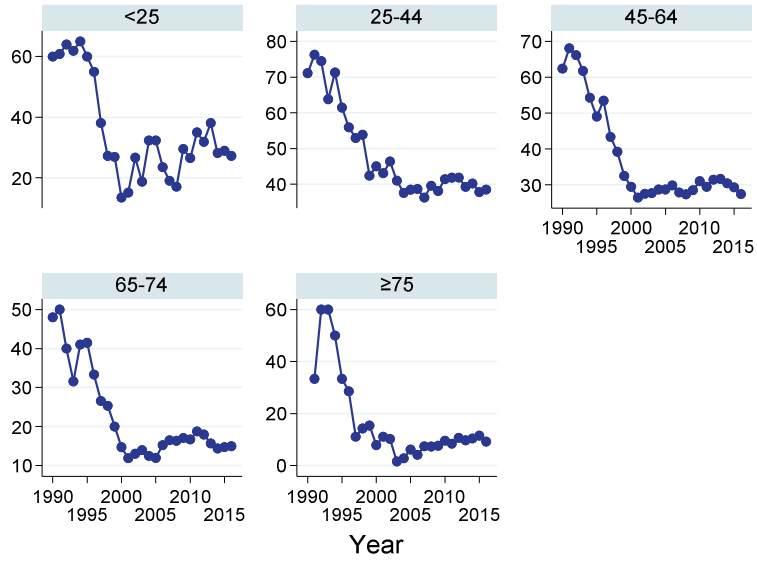


Figure 4.39.2 - Home HD Percent of all HD by Age at 31 Dec 2016 - New Zealand



There is substantial variation between hospitals, and between countries, in the proportion of haemodialysis patients who dialyse at home (figure 4.40).

Figure 4.40.1 - % Haemodialysis Patients on Home HD - Australia 31 December 2016

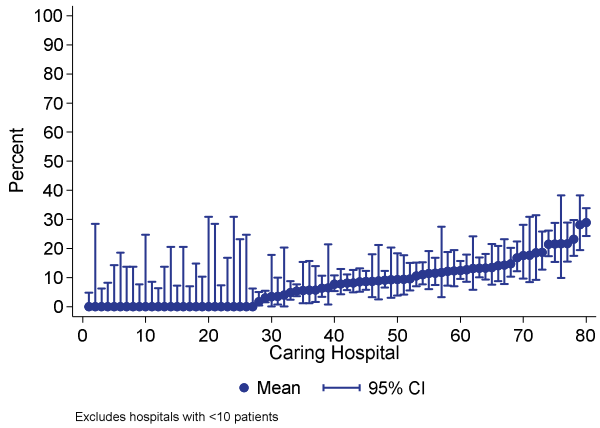
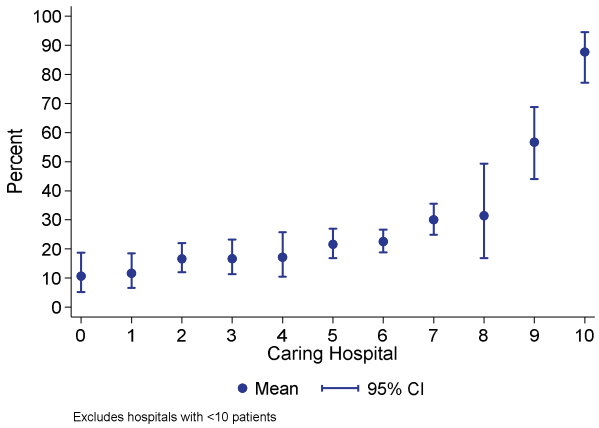


Figure 4.40.2 - % Haemodialysis Patients on Home HD - New Zealand 31 December 2016



The following figures explore the concept of technique failure as applied to home haemodialysis. Each treatment episode can end in a variety of ways. Changes to another dialysis modality (either institutional haemodialysis or peritoneal dialysis) for 30 or more days are considered a “failure”, as is death. Follow-up is censored at transplantation, or 31 Dec 2016. When death of a patient is counted as a censoring event (rather than “failure”), the differences between the age groups become less apparent (figure 4.43).

Figure 4.41.3 - Technique Survival - Home Haemodialysis 2006 – 2016

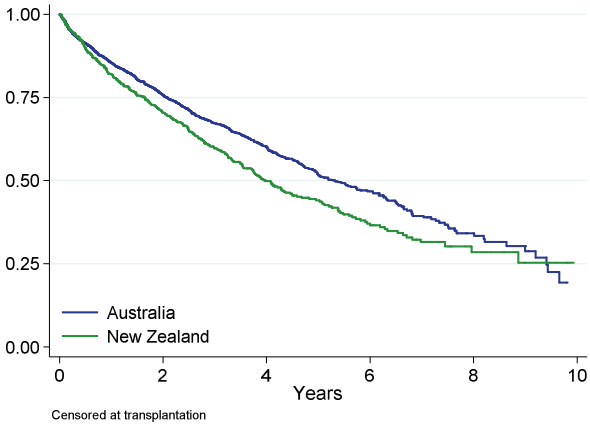


Figure 4.42 - Technique Survival - Home haemodialysis 2006 – 2016

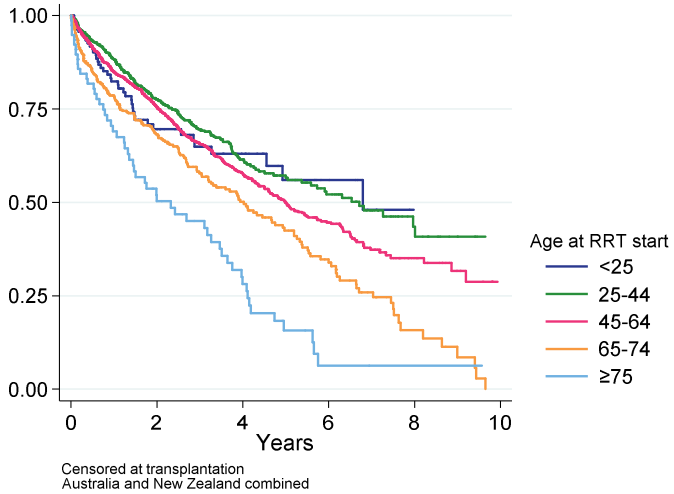


Figure 4.43.1 - Death-Censored Technique Survival - Home Haemodialysis 2006 - 2016 Australia

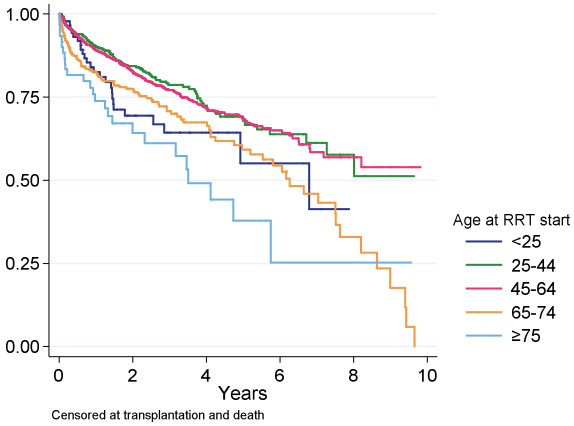


Figure 4.43.2 - Death-Censored Technique Survival - Home Haemodialysis 2006 - 2016 New Zealand

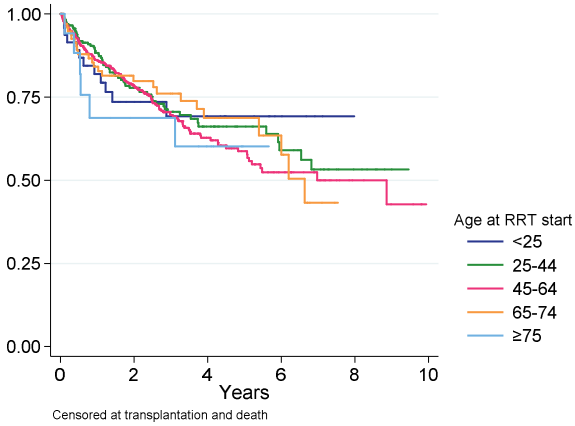
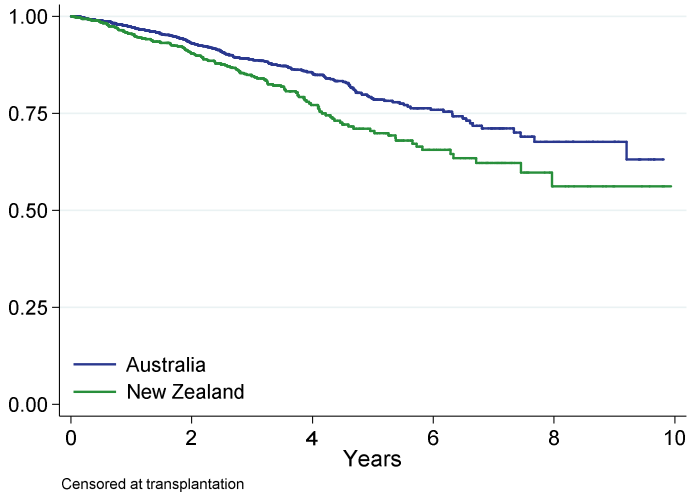


Figure 4.44 - Patient Survival - Home Haemodialysis 2006 – 2016



The following figures explore trends in home haemodialysis prescriptions. In general prescriptions are either stable or moving towards less frequent, shorter sessions. Quotidian dialysis is defined as >3 sessions per week OR >5 hours per session.

Figure 4.45 - Home Haemodialysis Conventional/Quotidian - 2014-2016

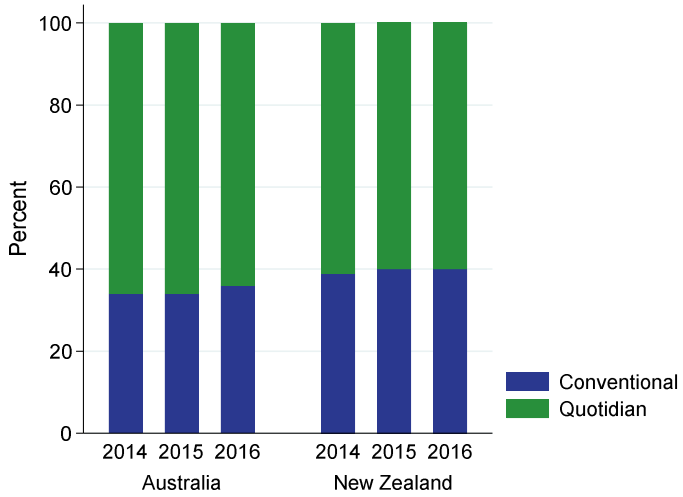


Figure 4.46 - Home Haemodialysis Frequency Per Week - 2014-2016

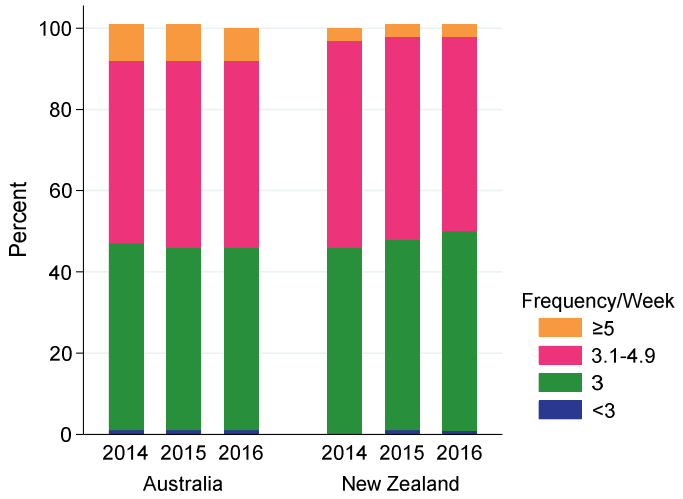


Figure 4.47 - Home Haemodialysis Session Length (Hours) - December 2014-2016

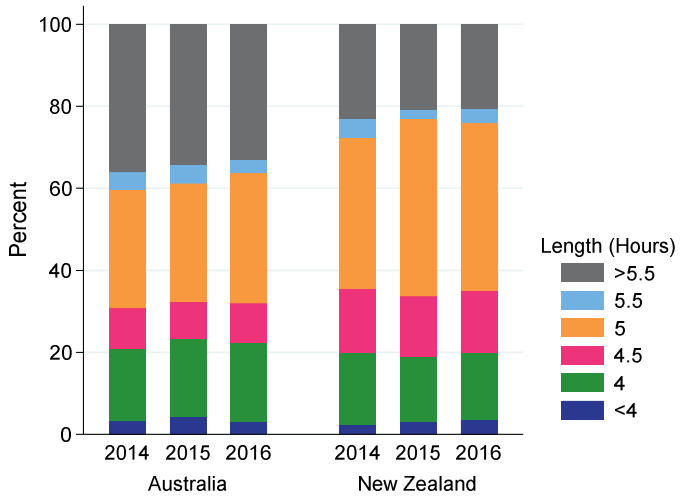


Figure 4.48 - Home Haemodialysis Duration (Hours Per Week) - December 2014-2016

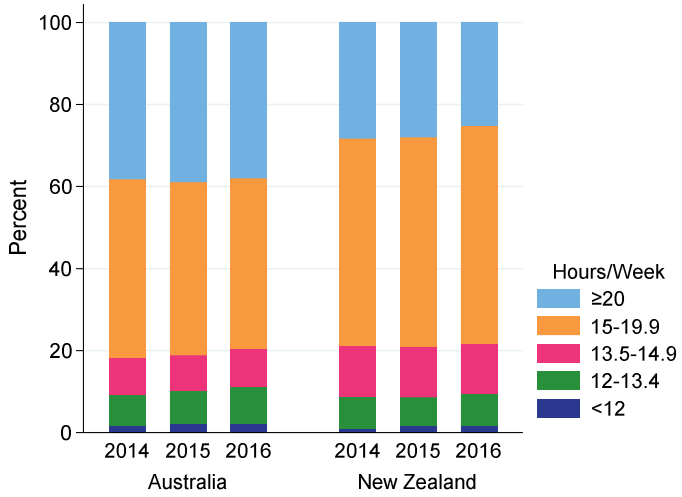


Figure 4.49 - Percentage of Home HD Patients Dialysing Five or More Days Per Week

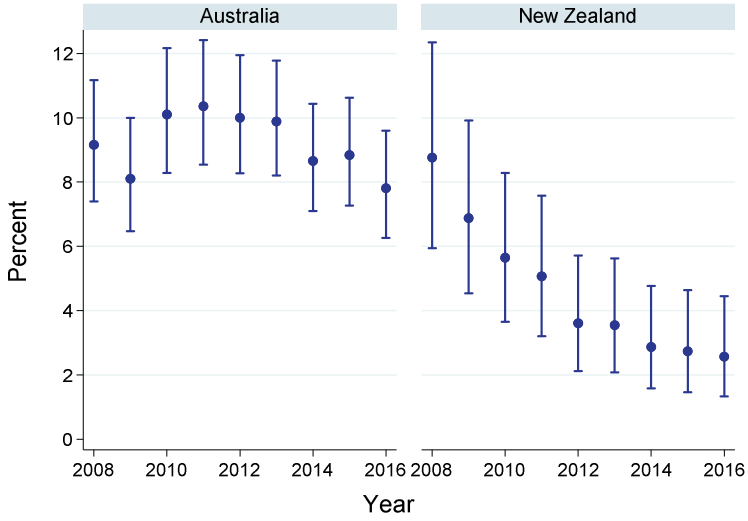


Figure 4.50 - Percentage of Home HD Patients Dialysing 3 Days Per Week Dialysing 4.5 Hours or Longer Per Session

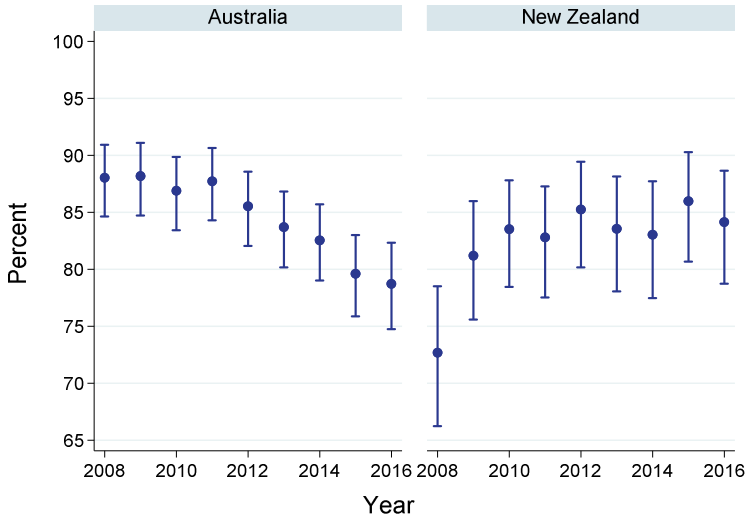


Figure 4.51 - Percentage of Home HD Patients Dialysing >12 Hours Per Week