



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

Suggested citation.....	2
Stock and Flow.....	3
Survival.....	6
Dialysis Prescription.....	9
Anaemia.....	14
Biochemistry.....	16
Dialysis Adequacy.....	16
Vascular Access.....	18
Incident Patients.....	18
Prevalent Patients.....	21
Home Haemodialysis.....	23

Executive Summary

There were 10,983 people in Australia and 1,978 people in New Zealand receiving haemodialysis at the time of the 31 December 2018 survey. The number of new patients in Australia continues to increase each year (2,990 in 2018) whereas the number of new patients in New Zealand has not (548 in 2018). In both countries, approximately half of incident and prevalent patients were aged between 55-74 years.

In this Report, reported survival is from dialysis start and not from day 90 as in previous Reports. Survival of incident haemodialysis patients in both countries has not changed significantly since 2007, and the 1-year and 5-year survival in the largest age group (60 to 74 years) was 87% and 50% respectively in Australia, and 87% and 45% respectively in New Zealand.

Very few patients have 5 or more sessions of haemodialysis per week. The proportion of patients receiving more than 12 hours of haemodialysis each week is highest in New Zealand (74%, vs 55% in Australia). The proportion receiving haemodiafiltration continues to rise in Australia (now 37.8%) but remains static in New Zealand (22.4%); and within Australia ranges from 0.5% in Tasmania to 67.8% in Western Australia. In Australia, post-dilution delivery of substitution fluid is the most common practice whereas one third of New Zealand patients receiving haemodiafiltration have pre-dilution.

Vascular access practice has not changed in 2018. A high proportion of patients still require a catheter when they start haemodialysis, and this differs somewhat between our two countries. The difference appears greatest between treating hospitals in both NZ and Australia, from below 3% to almost 76%. For prevalent patients, the picture was much better: 83% of prevalent Australian patients and 68% of New Zealand patients underwent haemodialysis through permanent vascular access.

The proportion of patients undertaking haemodialysis at home declined slightly in 2018 compared to recent years and is now 21.3% in New Zealand and 9.6% in Australia. The majority are aged 45-64 years and median technique survival is 4 to 5 years.

Suggested citation

Stock and Flow

Table 4.1 presents the stock and flow of haemodialysis patients in Australia and New Zealand over 2014-2018. Note that dialysis modality changes lasting less than 30 days are not included. The number of incident patients in Australia is growing steadily, whereas in New Zealand the number remains approximately constant. In Australia, the number of patients ceasing HD is lower than the number of incident patients, leading to strong growth in prevalent numbers. In New Zealand these numbers are similar, leading to a relatively stable number of prevalent patients.

Table 4.1 Stock and Flow of Haemodialysis Patients in Australia and New Zealand 2014-2018

Country		2014	2015	2016	2017	2018
Australia	All patients who commenced HD					
	First dialysis treatment or returning after renal recovery	1912	1905	2010	2174	2222
	Transfer from PD (no prior HD)	299	362	410	406	389
	Transfer from PD (prior HD)	179	191	170	172	147
	Failed Transplant (no prior HD)	39	46	26	52	44
	Failed Transplant (prior HD)	145	153	158	157	188
	Total	2574	2657	2774	2961	2990
	All patients who ceased HD					
	Received kidney transplant	556	555	639	631	663
	Transfer to PD	347	321	309	314	288
	Renal recovery	56	58	70	80	80
	Deaths	1362	1412	1514	1633	1564
	Total	2321	2346	2532	2658	2595
	Total patients on HD at 31 December	9803	10099	10323	10610	10983
	Patients on HD at home at 31 December (% of all HD patients)	1182 (12.1%)	1194 (11.8%)	1136 (11.0%)	1043 (9.8%)	1057 (9.6%)
New Zealand	All patients who commenced HD					
	First dialysis treatment or returning after renal recovery	353	322	345	373	357
	Transfer from PD (no prior HD)	89	100	106	77	96
	Transfer from PD (prior HD)	57	77	60	44	64
	Failed Transplant (no prior HD)	5	7	9	7	10
	Failed Transplant (prior HD)	25	15	15	21	21
	Total	529	521	535	522	548
	All patients who ceased HD					
	Received kidney transplant	67	76	93	96	81
	Transfer to PD	124	111	131	122	124
	Renal recovery	10	9	7	15	14
	Deaths	225	278	288	299	274
	Total	426	474	519	532	493
	Total patients on HD at 31 December	1870	1919	1934	1917	1978
	Patients on HD at home at 31 December (% of all HD patients)	489 (26.1%)	484 (25.2%)	469 (24.3%)	441 (23.0%)	422 (21.3%)

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 - Australia 2018

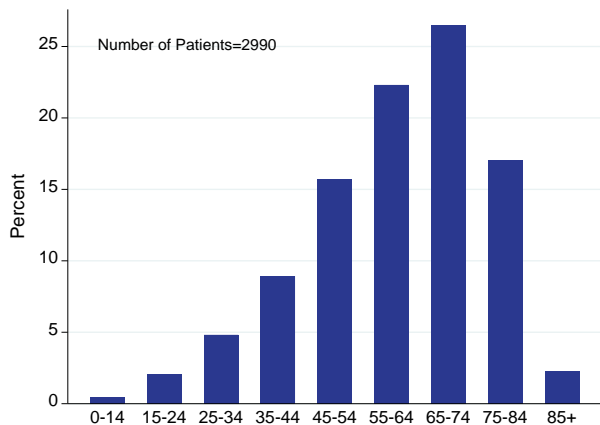


Figure 4.1.2 - Age (%) of Incident Haemodialysis Patients - New Zealand 2018

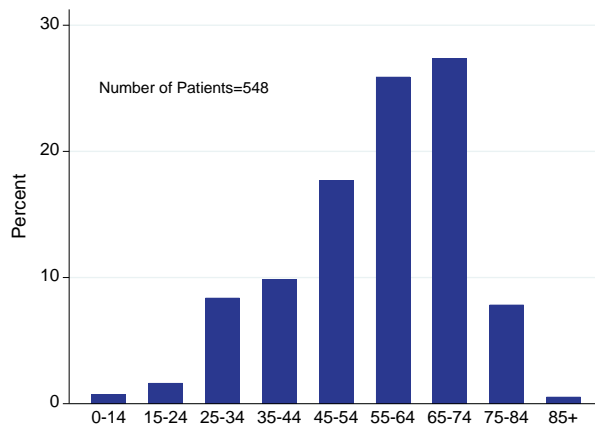


Figure 4.2.2 - Age (%) of Prevalent Haemodialysis Patients - New Zealand 31 Dec 2018

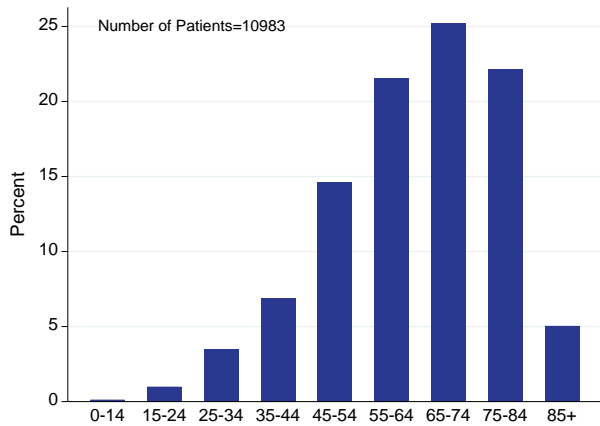


Table 4.2.1 Incident and Prevalent Haemodialysis Patients in Australia by Age Group 2014-2018

	Age group	2014	2015	2016	2017	2018
Incident Patients	0-14	13 (1%)	12 (0%)	16 (1%)	17 (1%)	13 (0%)
	15-24	60 (2%)	48 (2%)	62 (2%)	69 (2%)	62 (2%)
	25-34	136 (5%)	128 (5%)	139 (5%)	145 (5%)	144 (5%)
	35-44	240 (9%)	239 (9%)	257 (9%)	246 (8%)	267 (9%)
	45-54	427 (17%)	436 (16%)	451 (16%)	492 (17%)	469 (16%)
	55-64	603 (23%)	570 (21%)	585 (21%)	687 (23%)	667 (22%)
	65-74	570 (22%)	705 (27%)	739 (27%)	750 (25%)	792 (26%)
	75-84	469 (18%)	467 (18%)	477 (17%)	502 (17%)	509 (17%)
	85+	56 (2%)	52 (2%)	48 (2%)	53 (2%)	67 (2%)
	Total	2574	2657	2774	2961	2990
Prevalent Patients	0-14	7 (0%)	7 (0%)	11 (0%)	10 (0%)	14 (0%)
	15-24	108 (1%)	108 (1%)	93 (1%)	107 (1%)	109 (1%)
	25-34	336 (3%)	333 (3%)	346 (3%)	352 (3%)	381 (3%)
	35-44	751 (8%)	766 (8%)	751 (7%)	758 (7%)	754 (7%)
	45-54	1494 (15%)	1538 (15%)	1563 (15%)	1592 (15%)	1603 (15%)
	55-64	2079 (21%)	2117 (21%)	2169 (21%)	2268 (21%)	2367 (22%)
	65-74	2351 (24%)	2474 (24%)	2586 (25%)	2660 (25%)	2770 (25%)
	75-84	2182 (22%)	2235 (22%)	2284 (22%)	2322 (22%)	2431 (22%)
	85+	495 (5%)	521 (5%)	520 (5%)	541 (5%)	554 (5%)
	Total	9803	10099	10323	10610	10983

Table 4.2.2 Incident and Prevalent Haemodialysis Patients in New Zealand by Age Group 2014-2018

	Age group	2014	2015	2016	2017	2018
Incident Patients	0-14	2 (0%)	3 (1%)	2 (0%)	3 (1%)	4 (1%)
	15-24	16 (3%)	15 (3%)	12 (2%)	13 (2%)	9 (2%)
	25-34	41 (8%)	23 (4%)	34 (6%)	40 (8%)	46 (8%)
	35-44	47 (9%)	51 (10%)	49 (9%)	39 (7%)	54 (10%)
	45-54	104 (20%)	113 (22%)	99 (19%)	116 (22%)	97 (18%)
	55-64	147 (28%)	150 (29%)	154 (29%)	133 (25%)	142 (26%)
	65-74	136 (26%)	117 (22%)	130 (24%)	137 (26%)	150 (27%)
	75-84	34 (6%)	48 (9%)	50 (9%)	40 (8%)	43 (8%)
	85+	2 (0%)	1 (0%)	5 (1%)	1 (0%)	3 (1%)
	Total	529	521	535	522	548
Prevalent Patients	0-14	2 (0%)	1 (0%)	1 (0%)	1 (0%)	2 (0%)
	15-24	37 (2%)	36 (2%)	32 (2%)	29 (2%)	33 (2%)
	25-34	119 (6%)	119 (6%)	116 (6%)	116 (6%)	120 (6%)
	35-44	186 (10%)	179 (9%)	203 (10%)	201 (10%)	206 (10%)
	45-54	380 (20%)	406 (21%)	368 (19%)	364 (19%)	359 (18%)
	55-64	512 (27%)	521 (27%)	537 (28%)	524 (27%)	532 (27%)
	65-74	451 (24%)	463 (24%)	491 (25%)	498 (26%)	523 (26%)
	75-84	163 (9%)	177 (9%)	171 (9%)	167 (9%)	189 (10%)
	85+	20 (1%)	17 (1%)	15 (1%)	17 (1%)	14 (1%)
	Total	1870	1919	1934	1917	1978

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 2014-2018

Primary Renal Disease	2014	2015	2016	2017	2018
Diabetic Nephropathy	942 (37%)	1003 (38%)	997 (36%)	1128 (38%)	1125 (38%)
Glomerulonephritis	571 (22%)	531 (20%)	563 (20%)	560 (19%)	534 (18%)
Hypertension	306 (12%)	341 (13%)	376 (14%)	375 (13%)	357 (12%)
Polycystic Disease	156 (6%)	147 (6%)	156 (6%)	164 (6%)	181 (6%)
Reflux Nephropathy	69 (3%)	66 (2%)	67 (2%)	77 (3%)	64 (2%)
Other	364 (14%)	366 (14%)	400 (14%)	426 (14%)	502 (17%)
Uncertain	121 (5%)	119 (4%)	109 (4%)	167 (6%)	159 (5%)
Not reported	45 (2%)	84 (3%)	106 (4%)	64 (2%)	68 (2%)
Total	2574	2657	2774	2961	2990

Table 4.3.2 Incident Haemodialysis Patients in New Zealand by Primary Renal Disease 2014-2018

Primary Renal Disease	2014	2015	2016	2017	2018
Diabetic Nephropathy	275 (52%)	258 (50%)	264 (49%)	266 (51%)	262 (48%)
Glomerulonephritis	111 (21%)	105 (20%)	122 (23%)	123 (24%)	107 (20%)
Hypertension	44 (8%)	39 (7%)	37 (7%)	36 (7%)	26 (5%)
Polycystic Disease	18 (3%)	26 (5%)	23 (4%)	19 (4%)	19 (3%)
Reflux Nephropathy	16 (3%)	9 (2%)	8 (1%)	9 (2%)	11 (2%)
Other	50 (9%)	67 (13%)	64 (12%)	48 (9%)	94 (17%)
Uncertain	11 (2%)	15 (3%)	14 (3%)	17 (3%)	25 (5%)
Not reported	4 (1%)	2 (0%)	3 (1%)	4 (1%)	4 (1%)
Total	529	521	535	522	548

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 commencement is reported. A new definition of survival for haemodialysis patients has been used in this report. Survival begins from the date of commencing renal replacement therapy with haemodialysis rather than being on haemodialysis at “Day 90”, as in previous reports. Outcome is death with censoring for other events. 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 RRT Start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 years	5 years
Australia	2007-2009	5258	92 [92, 93]	87 [86, 88]	68 [66, 69]	51 [50, 53]
Australia	2010-2012	5470	93 [92, 94]	88 [87, 89]	69 [67, 70]	51 [49, 52]
Australia	2013-2015	5604	94 [93, 94]	89 [88, 90]	70 [68, 71]	50 [48, 52]
Australia	2016-2018	6331	95 [94, 95]	90 [89, 91]	-	-
New Zealand	2007-2009	990	93 [91, 95]	89 [87, 91]	70 [66, 73]	53 [49, 56]
New Zealand	2010-2012	991	93 [91, 95]	89 [87, 91]	71 [67, 74]	53 [49, 57]
New Zealand	2013-2015	1028	95 [93, 96]	90 [88, 92]	71 [68, 74]	51 [47, 56]
New Zealand	2016-2018	1062	93 [91, 95]	89 [86, 91]	-	-

Figure 4.3.1 - Patient Survival by Era - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant

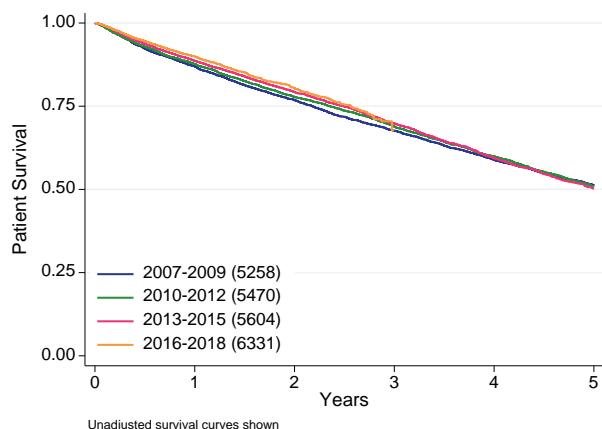


Figure 4.3.2 - Patient Survival by Era - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant

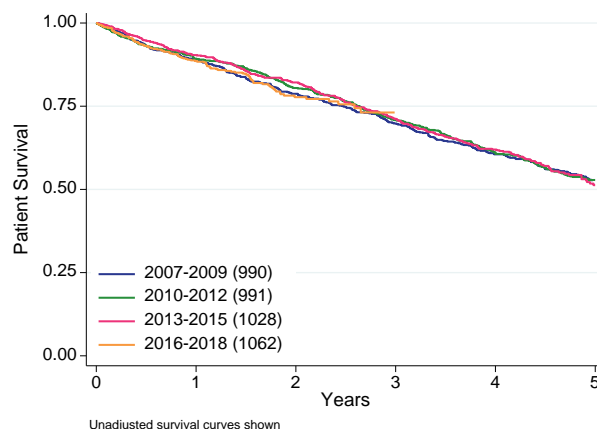


Figure 4.4.1 - Patient Survival by Era - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant Adjusted for Age, Ethnicity, Diabetic Nephropathy, Comorbidity and Gender

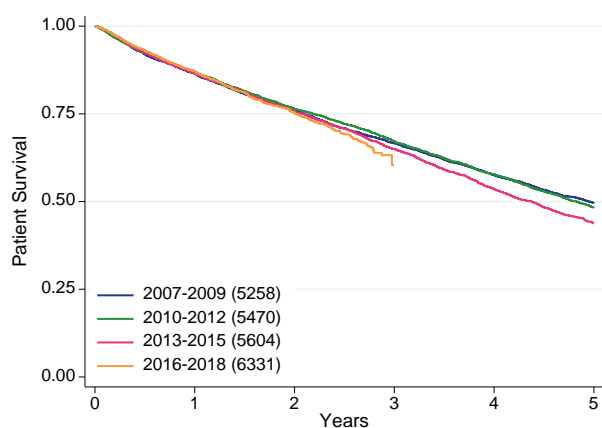


Figure 4.4.2 - Patient Survival by Era - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant Adjusted for Age, Ethnicity, Diabetic Nephropathy, Comorbidity and Gender

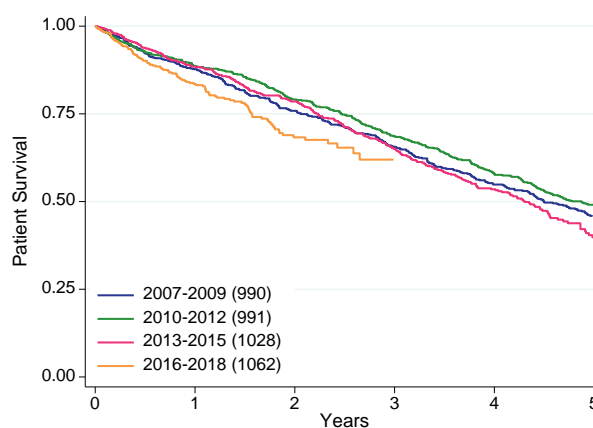


Table 4.5 and figure 4.5 present unadjusted patient survival stratified by age, and table 4.6 and figure 4.6 present the same data by diabetic status.

Table 4.5 Patient Survival by Age Group - Haemodialysis at RRT Start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 years	5 years
Australia	<40 years	2239	98 [97, 99]	96 [95, 97]	87 [85, 89]	78 [75, 81]
Australia	40-59 years	7004	97 [96, 97]	93 [93, 94]	80 [79, 81]	66 [64, 68]
Australia	60-74 years	8437	93 [92, 93]	87 [86, 88]	67 [66, 68]	50 [48, 51]
Australia	≥75 years	4983	88 [88, 89]	81 [79, 82]	55 [53, 56]	33 [31, 34]
New Zealand	<40 years	489	99 [97, 99]	96 [93, 98]	89 [84, 92]	79 [72, 84]
New Zealand	40-59 years	1662	95 [94, 96]	93 [91, 94]	79 [76, 82]	62 [58, 65]
New Zealand	60-74 years	1527	92 [91, 94]	87 [85, 89]	63 [60, 66]	45 [41, 49]
New Zealand	≥75 years	393	85 [81, 88]	75 [70, 80]	44 [38, 50]	20 [15, 26]

Figure 4.5.1 - Patient Survival by Age Group - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant

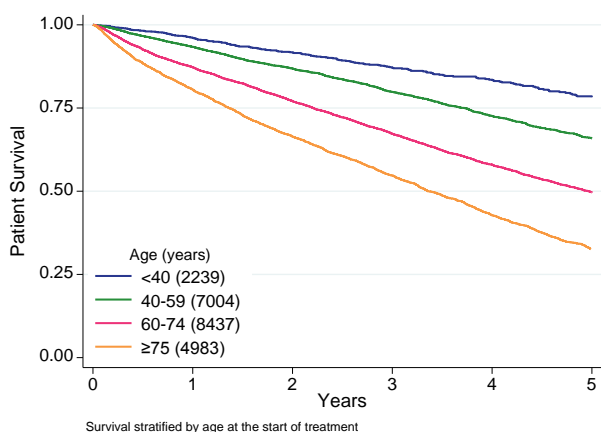


Figure 4.5.2 - Patient Survival by Age Group - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant

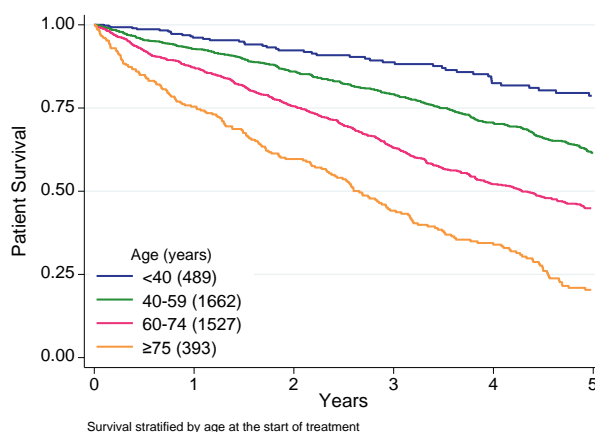


Table 4.6 Patient Survival by Diabetes - Haemodialysis at RRT Start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Diabetes	Number of Patients	Survival			
			6 months	1 year	3 years	5 years
Australia	Non diabetic	11067	93 [93, 94]	88 [88, 89]	71 [70, 72]	55 [54, 56]
Australia	Diabetic	11596	94 [93, 94]	88 [88, 89]	68 [67, 69]	48 [47, 50]
New Zealand	Non diabetic	1644	93 [91, 94]	89 [87, 91]	73 [70, 76]	57 [53, 60]
New Zealand	Diabetic	2427	94 [93, 95]	90 [88, 91]	69 [66, 71]	50 [47, 53]

Figure 4.6.1 - Patient Survival by Diabetes - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant

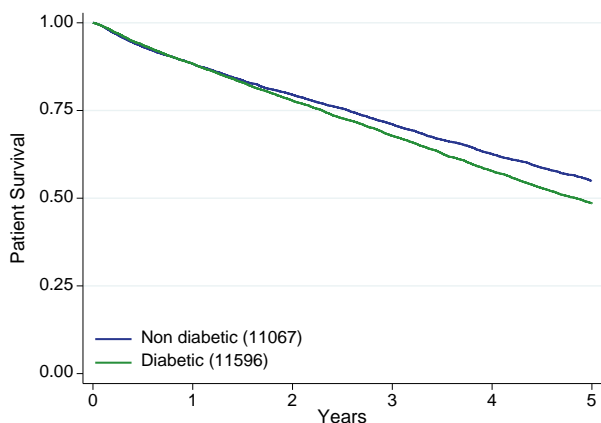


Figure 4.6.2 - Patient Survival by Diabetes - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant

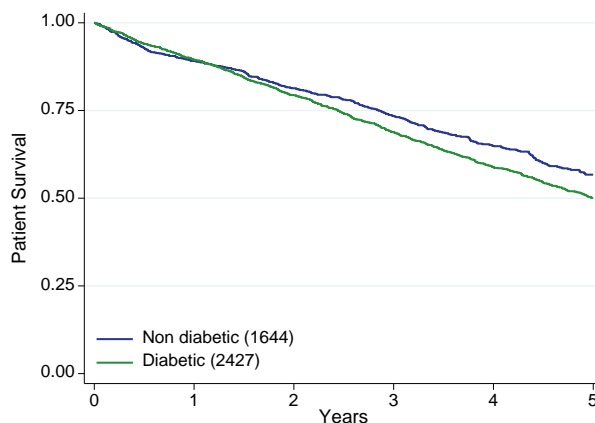


Figure 4.7 presents patient survival data for Australian haemodialysis patients by age, and by the presence of diabetes and/or cardiovascular disease. Figure 4.8 presents the same data for New Zealand. **Figure 4.7.1 - Patient Survival by Age Group - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant No Diabetes and No Cardiovascular Disease**

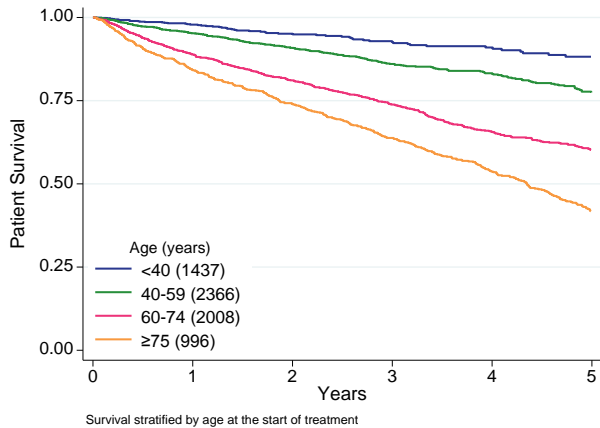


Figure 4.7.2 - Patient Survival by Age Group - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant Diabetes but No Cardiovascular Disease

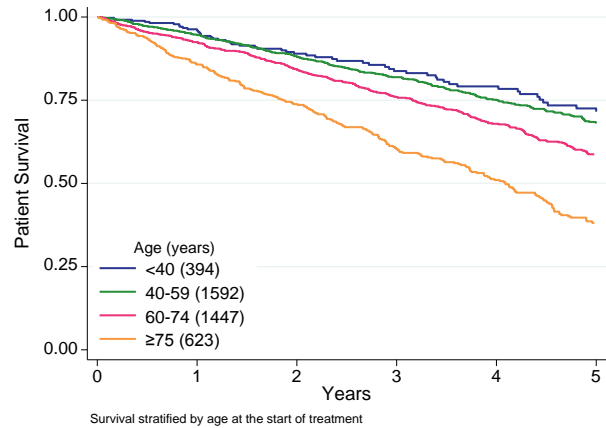


Figure 4.7.3 - Patient Survival by Age Group - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant Cardiovascular Disease but No Diabetes

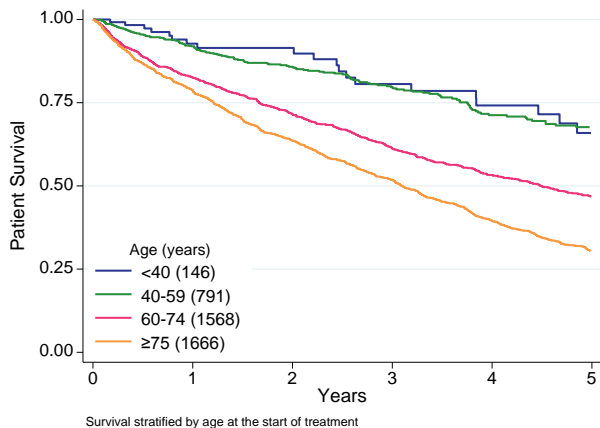


Figure 4.7.4 - Patient Survival by Age Group - Haemodialysis at RRT Start - Australia 2007-2018 Censored for Transplant Both Diabetes and Cardiovascular Disease

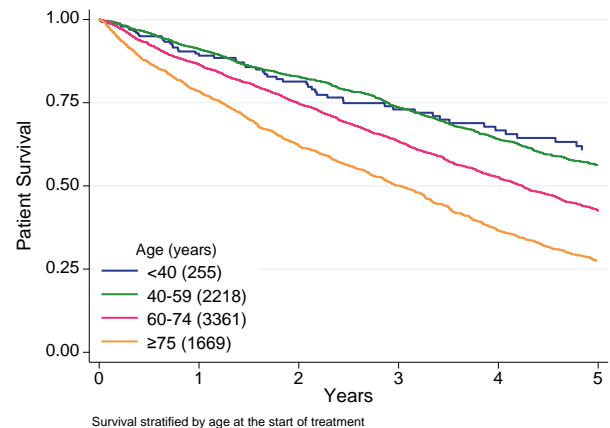


Figure 4.8.1 - Patient Survival by Age Group - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant No Diabetes and No Cardiovascular Disease

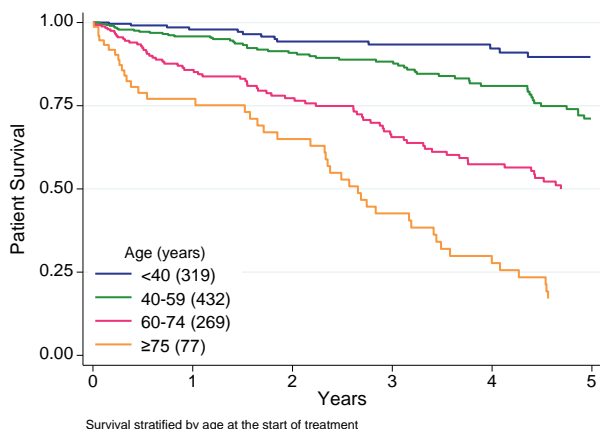


Figure 4.8.2 - Patient Survival by Age Group - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant Diabetes but No Cardiovascular Disease

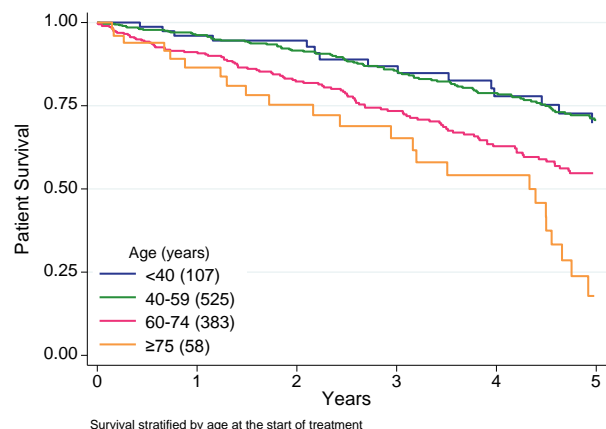


Figure 4.8.3 - Patient Survival by Age Group - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant Cardiovascular Disease but No Diabetes

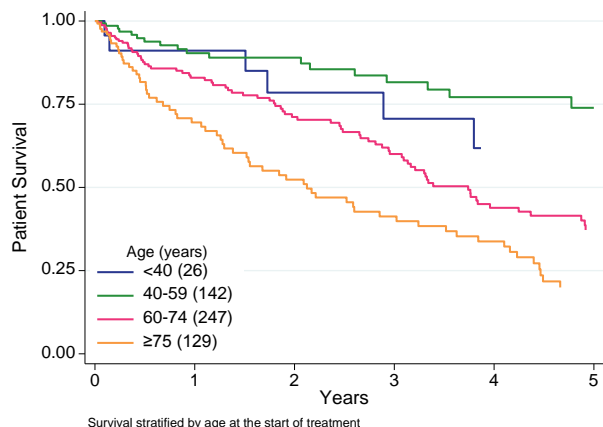
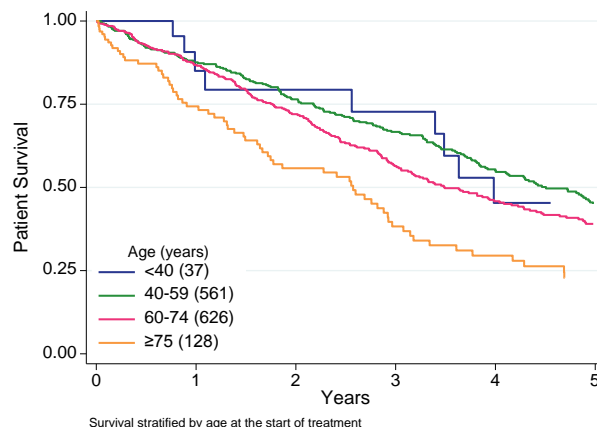


Figure 4.8.4 - Patient Survival by Age Group - Haemodialysis at RRT Start - New Zealand 2007-2018 Censored for Transplant Both Diabetes and Cardiovascular Disease



Dialysis Prescription

Table 4.7 shows the blood flow rates by year and country. Flows of 300-349mL/min were the most common in each country. Table 4.8 presents the same data by vascular access type for 2018; the distribution of blood flow rates was similar within each type of access, although slightly lower rates were seen in patients dialysing with a central venous catheter (CVC). The overall distribution of blood flow rates over 2016-2018 is shown in figure 4.9.

Table 4.7 Blood Flow Rates (mL/minute) 2014-2018

Country	Year	Total Patients*	NR**	<200	200-249	250-299	300-349	350-399	400+
Australia	2014	9803	363 (3.7%)	25 (0.3%)	203 (2.1%)	1414 (14.4%)	5732 (58.5%)	1845 (18.8%)	221 (2.3%)
	2015	10095	552 (5.5%)	32 (0.3%)	214 (2.1%)	1438 (14.2%)	6000 (59.4%)	1664 (16.5%)	195 (1.9%)
	2016	10323	753 (7.3%)	28 (0.3%)	172 (1.7%)	1478 (14.3%)	6225 (60.3%)	1526 (14.8%)	141 (1.4%)
	2017	10610	372 (3.5%)	30 (0.3%)	190 (1.8%)	1542 (14.5%)	6891 (64.9%)	1458 (13.7%)	127 (1.2%)
	2018	10983	271 (2.5%)	42 (0.4%)	211 (1.9%)	1648 (15.0%)	7392 (67.3%)	1305 (11.9%)	114 (1.0%)
New Zealand	2014	1870	30 (1.6%)	0 (0.0%)	108 (5.8%)	412 (22.0%)	1015 (54.3%)	263 (14.1%)	42 (2.2%)
	2015	1919	77 (4.0%)	1 (0.1%)	107 (5.6%)	410 (21.4%)	1067 (55.6%)	230 (12.0%)	27 (1.4%)
	2016	1934	51 (2.6%)	7 (0.4%)	118 (6.1%)	469 (24.3%)	976 (50.5%)	274 (14.2%)	39 (2.0%)
	2017	1917	33 (1.7%)	6 (0.3%)	118 (6.2%)	430 (22.4%)	1024 (53.4%)	259 (13.5%)	47 (2.5%)
	2018	1977	36 (1.8%)	6 (0.3%)	93 (4.7%)	417 (21.1%)	1083 (54.8%)	277 (14.0%)	65 (3.3%)

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

Table 4.8 Blood Flow Rate by Type of Access - December 2018

Blood Flow Rate	Australia			New Zealand		
	AVF	AVG	CVC	AVF	AVG	CVC
<200	22 (0.3%)	0 (0.0%)	20 (1.1%)	2 (0.2%)	0 (0.0%)	4 (0.7%)
200-249	127 (1.5%)	9 (1.9%)	75 (4.2%)	57 (4.5%)	5 (10.0%)	31 (5.1%)
250-299	1017 (12.0%)	80 (16.6%)	548 (30.9%)	215 (16.8%)	22 (44.0%)	180 (29.4%)
300-349	5970 (70.7%)	330 (68.6%)	1077 (60.7%)	704 (55.1%)	18 (36.0%)	361 (58.9%)
350-399	1194 (14.1%)	61 (12.7%)	49 (2.8%)	236 (18.5%)	4 (8.0%)	37 (6.0%)
400+	112 (1.3%)	1 (0.2%)	1 (0.1%)	64 (5.0%)	1 (2.0%)	0 (0.0%)
Total	8448	481	1774	1278	50	613

* CVV-HD Patients excluded from Total.

** Blood Flow Rate or Type of Access Not Reported for 290 Australian and 36 New Zealand patients.

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

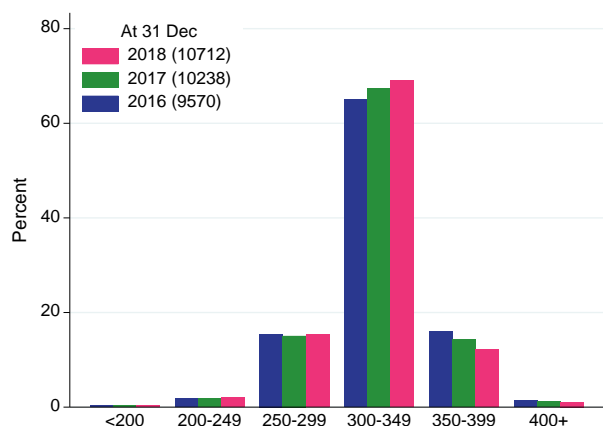


Figure 4.9.2 - Distribution of Blood Flow Rates - Prevalent Haemodialysis - New Zealand

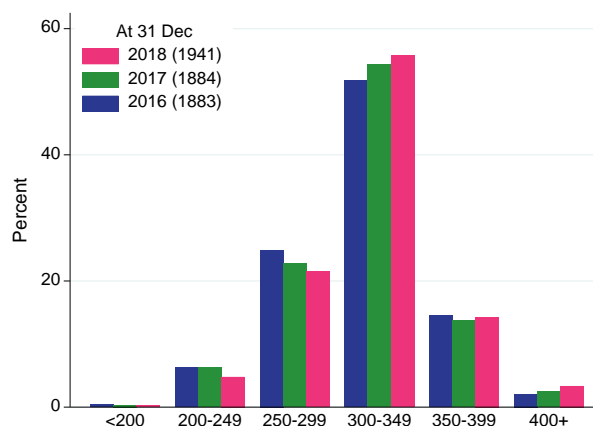


Table 4.9 shows the number of weekly sessions, and hours per session, at 31 December 2018. In each country the large majority were dialysing for ≤ 3 sessions per week, and for between 4-5 hours per session. Figure 4.10 shows the percentage of patients undertaking quotidian dialysis (>3 sessions per week OR >5 hours per session). Figures 4.11 and 4.12 show HD frequency and session length respectively over 2016-2018. Figure 4.13 combines sessions and session length to show the total number of weekly hours of HD over 2016-2018. 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 2018

Country	Sessions per week	Hours of Each Treatment						Total
		<4	4	4.5	5	5.5	>5.5	
Australia	<3	67 (19.1%)	165 (47.1%)	61 (17.4%)	51 (14.6%)	4 (1.1%)	2 (0.6%)	350
	3	404 (4.1%)	4094 (42.0%)	2221 (22.8%)	2643 (27.1%)	151 (1.6%)	226 (2.3%)	9739
	3.1-4.9	29 (5.5%)	107 (20.5%)	45 (8.6%)	133 (25.4%)	13 (2.5%)	196 (37.5%)	523
	5+	37 (34.9%)	30 (28.3%)	3 (2.8%)	10 (9.4%)	1 (0.9%)	25 (23.6%)	106
	Total	537 (5.0)	4396 (41.0)	2330 (21.7)	2837 (26.5)	169 (1.6)	449 (4.2)	10718
New Zealand	<3	1 (9.1%)	4 (36.4%)	0 (0.0%)	5 (45.5%)	0 (0.0%)	1 (9.1%)	11
	3	29 (1.7%)	461 (27.4%)	487 (29.0%)	552 (32.8%)	54 (3.2%)	98 (5.8%)	1681
	3.1-4.9	6 (2.5%)	46 (19.2%)	49 (20.5%)	81 (33.9%)	3 (1.3%)	54 (22.6%)	239
	5+	4 (36.4%)	3 (27.3%)	0 (0.0%)	3 (27.3%)	0 (0.0%)	1 (9.1%)	11
	Total	40 (2.1)	514 (26.5)	536 (27.6)	641 (33.0)	57 (2.9)	154 (7.9)	1942

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

** Hours or number of sessions were not reported for 265 Australian and 36 New Zealand patients.

Figure 4.10 - Haemodialysis Conventional/Quotidian - 2016-2018

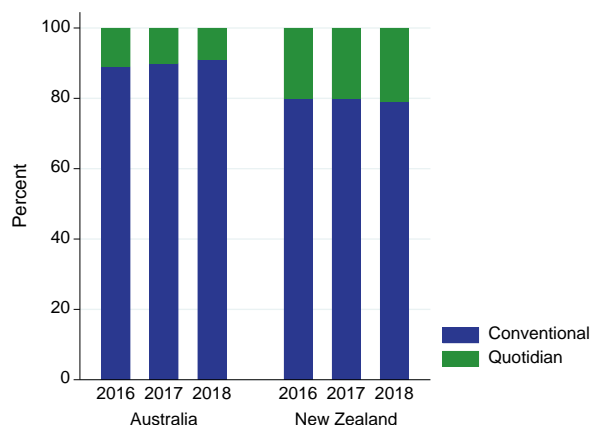


Figure 4.11 - Haemodialysis Frequency Per Week - 2016-2018

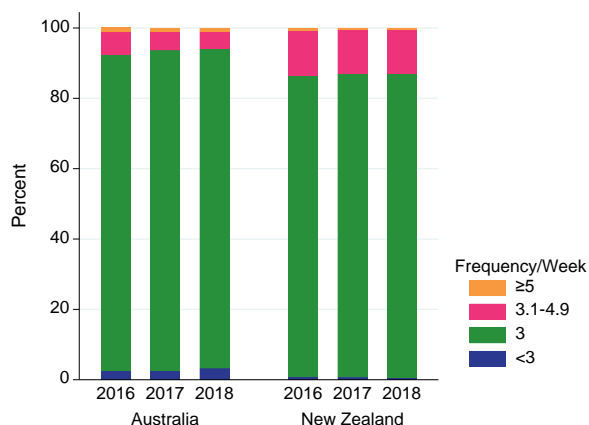


Figure 4.12 - Haemodialysis Session Length (Hours) - December 2016-2018

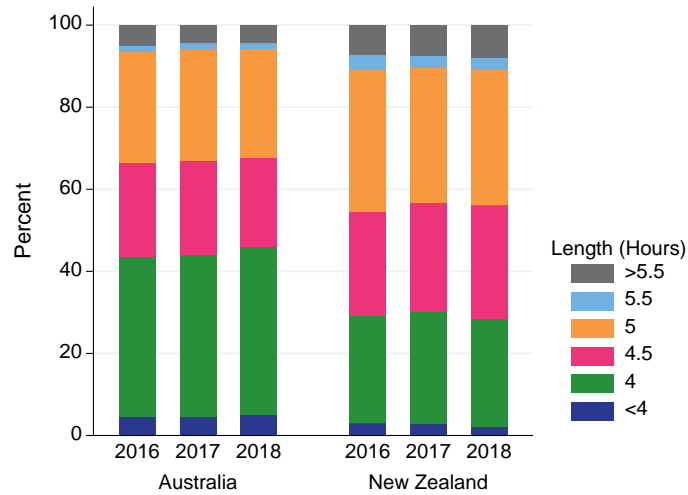
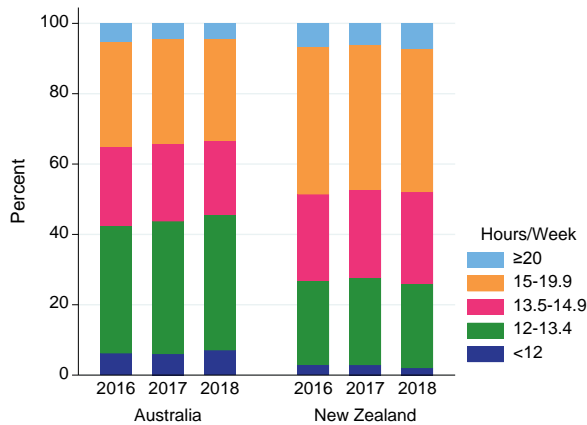


Figure 4.13 - Haemodialysis Duration (Hours Per Week) - December 2016-2018



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 has begun to fall, and the proportion dialysing >12 hours per week has plateaued. Tables 4.10-4.12 present these same data for 2015-2018 by state and country.

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

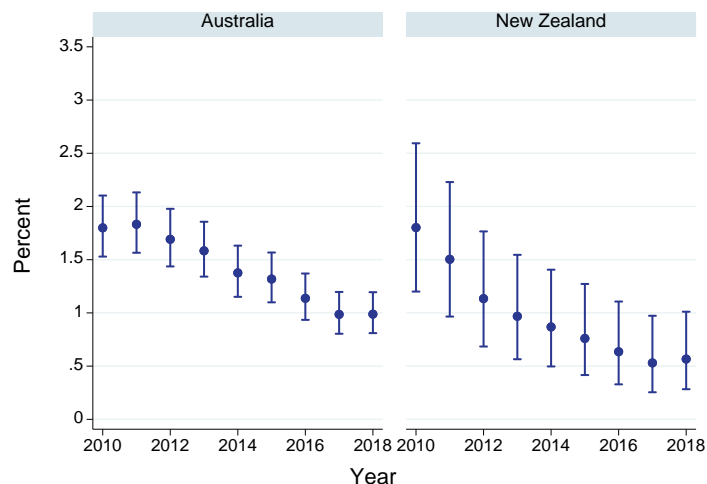


Figure 4.15 - Percentage of HD Patients Dialysing 3 Days Per Week Dialysing 4.5 Hours or Longer Per Session
ANZDATA Annual Report 2019 - Chapter 4 - Haemodialysis

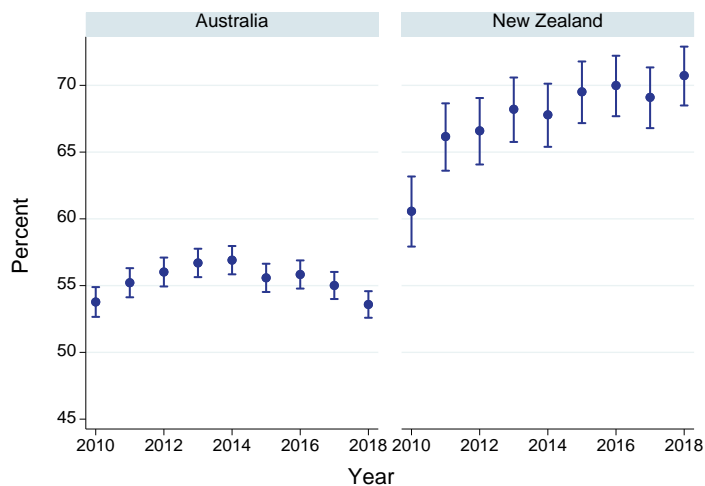


Figure 4.16 - Percentage of HD Patients Dialysing >12 Hours Per Week

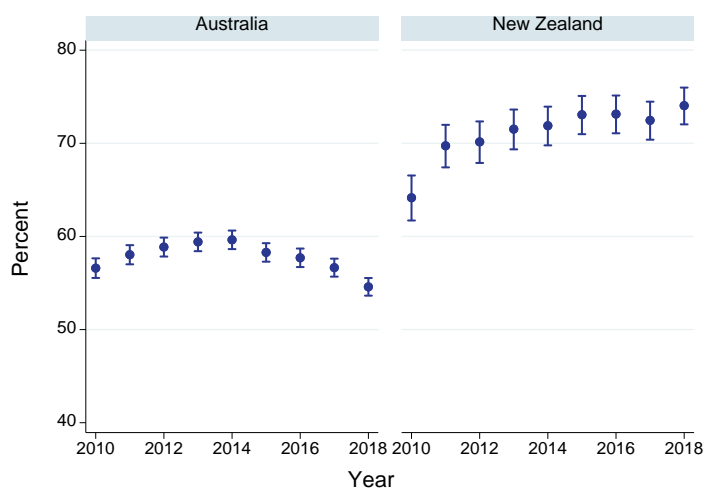


Table 4.10 Haemodialysis ≥5 Sessions per Week by Australian State and Country 2015-2018

State	2015	2016	2017	2018
QLD	47 (2.5%)	38 (2.1%)	33 (1.7%)	34 (1.6%)
NSW/ACT	15 (0.5%)	12 (0.4%)	15 (0.5%)	18 (0.6%)
VIC	42 (1.8%)	43 (1.9%)	37 (1.5%)	34 (1.3%)
TAS	3 (1.5%)	3 (1.7%)	2 (1.1%)	2 (1.1%)
SA	7 (1.1%)	6 (0.9%)	4 (0.5%)	5 (0.6%)
NT	1 (0.2%)	1 (0.2%)	1 (0.2%)	1 (0.1%)
WA	11 (1.2%)	6 (0.7%)	9 (0.8%)	12 (1.1%)
Australia	126 (1.3%)	109 (1.1%)	101 (1.0%)	106 (1.0%)
New Zealand	14 (0.8%)	12 (0.6%)	10 (0.5%)	11 (0.6%)

Table 4.11 Haemodialysis ≥4.5 Hours per Session - Three Sessions per Week by Australian State and Country 2015-2018

State	2015	2016	2017	2018
QLD	912 (56.4%)	917 (56.8%)	984 (55.4%)	946 (50.5%)
NSW/ACT	1958 (70.4%)	1920 (68.8%)	2021 (70.4%)	2077 (71.0%)
VIC	1027 (49.3%)	1041 (50.8%)	1128 (50.7%)	1183 (50.5%)
TAS	105 (64.8%)	101 (62.7%)	105 (66.0%)	109 (66.5%)
SA	179 (30.1%)	200 (31.7%)	215 (30.4%)	225 (30.4%)
NT	370 (72.5%)	421 (73.7%)	447 (71.2%)	439 (65.6%)
WA	213 (25.8%)	203 (25.9%)	237 (24.4%)	240 (23.4%)
Australia	4764 (55.6%)	4803 (55.8%)	5137 (55.0%)	5219 (53.6%)
New Zealand	1090 (69.5%)	1131 (70.0%)	1125 (69.1%)	1189 (70.7%)

Table 4.12 Haemodialysis >12 Hours per Week by Australian State and Country 2015-2018

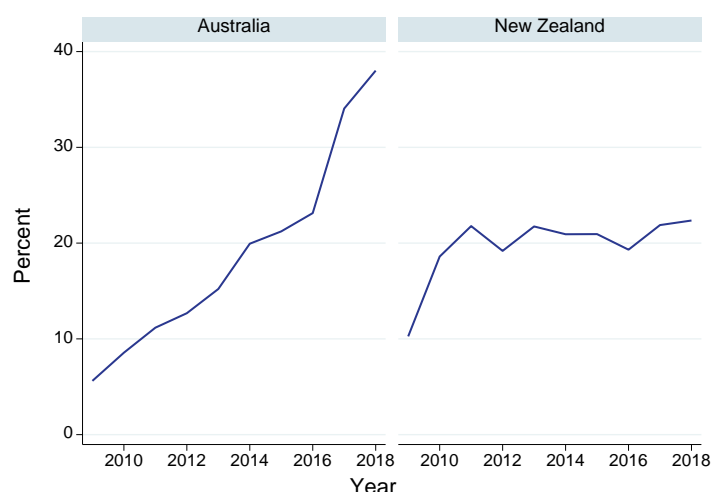
State	2015	2016	2017	2018
QLD	1096 (59.2%)	1091 (59.2%)	1126 (56.5%)	1101 (51.4%)
NSW/ACT	2191 (70.6%)	2131 (68.0%)	2214 (69.7%)	2251 (69.5%)
VIC	1261 (53.8%)	1259 (54.6%)	1323 (54.1%)	1361 (52.9%)
TAS	131 (67.5%)	119 (66.5%)	119 (67.6%)	125 (67.9%)
SA	218 (34.5%)	235 (35.0%)	243 (32.9%)	252 (32.6%)
NT	388 (73.6%)	428 (73.8%)	456 (71.6%)	445 (65.4%)
WA	286 (31.5%)	261 (30.3%)	319 (29.7%)	316 (28.0%)
Australia	5571 (58.3%)	5524 (57.7%)	5800 (56.7%)	5851 (54.6%)
New Zealand	1346 (73.1%)	1378 (73.1%)	1366 (72.5%)	1438 (74.0%)

Table 4.13 shows the use of high-flux dialysis and haemodiafiltration by state and country in 2018. There are substantial differences across states and countries. Figure 4.17 shows the rapid growth in the use of HDF in Australia, in contrast to New Zealand where its use has been steady since 2010.

Table 4.13 Number of Patients Receiving Standard Haemodialysis (and Membrane Type), Haemofiltration and Haemodiafiltration - December 2018

HD Modality	QLD	NSW/ACT	VIC	TAS	SA	NT	WA	Australia	New Zealand
Haemodialysis	1160	1954	2062	183	439	490	364	6652	1507
High Flux	1148	1931	2021	159	438	489	331	6517	1342
Non-High Flux	12	14	36	24	1	0	31	118	165
Unreported	0	9	5	0	0	1	2	17	0
Haemofiltration	9	7	2	0	0	2	0	20	0
Haemodiafiltration	975	1281	513	1	334	189	766	4059	434
Percent HDF of Total	45.5%	39.5%	19.9%	.5%	43.2%	27.8%	67.8%	37.8%	22.4%
Total	2144	3242	2577	184	773	681	1130	10731	1941

Figure 4.17 - Use of Haemodiafiltration - Prevalent Haemodialysis Patients 2009-2018



The mode of delivery of substitution fluid for haemodiafiltration is reported for the second time in this Report (table 4.14). In Australia and New Zealand, the predominant mode of delivery of substitution fluid for HDF was post-dilution, however pre-dilution was more common in New Zealand than in Australia. In the next report, the volume of substitution fluid will be reported

Table 4.14 Mode of delivery of substitution fluid in patients using haemodiafiltration - December 2018

Country	HDF Type	2017	2018
Australia	Predilution	198 (6%)	231 (6%)
	Mixed Dilution	62 (2%)	156 (4%)
	Postdilution	3180 (92%)	3672 (90%)
	Not Reported	24 (1%)	0 (0%)
	Total	3464	4059
New Zealand	Predilution	147 (35%)	160 (37%)
	Mixed Dilution	2 (0%)	0 (0%)
	Postdilution	264 (64%)	274 (63%)
	Not Reported	2 (0%)	0 (0%)
	Total	415	434

Anaemia

Figure 4.18 shows the variation in Hb between treating hospitals; median Hb ranged from 104 to 118g/L in Australia and 107 to 112.5g/L in New Zealand.

Figure 4.18.1 - Haemoglobin in Haemodialysis Patients - Australia 31 December 2018

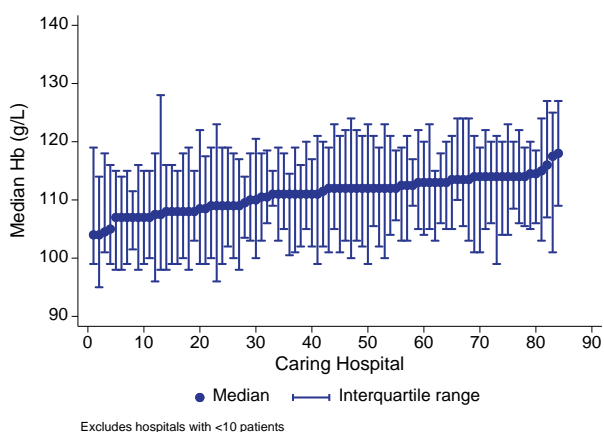


Figure 4.18.2 - Haemoglobin in Haemodialysis Patients - New Zealand 31 December 2018

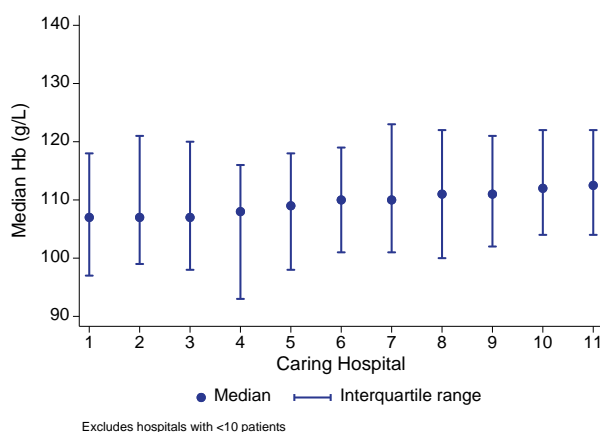


Figure 4.19 shows the proportion of patients with Hb between 110-129g/L; the proportion ranged from 20-70% in Australia and 30-46% in New Zealand.

Figure 4.19.1 - % Haemodialysis Patients with Hb 110-129 g/L - Australia 31 December 2018

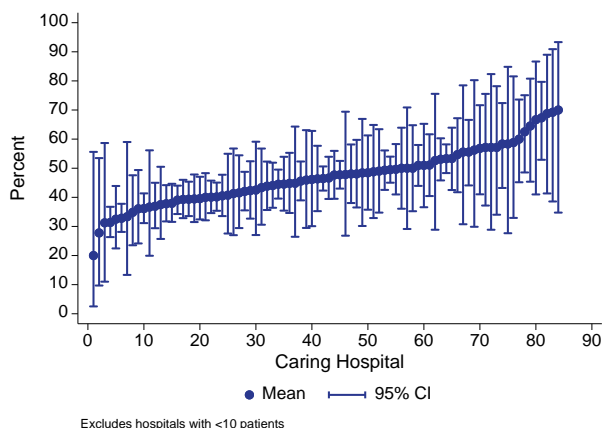
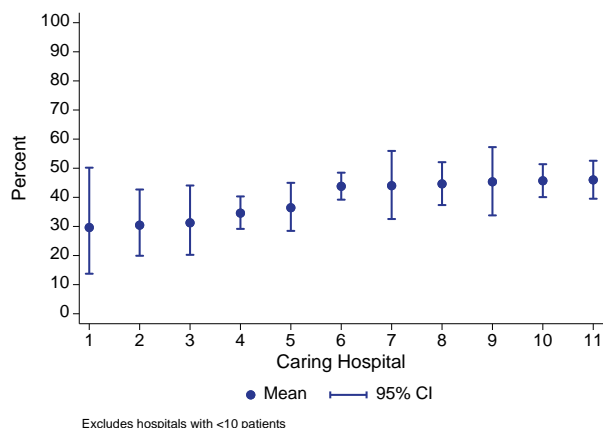


Figure 4.19.2 - % Haemodialysis Patients with Hb 110-129 g/L - New Zealand 31 December 2018



The proportion of patients with ferritin between 200-500µg/L ranged from 3-69% in Australia and 26-49% in New Zealand (figure 4.20). Figure 4.21 presents equivalent data for transferrin saturation.

Figure 4.20.1 - % Haemodialysis Patients with Ferritin 200-500 µg/L - Australia 31 December 2018

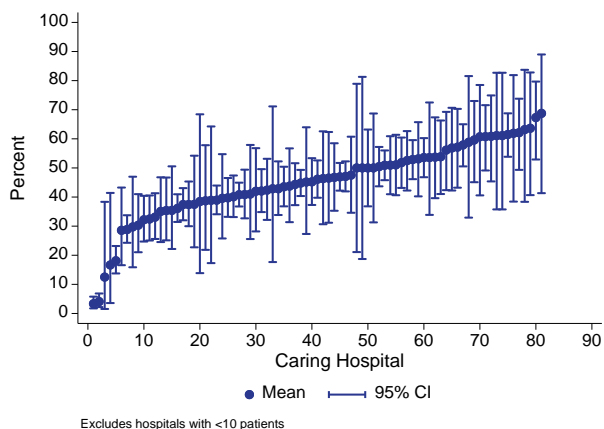


Figure 4.20.2 - % Haemodialysis Patients with Ferritin 200-500 µg/L - New Zealand 31 December 2018

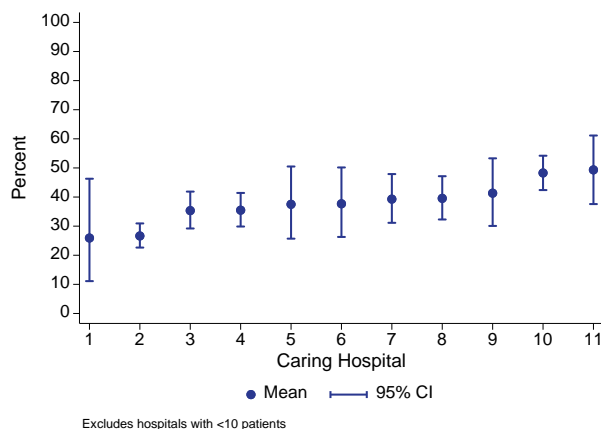


Figure 4.21.1 - % Haemodialysis Patients with TSat>20% - Australia 31 December 2018

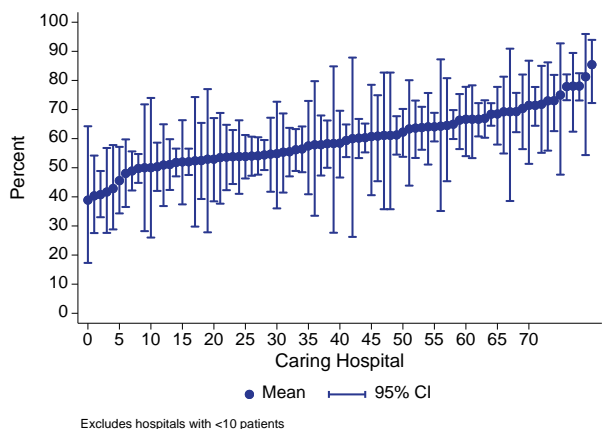
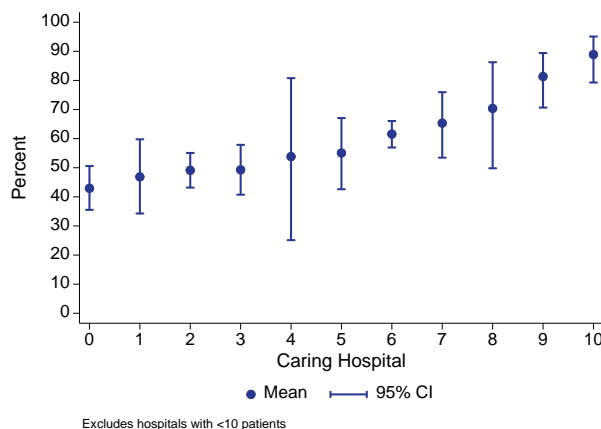


Figure 4.21.2 - % Haemodialysis Patients with TSat>20% - New Zealand 31 December 2018



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 2018

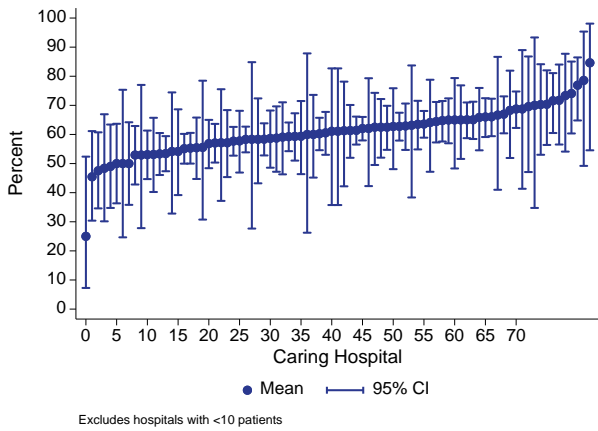


Figure 4.22.2 - % Haemodialysis Patients with Calcium 2.1-2.4 mmol/L - New Zealand 31 December 2018

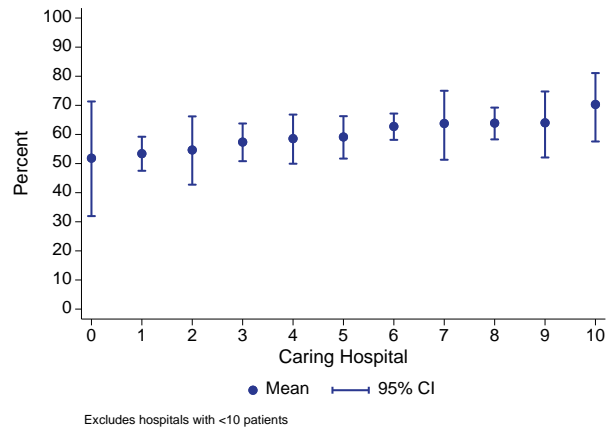


Figure 4.23.1 - % Haemodialysis Patients with Phosphate 0.8-1.6 mmol/L - Australia 31 December 2018

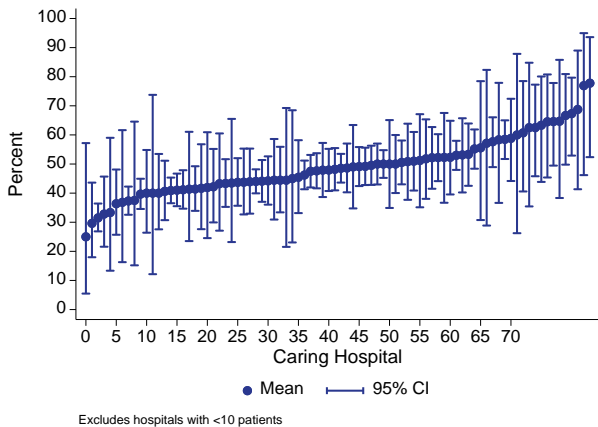
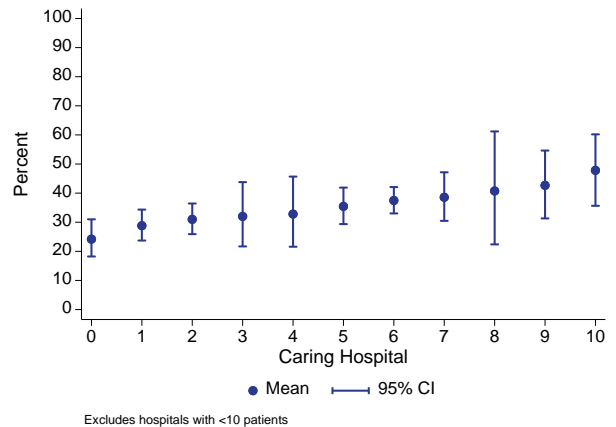


Figure 4.23.2 - % Haemodialysis Patients with Phosphate 0.8-1.6 mmol/L - New Zealand 31 December 2018



Dialysis Adequacy

Figure 4.24 shows the distribution of urea reduction ratio (URR) by country over 2016-2018; there is little change from year to year, and clearances are lower in New Zealand than in Australia. Figure 4.25 presents the 2018 data stratified by vascular access type.

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

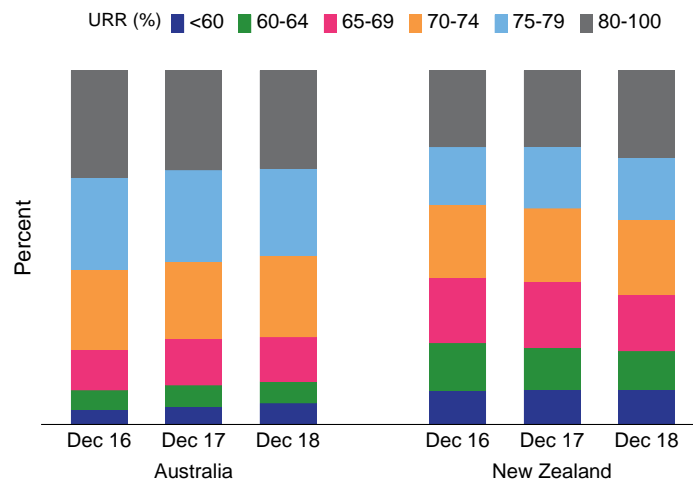


Figure 4.25 - Urea Reduction Ratio - By Type of Access, 2018 HD Three Sessions Per Week

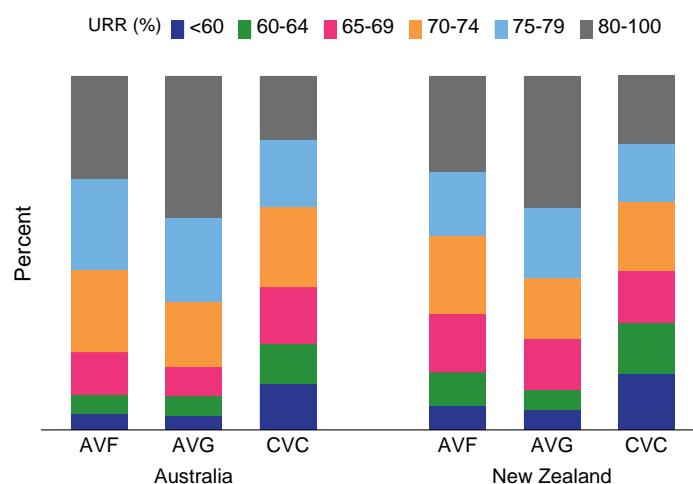


Table 4.15 presents URR by dialysis session duration. In general, as expected, the proportion of patients with a URR >70% typically increases with longer session duration.

Table 4.15 Urea Reduction Ratio - Prevalent Patients Three Sessions per Week - December 2018

Country	Hours per Session	Urea Reduction Ratio %		
		≤70	>70	Total
Australia	<4 hours	155 (41.0%)	223 (59.0%)	378
	4 hours	1140 (29.9%)	2679 (70.1%)	3819
	>4-5 hours	1131 (25.2%)	3355 (74.8%)	4486
	>5 hours	90 (28.0%)	231 (72.0%)	321
	Total	2516 (27.9%)	6488 (72.1%)	9004
New Zealand	<4 hours	14 (51.9%)	13 (48.1%)	27
	4 hours	175 (42.1%)	241 (57.9%)	416
	>4-5 hours	343 (38.0%)	559 (62.0%)	902
	>5 hours	34 (27.9%)	88 (72.1%)	122
	Total	566 (38.6%)	901 (61.4%)	1467

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 67-89%, and in New Zealand it ranged from 68-82%.

Figure 4.26.1 - Median URR in Haemodialysis Patients - Three Sessions Per Week Australia 31 December 2018

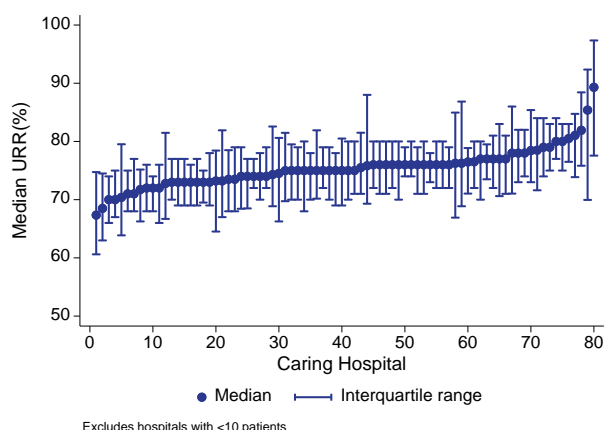


Figure 4.26.2 - Median URR in Haemodialysis Patients - Three Sessions Per Week New Zealand 31 December 2018

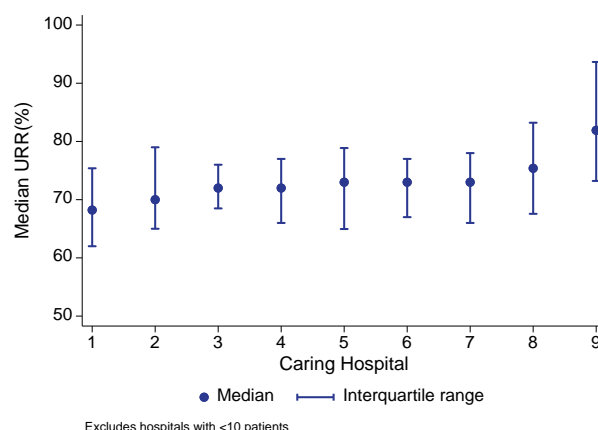


Figure 4.27 shows the proportion of patients with a URR >70%. In Australia this proportion ranged from 38-100%, and in New Zealand from 43-86%.

Figure 4.27.1 - % Haemodialysis Patients with URR>70% - Three Sessions Per Week Australia 31 December 2018

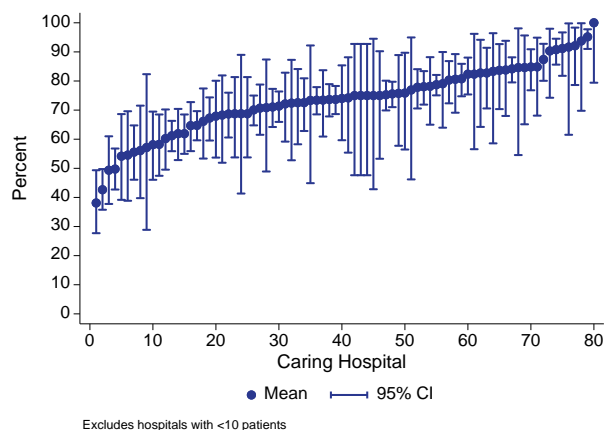
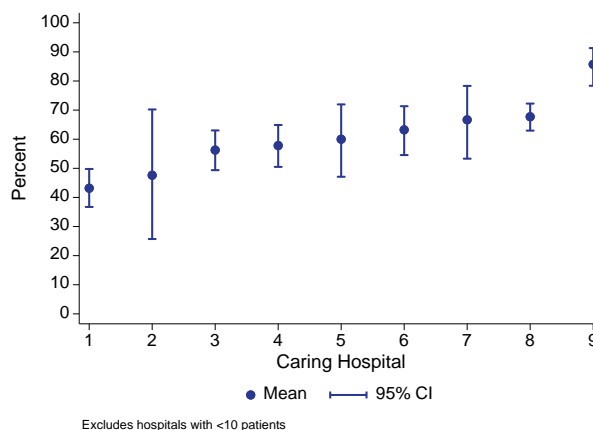


Figure 4.27.2 - % Haemodialysis Patients with URR>70% - Three Sessions Per Week New Zealand 31 December 2018



Vascular Access

Incident Patients

As shown in figures 4.28 to 4.31 and table 4.16, the majority of patients commenced haemodialysis as their first RRT with a catheter; tunnelled catheters were 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

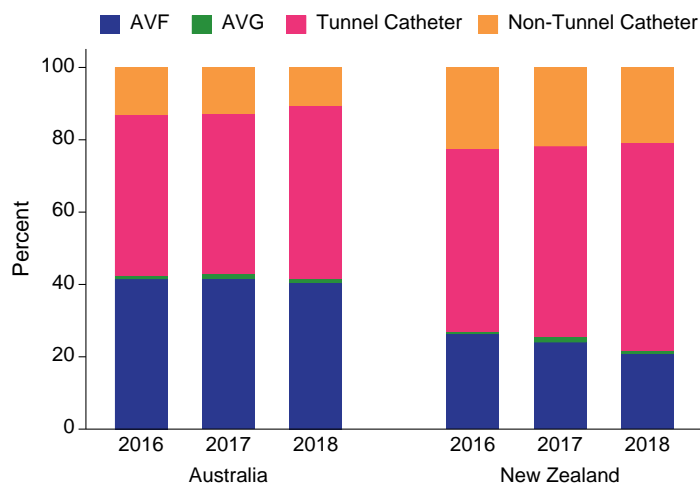


Figure 4.29 - Vascular Access - Initial RRT - By Age Group 2018

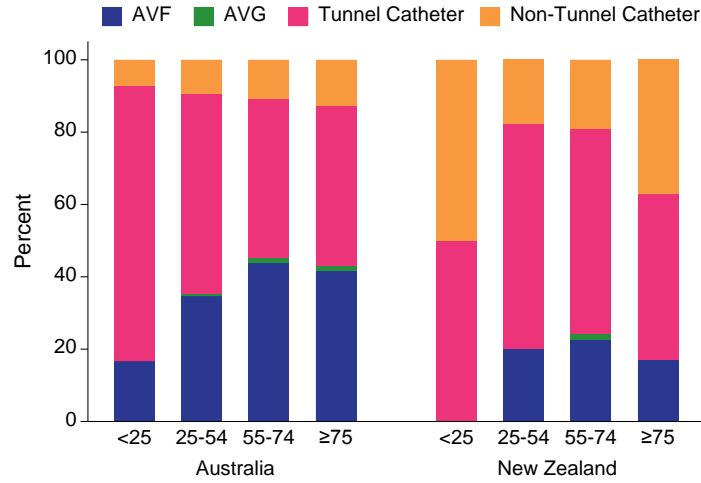


Figure 4.30.1 - Vascular Access - Initial RRT - By Gender – Australia

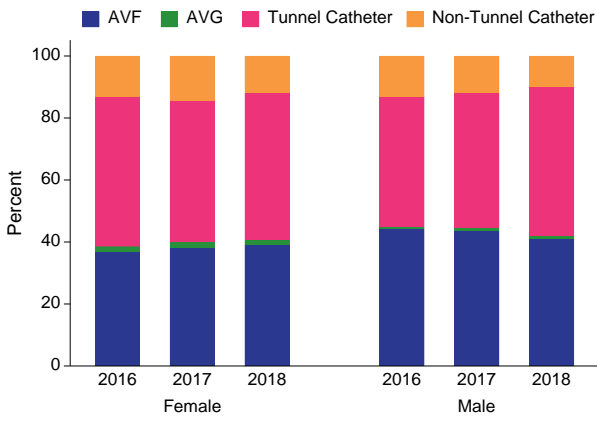


Figure 4.30.2 - Vascular Access - Initial RRT - By Gender - New Zealand

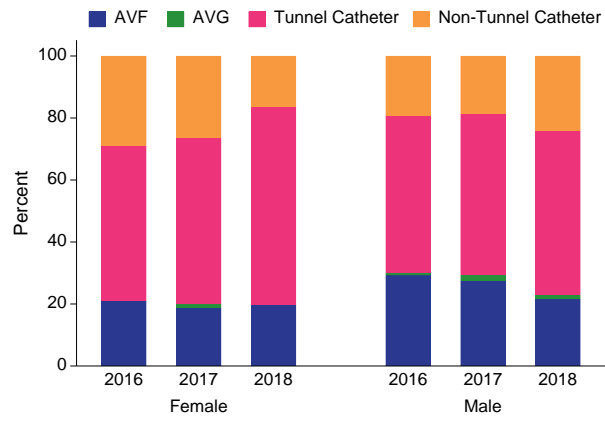


Figure 4.31.1 - Vascular Access - Initial RRT - By Referral Time - Australia

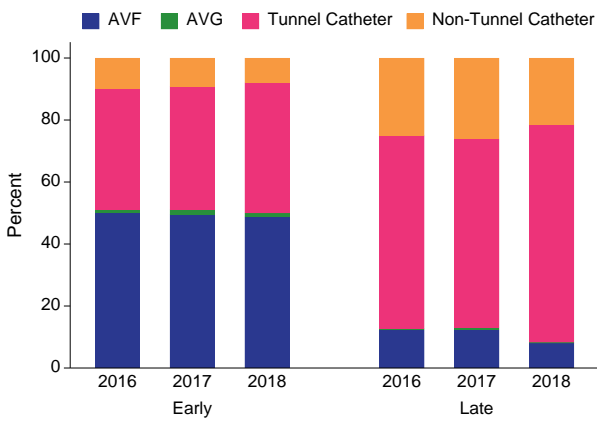


Figure 4.31.2 - Vascular Access - Initial RRT - By Referral Time - New Zealand

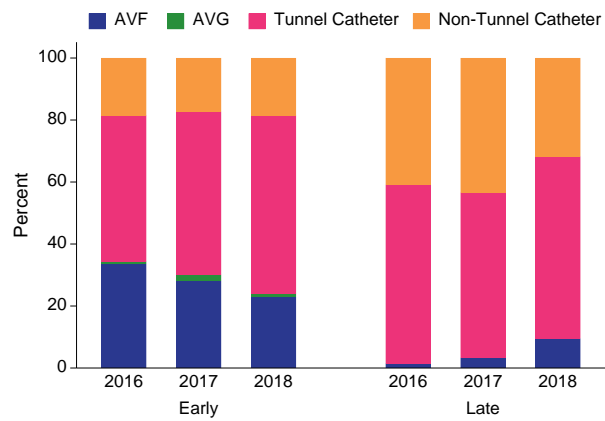


Table 4.16 Incident Vascular Access by Australian State and Country 2016-2018

State/Country	2016		2017		2018	
	AVF/AVG	CVC	AVF/AVG	CVC	AVF/AVG	CVC
QLD	154 (42%)	212 (58%)	204 (44%)	255 (56%)	205 (43%)	272 (57%)
NSW/ACT	240 (41%)	344 (59%)	262 (43%)	344 (57%)	250 (41%)	356 (59%)
VIC	218 (46%)	257 (54%)	225 (44%)	281 (56%)	228 (42%)	312 (58%)
TAS	25 (57%)	19 (43%)	13 (33%)	27 (68%)	11 (29%)	27 (71%)
SA	80 (49%)	82 (51%)	78 (53%)	68 (47%)	73 (47%)	81 (53%)
NT	33 (44%)	42 (56%)	48 (42%)	65 (58%)	39 (33%)	80 (67%)
WA	81 (33%)	166 (67%)	84 (33%)	173 (67%)	100 (40%)	149 (60%)
Australia	831 (43%)	1122 (57%)	914 (43%)	1213 (57%)	906 (42%)	1277 (58%)
New Zealand	90 (27%)	243 (73%)	94 (26%)	273 (74%)	77 (22%)	278 (78%)

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 3-76%. The corresponding range in New Zealand was 4-64%. 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 2018

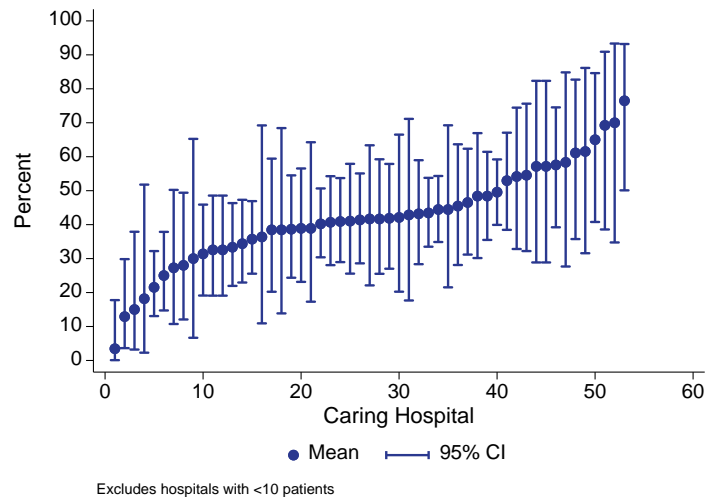
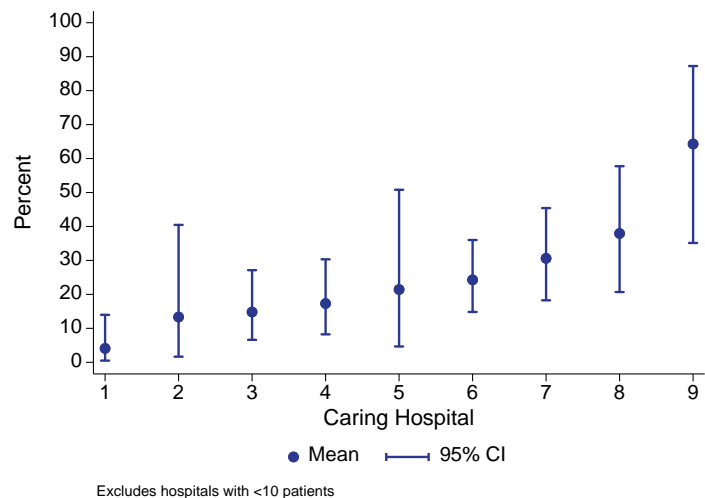


Figure 4.32.2 - % Initial RRT HD Patients Starting with AVF/AVG - New Zealand 2018



Prevalent Patients

Figures 4.33 to 4.36 and table 4.17 show dialysis access among prevalent (rather than incident) patients (those receiving haemodialysis at 31 December 2018). In Australia, the proportions of patients dialysing with AV grafts and fistulae at 31 December were stable, whereas in New Zealand there is a slight downward trend. 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 had the highest rate of AVF use in both Australia and New Zealand.

Figure 4.33 - Prevalent Haemodialysis Access

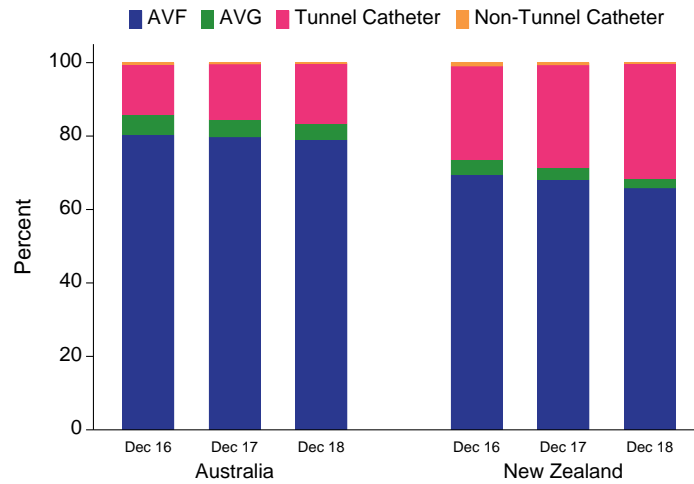


Figure 4.34 - Prevalent Haemodialysis Access - By Age Group 2018

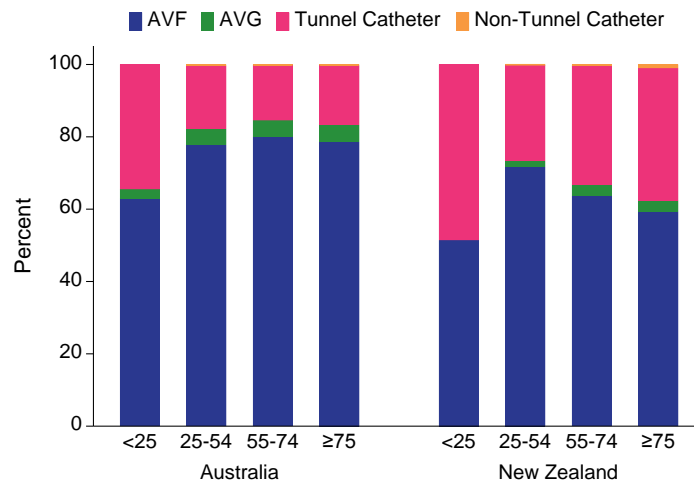


Figure 4.35.1 - Prevalent Haemodialysis Access - By Gender – Australia

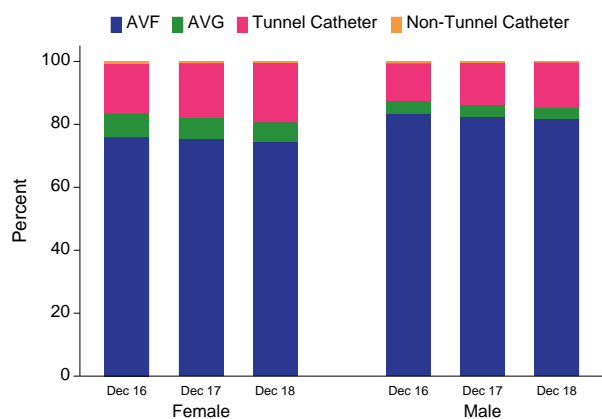


Figure 4.35.2 - Prevalent Haemodialysis Access - By Gender - New Zealand

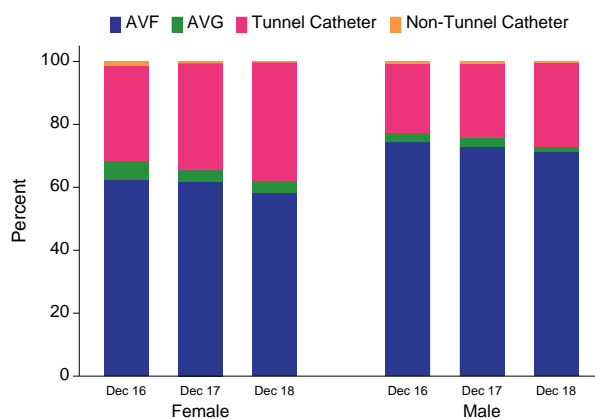


Figure 4.36 - Prevalent Haemodialysis Access - By Location 2018

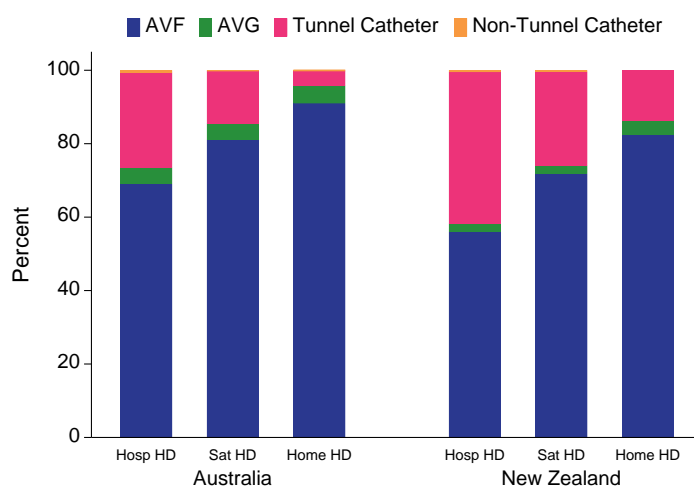


Table 4.17 Prevalent Vascular Access by Australian State and Country at 31 December 2018

State/Country	2016		2017		2018	
	AVF/AVG	CVC	AVF/AVG	CVC	AVF/AVG	CVC
QLD	1595 (87%)	246 (13%)	1712 (86%)	279 (14%)	1789 (84%)	352 (16%)
NSW/ACT	2650 (85%)	464 (15%)	2660 (84%)	516 (16%)	2687 (83%)	549 (17%)
VIC	1981 (86%)	319 (14%)	2092 (86%)	352 (14%)	2154 (84%)	415 (16%)
TAS	149 (83%)	30 (17%)	134 (76%)	42 (24%)	139 (76%)	45 (24%)
SA	607 (90%)	65 (10%)	667 (90%)	71 (10%)	689 (89%)	84 (11%)
NT	523 (90%)	58 (10%)	560 (88%)	73 (12%)	587 (87%)	85 (13%)
WA	684 (80%)	171 (20%)	821 (77%)	250 (23%)	884 (78%)	244 (22%)
Australia	8189 (86%)	1353 (14%)	8646 (85%)	1583 (15%)	8929 (83%)	1774 (17%)
New Zealand	1387 (74%)	497 (26%)	1344 (71%)	539 (29%)	1328 (68%)	614 (32%)

Figure 4.37 shows the proportion of haemodialysis patients at each hospital dialysing with an AVF/AVG on 31st December 2018, arranged from the lowest to the highest. In Australia, these proportions varied widely from 64-100%. The corresponding range in New Zealand was 33-84%.

Figure 4.37.1 - % Prevalent HD Patients Dialysing with AVF/AVG - Australia 31 December 2018

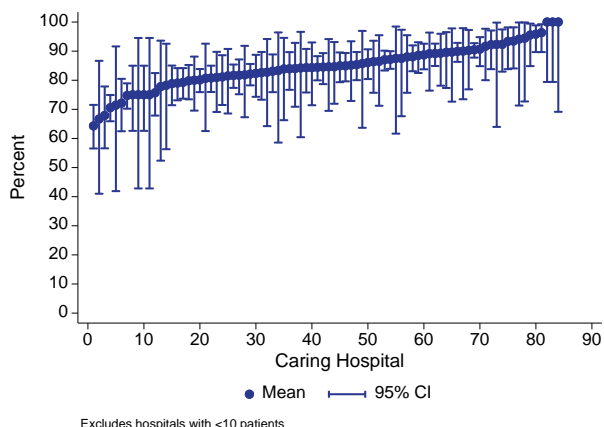
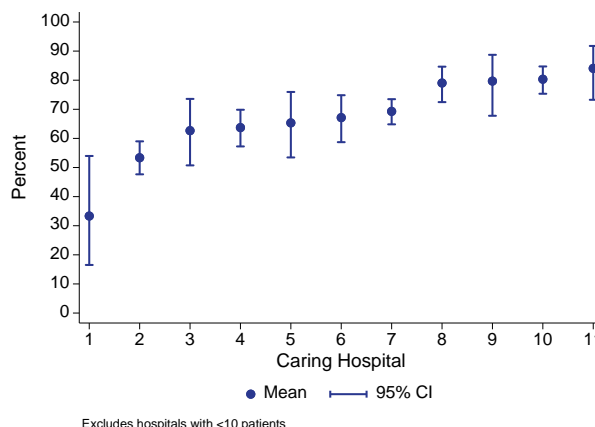


Figure 4.37.2 - % Prevalent HD Patients Dialysing with AVF/AVG - New Zealand 31 December 2018



Home Haemodialysis

The distribution of prevalent home haemodialysis patients by state is shown in table 4.18. The 2018 data are further stratified by age in figure 4.38, and the distribution of patients aged 65 and older is shown in table 4.19.

Table 4.18 Number (%) of Prevalent Haemodialysis Patients Treated with Home Haemodialysis 2014 - 2018

State	2014	2015	2016	2017	2018
QLD	289 (15.7%)	284 (14.6%)	266 (13.3%)	248 (11.9%)	265 (12.0%)
NSW/ACT	499 (15.6%)	503 (15.5%)	477 (14.5%)	430 (13.2%)	441 (13.3%)
VIC	216 (9.0%)	217 (8.9%)	204 (8.3%)	194 (7.7%)	179 (6.8%)
TAS	24 (12.6%)	25 (12.9%)	21 (11.7%)	11 (6.3%)	13 (7.0%)
SA	33 (5.3%)	34 (5.2%)	30 (4.5%)	28 (3.7%)	33 (4.3%)
NT	46 (8.7%)	42 (7.2%)	41 (6.8%)	40 (6.1%)	36 (5.2%)
WA	75 (7.5%)	89 (8.5%)	97 (8.6%)	92 (7.9%)	90 (7.6%)
Australia	1182 (12.1%)	1194 (11.8%)	1136 (11.0%)	1043 (9.8%)	1057 (9.6%)
New Zealand	489 (26.1%)	484 (25.2%)	469 (24.3%)	441 (23.0%)	422 (21.3%)

Figure 4.38 - Home HD by Age Group - at 31 Dec 2018

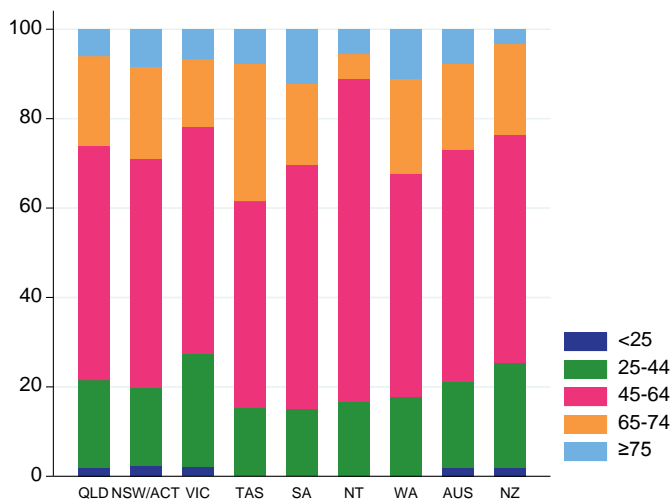


Table 4.19 Number (%) of Prevalent Haemodialysis Patients Aged ≥65 Years Treated with Home Haemodialysis 2014 - 2018

State	2014	2015	2016	2017	2018
QLD	77 (8.7%)	73 (7.6%)	60 (6.1%)	53 (5.2%)	69 (6.1%)
NSW/ACT	125 (7.1%)	123 (6.8%)	134 (7.2%)	122 (6.6%)	128 (6.9%)
VIC	53 (3.8%)	52 (3.6%)	51 (3.4%)	45 (3.0%)	39 (2.5%)
TAS	7 (8.0%)	6 (6.2%)	5 (5.2%)	4 (4.4%)	5 (4.8%)
SA	5 (1.4%)	8 (2.2%)	9 (2.5%)	6 (1.5%)	10 (2.4%)
NT	6 (8.0%)	6 (6.1%)	5 (5.0%)	6 (4.7%)	4 (3.3%)
WA	14 (3.0%)	16 (3.4%)	25 (4.9%)	27 (5.2%)	29 (5.4%)
Australia	287 (5.7%)	284 (5.4%)	289 (5.4%)	263 (4.8%)	284 (4.9%)
New Zealand	85 (13.4%)	91 (13.9%)	94 (13.9%)	96 (14.1%)	99 (13.6%)

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 2018 – Australia

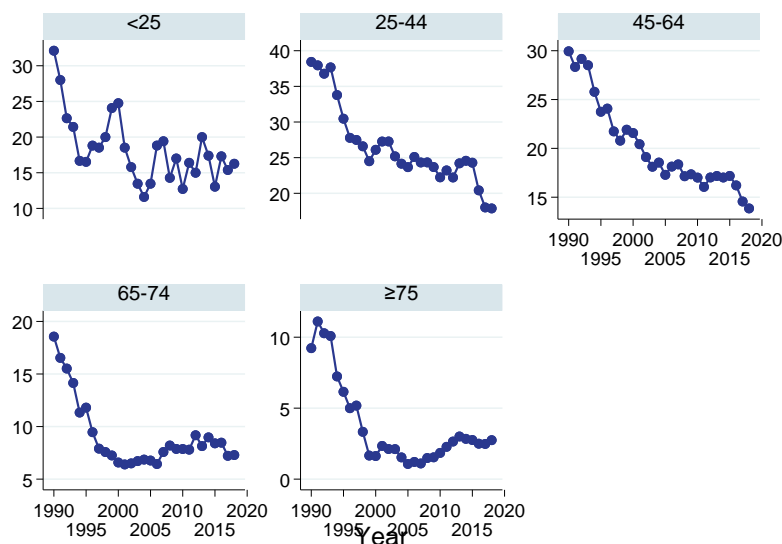
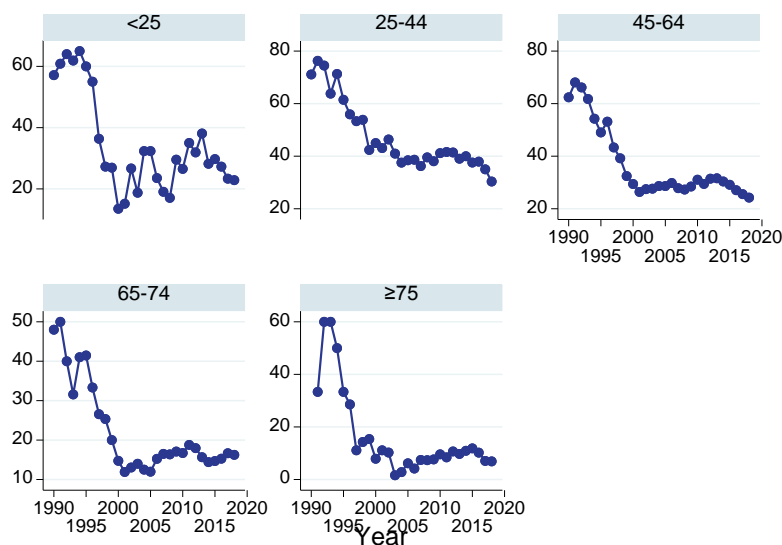


Figure 4.39.2 - Home HD Percent of all HD by Age at 31 Dec 2018 - New Zealand



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 2018

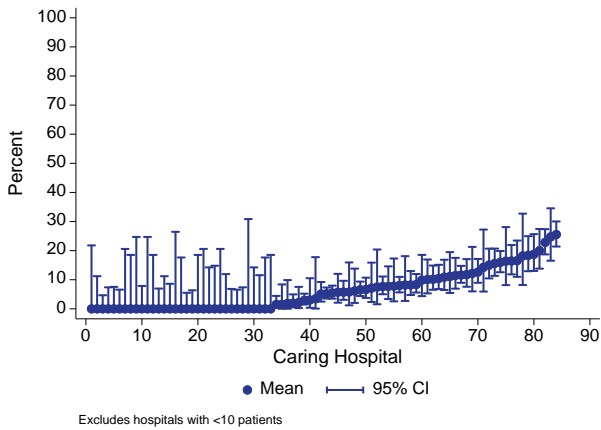
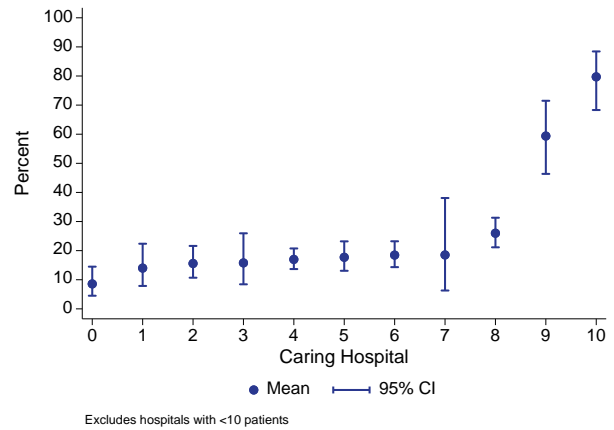


Figure 4.40.2 - % Haemodialysis Patients on Home HD - New Zealand 31 December 2018



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 2018. Only patients initiating home haemodialysis within the first 365 days of RRT commencement are included. 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 - Technique Survival - Home Haemodialysis 2008 – 2018

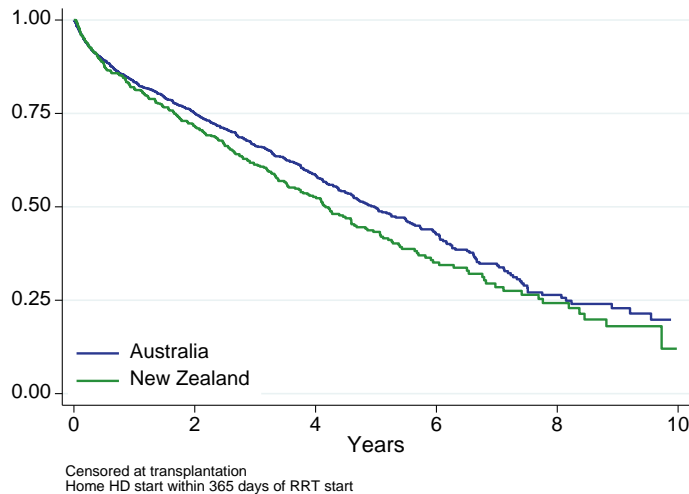


Figure 4.42 - Technique Survival by Age Group - Home Haemodialysis 2008 – 2018

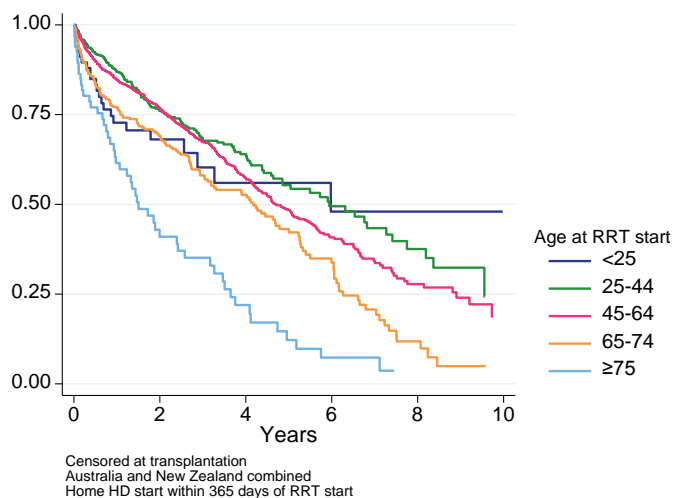


Figure 4.43.1 - Death-Censored Technique Survival by Age Group - Home Haemodialysis 2008 - 2018 Australia

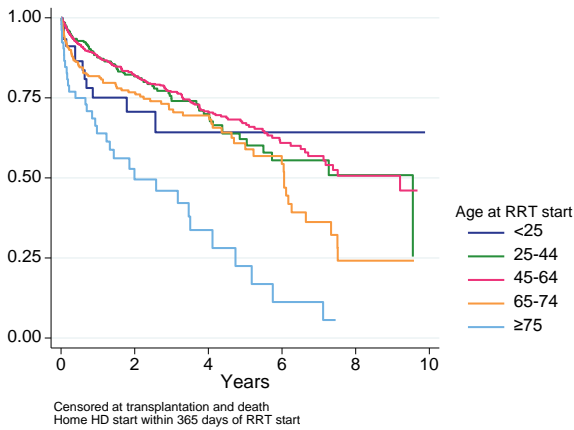


Figure 4.43.2 - Death-Censored Technique Survival by Age Group - Home Haemodialysis 2008 - 2018 New Zealand

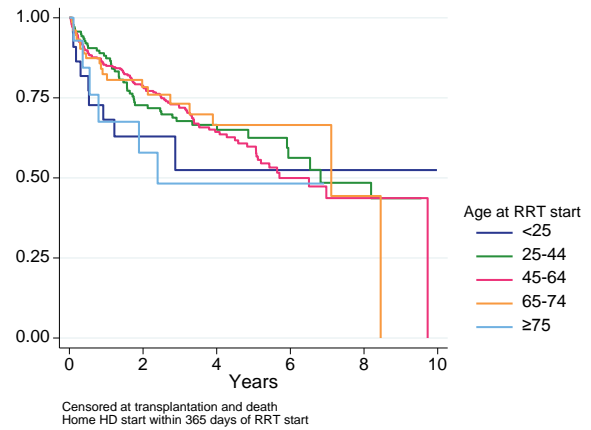
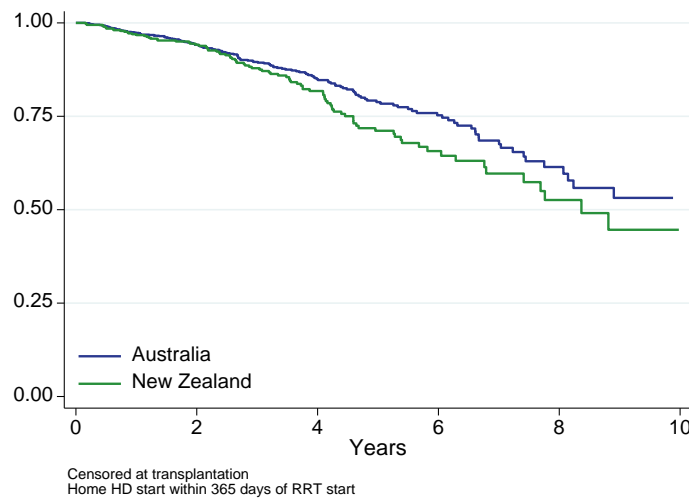


Figure 4.44 - Patient Survival - Home Haemodialysis 2008 - 2018



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 - 2016-2018

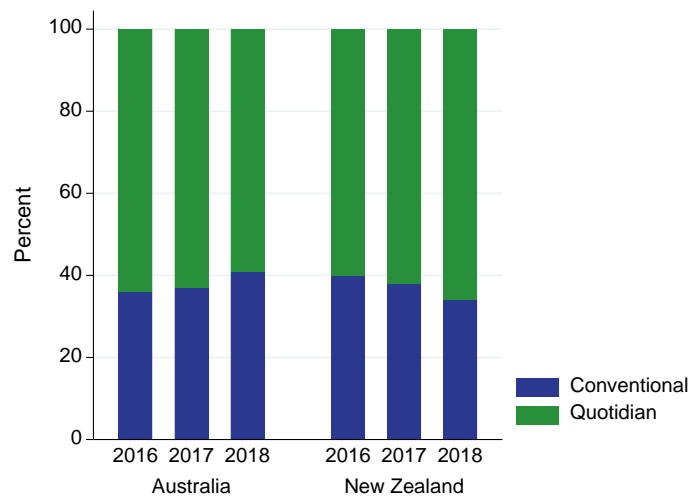


Figure 4.46 - Home Haemodialysis Frequency Per Week - 2016-2018

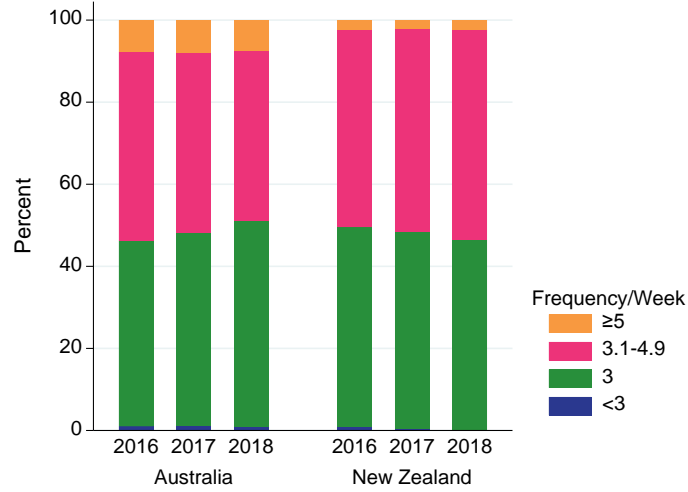


Figure 4.47 - Home Haemodialysis Session Length (Hours) - December 2016-2018

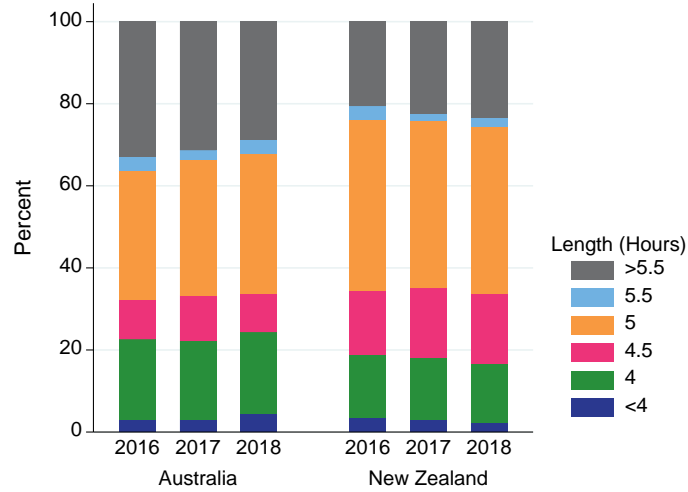


Figure 4.48 - Home Haemodialysis Duration (Hours Per Week) - December 2016-2018

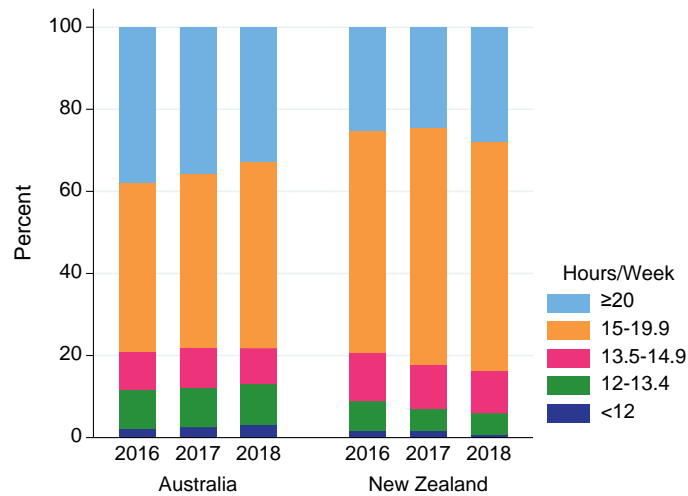


Figure 4.49 - Percentage of Home HD Patients Dialysing Five or More Days Per Week

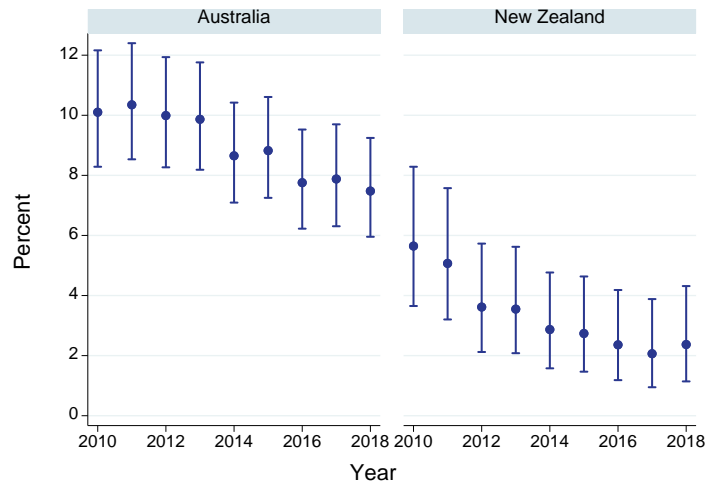


Figure 4.50 - Percentage of Home HD Patients Dialysing 3 Days Per Week Dialysing 4.5 Hours or Longer Per Session

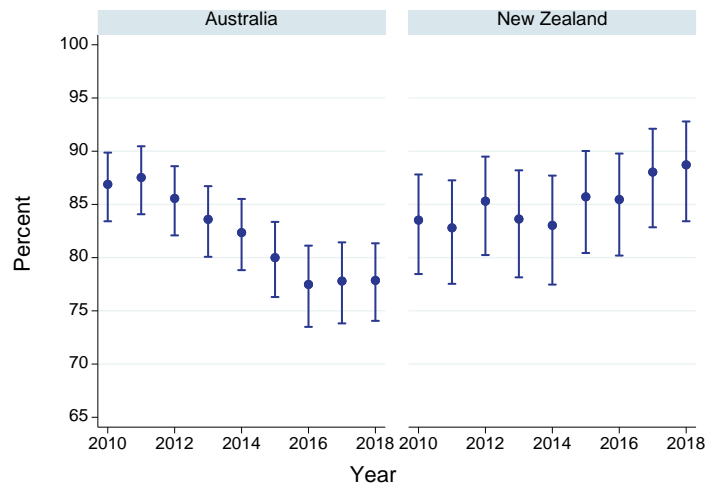


Figure 4.51 - Percentage of Home HD Patients Dialysing >12 Hours Per Week

