CHAPTER 5

Peritoneal Dialysis

Reporting the incidence, prevalence and survival of peritoneal dialysis patients in Australia and New Zealand; summarising dialysis fluids, laboratory results, rates of technique and peritonitis.

Contents

Executive Summary

There were 2,416 people in Australia and 868 people in New Zealand receiving peritoneal dialysis at the time of the 31 December 2018 survey. The number of people commencing peritoneal dialysis during this survey period was 1,113 in Australia and 345 in New Zealand. The proportion of people receiving home dialysis on peritoneal dialysis was 70% in Australia and 67% in New Zealand and the total percentage of the dialysis population receiving peritoneal dialysis remained higher in New Zealand with 30% compared with Australia with 18%.

Overall peritoneal dialysis patient survival remained stable in Australia and improved slightly in New Zealand, with the proportion of people surviving at 3 years 73% in Australia and 68% in New Zealand. No improvement in technique survival was observed with 3-year rates remaining low at only 39% in Australia and 40% in New Zealand. The primary causes of technique failure were death at 32% in Australia and 45% in New Zealand, and infective complications at 21% in Australia and 20% in New Zealand.

ANZDATA only reports on Australian peritoneal dialysis episodes of peritonitis, as New Zealand has a separate registry that is not currently linked to ANZDATA. In Australia, the overall peritonitis rate has dropped considerably, however there remains significant variation between individual states and treating hospitals. The distribution of organisms causing peritonitis was stable, although the proportion of culture negative infections is gradually increasing.

Peritoneal dialysis fluids showed the use of icodextrin has been stable in Australia (used in 48% of the peritoneal dialysis population) and decreased slightly in New Zealand to 66%. Peritoneal dialysis modalities varied between Australia and New Zealand with automated peritoneal dialysis utilisation rates at 69% in Australia and 55% in New Zealand. The remainder received continuous ambulatory peritoneal dialysis.

Suggested Citation

ANZDATA Registry. 42nd Report, Chapter 5: Peritoneal dialysis. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2020. Available at: http://www.anzdata.org.au

Stock and Flow

Table 5.1 shows the proportion of all dialysis patients undergoing peritoneal dialysis (PD) in each state and country over 2014-2018. Table 5.2 shows the same data as a proportion of home dialysis patients. Overall around two-thirds of home dialysis patients undergo PD, although there is some variation between states.

The duration of time spent on PD by prevalent patients is shown in figure 5.1.

Table 5.1 Proportion (%) PD of all Dialysis Patients

State	2014	2015	2016	2017	2018
Queensland	22%	20%	18%	18%	17%
New South Wales	25%	25%	24%	24%	23%
Australian Capital Territory	12%	8%	10%	9%	9%
Victoria	20%	20%	20%	19%	18%
Tasmania	17%	20%	22%	19%	12%
South Australia	16%	15%	16%	14%	15%
Northern Territory	5%	4%	4%	4%	4%
Western Australia	18%	17%	16%	15%	15%
Australia	**20%**	**20%**	**19%**	**19%**	**18%**
New Zealand	**31%**	**29%**	**30%**	**31%**	**30%**

Table 5.2 Proportion (%) PD of all Home Dialysis Patients

State	2014	2015	2016	2017	2018
Queensland	64%	64%	62%	65%	64%
New South Wales	67%	68%	68%	70%	69%
Australian Capital Territory	49%	41%	52%	55%	52%
Victoria	73%	74%	75%	76%	77%
Tasmania	62%	66%	70%	79%	67%
South Australia	79%	78%	81%	81%	80%
Northern Territory	38%	39%	38%	38%	47%
Western Australia	75%	71%	68%	70%	70%
Australia	**68%**	**68%**	**68%**	**70%**	**70%**
New Zealand	**63%**	**62%**	**64%**	**66%**	**67%**

Figure 5.1.1 - Time on Peritoneal Dialysis - Prevalent PD Patients Australia 31 Dec 2018

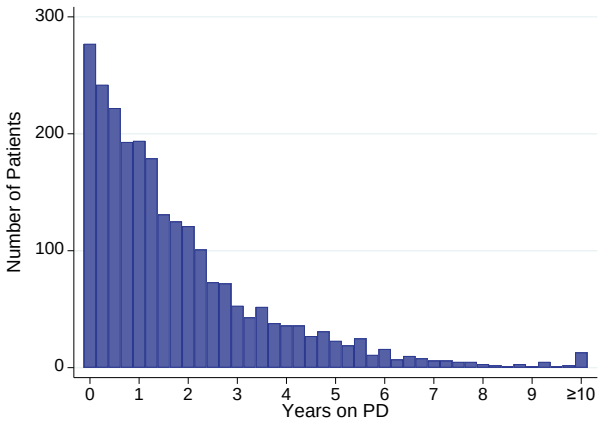


Figure 5.1.2 - Time on Peritoneal Dialysis - Prevalent PD Patients New Zealand 31 Dec 2018

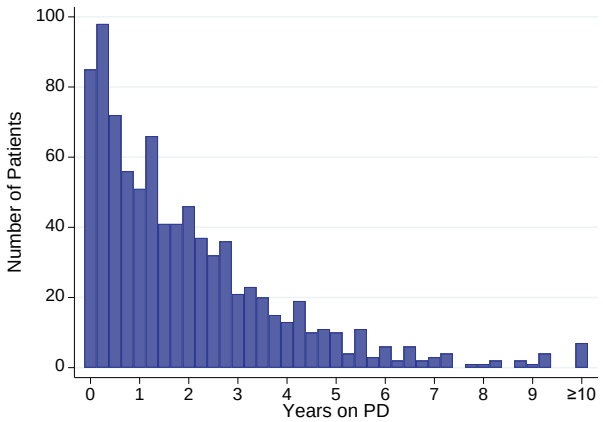


Table 5.3 shows the overall stock and flow of PD patients. Note that dialysis modality changes lasting less than 30 days are not included. The number of prevalent patients fell in 2018 in Australia but grew in New Zealand. Figure 5.2 presents some of these data graphically.

Table 5.3 Stock and Flow of Peritoneal Dialysis Patients 2014 - 2018

Country		2014	2015	2016	2017	2018
Australia	**All patients who commenced PD**					
	First dialysis treatment or returning after renal recovery	799	778	823	817	788
	Transfer from HD (no prior PD)	288	247	242	253	244
	Transfer from HD (prior PD)	44	48	33	44	42
	Failed Transplant (no prior PD)	17	25	17	22	21
	Failed Transplant (prior PD)	15	14	17	21	18
	Total	**1163**	**1112**	**1132**	**1157**	**1113**
	All patients who ceased PD					
	Received kidney transplant	231	272	321	321	326
	Transfer to HD	444	502	517	544	519
	Renal recovery	27	18	23	18	10
	Deaths	278	309	325	300	265
	Total	**980**	**1101**	**1186**	**1183**	**1120**
	Total patients on PD at 31 December	**2499**	**2512**	**2449**	**2422**	**2416**
New Zealand	**All patients who commenced PD**					
	First dialysis treatment or returning after renal recovery	192	222	216	225	227
	Transfer from HD (no prior PD)	90	85	96	96	83
	Transfer from HD (prior PD)	18	12	15	18	20
	Failed Transplant (no prior PD)	2	4	4	1	8
	Failed Transplant (prior PD)	3	3	8	1	7
	Total	**305**	**326**	**339**	**341**	**345**
	All patients who ceased PD					
	Received kidney transplant	47	46	47	66	65
	Transfer to HD	119	160	139	109	132
	Renal recovery	2	10	7	5	6
	Deaths	146	134	115	126	134
	Total	**314**	**350**	**308**	**306**	**337**
	Total patients on PD at 31 December	**822**	**797**	**829**	**862**	**868**

Figure 5.2.1 - Stock and Flow of Peritoneal Dialysis Patients - Australia 2014-2018

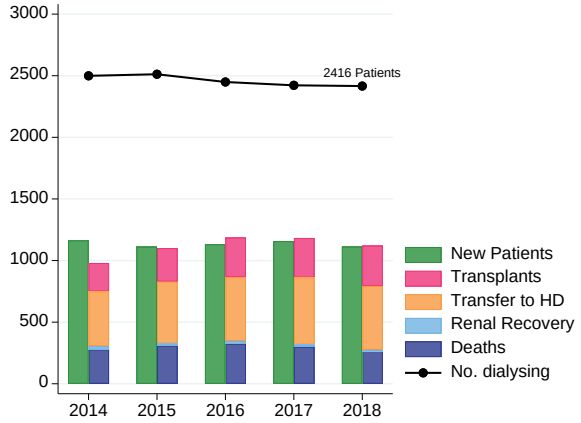
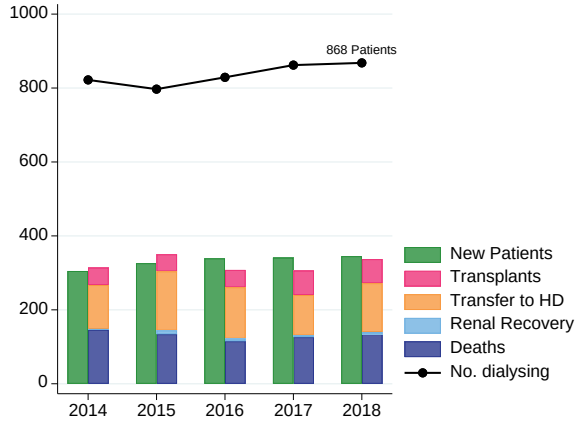


Figure 5.2.2 - Stock and Flow of Peritoneal Dialysis Patients - New Zealand 2014-2018



The age distributions of incident and prevalent PD patients are shown in figures 5.3 and 5.4 respectively.

Figure 5.3.1 - Age (%) of New Peritoneal Dialysis Patients - Australia 2018

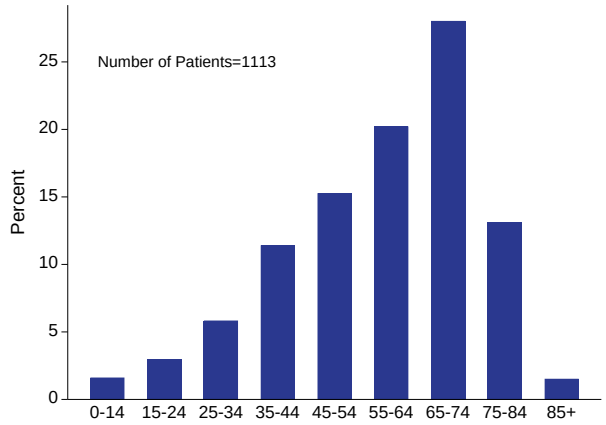


Figure 5.3.2 - Age (%) of New Peritoneal Dialysis Patients - New Zealand 2018

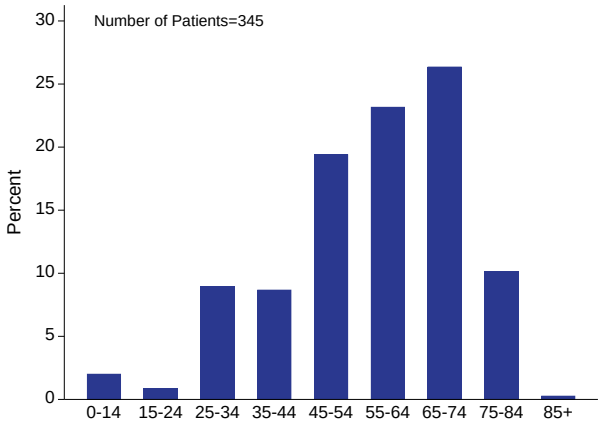


Figure 5.4.1 - Age (%) of Current Peritoneal Dialysis Patients - Australia 2018

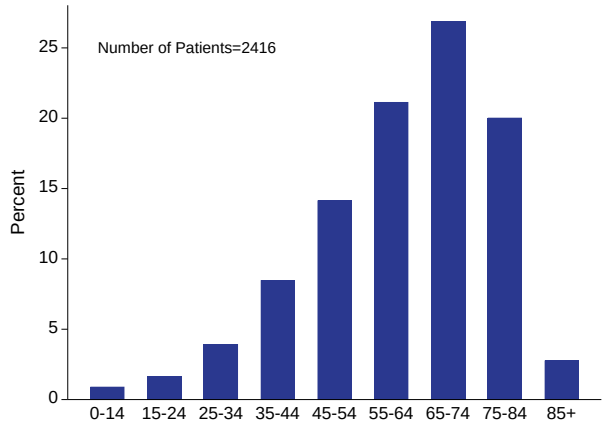


Figure 5.4.2 - Age (%) of Current Peritoneal Dialysis Patients - New Zealand 2018

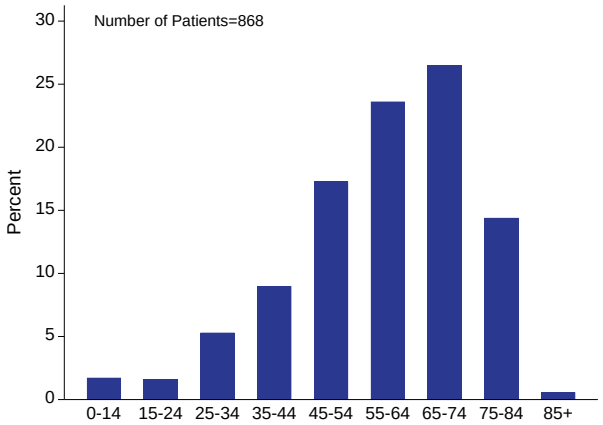


Table 5.4 presents the number and proportion of incident and prevalent peritoneal dialysis patients by age group.

Table 5.4.1 Incident and Prevalent PD patients by Age Group - Australia

Category	Age group	2014	2015	2016	2017	2018
Incident Patients	**0-14**	27 (2%)	21 (2%)	22 (2%)	29 (3%)	18 (2%)
	15-24	34 (3%)	30 (3%)	42 (4%)	31 (3%)	33 (3%)
	25-34	56 (5%)	76 (7%)	58 (5%)	73 (6%)	65 (6%)
	35-44	131 (11%)	94 (8%)	123 (11%)	126 (11%)	127 (11%)
	45-54	195 (17%)	180 (16%)	203 (18%)	193 (17%)	170 (15%)
	55-64	253 (22%)	244 (22%)	246 (22%)	266 (23%)	225 (20%)
	65-74	291 (25%)	291 (26%)	276 (24%)	276 (24%)	312 (28%)
	75-84	160 (14%)	168 (15%)	150 (13%)	150 (13%)	146 (13%)
	85+	16 (1%)	8 (1%)	12 (1%)	13 (1%)	17 (2%)
	Total	**1163**	**1112**	**1132**	**1157**	**1113**
Prevalent Patients	**0-14**	31 (1%)	28 (1%)	30 (1%)	32 (1%)	22 (1%)
	15-24	38 (2%)	42 (2%)	47 (2%)	42 (2%)	40 (2%)
	25-34	96 (4%)	110 (4%)	103 (4%)	108 (4%)	95 (4%)
	35-44	221 (9%)	199 (8%)	185 (8%)	202 (8%)	205 (8%)
	45-54	347 (14%)	333 (13%)	340 (14%)	352 (15%)	342 (14%)
	55-64	554 (22%)	540 (21%)	519 (21%)	521 (22%)	511 (21%)
	65-74	694 (28%)	720 (29%)	682 (28%)	625 (26%)	650 (27%)
	75-84	458 (18%)	473 (19%)	477 (19%)	471 (19%)	484 (20%)
	85+	60 (2%)	67 (3%)	66 (3%)	69 (3%)	67 (3%)
	Total	**2499**	**2512**	**2449**	**2422**	**2416**

Table 5.4.2 Incident and Prevalent PD patients by Age Group - New Zealand

Category	Age group	2014	2015	2016	2017	2018
Incident Patients	0-14	6 (2%)	3 (1%)	9 (3%)	7 (2%)	7 (2%)
	15-24	14 (5%)	10 (3%)	11 (3%)	9 (3%)	3 (1%)
	25-34	21 (7%)	17 (5%)	18 (5%)	25 (7%)	31 (9%)
	35-44	32 (10%)	40 (12%)	39 (12%)	31 (9%)	30 (9%)
	45-54	54 (18%)	59 (18%)	62 (18%)	63 (18%)	67 (19%)
	55-64	72 (24%)	88 (27%)	82 (24%)	81 (24%)	80 (23%)
	65-74	75 (25%)	75 (23%)	77 (23%)	97 (28%)	91 (26%)
	75-84	27 (9%)	34 (10%)	39 (12%)	28 (8%)	35 (10%)
	85+	4 (1%)	0 (0%)	2 (1%)	0 (0%)	1 (0%)
	Total	**305**	**326**	**339**	**341**	**345**
Prevalent Patients	0-14	7 (1%)	4 (1%)	10 (1%)	13 (2%)	15 (2%)
	15-24	23 (3%)	15 (2%)	19 (2%)	19 (2%)	14 (2%)
	25-34	34 (4%)	36 (5%)	37 (4%)	48 (6%)	46 (5%)
	35-44	64 (8%)	71 (9%)	84 (10%)	85 (10%)	78 (9%)
	45-54	140 (17%)	129 (16%)	141 (17%)	141 (16%)	150 (17%)
	55-64	227 (28%)	219 (27%)	204 (25%)	206 (24%)	205 (24%)
	65-74	222 (27%)	212 (27%)	220 (27%)	234 (27%)	230 (26%)
	75-84	93 (11%)	103 (13%)	106 (13%)	110 (13%)	125 (14%)
	85+	12 (1%)	8 (1%)	8 (1%)	6 (1%)	5 (1%)
	Total	**822**	**797**	**829**	**862**	**868**

Table 5.5 presents the number and proportion of incident peritoneal dialysis patients by primary renal disease.

Table 5.5.1 Incident PD Patients by Primary Disease - Australia

Primary Renal Disease	2014	2015	2016	2017	2018
Diabetic Nephropathy	380 (33%)	359 (32%)	366 (32%)	398 (34%)	362 (33%)
Glomerulonephritis	292 (25%)	261 (23%)	281 (25%)	254 (22%)	282 (25%)
Hypertension	169 (15%)	162 (15%)	159 (14%)	144 (12%)	144 (13%)
Polycystic Disease	69 (6%)	68 (6%)	63 (6%)	80 (7%)	74 (7%)
Reflux Nephropathy	35 (3%)	25 (2%)	36 (3%)	47 (4%)	24 (2%)
Other	146 (13%)	153 (14%)	143 (13%)	133 (11%)	161 (14%)
Uncertain	54 (5%)	57 (5%)	58 (5%)	80 (7%)	53 (5%)
Not reported	18 (2%)	27 (2%)	26 (2%)	21 (2%)	13 (1%)
Total	**1163**	**1112**	**1132**	**1157**	**1113**

Table 5.5.2 Incident PD Patients by Primary Disease - New Zealand

Primary Renal Disease	2014	2015	2016	2017	2018
Diabetic Nephropathy	134 (44%)	154 (47%)	144 (42%)	165 (48%)	160 (46%)
Glomerulonephritis	70 (23%)	74 (23%)	83 (24%)	74 (22%)	79 (23%)
Hypertension	30 (10%)	29 (9%)	38 (11%)	33 (10%)	35 (10%)
Polycystic Disease	14 (5%)	12 (4%)	15 (4%)	13 (4%)	12 (3%)
Reflux Nephropathy	12 (4%)	10 (3%)	10 (3%)	4 (1%)	7 (2%)
Other	37 (12%)	34 (10%)	38 (11%)	36 (11%)	34 (10%)
Uncertain	8 (3%)	12 (4%)	10 (3%)	13 (4%)	16 (5%)
Not reported	0 (0%)	1 (0%)	1 (0%)	3 (1%)	2 (1%)
Total	**305**	**326**	**339**	**341**	**345**

Figure 5.5 shows the proportion of dialysis patients using PD as their modality by age. In both Australia and New Zealand PD is the predominant modality for paediatric patients, but HD is the predominant modality for adult patients.

Figure 5.5.1 - PD Patients (%) of all Prevalent Dialysis - Australia 2018

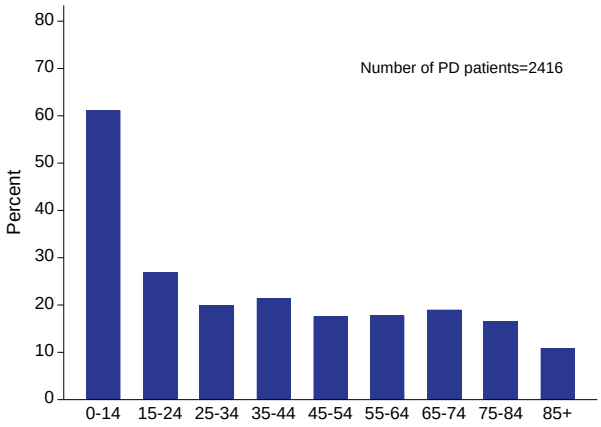


Figure 5.5.2 - PD Patients (%) of all Prevalent Dialysis - New Zealand 2018

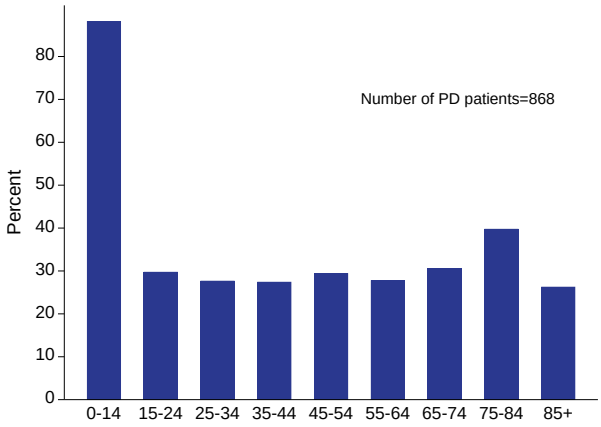


Table 5.6.1 and 5.6.2 shows the number of prevalent PD patients, and number per million population, according to PD type.

Population estimates for Australia and New Zealand used for the calculation of prevalence per million population were sourced from the Australian Bureau of Statistics (2018)[1] and Stats NZ (2018)[2].

Table 5.6.1 Number (per Million) of Prevalent PD Patients, Australia 2014-2018

	2014	2015	2016	2017	2018
Total	**2499 (106)**	**2512 (105)**	**2449 (101)**	**2422 (98)**	**2416 (97)**
APD	1625 (69)	1687 (71)	1667 (69)	1633 (66)	1661 (66)
CAPD	874 (37)	825 (35)	782 (32)	789 (32)	755 (30)

Table 5.6.2 Number (per Million) of Prevalent PD Patients, New Zealand 2014-2018

	2014	2015	2016	2017	2018
Total	**822 (182)**	**797 (173)**	**829 (177)**	**862 (180)**	**868 (178)**
APD	394 (87)	418 (91)	432 (92)	454 (95)	476 (97)
CAPD	428 (95)	379 (82)	397 (85)	408 (85)	392 (80)

Peritoneal Dialysis Fluids

Table 5.7 shows the use of icodextrin by country and PD type at the end of 2018. Figure 5.6 shows the trends in icodextrin use over the last three years. Finally, figure 5.7 shows icodextrin use by state and PD type at the end of 2018.

Table 5.7 Icodextrin Usage by Modality Type - December 2018

PD Type		Australia				New Zealand			
		No	Yes	Not Reported	Total	No	Yes	Not Reported	Total
CAPD	n	414	316	25	755	134	245	13	392
	%	**55%**	**42%**	**3%**		**34%**	**63%**	**3%**	
APD	n	804	839	18	1661	146	325	5	476
	%	**48%**	**51%**	**1%**		**31%**	**68%**	**1%**	
Total	n	1218	1155	43	2416	280	570	18	868
	%	**50%**	**48%**	**2%**		**32%**	**66%**	**2%**	

Figure 5.6.1 - Icodextrin Use by Modality - Prevalent Patients December 2016 - 2018 Australia

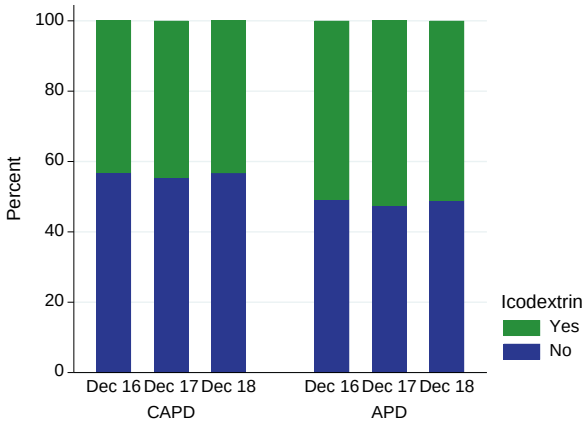


Figure 5.6.2 - Icodextrin Use by Modality - Prevalent Patients December 2016 - 2018 New Zealand

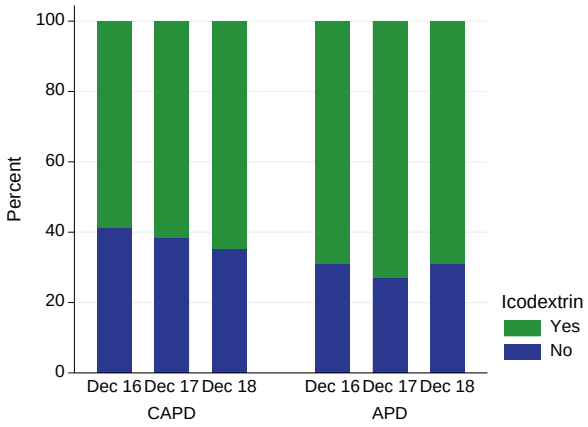


Figure 5.7 - Icodextrin Use by State and Country - Prevalent Patients December 2018

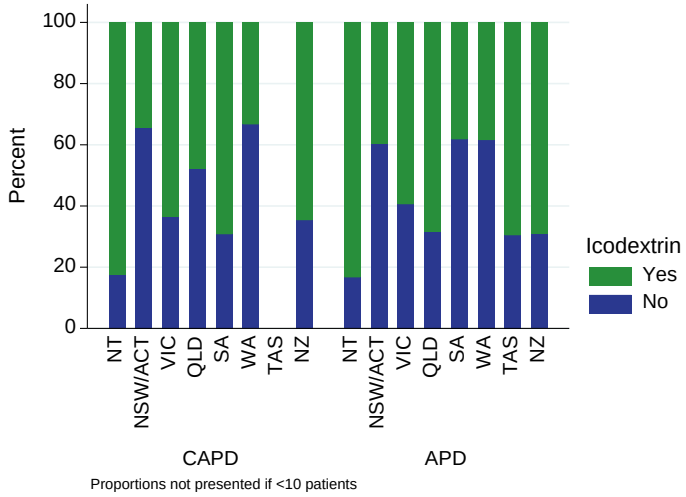


Table 5.8 and figures 5.8 and 5.9 present similar data for low GDP PD solutions. The use of these PD solutions is more common in Australia than in New Zealand and varies considerably by Australian state.

Table 5.8 Low GDP Usage by Modality Type - December 2018

PD Type		Australia				New Zealand			
		No	Yes	Not Reported	Total	No	Yes	Not Reported	Total
CAPD	n	470	260	25	755	350	28	14	392
	%	**62%**	**34%**	**3%**		**89%**	**7%**	**4%**	
APD	n	1312	331	18	1661	440	30	6	476
	%	**79%**	**20%**	**1%**		**92%**	**6%**	**1%**	
Total	n	1782	591	43	2416	790	58	20	868
	%	**74%**	**24%**	**2%**		**91%**	**7%**	**2%**	

Figure 5.8.1 - Low GDP Use by Modality - Prevalent Patients December 2016 - 2018 Australia

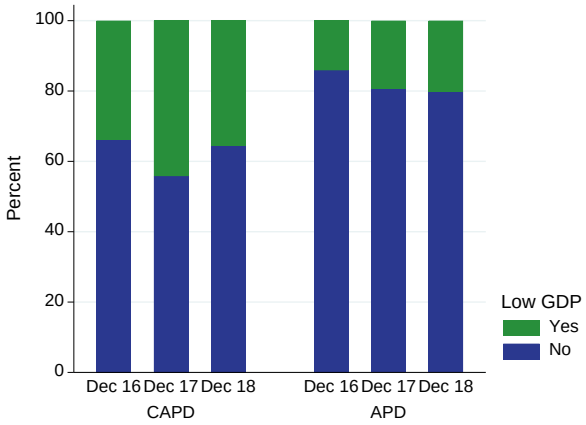


Figure 5.8.2 - Low GDP Use by Modality - Prevalent Patients December 2016 - 2018 New Zealand

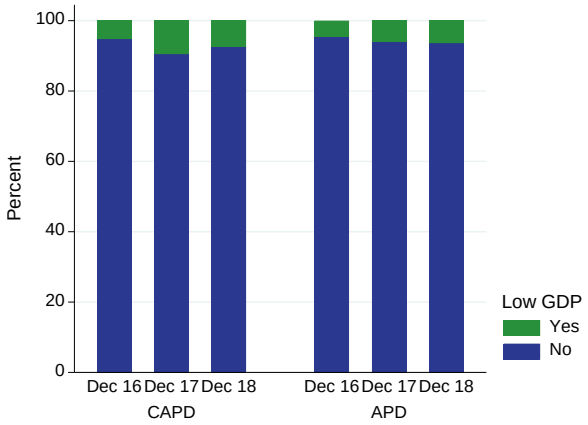
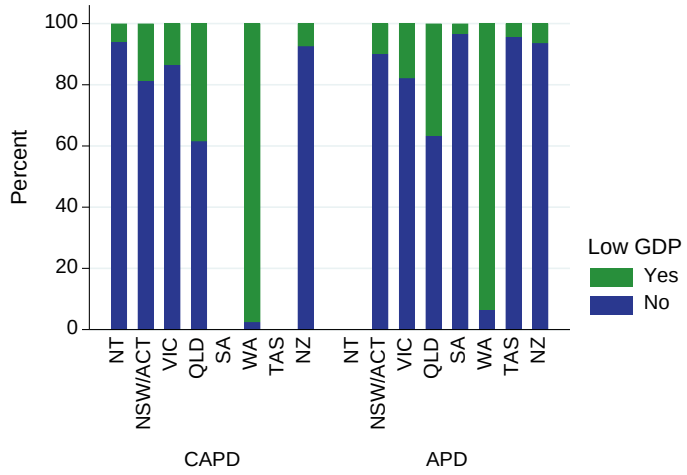


Figure 5.9 - Low GDP Use by State and Country - Prevalent Patients December 2018



Proportions not presented if <10 patients

Patient Survival

The next section examines PD patient survival. Survival time is presented for those commencing PD for the first time within 365 days of RRT start, from the date of PD start, and censored at transplantation. Patients commencing PD after a transplant are excluded.

Table 5.9 and figure 5.10 show patient survival by era.

Table 5.9 Patient Survival by Era - Peritoneal Dialysis within 365 days of 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**	2613	96[95,96]	91[90,92]	69[67,71]	50[48,53]
Australia	**2010 - 2012**	2459	97[96,97]	93[92,94]	72[70,74]	51[48,53]
Australia	**2013 - 2015**	2969	97[96,98]	93[92,94]	73[71,75]	54[51,56]
Australia	**2016 - 2018**	3061	97[96,97]	93[92,94]	-	-
New Zealand	**2007 - 2009**	756	95[94,97]	89[87,91]	66[63,70]	44[40,48]
New Zealand	**2010 - 2012**	752	97[96,98]	93[90,94]	65[61,69]	40[36,44]
New Zealand	**2013 - 2015**	815	97[95,98]	92[90,94]	68[65,71]	48[43,52]
New Zealand	**2016 - 2018**	916	96[94,97]	91[89,93]	-	-

Figure 5.10.1 - Patient Survival by Era Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - Australia

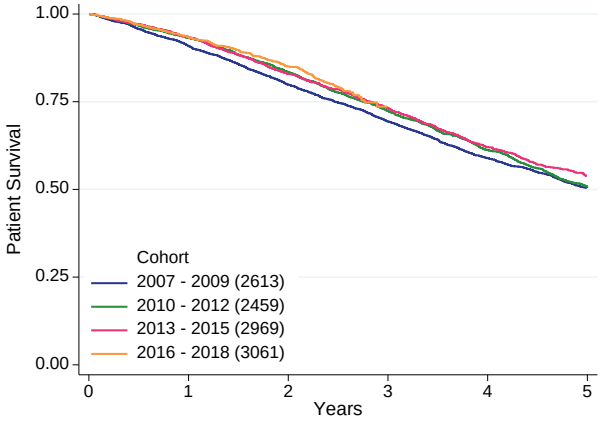


Figure 5.10.2 - Patient Survival by Era Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - New Zealand

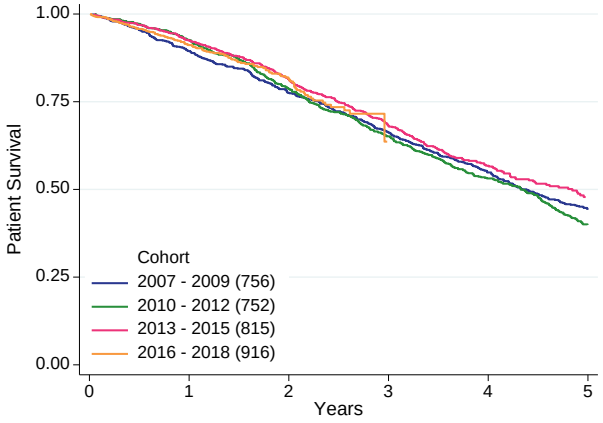


Table 5.10 and figure 5.11 demonstrate the strong association between patient age and survival.

Table 5.10 Patient Survival by Age Group - Peritoneal Dialysis within 365 days of RRT start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**<40**	1665	99[98,99]	98[97,98]	92[89,93]	84[81,87]
Australia	**40-59**	3528	98[98,98]	95[94,96]	80[79,82]	63[61,66]
Australia	**60-74**	4095	96[95,97]	92[91,92]	69[68,71]	49[47,51]
Australia	**≥75**	1814	94[92,95]	87[85,88]	55[52,57]	29[26,31]
New Zealand	**<40**	445	99[98,100]	98[96,99]	88[84,92]	74[67,81]
New Zealand	**40-59**	1196	97[96,98]	95[93,96]	74[71,77]	53[49,57]
New Zealand	**60-74**	1289	96[94,97]	88[86,90]	60[57,63]	35[32,39]
New Zealand	**≥75**	309	92[88,95]	84[79,88]	46[40,52]	18[13,24]

Figure 5.11.1 - Patient Survival by Age Group Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - Australia

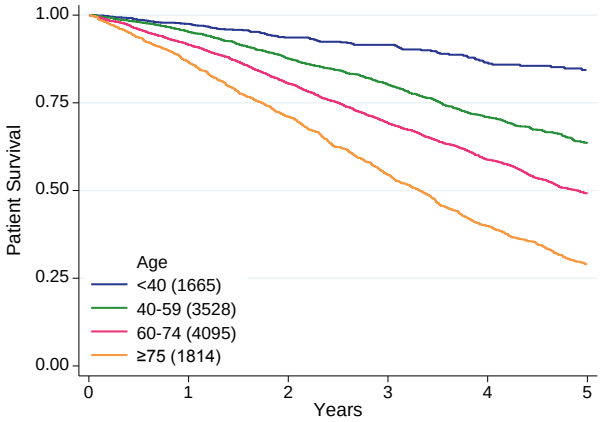


Figure 5.11.2 - Patient Survival by Age Group Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - New Zealand

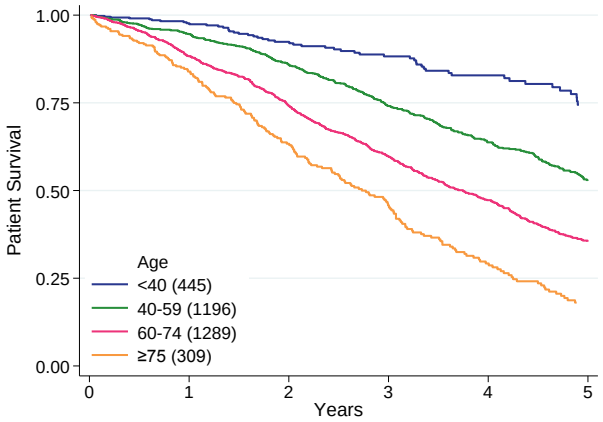


Table 5.11 and figure 5.12 present these data by diabetic status.

Table 5.11 Patient Survival by Diabetic Status - Peritoneal Dialysis within 365 days of RRT start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**Non-diabetic**	6161	97[97,98]	95[94,95]	78[77,80]	61[59,62]
	Diabetic	4906	96[95,96]	90[89,91]	65[64,67]	43[41,45]
New Zealand	**Non-diabetic**	1526	96[95,97]	92[91,93]	74[71,76]	54[50,57]
	Diabetic	1712	96[95,97]	91[89,92]	61[58,64]	36[33,39]

Figure 5.12.1 - Patient Survival by Diabetic Status Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - Australia

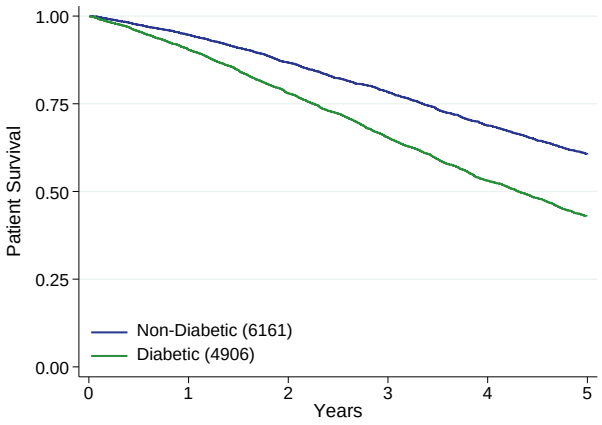
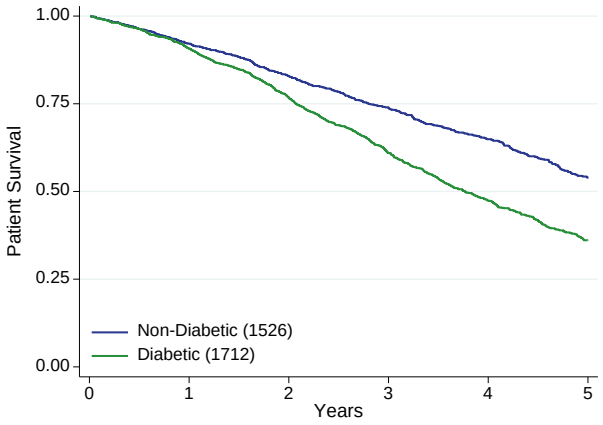


Figure 5.12.2 - Patient Survival by Diabetic Status Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - New Zealand



Technique Survival

This section examines PD technique survival, defined as the number of days the patient spent on PD before transferring to HD for at least 30 days or dying (either on PD or within 30 days of transfer to HD). Survival time is calculated from the date of PD start and censored at transplantation. Only patients initiating PD for the first time within 365 days of RRT commencement are included. Patients commencing PD after a transplant are excluded. Survival is shown for the same categories reported for patient survival above. As with patient survival, technique survival is adversely affected by older age and diabetic status.

Table 5.12 and figure 5.13 show technique survival by era; there is no clear improvement over time.

Table 5.12 Technique Survival by Era - Peritoneal Dialysis within 365 days of RRT start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**2007 - 2009**	2613	83[82,84]	71[69,72]	35[33,37]	16[15,18]
	2010 - 2012	2459	84[83,86]	73[71,75]	38[35,40]	16[14,18]
	2013 - 2015	2969	88[87,89]	78[76,79]	39[37,41]	17[15,19]
	2016 - 2018	3061	86[85,88]	75[74,77]	-	-
New Zealand	**2007 - 2009**	756	88[86,90]	78[75,81]	41[38,45]	19[16,22]
	2010 - 2012	752	89[86,91]	80[77,83]	41[37,45]	16[13,19]
	2013 - 2015	815	87[85,89]	77[74,79]	40[37,44]	22[18,26]
	2016 - 2018	916	88[85,90]	79[76,82]	-	-

Figure 5.13.1 - Technique Survival by Era Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - Australia

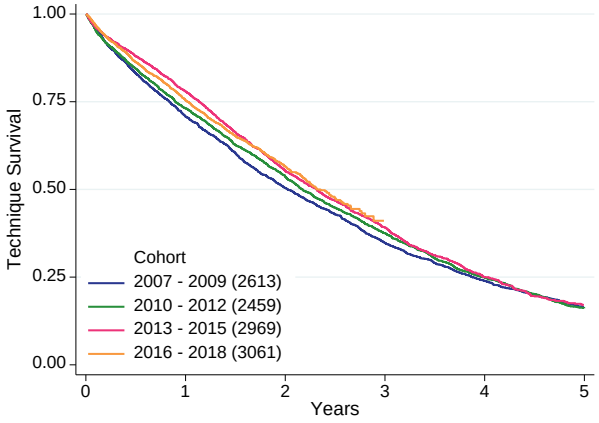


Figure 5.13.2 - Technique Survival by Era Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - New Zealand

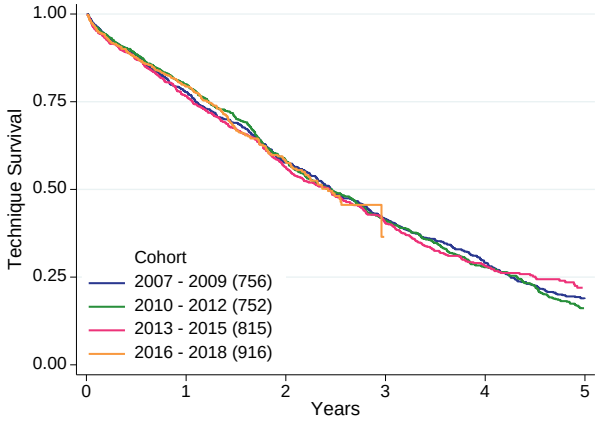


Table 5.13 and figure 5.14 show the association between patient age and technique survival. In general younger patients have higher technique survival.

Table 5.13 Technique Survival by Age Group - Peritoneal Dialysis within 365 days of RRT start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**<40**	1665	89[87,91]	76[74,78]	45[42,49]	27[22,31]
	40-59	3528	87[85,88]	77[75,78]	40[38,42]	18[16,20]
	60-74	4095	85[84,86]	74[73,76]	38[36,40]	18[16,19]
	≥75	1814	82[80,84]	69[67,71]	29[27,32]	10[8,11]
New Zealand	**<40**	445	89[85,91]	79[74,82]	44[37,50]	28[21,36]
	40-59	1196	89[87,91]	81[79,84]	44[41,47]	20[17,23]
	60-74	1289	87[85,89]	77[74,79]	40[37,43]	18[15,20]
	≥75	309	84[79,88]	74[68,79]	32[26,38]	9[5,14]

Figure 5.14.1 - Technique Survival by Age Group Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - Australia

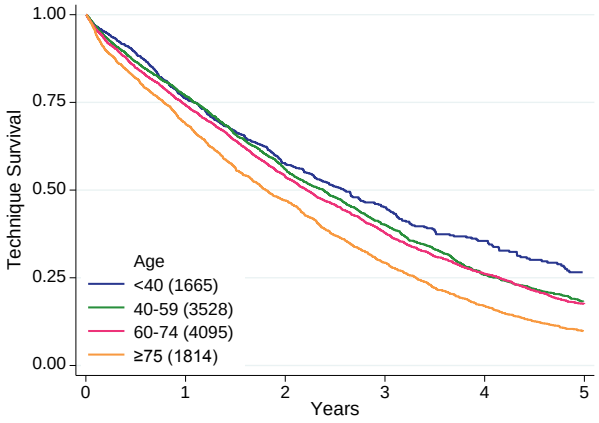


Figure 5.14.2 - Technique Survival by Age Group Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - New Zealand

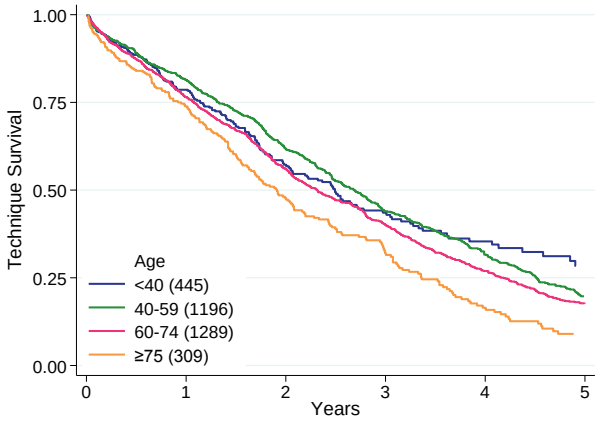


Table 5.14 and figure 5.15 present these data by diabetic status; technique survival is worse in diabetic patients.

Table 5.14 Technique Survival by Diabetic Status - Peritoneal Dialysis within 365 days of RRT start - Censored for Transplant 2007-2018; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**Non-diabetic**	6161	87[86,87]	76[75,77]	43[41,44]	22[20,24]
	Diabetic	4906	84[83,85]	72[71,73]	32[31,34]	12[10,13]
New Zealand	**Non-diabetic**	1526	88[87,90]	79[77,81]	48[45,51]	26[23,29]
	Diabetic	1712	87[86,89]	78[75,80]	35[33,38]	13[11,15]

Figure 5.15.1 - Technique Survival by Diabetic Status Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - Australia

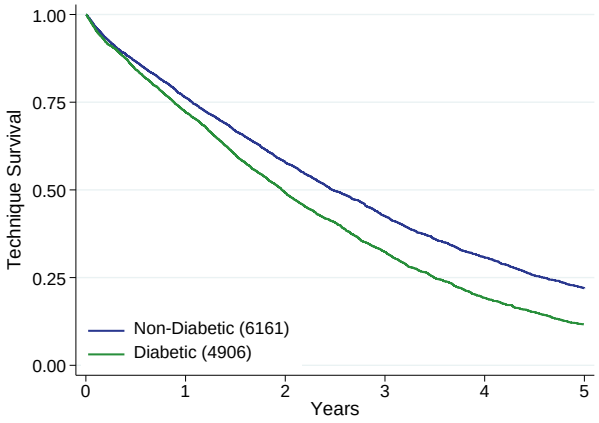


Figure 5.15.2 - Technique Survival by Diabetic Status Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Transplant - New Zealand

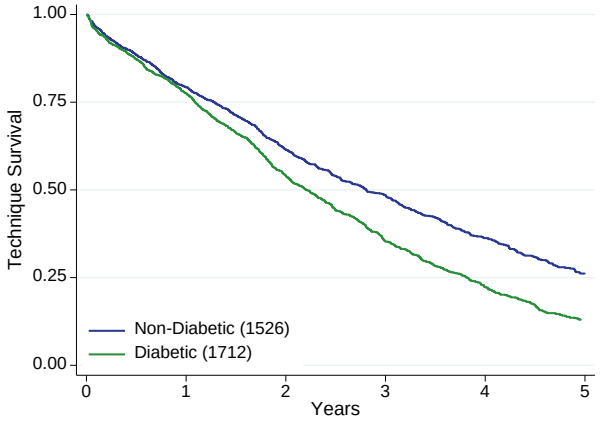


Table 5.15 and figure 5.16 show death-censored technique survival by era; there is no clear improvement over time.

Table 5.15 Technique Survival by Era - Peritoneal Dialysis within 365 days of RRT start - Censored for Death and Transplant 2007-2018; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**2007 - 2009**	2613	87[85,88]	78[76,79]	51[49,53]	36[33,38]
	2010 - 2012	2459	87[86,89]	78[76,80]	52[49,54]	33[31,36]
	2013 - 2015	2969	90[89,91]	83[82,84]	53[51,56]	34[31,37]
	2016 - 2018	3061	89[88,90]	80[79,82]	-	-
New Zealand	**2007 - 2009**	756	92[90,94]	86[83,88]	63[58,67]	43[38,48]
	2010 - 2012	752	91[89,93]	86[84,89]	64[60,68]	44[38,49]
	2013 - 2015	815	90[88,92]	83[80,85]	60[56,64]	47[42,52]
	2016 - 2018	916	91[89,93]	86[83,88]	-	-

Figure 5.16.1 - Technique Survival by Era Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Death and Transplant - Australia

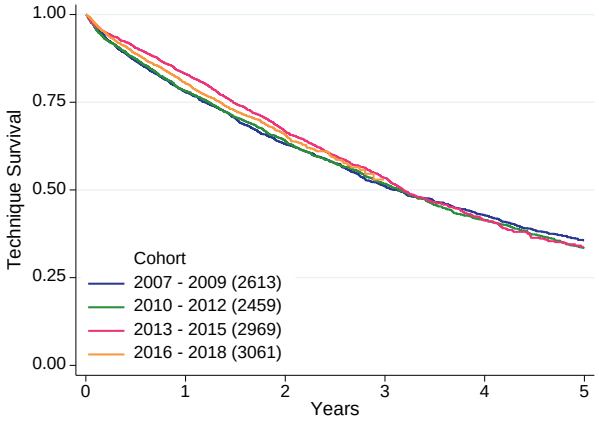


Figure 5.16.2 - Technique Survival by Era Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Death and Transplant - New Zealand

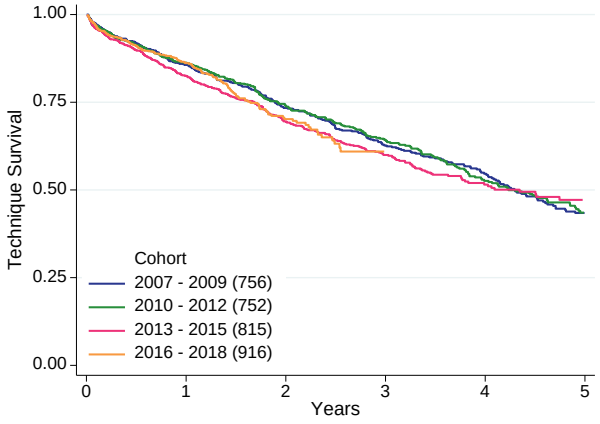


Table 5.16 and figure 5.17 show the association between patient age and death-censored technique survival. In contrast to overall technique survival, older patients receiving PD have higher death-censored technique survival.

Table 5.16 Technique Survival by Age Group - Peritoneal Dialysis within 365 days of RRT start - Censored for Death and Transplant 2007-2018; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	<40	1665	90[89,92]	78[76,80]	48[45,52]	30[25,35]
	40-59	3528	88[87,89]	80[79,82]	49[47,51]	28[26,31]
	60-74	4095	88[87,89]	81[79,82]	54[52,56]	38[35,40]
	≥75	1814	88[86,89]	80[78,82]	57[54,60]	41[37,45]
New Zealand\	<40	445	89[86,92]	80[76,84]	50[43,56]	36[28,44]
	40-59	1196	91[89,93]	85[83,87]	60[56,63]	37[33,42]
	60-74	1289	91[89,93]	86[84,88]	66[62,69]	50[46,55]
	≥75	309	91[88,94]	88[84,91]	71[64,77]	61[51,70]

Figure 5.17.1 - Technique Survival by Age Group Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Death and Transplant - Australia

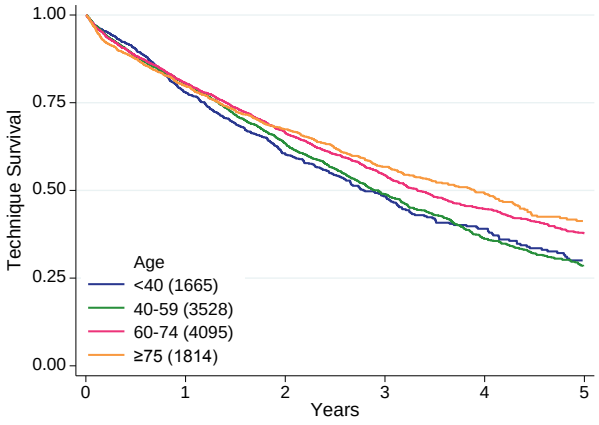


Figure 5.17.2 - Technique Survival by Age Group Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Death and Transplant - New Zealand

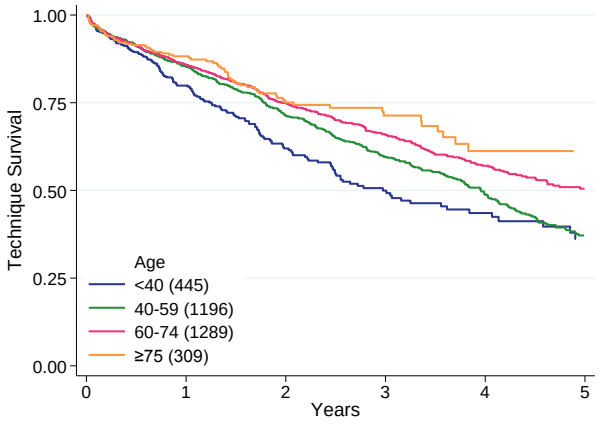


Table 5.17 and figure 5.18 present these data by diabetic status; death-censored technique survival is slightly worse in diabetic patients after the first year.

Table 5.17 Technique Survival by Diabetic Status - Peritoneal Dialysis within 365 days of RRT start - Censored for Death and Transplant 2007-2018; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia\	Non-diabetic	6161	89[88,90]	80[79,81]	55[53,56]	37[35,40]
	Diabetic	4906	88[87,89]	79[78,81]	49[47,51]	31[29,33]
New Zealand\	Non-diabetic	1526	92[90,93]	85[83,87]	65[62,68]	48[44,52]
	Diabetic	1712	90[89,92]	85[83,87]	59[56,62]	40[35,44]

Figure 5.18.1 - Technique Survival by Diabetic Status Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Death and Transplant - Australia

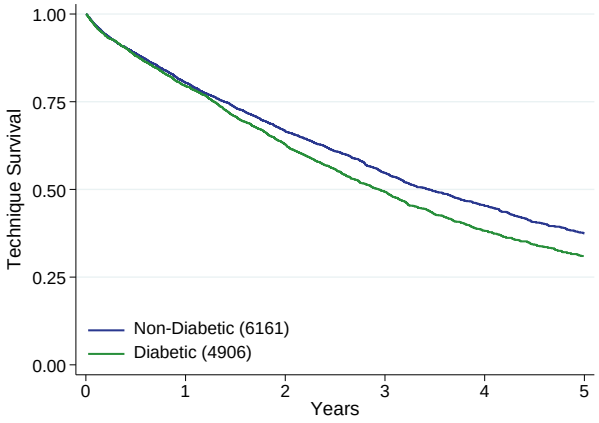
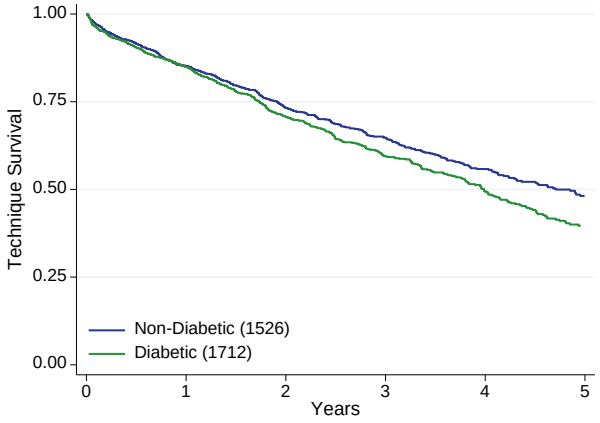


Figure 5.18.2 - Technique Survival by Diabetic Status Peritoneal Dialysis within 365 days of RRT start - 2007 - 2018 Censored for Death and Transplant - New Zealand



The causes of PD technique failure in 2018 are shown in table 5.18. After death, infection is the most common cause of technique failure in both countries.

Table 5.18 Reason for Technique Failure 2018

Category	Cause of Technique Failure	Australia	New Zealand
Infection	Recurrent/Persistent Peritonitis	58	17
	Acute Peritonitis	83	18
	Tunnel/Exit Site Infection	21	21
	Diverticulitis	3	0
	Abdominal Abscess	3	2
	Total	**168 (21%)**	**58 (20%)**
Inadequate dialysis	Inadequate Solute Clearance	109	17
	Inadequate Fluid Ultrafiltration	37	7
	Poor Nutrition	0	2
	Total	**146 (18%)**	**26 (9%)**
Mechanical	Dialysate Leak	20	4
	Catheter Block	18	5
	Hernia	17	5
	Abdominal Pain	4	1
	Abdominal Surgery	12	8
	Multiple Adhesions	3	1
	Pleural Effusion	9	5
	Other Surgery	5	0
	Hydrothorax	1	2
	Scrotal Oedema	3	4
	Total	**92 (12%)**	**35 (12%)**
Social	Patient Preference	31	2
	Unable to Manage Self-Care	35	13
	Total	**66 (8%)**	**15 (5%)**
Other	Cardiovascular	1	0
	Planned Transfer After Acute PD Start	0	1
	Other (Specify)	41	11
	Total	**42 (5%)**	**12 (4%)**
Death	**Total**	**250 (32%)**	**130 (45%)**
Not reported	**Total**	**27 (3%)**	**10 (3%)**

Figure 5.19 and table 5.19 show the cumulative incidence of patients returning to PD after a technique failure over 2014-2018. These data are censored at transplantation, and death is treated as a competing risk. Return to PD was common after a mechanical failure but rare after technique failure due to inadequate dialysis or social reasons.

Figure 5.19.1 - Time to Restarting PD after Technique Failure - Australia 2014-2018

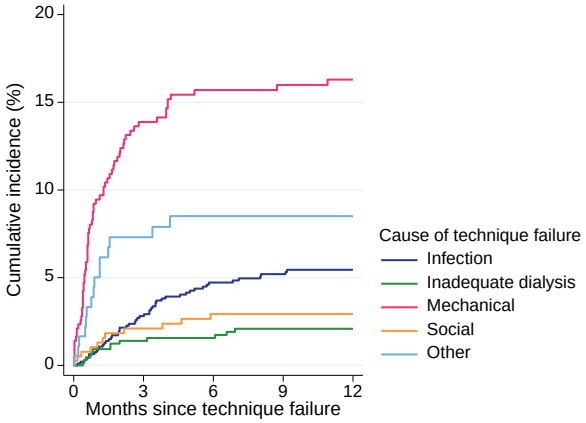


Figure 5.19.2 - Time to Restarting PD after Technique Failure - New Zealand 2014-2018

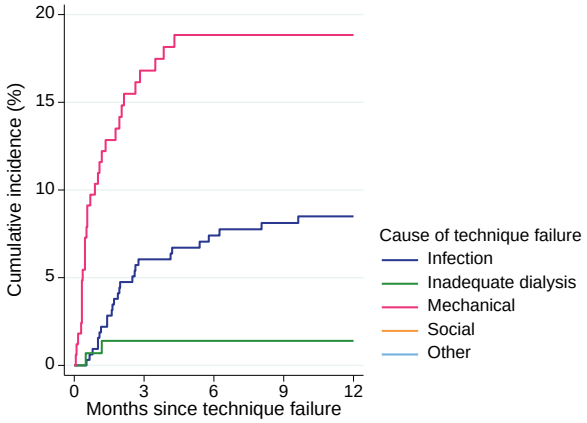


Table 5.19.1 Return to PD (Cumulative Incidence and 95% CI) by Cause of Technique Failure, Australia 2014-2018

Cause of technique failure	3 months	6 months	9 months	12 months
Infection	2.8 (1.9, 4.0)	4.7 (3.5, 6.2)	5.2 (3.9, 6.8)	5.4 (4.1, 7.1)
Inadequate dialysis	1.4 (0.7, 2.6)	1.6 (0.8, 2.8)	2.1 (1.2, 3.5)	2.1 (1.2, 3.5)
Mechanical	13.9 (10.8, 17.4)	15.7 (12.4, 19.4)	16.0 (12.6, 19.7)	16.3 (12.9, 20.0)
Social	2.1 (1.0, 3.9)	2.9 (1.6, 5.0)	2.9 (1.6, 5.0)	2.9 (1.6, 5.0)
Other	7.3 (4.1, 11.7)	8.5 (5.0, 13.2)	8.5 (5.0, 13.2)	8.5 (5.0, 13.2)

Table 5.19.2 Return to PD (Cumulative Incidence and 95% CI) by Cause of Technique Failure, New Zealand 2014-2018

Cause of technique failure	3 months	6 months	9 months	12 months
Infection	6.0 (3.8, 9.1)	7.4 (4.8, 10.7)	8.1 (5.4, 11.5)	8.5 (5.7, 12.0)
Inadequate dialysis	1.4 (0.3, 4.5)	1.4 (0.3, 4.5)	1.4 (0.3, 4.5)	1.4 (0.3, 4.5)
Mechanical	16.8 (11.5, 23.0)	18.8 (13.2, 25.3)	18.8 (13.2, 25.3)	18.8 (13.2, 25.3)
Social	-	-	-	-
Other	-	-	-	-

Peritonitis

Table 5.20 and figure 5.20 present the time to first peritonitis over 2014-2018 by age at PD start. Peritonitis is more common in children, but otherwise there is little association between age and time to first peritonitis.

Table 5.20 First PD Treatment to First Episode of Peritonitis By Age at Entry 01-Jan-2014 to 31-Dec-2018 % Survival [95% Confidence Interval]

Survival	Age Groups						
	00-14	15-34	35-54	55-64	65-74	≥75	All
Australia	**(n=108)**	**(n=455)**	**(n=1417)**	**(n=1162)**	**(n=1382)**	**(n=803)**	**(n=5327)**
3 months	87 [79,92]	93 [90,95]	92 [90,93]	93 [91,94]	93 [91,94]	93 [90,94]	**92 [92,93]**
6 months	79 [69,86]	87 [83,90]	86 [84,88]	87 [85,89]	88 [86,89]	88 [86,91]	**87 [86,88]**
9 months	68 [57,77]	82 [78,86]	80 [78,83]	81 [78,83]	82 [80,84]	82 [79,85]	**81 [80,82]**
1 year	68 [57,77]	77 [72,82]	76 [73,78]	76 [73,78]	78 [75,80]	78 [75,81]	**77 [75,78]**
2 years	50 [34,64]	60 [53,67]	59 [55,62]	59 [55,63]	60 [56,63]	63 [58,67]	**60 [58,61]**
3 years	19 [2,51]	48 [37,57]	44 [38,49]	49 [44,53]	46 [42,51]	45 [38,51]	**46 [43,48]**
New Zealand	**(n=30)**	**(n=139)**	**(n=437)**	**(n=372)**	**(n=394)**	**(n=161)**	**(n=1533)**
3 months	87 [68,95]	96 [90,98]	96 [94,98]	92 [88,94]	93 [89,95]	93 [87,96]	**94 [92,95]**
6 months	75 [55,87]	89 [82,94]	92 [88,94]	85 [80,88]	87 [82,90]	89 [82,93]	**88 [86,89]**
9 months	71 [50,84]	82 [74,89]	86 [82,90]	81 [76,85]	83 [78,87]	86 [79,91]	**84 [81,85]**
1 year	65 [43,81]	79 [69,86]	82 [77,85]	70 [64,75]	77 [72,81]	80 [72,86]	**77 [74,79]**
2 years	65 [43,81]	62 [48,74]	64 [57,70]	53 [46,60]	60 [53,66]	63 [52,72]	**60 [56,63]**
3 years	-	49 [31,64]	51 [43,60]	43 [34,51]	48 [39,57]	49 [36,61]	**48 [43,52]**

Figure 5.20.1 - First PD Treatment to First Peritonitis - By Age at First PD Australia 2014 - 2018

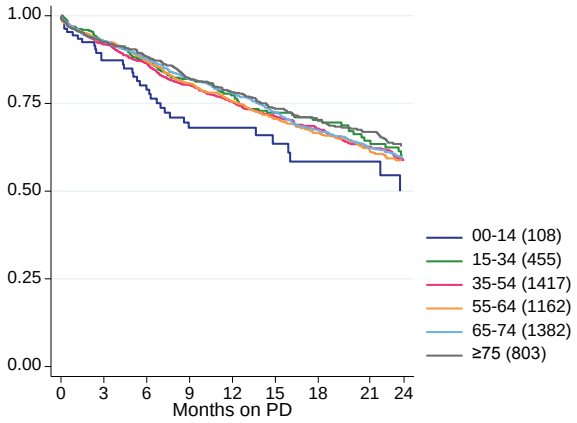
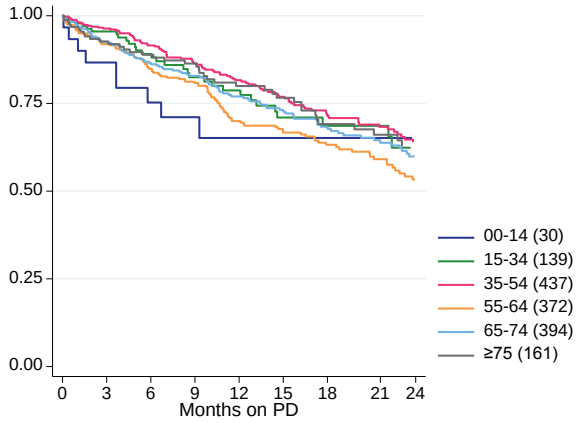


Figure 5.20.2 - First PD Treatment to First Peritonitis - By Age at First PD New Zealand 2014 - 2018



In Australia peritonitis is more common in Indigenous patients and less common in Asian patients. In New Zealand a similar but less pronounced pattern is seen (figure 5.21).

Figure 5.21.1 - First PD Treatment to First Peritonitis - By Ethnicity Australia 2014 - 2018

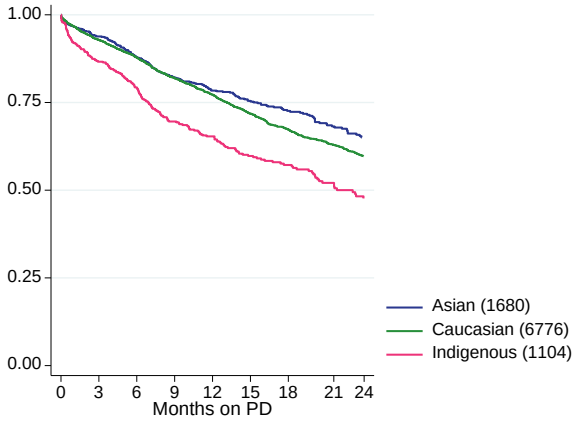
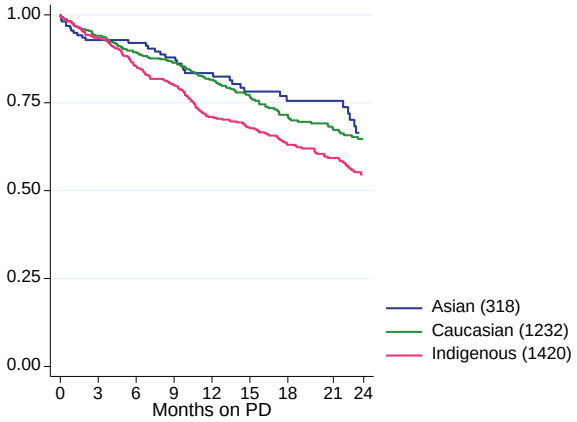


Figure 5.21.2 - First PD Treatment to First Peritonitis - By Ethnicity New Zealand 2014 - 2018



Diabetes is associated with a shorter time to first peritonitis in both countries, but this difference only appears several months into PD treatment (figure 5.22).

Figure 5.22.1 - First PD Treatment to First Peritonitis - By Diabetic Status at RRT entry Australia 2014 - 2018

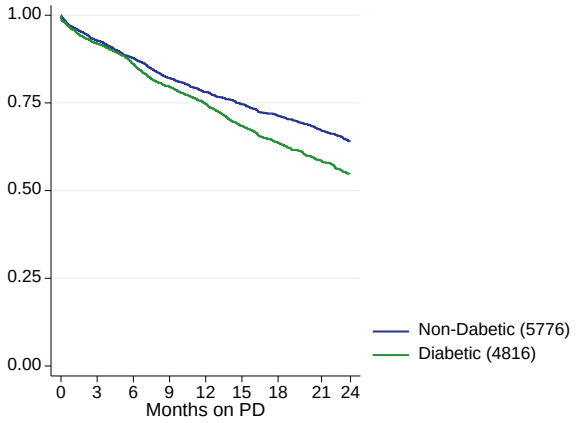
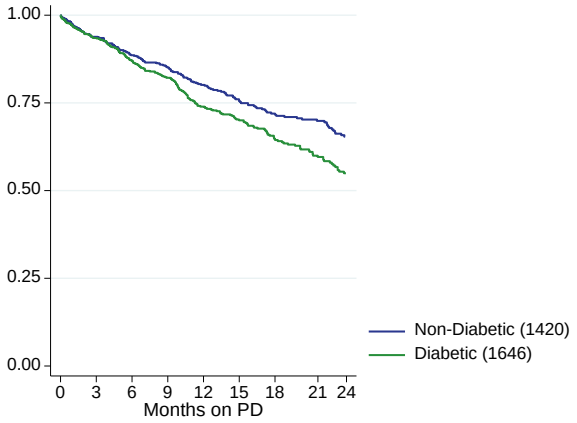


Figure 5.22.2 - First PD Treatment to First Peritonitis - By Diabetic Status at RRT entry New Zealand 2014 - 2018



Australian Peritonitis Registry

Since October 2003 ANZDATA has collected detailed information on PD peritonitis episodes in Australian patients. A selection of those data is reported here. New Zealand has a separate PD registry which is not currently linked with ANZDATA.

Table 5.21 and Figures 5.23-5.27 report the peritonitis rate, expressed as episodes per patient-year in the table and on the left y axis of the figures and patient-months per episode on the right y axis of the figures, according to different categories. The overall peritonitis rate in Australia has dropped considerably over the last few years (figure 5.23). However, there remains significant variation between states (figures 5.24 and 5.25) and individual treating hospitals (figures 5.26 and 5.27).

Table 5.21 PD Peritonitis Episodes Per Year By State, Australia 2014-2018

State	2014	2015	2016	2017	2018	2014-2018
QLD	0.44	0.48	0.39	0.43	0.40	**0.43**
NSW	0.34	0.31	0.31	0.32	0.32	**0.32**
ACT	0.41	0.58	0.42	0.38	0.41	**0.44**
VIC	0.24	0.30	0.31	0.24	0.26	**0.27**
TAS	0.29	0.33	0.29	0.12	0.20	**0.25**
SA	0.37	0.31	0.27	0.29	0.15	**0.27**
NT	0.79	0.71	0.58	0.59	0.60	**0.66**
WA	0.49	0.48	0.38	0.32	0.39	**0.41**
Australia	**0.36**	**0.37**	**0.33**	**0.32**	**0.32**	**0.34**

Figure 5.23 - PD Peritonitis Rate - Australia 2004-2018

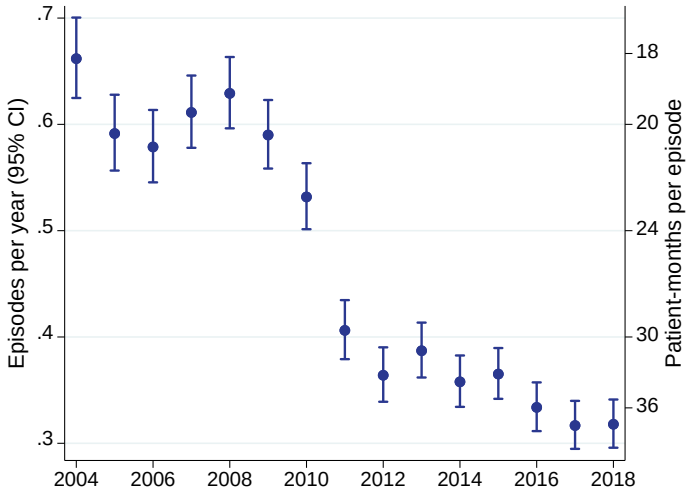


Figure 5.24 - PD Peritonitis Rate - By State, Australia 2014-2018

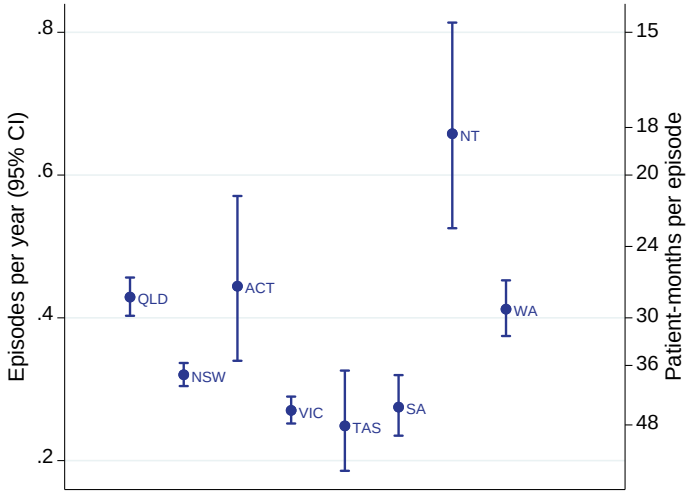


Figure 5.25 - PD Peritonitis Rate - By State, Australia 2009-2018

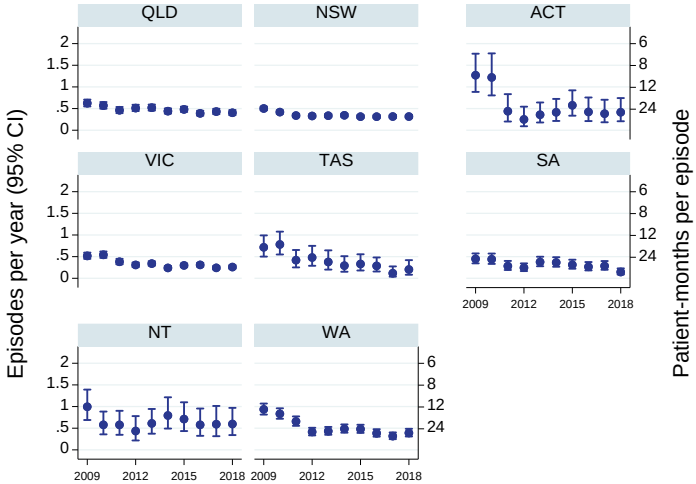


Figure 5.26 - PD Peritonitis Rate - By Treating Unit, Australia 2009-2018

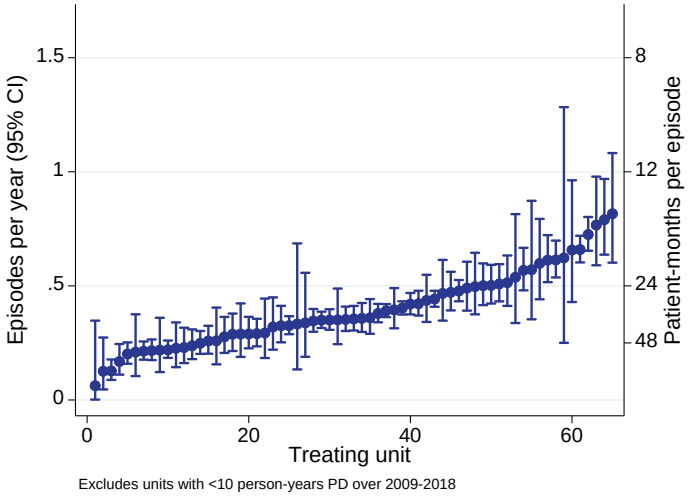
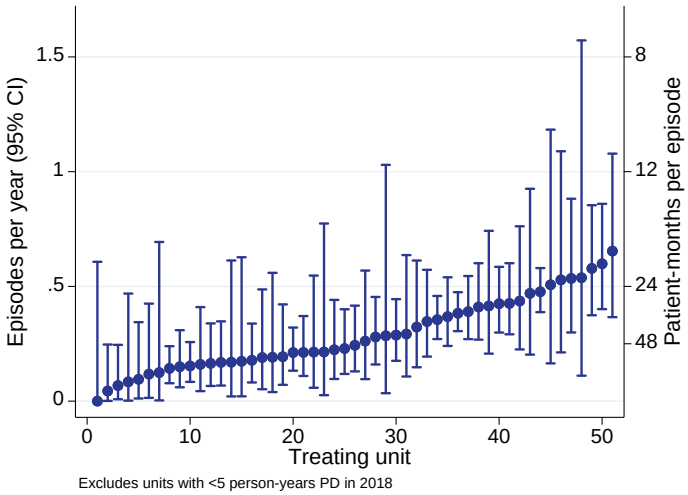


Figure 5.27 - PD Peritonitis Rate - By Treating Unit, Australia 2018



The organisms causing peritonitis are presented in figure 5.28. The distribution of organisms is quite stable, although there has been a gradual increase the proportion of culture negative infections. Figure 5.29 shows these data for 2018 stratified by state.

Figure 5.28 - Distribution of Organisms Causing Peritonitis - Australia 2013-2018

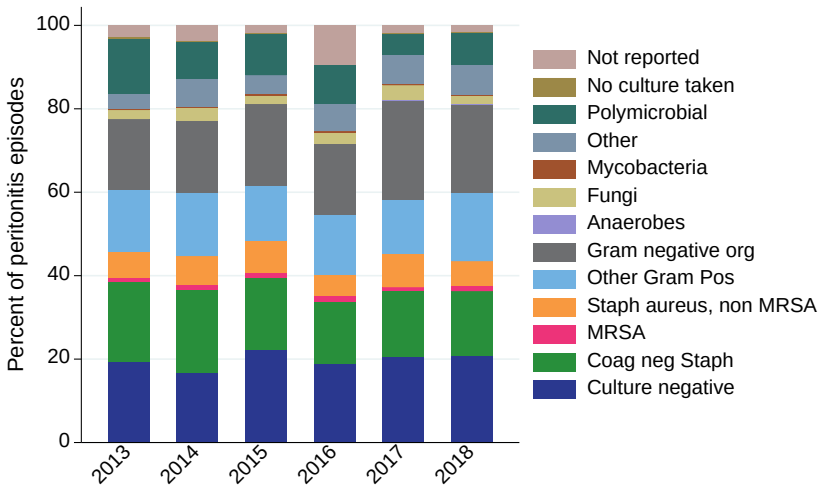
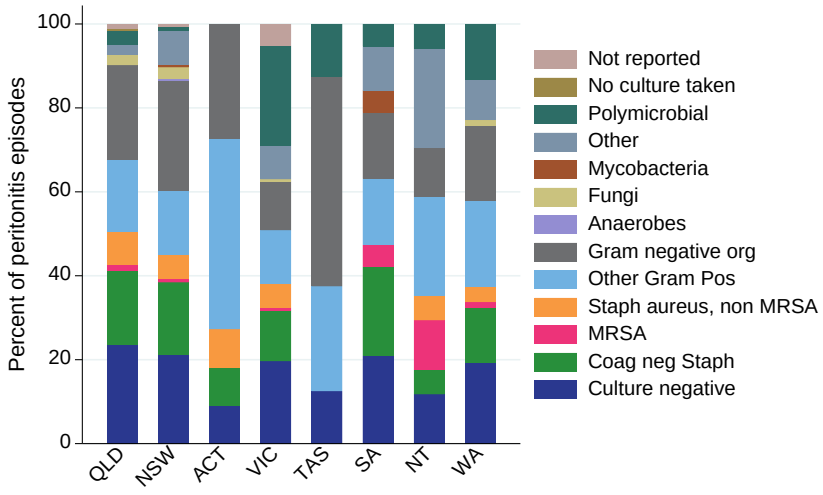


Figure 5.29 - Distribution of Organisms Causing Peritonitis - Australia 2018



Around 40% of episodes are initially treated with vancomycin, and the majority receive an aminoglycoside (figure 5.30). The use of these drugs in the final regimen are shown in figure 5.31.

Figure 5.30 - Initial Antibiotic Regimen - Australia 2013-2018

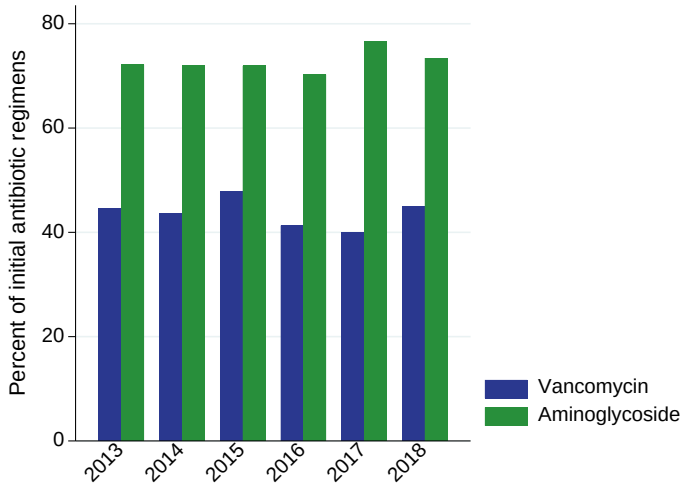
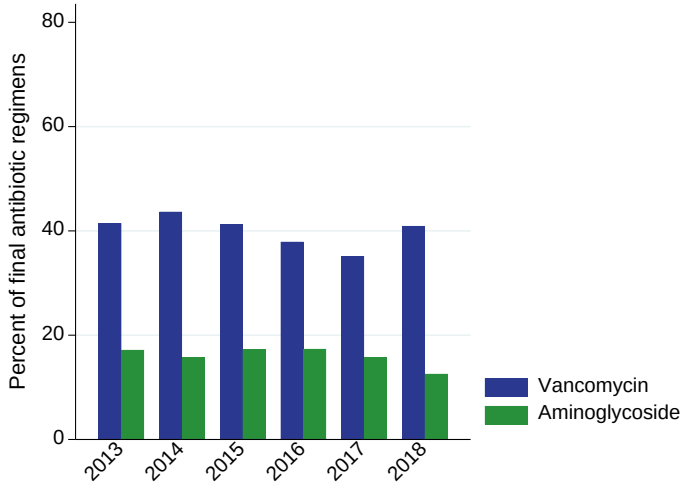
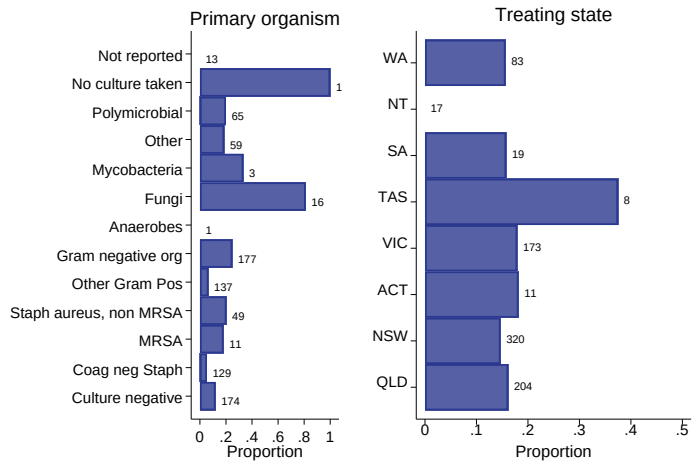


Figure 5.31 - Final Antibiotic Regimen - Australia 2013-2018



The proportion of peritonitis episodes resulting in a permanent transfer to haemodialysis varies by organism and, to a lesser extent, state (figure 5.32).

Figure 5.32 - Proportion of Episodes Resulting in Permanent HD Transfer - Australia 2018



Values are total number of peritonitis episodes reported in 2018

Laboratory Values

Anaemia

Figure 5.33 shows the distribution of Hb in PD patients over the last 3 years, and figure 5.34 presents the same data stratified by the presence or absence of coronary artery disease.

Figure 5.33 - Haemoglobin - Peritoneal Dialysis - December 2016-2018

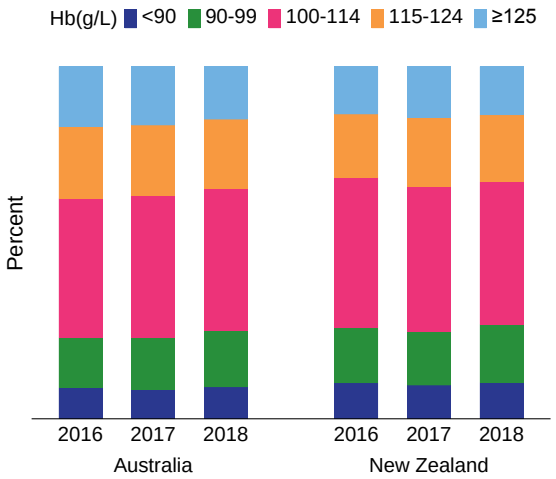


Figure 5.34.1 - Haemoglobin - Peritoneal Dialysis - By Coronary Artery Disease Status Australia, December 2016-2018

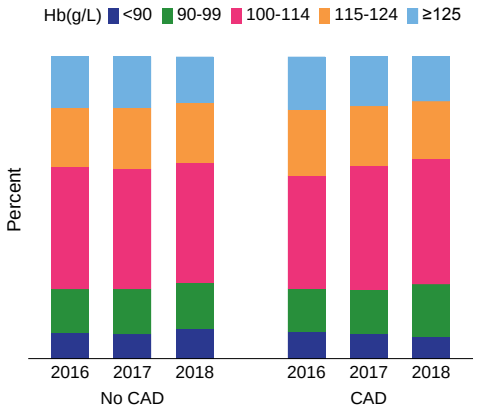


Figure 5.34.2 - Haemoglobin - Peritoneal Dialysis - By Coronary Artery Disease Status New Zealand, December 2016-2018

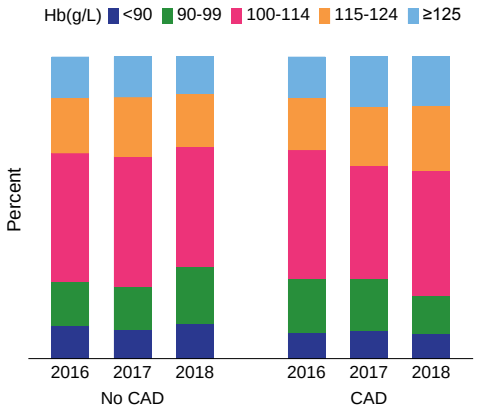


Figure 5.35 shows the variation in Hb between treating hospitals; median Hb ranged from 102 to 128g/L in Australia and 105-114g/L in New Zealand.

Figure 5.35.1 - Haemoglobin in Peritoneal Dialysis Patients - Australia 31 December 2018

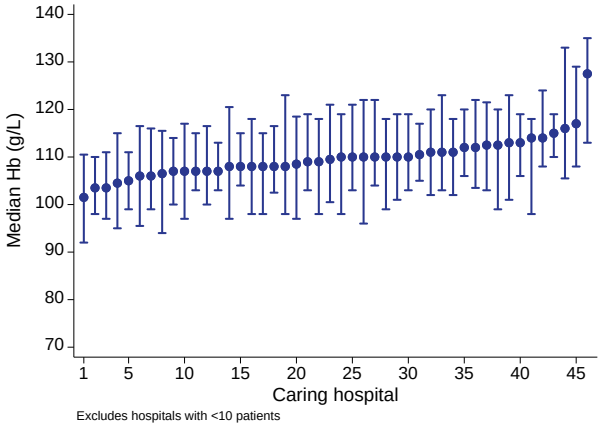


Figure 5.35.2 - Haemoglobin in Peritoneal Dialysis Patients - New Zealand 31 December 2018

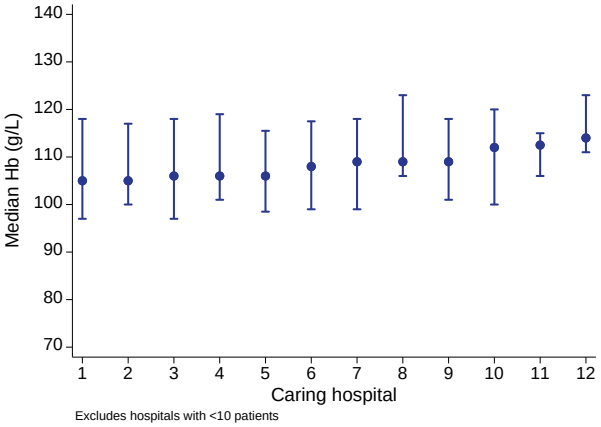


Figure 5.36 shows the proportion of patients with Hb between 110-129g/L; the proportion ranged from 20-69% in Australia and 31-76% in New Zealand.

Figure 5.36.1 - % Peritoneal Dialysis Patients with Hb 110-129 g/L - Australia 31 December 2018

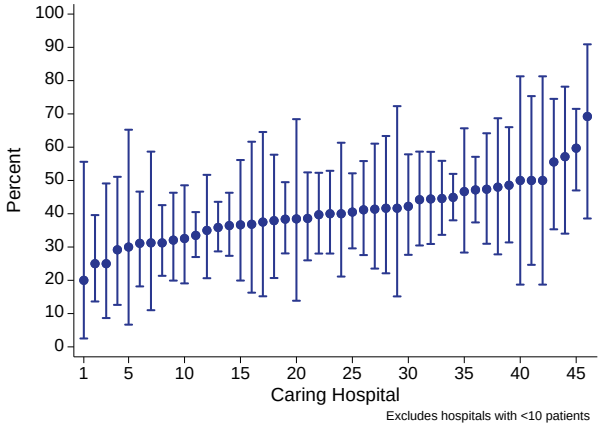
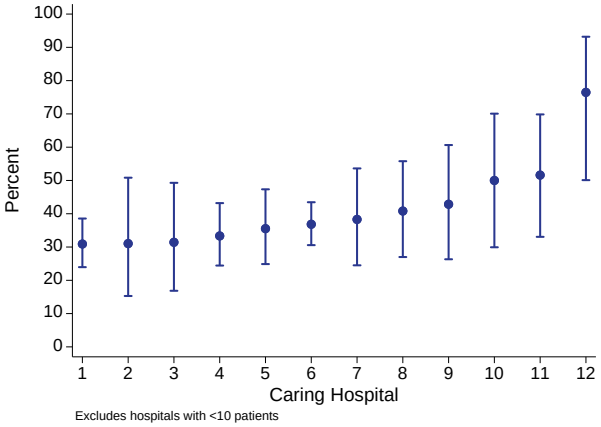


Figure 5.36.2 - % Peritoneal Dialysis Patients with Hb 110-129 g/L - New Zealand 31 December 2018



Biochemistry

Figures 5.37-5.40 present the distributions of calcium and phosphate. These numbers remain stable compared with previous years.

Figure 5.37 - Serum Calcium - Peritoneal Dialysis - December 2016-2018

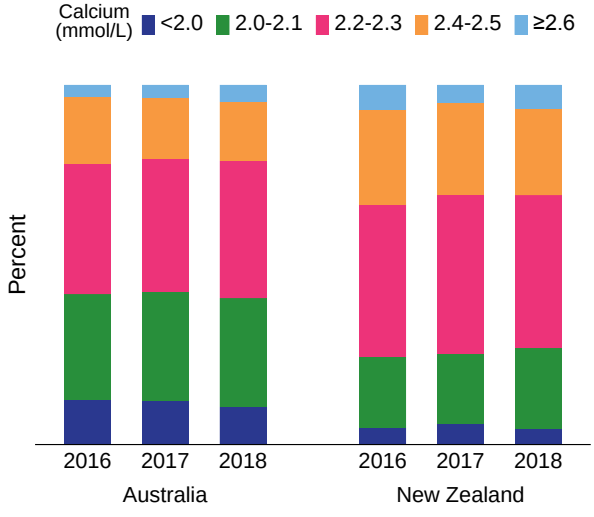


Figure 5.38.1 - % PD Patients with Calcium 2.1-2.4 mmol/L - Australia 31 December 2018

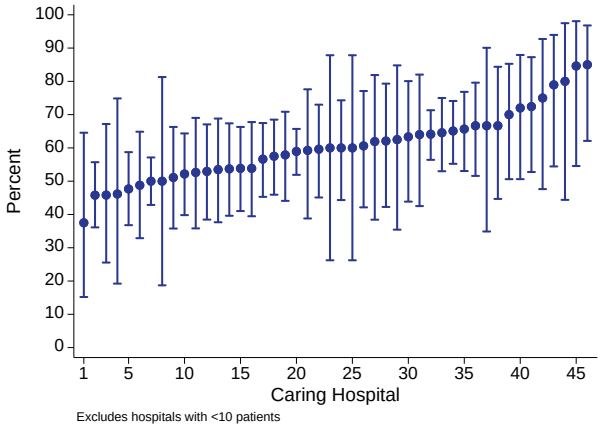


Figure 5.38.2 - % PD Patients with Calcium 2.1-2.4 mmol/L - New Zealand 31 December 2018

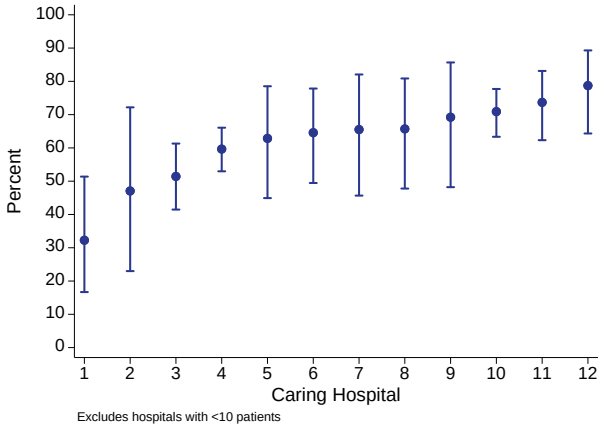


figure 5.39 - Serum Phosphate - Peritoneal Dialysis - December 2016-2018

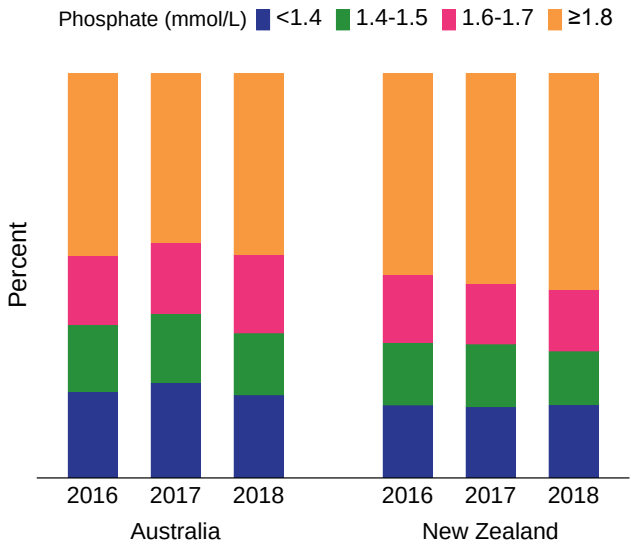


Figure 5.40.1 - % PD Patients with Phosphate 0.8-1.6 mmol/L - Australia 31 December 2018

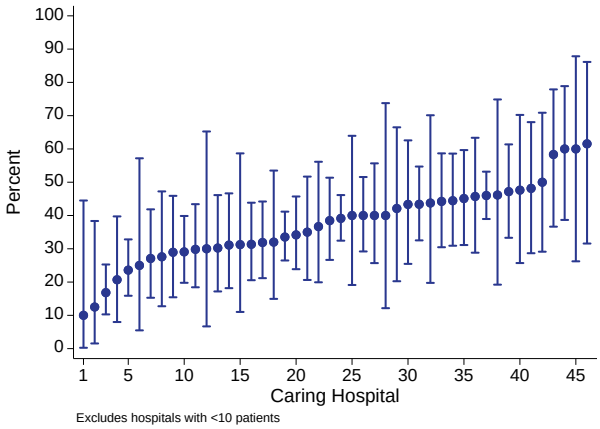
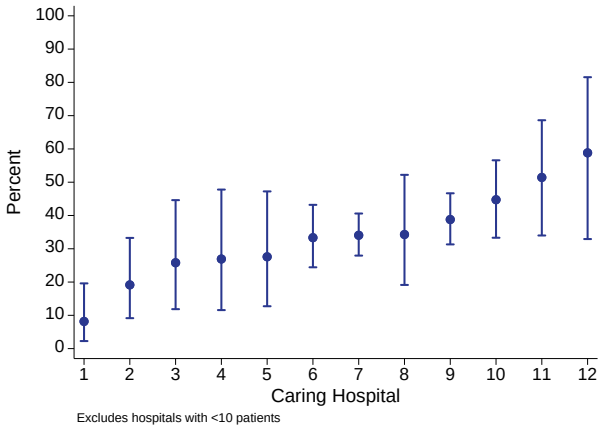


Figure 5.40.2 - % PD Patients with Phosphate 0.8-1.6 mmol/L - New Zealand 31 December 2018



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[1] Australian Bureau of Statistics, 2018, Australian Demographic Statistics, Jun 2018, time series spreadsheets, cat. no. 3101.0, viewed 27 Dec 2018, http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202018?OpenDocument

[2] This work is based on/includes Stats NZ's data which are licensed by Stats NZ for re-use under the Creative Commons Attribution 4.0 International licence. Stats NZ, 2018, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 27 Dec 2018, http://archive.stats.govt.nz/infoshare/