CHAPTER 5

Peritoneal Dialysis

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

Contents

Executive Summary

There were 2,440 people in Australia and 823 people in New Zealand receiving peritoneal dialysis at the time of the 31 December 2016 survey. The number of people commencing peritoneal dialysis during this survey period was 1,100 in Australia and 326 in New Zealand. The proportion of people receiving home dialysis on peritoneal dialysis was 69% in Australia and 64% in New Zealand and the total percentage of the dialysis population receiving peritoneal dialysis remained higher in New Zealand with 30% compared to Australia with 19%.

Overall peritoneal dialysis patient survival remained stable in Australia and improved slightly in New Zealand, with the proportion of people surviving at 3 years 78% in Australia and 80% in New Zealand. No improvement in patient technique survival was observed with 3-year rates remaining low at only 41% in Australia and 49% in New Zealand. The primary causes of technique failure were death at 36% in Australia and 41% in New Zealand and infective complications at 21% in Australia and 23% in New Zealand.

ANZDATA only reports on Australian peritoneal dialysis episodes of peritonitis, as New Zealand has a separate registry that is not linked to ANZDATA. In Australia, the overall peritonitis rate has dropped considerably, however there remain significant variations 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 45% of the peritoneal dialysis population) and increased slightly in New Zealand to 61%.

Peritoneal dialysis modalities varied between Australia and New Zealand with automated peritoneal dialysis utilisation rates at 67% in Australia and 52% in New Zealand. The remainder received continuous ambulatory peritoneal dialysis.

Suggested citation

ANZDATA Registry. 40th Report, Chapter 5: Peritoneal dialysis. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2018. 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 2012-2016. 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	2012	2013	2014	2015	2016
Queensland	19%	20%	22%	21%	18%
New South Wales	25%	24%	25%	25%	24%
Australian Capital Territory	10%	10%	12%	8%	10%
Victoria	17%	18%	20%	20%	19%
Tasmania	16%	19%	17%	20%	22%
South Australia	19%	17%	16%	15%	16%
Northern Territory	6%	6%	5%	4%	4%
Western Australia	19%	19%	18%	18%	16%
Australia	**20%**	**20%**	**20%**	**20%**	**19%**
New Zealand	**31%**	**32%**	**31%**	**29%**	**30%**

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

State	2012	2013	2014	2015	2016
Queensland	63%	62%	64%	64%	63%
New South Wales	66%	65%	67%	68%	69%
Australian Capital Territory	45%	48%	51%	42%	52%
Victoria	69%	72%	73%	74%	74%
Tasmania	68%	69%	61%	65%	70%
South Australia	87%	80%	79%	78%	81%
Northern Territory	47%	45%	38%	39%	38%
Western Australia	77%	77%	75%	71%	69%
Australia	**67%**	**67%**	**68%**	**68%**	**69%**
New Zealand	**62%**	**64%**	**63%**	**62%**	**64%**

Figure 5.1.1 - Time on peritoneal dialysis - Prevalent PD patients Australia 31 Dec 2016

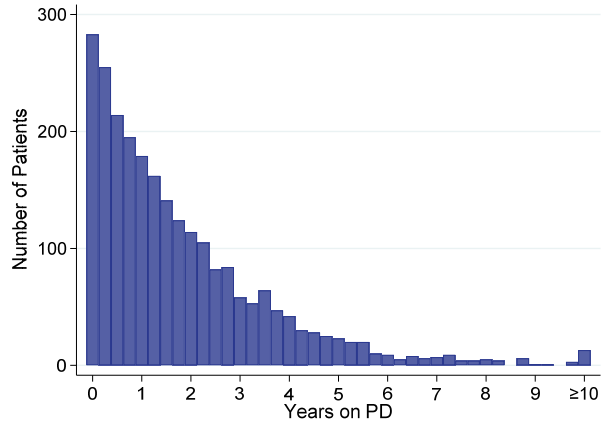


Figure 5.1.2 - Time on peritoneal dialysis - Prevalent PD patients New Zealand 31 Dec 2016

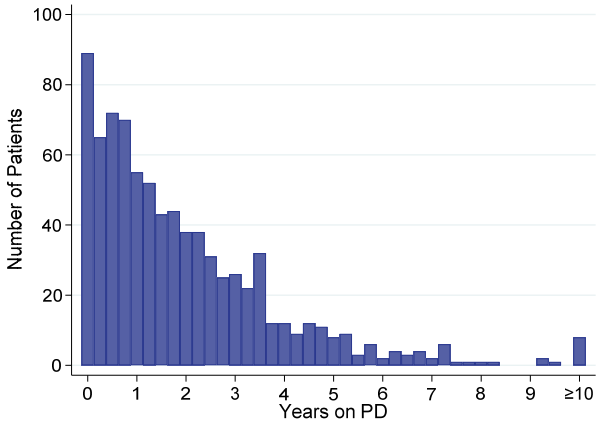


Table 5.3 shows the overall stock and flow of PD patients. The number of prevalent patients fell in 2016 in Australia but grew in New Zealand. Figure 5.2 presents some of these data graphically.

Table 5.3 Stock and Flow of Peritoneal Dialysis Patients 2012 - 2016

Country		2012	2013	2014	2015	2016
Australia	***All patients who commenced PD***					
	First dialysis treatment or returning after renal recovery	684	722	798	776	798
	Transfer from HD (no prior PD)	319	249	288	248	236
	Transfer from HD (prior PD)	35	51	44	48	33
	Failed Transplant (no prior PD)	14	18	17	25	16
	Failed Transplant (prior PD)	18	15	15	14	17
	Total	**1070**	**1055**	**1162**	**1111**	**1100**
	All patients who ceased PD					
	Received kidney transplant	207	241	231	271	320
	Transfer to HD	429	462	443	498	517
	Renal recovery	17	23	28	19	17
	Deaths	246	258	278	309	317
	Total	**899**	**984**	**980**	**1097**	**1171**
	Total patients on PD at 31 December	**2254**	**2317**	**2499**	**2515**	**2440**
New Zealand	***All patients who commenced PD***					
	First dialysis treatment or returning after renal recovery	176	184	191	221	209
	Transfer from HD (no prior PD)	95	113	90	85	91
	Transfer from HD (prior PD)	10	16	18	12	14
	Failed Transplant (no prior PD)	4	2	2	4	4
	Failed Transplant (prior PD)	5	5	3	3	8
	Total	**290**	**320**	**304**	**325**	**326**
	All patients who ceased HD					
	Received kidney transplant	43	38	47	46	47
	Transfer to HD	124	101	119	158	138
	Renal recovery	6	6	2	10	6
	Deaths	133	121	146	134	111
	Total	**306**	**266**	**314**	**348**	**302**
	Total patients on PD at 31 December	**779**	**837**	**821**	**798**	**823**

Figure 5.2.1 - Stock and flow of peritoneal dialysis patients - Australia 2012-2016

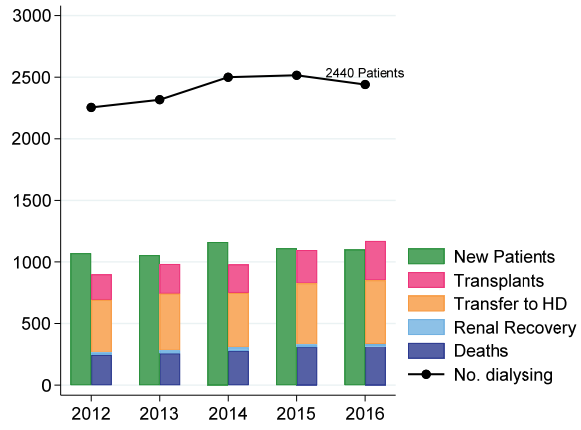
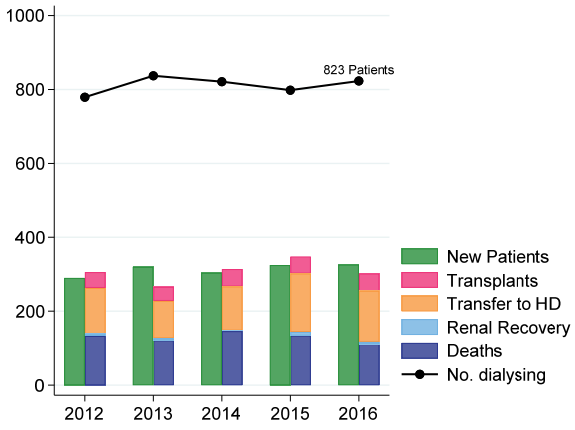


Figure 5.2.2 - Stock and flow of peritoneal dialysis patients - New Zealand 2012-2016



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 2016

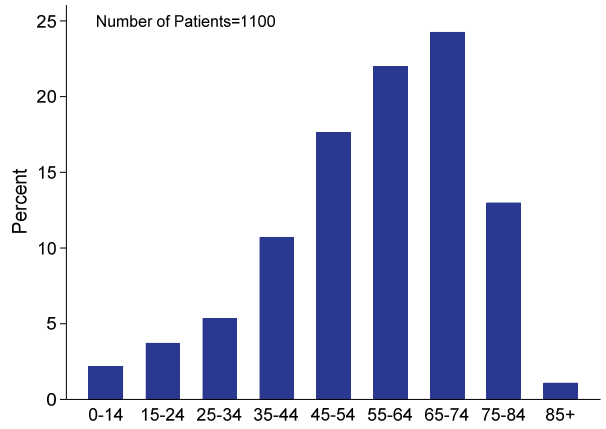


Figure 5.3.2 - Age (%) of new peritoneal dialysis patients - New Zealand 2016

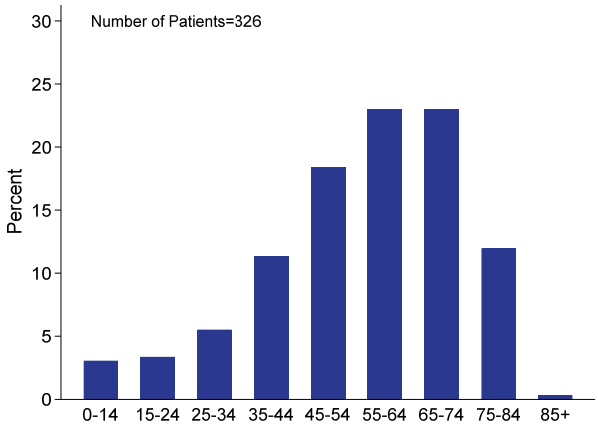


Figure 5.4.1 - Age (%) of current peritoneal dialysis patients - Australia 2016

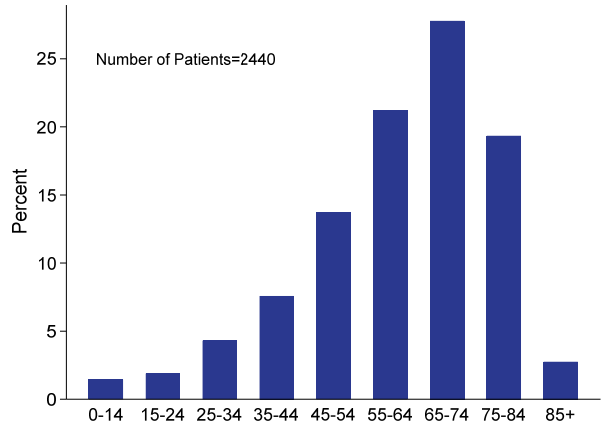


Figure 5.4.2 - Age (%) of current peritoneal dialysis patients - New Zealand 2016

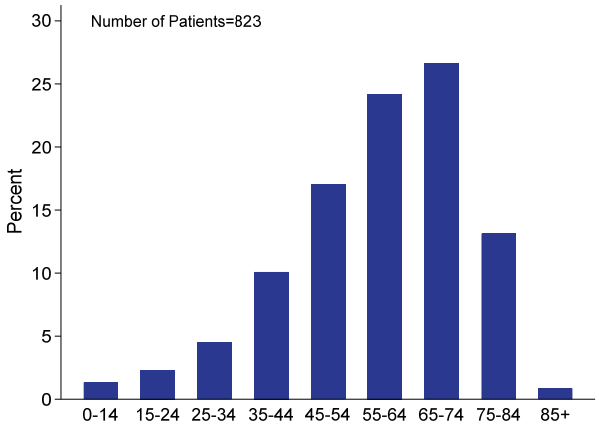


Table 5.4 presents the number and proportion of incident and prevalent peritoneal dialysis patients by age group.

Table 5.4.1 Incident and prevalent PD patients by age group - Australia

Category	Age group	2012	2013	2014	2015	2016
Incident Patients	**0-14**	23 (2%)	24 (2%)	27 (2%)	23 (2%)	24 (2%)
	15-24	30 (3%)	30 (3%)	34 (3%)	30 (3%)	41 (4%)
	25-34	67 (6%)	73 (7%)	55 (5%)	77 (7%)	59 (5%)
	35-44	130 (12%)	100 (9%)	131 (11%)	94 (8%)	118 (11%)
	45-54	158 (15%)	177 (17%)	195 (17%)	180 (16%)	194 (18%)
	55-64	245 (23%)	235 (22%)	253 (22%)	243 (22%)	242 (22%)
	65-74	248 (23%)	264 (25%)	291 (25%)	289 (26%)	267 (24%)
	75-84	156 (15%)	135 (13%)	160 (14%)	167 (15%)	143 (13%)
	85+	13 (1%)	17 (2%)	16 (1%)	8 (1%)	12 (1%)
	Total	**1070**	**1055**	**1162**	**1111**	**1100**
Prevalent Patients	**0-14**	30 (1%)	26 (1%)	31 (1%)	30 (1%)	35 (1%)
	15-24	42 (2%)	46 (2%)	38 (2%)	41 (2%)	46 (2%)
	25-34	98 (4%)	105 (5%)	96 (4%)	109 (4%)	105 (4%)
	35-44	206 (9%)	199 (9%)	221 (9%)	200 (8%)	185 (8%)
	45-54	342 (15%)	330 (14%)	347 (14%)	334 (13%)	335 (14%)
	55-64	500 (22%)	515 (22%)	554 (22%)	541 (22%)	517 (21%)
	65-74	565 (25%)	597 (26%)	693 (28%)	718 (29%)	678 (28%)
	75-84	417 (19%)	440 (19%)	458 (18%)	474 (19%)	472 (19%)
	85+	54 (2%)	59 (3%)	61 (2%)	68 (3%)	67 (3%)
	Total	**2254**	**2317**	**2499**	**2515**	**2440**

Table 5.4.2 Incident and prevalent PD patients by age group - New Zealand

Category	Age group	2012	2013	2014	2015	2016
Incident Patients	0-14	6 (2%)	3 (1%)	6 (2%)	3 (1%)	10 (3%)
	15-24	11 (4%)	7 (2%)	14 (5%)	10 (3%)	11 (3%)
	25-34	12 (4%)	20 (6%)	21 (7%)	17 (5%)	18 (6%)
	35-44	30 (10%)	27 (8%)	32 (11%)	39 (12%)	37 (11%)
	45-54	66 (23%)	65 (20%)	53 (17%)	59 (18%)	60 (18%)
	55-64	85 (29%)	89 (28%)	71 (23%)	88 (27%)	75 (23%)
	65-74	64 (22%)	83 (26%)	76 (25%)	75 (23%)	75 (23%)
	75-84	15 (5%)	24 (8%)	27 (9%)	34 (10%)	39 (12%)
	85+	1 (0%)	2 (1%)	4 (1%)	0 (0%)	1 (0%)
	Total	**290**	**320**	**304**	**325**	**326**
Prevalent Patients	0-14	4 (1%)	4 (0%)	7 (1%)	4 (1%)	11 (1%)
	15-24	19 (2%)	21 (3%)	23 (3%)	15 (2%)	19 (2%)
	25-34	33 (4%)	36 (4%)	34 (4%)	36 (5%)	37 (4%)
	35-44	66 (8%)	66 (8%)	65 (8%)	71 (9%)	83 (10%)
	45-54	127 (16%)	146 (17%)	139 (17%)	131 (16%)	140 (17%)
	55-64	229 (29%)	247 (30%)	225 (27%)	217 (27%)	199 (24%)
	65-74	216 (28%)	223 (27%)	223 (27%)	213 (27%)	219 (27%)
	75-84	82 (11%)	88 (11%)	93 (11%)	103 (13%)	108 (13%)
	85+	3 (0%)	6 (1%)	12 (1%)	8 (1%)	7 (1%)
	Total	**779**	**837**	**821**	**798**	**823**

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	2012	2013	2014	2015	2016
Diabetic Nephropathy	338 (32%)	338 (32%)	379 (33%)	355 (32%)	351 (32%)
Glomerulonephritis	285 (27%)	270 (26%)	294 (25%)	263 (24%)	271 (25%)
Hypertension	130 (12%)	152 (14%)	169 (15%)	162 (15%)	153 (14%)
Polycystic Disease	57 (5%)	57 (5%)	69 (6%)	68 (6%)	62 (6%)
Reflux Nephropathy	39 (4%)	28 (3%)	35 (3%)	25 (2%)	36 (3%)
Other	161 (15%)	139 (13%)	143 (12%)	148 (13%)	137 (12%)
Uncertain	57 (5%)	62 (6%)	54 (5%)	58 (5%)	56 (5%)
Not reported	3 (0%)	9 (1%)	19 (2%)	32 (3%)	34 (3%)
Total	**1070**	**1055**	**1162**	**1111**	**1100**

Table 5.5.2 Incident PD patients by primary disease - New Zealand

Primary Renal Disease	2012	2013	2014	2015	2016
Diabetic Nephropathy	128 (44%)	139 (43%)	134 (44%)	154 (47%)	136 (42%)
Glomerulonephritis	64 (22%)	77 (24%)	69 (23%)	74 (23%)	78 (24%)
Hypertension	27 (9%)	31 (10%)	29 (10%)	29 (9%)	38 (12%)
Polycystic Disease	14 (5%)	20 (6%)	14 (5%)	12 (4%)	14 (4%)
Reflux Nephropathy	11 (4%)	12 (4%)	12 (4%)	10 (3%)	10 (3%)
Other	33 (11%)	32 (10%)	37 (12%)	34 (10%)	39 (12%)
Uncertain	10 (3%)	8 (3%)	8 (3%)	11 (3%)	10 (3%)
Not reported	3 (1%)	1 (0%)	1 (0%)	1 (0%)	1 (0%)
Total	**290**	**320**	**304**	**325**	**326**

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 2016

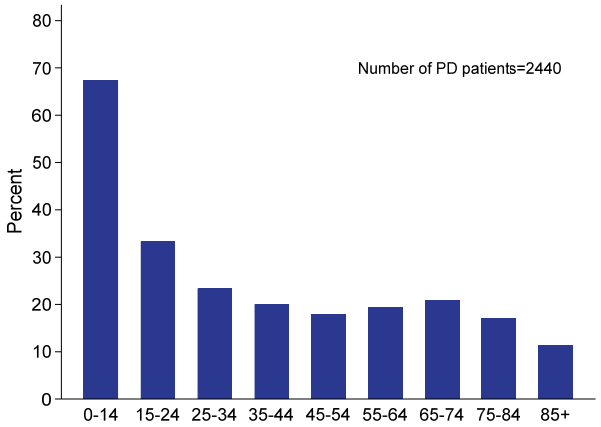


Figure 5.5.2 - PD patients (%) of all prevalent dialysis - New Zealand 2016

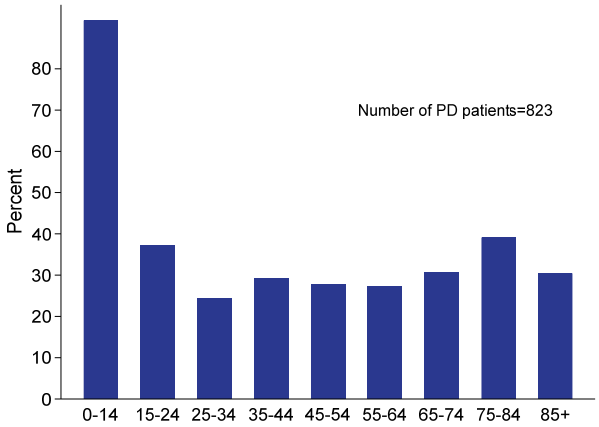


Table 5.6 shows the number of prevalent PD patients, and number per million population, according to PD type.

Table 5.6.1 Number (per Million) of Prevalent PD Patients, Australia 2012-2016

PD	2012	2013	2014	2015	2016
Total	**2254 (99)**	**2317 (100)**	**2499 (107)**	**2515 (106)**	**2440 (101)**
APD	1412 (62)	1482 (64)	1626 (69)	1688 (71)	1623 (67)
CAPD	842 (37)	835 (36)	873 (37)	827 (35)	817 (34)

Table 5.6.2 Number (per Million) of Prevalent PD Patients, New Zealand 2012-2016

PD	2012	2013	2014	2015	2016
Total	**779 (177)**	**837 (188)**	**821 (182)**	**798 (174)**	**823 (175)**
APD	377 (86)	393 (88)	394 (87)	419 (91)	426 (91)
CAPD	402 (91)	444 (100)	427 (95)	379 (82)	397 (85)

Peritoneal dialysis fluids

Table 5.7 shows the use of icodextrin by country and PD type at the end of 2016. 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 2016.

Table 5.7 Icodextrin Usage by Modality Type - December 2016

PD Type		Australia				New Zealand			
		No	Yes	Not Reported	Total	No	Yes	Not Reported	Total
CAPD	**n**	407	321	89	817	159	221	17	397
	%	**50%**	**39%**	**11%**		**40%**	**56%**	**4%**	
APD	**n**	768	787	68	1623	127	283	16	426
	%	**47%**	**48%**	**4%**		**30%**	**66%**	**4%**	
Total	**n**	1175	1108	157	2440	286	504	33	823
	%	**48%**	**45%**	**6%**		**35%**	**61%**	**4%**	

Figure 5.6.1 - Icodextrin use by modality - Prevalent patients December 2014 - 2016 Australia

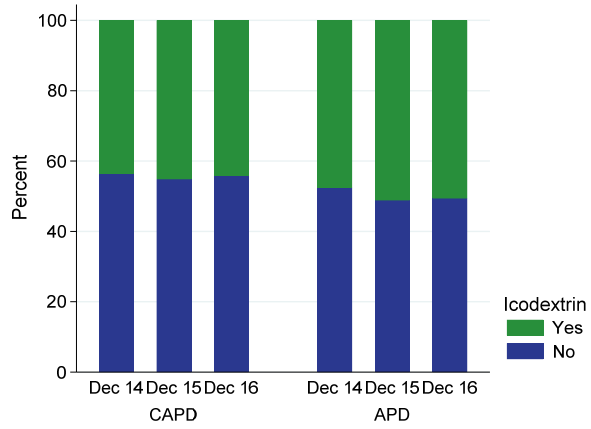


Figure 5.6.2 - Icodextrin use by modality - Prevalent patients December 2014 - 2016 New Zealand

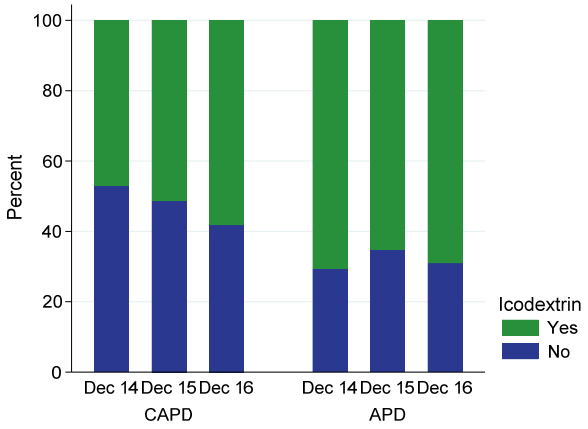


Figure 5.7 - Icodextrin use by state and country - Prevalent patients December 2016

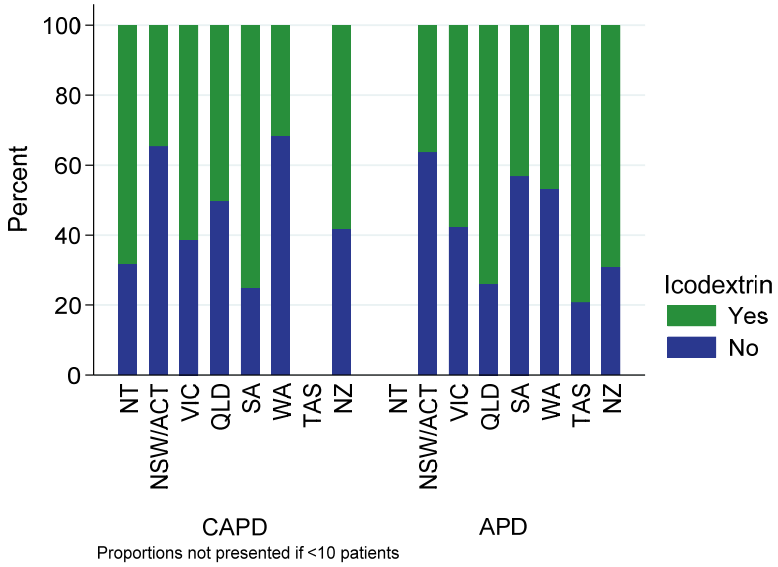


Table 5.8 and figures 5.8 and 5.9 present similar data for low GDP PD solutions. The use of these PD solutions is more common in Australia than in New Zealand and varies considerably by Australian state.

Table 5.8 Low GDP Usage by Modality Type - December 2016

PD Type		Australia				New Zealand			
		No	Yes	Not Reported	Total	No	Yes	Not Reported	Total
CAPD	**n**	493	235	89	817	360	20	17	397
	%	**60%**	**29%**	**11%**		**91%**	**5%**	**4%**	
APD	**n**	1348	207	68	1623	392	19	15	426
	%	**83%**	**13%**	**4%**		**92%**	**4%**	**4%**	
Total	**n**	1841	442	157	2440	752	39	32	823
	%	**75%**	**18%**	**6%**		**91%**	**5%**	**4%**	

Figure 5.8.1 - Low GDP use by modality - Prevalent patients December 2014 - 2016 Australia

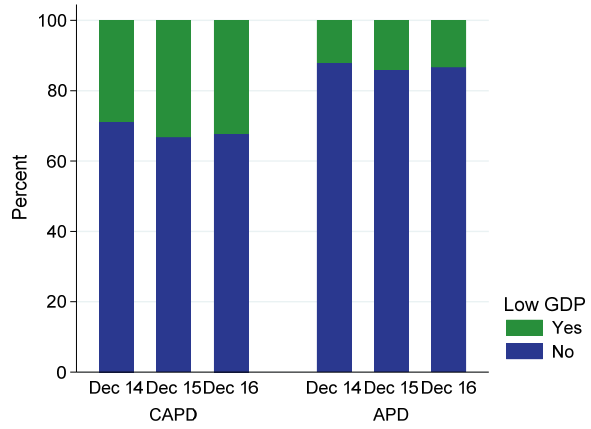


Figure 5.8.2 - Low GDP use by modality - Prevalent patients December 2014 - 2016 New Zealand

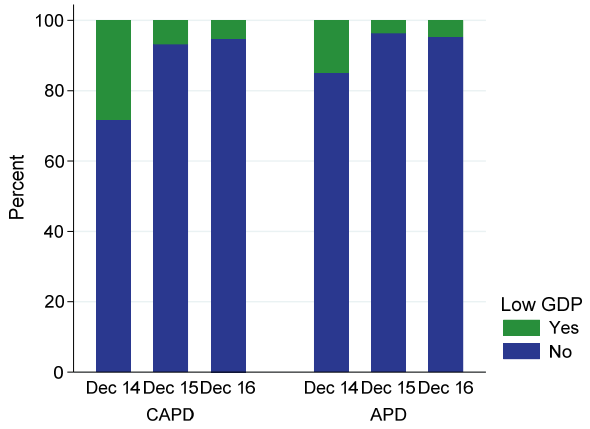
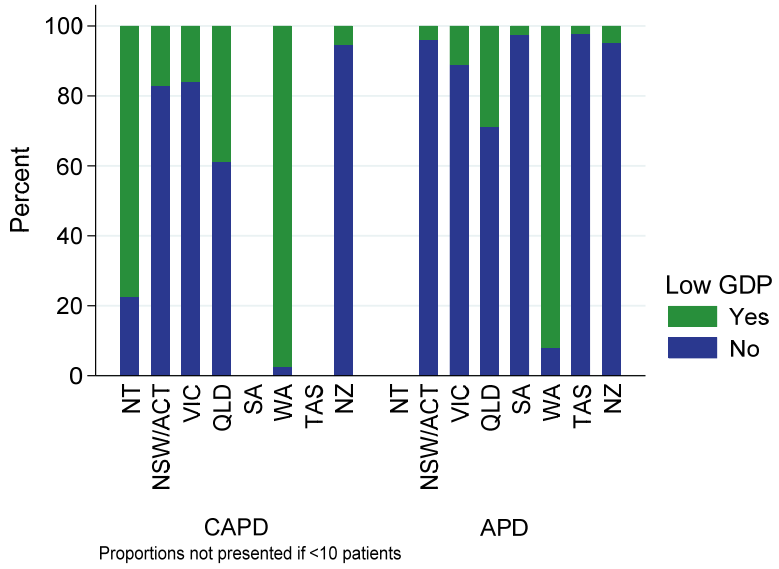


Figure 5.9 - Low GDP use by Australian state - Prevalent patients December 2016 Australia



Patient survival

The next section examines PD patient survival. Survival time is for those on PD at day 90, from day 90, and censored at transplantation.

Table 5.9 and figure 5.10 show patient survival by era.

Table 5.9 Patient Survival by Era - Peritoneal Dialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 years	5 years
Australia	2005 - 2007	2053	98[97,98]	92[91,93]	71[69,73]	57[54,59]
	2008 - 2010	2025	98[98,99]	94[93,95]	76[74,78]	60[58,62]
	2011 - 2013	2120	98[98,99]	96[95,96]	79[77,81]	64[61,66]
	2014 - 2016	2508	99[98,99]	95[94,96]	78[75,81]	-
New Zealand	2005 - 2007	614	98[97,99]	93[90,94]	70[67,74]	48[44,52]
	2008 - 2010	649	98[97,99]	93[91,95]	72[69,76]	52[48,56]
	2011 - 2013	629	99[98,100]	95[93,96]	70[66,73]	49[44,53]
	2014 - 2016	671	98[97,99]	95[93,96]	80[74,85]	-

Figure 5.10.1 - Patient survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for transplant - Australia

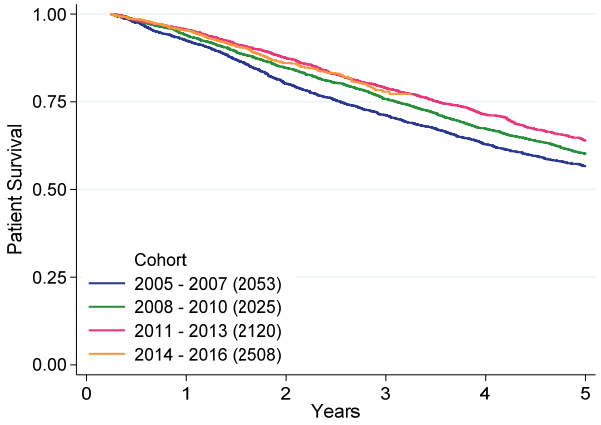


Figure 5.10.2 - Patient survival - peritoneal dialysis at 90 days - 2005 – 2016 - Censored for transplant - New Zealand

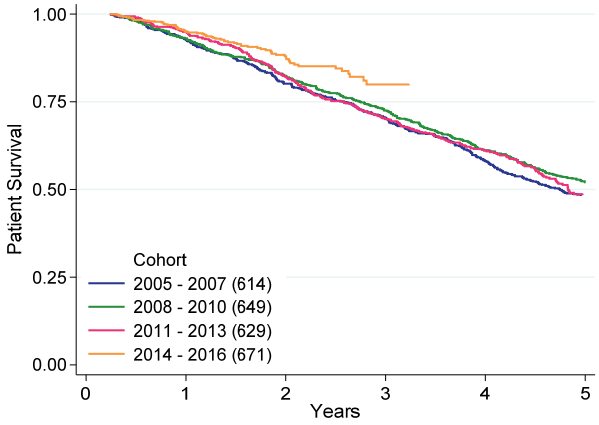


Table 5.10 and figure 5.11 demonstrate the strong association between patient age and survival.

Table 5.10 Patient Survival by Age Group - Peritoneal Dialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**<40**	1301	99[99,100]	98[98,99]	94[93,95]	91[89,93]
	40-59	2734	99[98,99]	96[96,97]	84[83,86]	73[71,75]
	60-74	3187	98[97,98]	93[92,94]	71[70,73]	52[50,54]
	>=75	1484	96[95,97]	89[87,90]	54[51,57]	29[27,32]
New Zealand	**<40**	305	99[97,100]	99[97,100]	92[88,95]	84[79,89]
	40-59	958	99[98,99]	96[94,97]	78[75,81]	59[55,62]
	60-74	1039	98[97,99]	92[90,93]	66[63,69]	42[39,46]
	>=75	261	97[94,98]	90[85,93]	51[44,58]	20[14,26]

Figure 5.11.1 - Patient survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for transplant - Australia

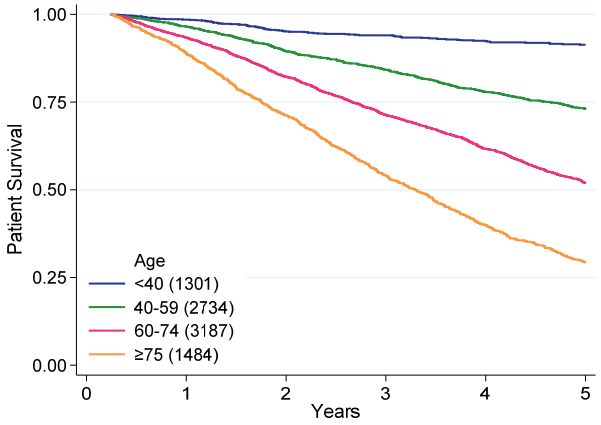


Figure 5.11.2 - Patient survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for transplant - New Zealand

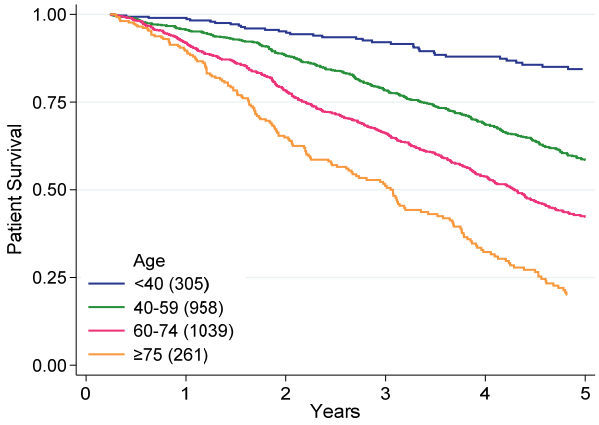


Table 5.11 and figure 5.12 present these data by diabetic status.

Table 5.11 Patient Survival by Diabetic Status - Peritoneal Dialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**Non-diabetic**	4899	98[98,99]	96[95,96]	82[80,83]	70[69,72]
	Diabetic	3782	98[97,98]	93[92,93]	68[67,70]	48[46,50]
New Zealand	**Non-diabetic**	1256	98[98,99]	95[94,96]	80[77,82]	64[61,67]
	Diabetic	1305	98[98,99]	93[91,94]	65[62,68]	38[35,41]

Figure 5.12.1 - Patient survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for transplant – Australia

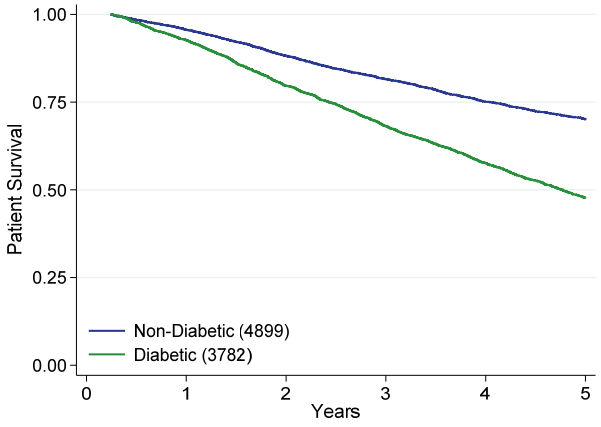
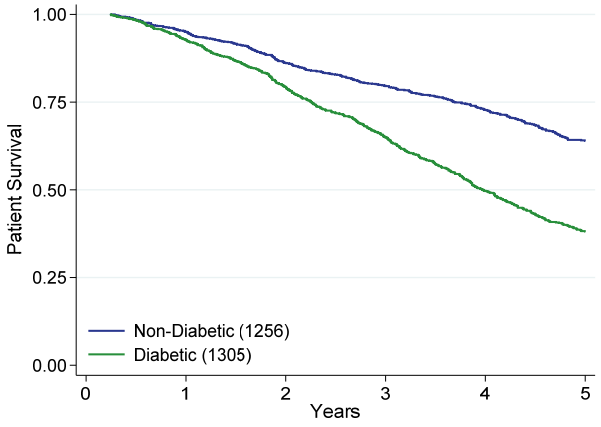


Figure 5.12.2 - Patient survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for transplant - New Zealand



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 day 90 and censored at transplantation. 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 and is improving gradually over time.

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 at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**2005 - 2007**	2053	93[91,94]	78[76,79]	37[34,39]	17[15,18]
	2008 - 2010	2025	92[91,93]	80[78,81]	41[38,43]	20[18,22]
	2011 - 2013	2120	94[92,95]	82[80,84]	43[41,45]	20[17,22]
	2014 - 2016	2508	95[94,95]	84[82,85]	41[37,46]	-
New Zealand	**2005 - 2007**	614	95[93,97]	84[81,87]	45[41,49]	21[18,25]
	2008 - 2010	649	95[93,96]	84[81,87]	47[43,51]	21[17,24]
	2011 - 2013	629	96[94,97]	87[84,89]	45[41,49]	17[13,21]
	2014 - 2016	671	94[92,96]	83[80,86]	49[41,56]	-

Figure 5.13.1 - Technique survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for transplant - Australia

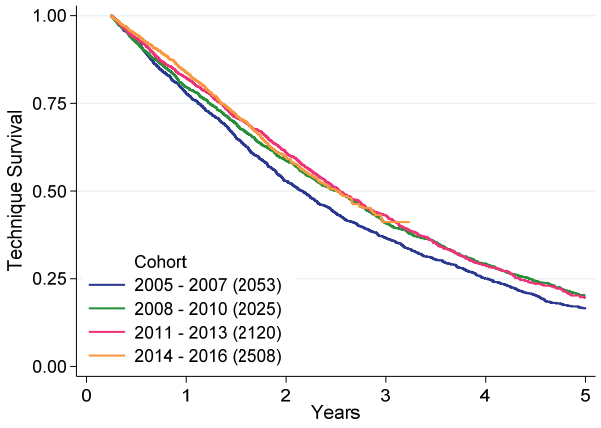


Figure 5.13.2 - Technique survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for transplant - New Zealand

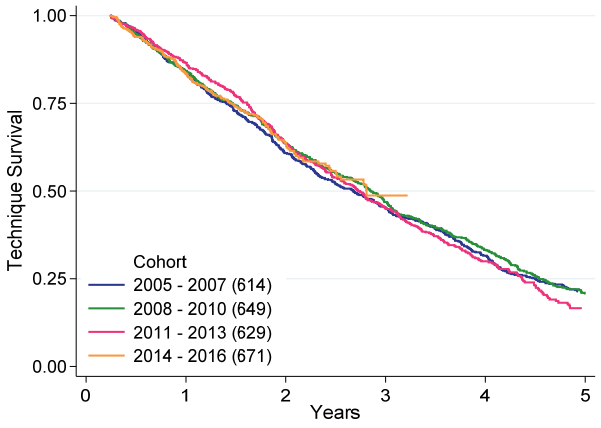


Table 5.13 and figure 5.14 show the association between patient age and technique survival. In general, younger patients have higher technique survival.

Table 5.13 Technique Survival by Age Group - Peritoneal Dialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	<40	1301	94[93,95]	80[78,82]	47[43,51]	28[23,33]
	40-59	2734	94[93,95]	82[81,84]	44[41,46]	22[19,24]
	60-74	3187	93[92,94]	81[80,83]	41[39,43]	19[18,21]
	>=75	1484	92[90,93]	77[75,80]	33[30,35]	11[9,13]
New Zealand	<40	305	95[92,97]	86[82,90]	47[40,55]	30[22,38]
	40-59	958	95[93,96]	86[83,88]	48[44,52]	23[19,27]
	60-74	1039	95[94,97]	84[81,86]	46[42,49]	20[17,23]
	>=75	261	94[90,96]	83[78,87]	36[30,43]	7[4,12]

Figure 5.14.1 - Technique survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for transplant – Australia

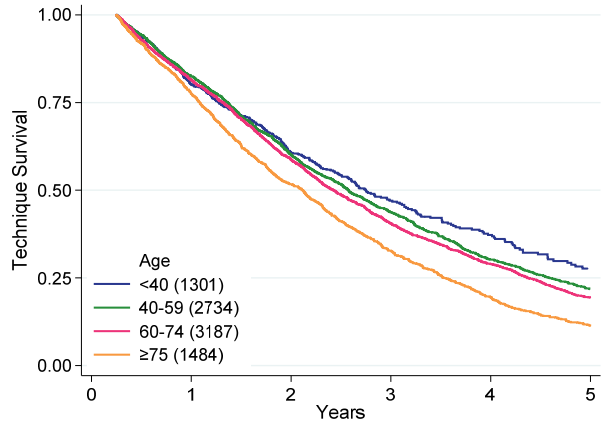


Figure 5.14.2 - Technique survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for transplant - New Zealand

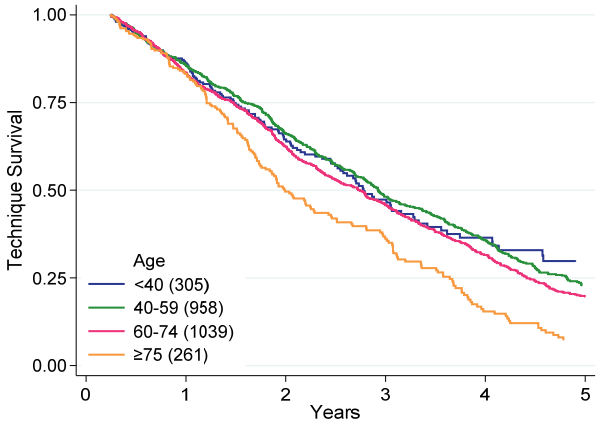


Table 5.14 and figure 5.15 present these data by diabetic status; technique survival is worse in diabetic patients.

Table 5.14 Technique Survival by Diabetic Status - Peritoneal Dialysis at 90 Days - Censored for Transplant 2005-2016; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	Non-diabetic	4899	94[93,94]	82[81,83]	45[43,46]	23[22,25]
	Diabetic	3782	93[92,94]	79[78,81]	36[34,38]	14[13,16]
New Zealand	Non-diabetic	1256	95[93,96]	86[84,88]	52[49,55]	26[23,30]
	Diabetic	1305	95[94,96]	83[81,85]	41[38,44]	15[13,18]

Figure 5.15.1 - Technique survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for transplant - Australia

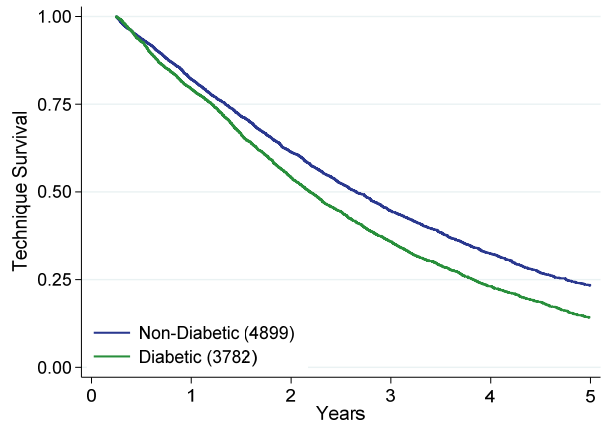


Figure 5.15.2 - Technique survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for transplant - New Zealand

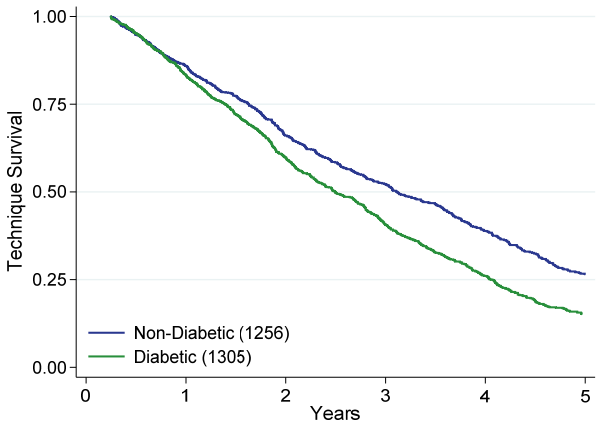


Table 5.15 and figure 5.16 show death-censored technique survival by era; there is no clear improvement over time.

Table 5.15 Technique Survival by Era - Peritoneal Dialysis at 90 Days - Censored for Death and Transplant 2005-2016; % [95% Confidence Interval]

Country	Era	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	2005 - 2007	2053	95[94,96]	84[83,86]	55[52,57]	37[34,40]
	2008 - 2010	2025	94[93,95]	85[83,87]	57[54,59]	41[38,44]
	2011 - 2013	2120	95[94,96]	86[84,87]	57[54,59]	37[33,41]
	2014 - 2016	2508	96[95,97]	88[86,89]	59[54,63]	-
New Zealand	2005 - 2007	614	97[95,98]	91[88,93]	67[62,71]	50[44,55]
	2008 - 2010	649	96[95,98]	90[87,92]	68[64,72]	48[43,53]
	2011 - 2013	629	97[95,98]	91[89,93]	67[62,71]	43[37,50]
	2014 - 2016	671	95[94,97]	88[85,91]	64[56,70]	-

Figure 5.16.1 - Technique survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for death and transplant – Australia

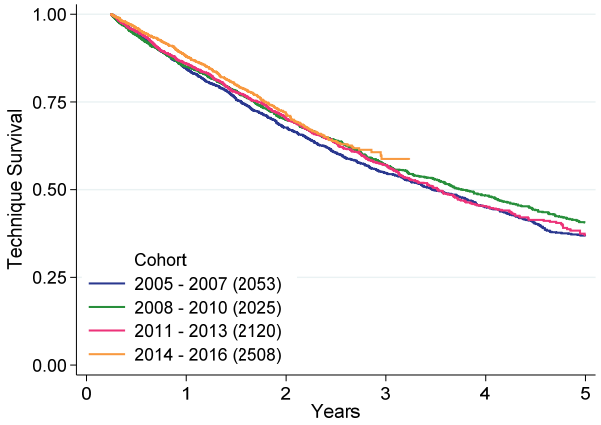


Figure 5.16.2 - Technique survival - peritoneal dialysis at 90 days - 2005 – 2016 Censored for death and transplant - New Zealand

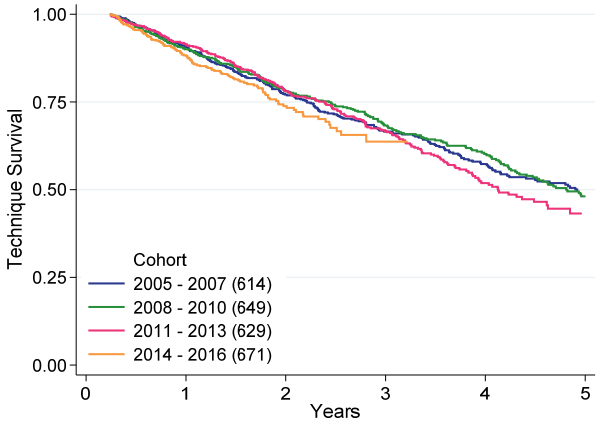


Table 5.16 and figure 5.17 show the association between patient age and death-censored technique survival. In contrast to overall technique survival, older patients receiving PD have higher death-censored technique survival.

Table 5.16 Technique Survival by Age Group - Peritoneal Dialysis at 90 Days - Censored for Death and Transplant 2005-2016; % [95% Confidence Interval]

Country	Age Group	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	<40	1301	94[93,96]	81[79,84]	51[46,55]	31[26,37]
	40-59	2734	95[94,96]	85[84,87]	53[51,55]	33[30,36]
	60-74	3187	95[94,96]	87[86,88]	59[56,61]	42[39,45]
	>=75	1484	95[94,96]	88[86,90]	64[61,67]	46[42,51]
New Zealand	<40	305	96[93,97]	87[83,91]	54[46,62]	39[30,48]
	40-59	958	96[94,97]	90[87,91]	63[59,67]	41[36,46]
	60-74	1039	97[96,98]	91[89,92]	71[68,75]	53[48,58]
	>=75	261	97[94,98]	93[89,96]	72[64,79]	55[43,65]

Figure 5.17.1 - Technique survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for death and transplant – Australia

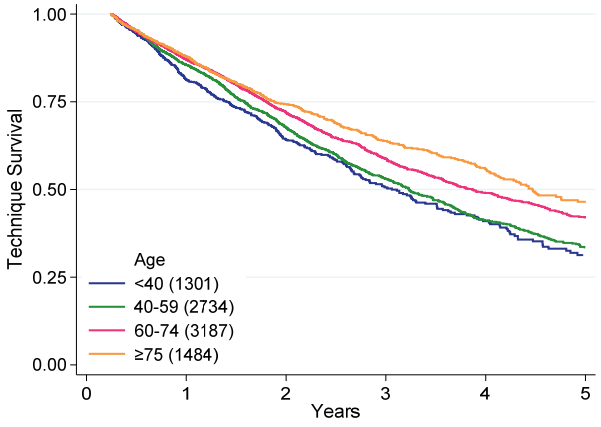


Figure 5.17.1 - Technique survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for death and transplant – Australia

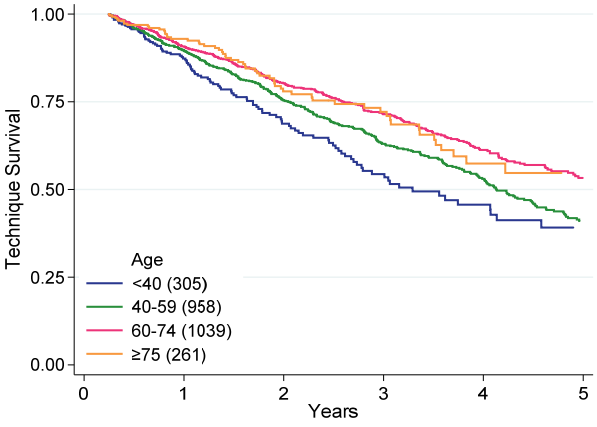


Table 5.17 and figure 5.18 present these data by diabetic status; death-censored technique survival is slightly worse in diabetic patients after the first year.

Table 5.17 Technique Survival by Diabetic Status - Peritoneal Dialysis at 90 Days - Censored for Death and Transplant 2005-2016; % [95% Confidence Interval]

Country	Diabetic Status	Number of Patients	Survival			
			6 months	1 year	3 year	5 year
Australia	**Non-diabetic**	4899	95[95,96]	86[85,87]	58[56,60]	40[38,43]
	Diabetic	3782	95[94,96]	86[84,87]	55[53,57]	37[34,39]
New Zealand	**Non-diabetic**	1256	96[95,97]	90[88,92]	68[65,71]	49[44,53]
	Diabetic	1305	97[96,98]	90[88,92]	65[62,68]	44[40,49]

Figure 5.18.1 - Technique survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for death and transplant - Australia

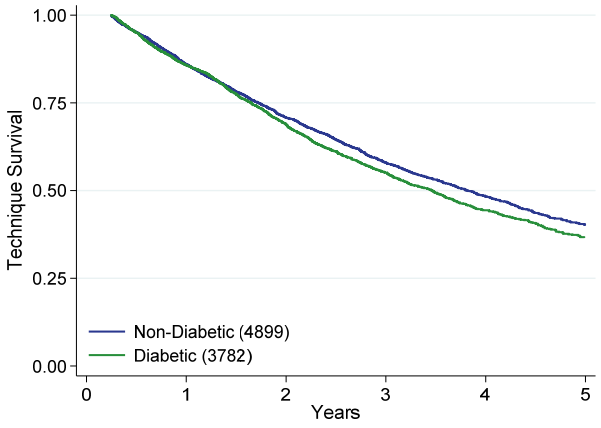
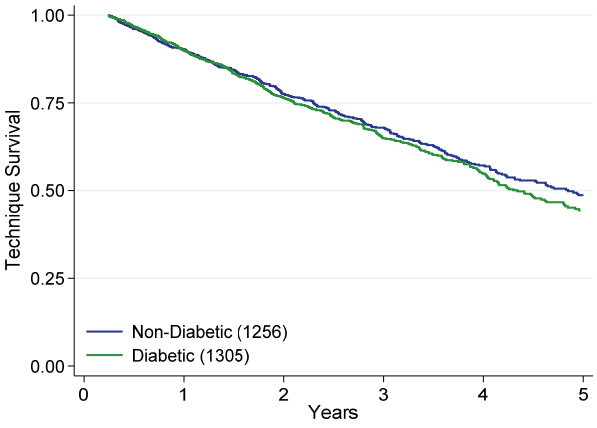


Figure 5.18.2 - Technique survival - peritoneal dialysis at 90 days - 2005 - 2016 Censored for death and transplant - New Zealand



The causes of PD technique failure in 2016 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 2016

Category	Cause of technique failure	Australia	New Zealand
Infection	Recurrent/Persistent Peritonitis	60	25
	Acute Peritonitis	93	22
	Tunnel/Exit Site Infection	22	12
	Diverticulitis	2	1
	Abdominal Abscess	1	2
	Total	**178 (21%)**	**62 (23%)**
Inadequate dialysis	Inadequate Solute Clearance	71	18
	Inadequate Fluid Ultrafiltration	25	10
	Excessive Fluid Ultrafiltration	2	0
	Total	**98 (11%)**	**28 (11%)**
Mechanical	Dialysate Leak	12	4
	Catheter Block	9	5
	Haemoperitoneum	1	0
	Catheter Fell Out	2	0
	Hernia	15	4
	Abdominal Pain	6	0
	Abdominal Surgery	22	1
	Multiple Adhesions	1	0
	Pleural Effusion	0	8
	Other Surgery	4	0
	Hydrothorax	4	0
	Scrotal Oedema	7	1
	Total	**83 (10%)**	**23 (9%)**
Social	Patient Preference	40	3
	Unable to Manage Self-Care	38	9
	Total	**78 (9%)**	**12 (5%)**
Other	Cardiovascular	4	0
	Transplantation	1	1
	Planned Transfer After Acute PD Start	1	0
	Other (Specify)	32	6
	Total	**38 (4%)**	**7 (3%)**
Death	**Total**	**304 (36%)**	**107 (41%)**
Not reported	**Total**	**77 (9%)**	**25 (9%)**

Figure 5.19 and table 5.19 show the cumulative incidence of patients returning to PD after a technique failure over 2012-2016. 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 2012-2016

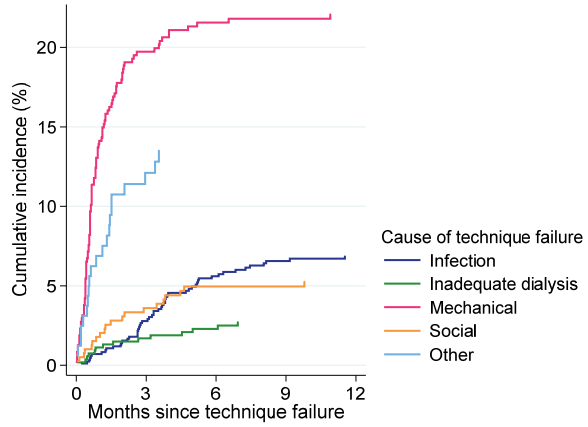


Figure 5.19.1 - Time to restarting PD after technique failure - New Zealand 2012-2016

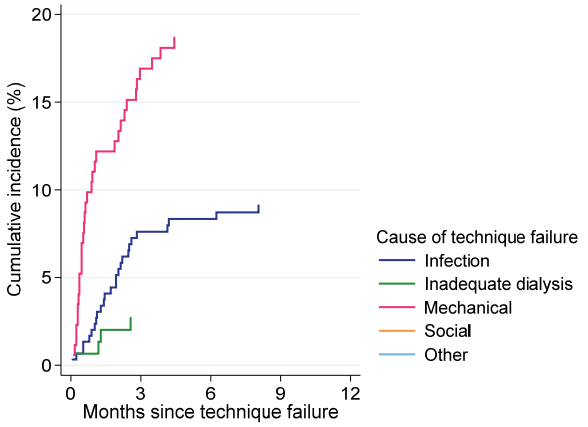


Table 5.19.1 Return to PD (cumulative incidence and 95% CI) by cause of technique failure, Australia 2012-2016

Cause of technique failure	3 months	6 months	9 months	12 months
Infection	2.8 (1.8, 4.1)	5.6 (4.2, 7.3)	6.6 (5.0, 8.4)	6.9 (5.2, 8.8)
Inadequate dialysis	1.7 (0.8, 3.1)	2.3 (1.3, 3.9)	2.7 (1.6, 4.4)	2.7 (1.6, 4.4)
Mechanical	19.7 (16.3, 23.4)	21.6 (18.0, 25.4)	21.8 (18.2, 25.7)	22.1 (18.4, 25.9)
Social	3.6 (2.1, 5.8)	5.0 (3.1, 7.5)	5.0 (3.1, 7.5)	5.3 (3.3, 7.8)
Other	12.1 (7.6, 17.8)	13.5 (8.7, 19.4)	13.5 (8.7, 19.4)	13.5 (8.7, 19.4)

Table 5.19.2 Return to PD (cumulative incidence and 95% CI) by cause of technique failure, New Zealand 2012-2016

Cause of technique failure	3 months	6 months	9 months	12 months
Infection	7.6 (4.9, 11.0)	8.3 (5.5, 11.9)	9.1 (6.1, 12.8)	9.1 (6.1, 12.8)
Inadequate dialysis	2.7 (0.9, 6.3)	2.7 (0.9, 6.3)	2.7 (0.9, 6.3)	2.7 (0.9, 6.3)
Mechanical	16.9 (11.7, 22.9)	18.7 (13.3, 24.9)	18.7 (13.3, 24.9)	18.7 (13.3, 24.9)
Social	1.7 (0.1, 7.8)	1.7 (0.1, 7.8)	1.7 (0.1, 7.8)	1.7 (0.1, 7.8)
Other	0 (., .)	0 (., .)	0 (., .)	0 (., .)

Peritonitis

Table 5.20 and figure 5.20 present the time to first peritonitis over 2012-2016 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-2012 to 31-Dec-2016 % Survival [95% Confidence Interval]

Survival	Age Groups						
	00-14	15-34	35-54	55-64	65-74	>=75	All
Australia	**(n=113)**	**(n=446)**	**(n=1366)**	**(n=1135)**	**(n=1291)**	**(n=789)**	**(n=5140)**
3 months	83 [74,89]	93 [90,95]	90 [88,92]	92 [91,94]	92 [90,93]	92 [90,94]	91 [91,92]
6 months	70 [59,78]	87 [83,90]	83 [80,85]	87 [85,89]	87 [84,88]	87 [85,90]	85 [84,86]
9 months	61 [50,71]	81 [76,85]	76 [73,78]	82 [79,84]	81 [78,83]	81 [77,84]	79 [78,80]
1 year	61 [50,71]	75 [70,80]	71 [68,74]	77 [74,79]	76 [74,79]	75 [71,78]	74 [73,76]
2 years	52 [37,64]	60 [52,67]	57 [53,61]	57 [53,61]	58 [54,61]	57 [52,62]	57 [55,59]
3 years	33 [13,56]	51 [41,61]	43 [38,48]	42 [37,47]	43 [39,48]	44 [38,50]	43 [41,46]
New Zealand	**(n=26)**	**(n=126)**	**(n=428)**	**(n=387)**	**(n=349)**	**(n=139)**	**(n=1455)**
3 months	84 [63,94]	98 [93,100]	94 [91,96]	93 [90,95]	93 [90,96]	95 [89,97]	94 [92,95]
6 months	69 [45,84]	91 [84,95]	88 [84,91]	88 [84,91]	89 [84,92]	88 [81,93]	88 [86,90]
9 months	63 [38,80]	87 [78,92]	82 [77,85]	82 [78,86]	87 [83,90]	86 [78,91]	84 [81,86]
1 year	54 [28,74]	84 [75,90]	78 [73,82]	76 [71,81]	84 [79,88]	81 [72,87]	79 [77,82]
2 years	-	77 [66,85]	60 [53,66]	59 [52,65]	72 [65,78]	70 [59,79]	64 [61,68]
3 years	-	62 [45,76]	45 [36,53]	56 [48,62]	63 [54,71]	64 [51,75]	55 [51,60]

Figure 5.20.1 - First PD treatment to first peritonitis - By age at first PD Australia 2012 – 2016

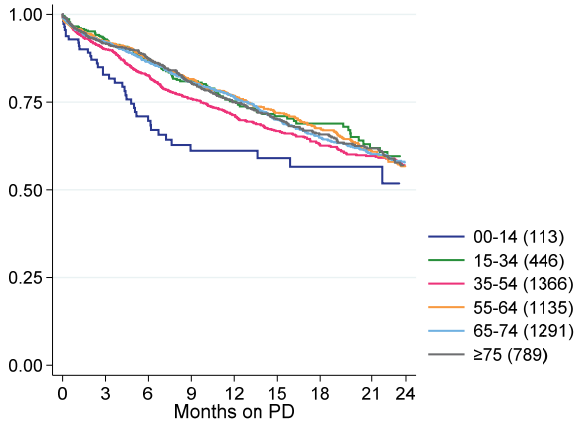
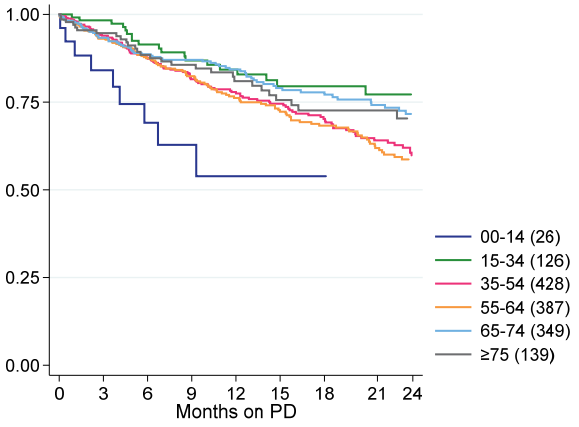


Figure 5.20.2 - First PD treatment to first peritonitis - By age at first PD New Zealand 2012 – 2016



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 2012 - 2016

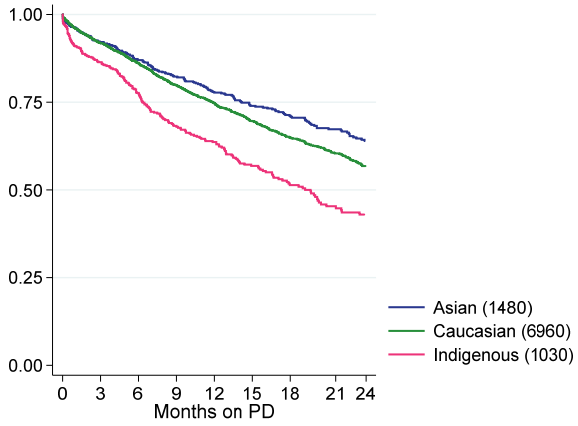
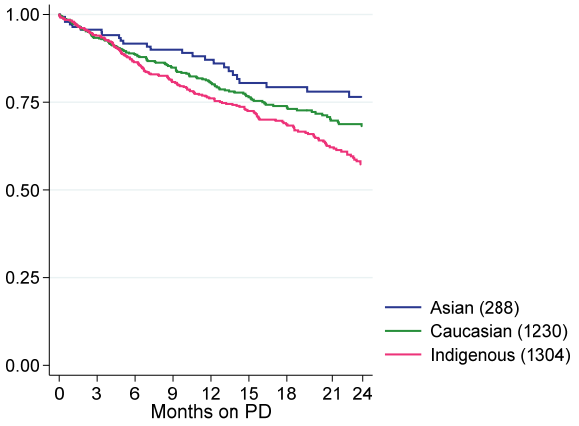


Figure 5.21.2 - First PD treatment to first peritonitis - By ethnicity New Zealand 2012 - 2016



Diabetes is associated with a shorter time to first peritonitis in both countries, but this difference only appears around 12 months into PD treatment (figure 5.22).

Figure 5.22.1 - First PD treatment to first peritonitis - By diabetic status at RRT entry Australia 2012 - 2016

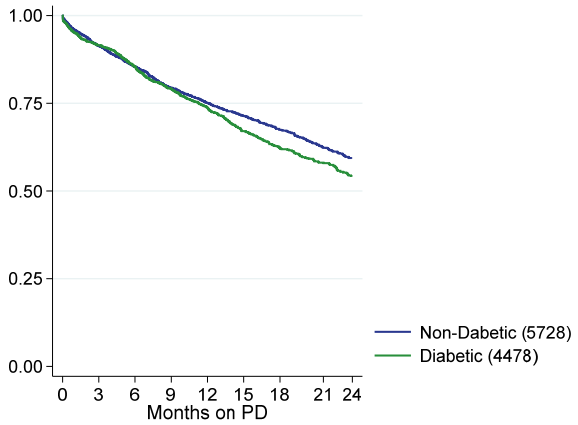
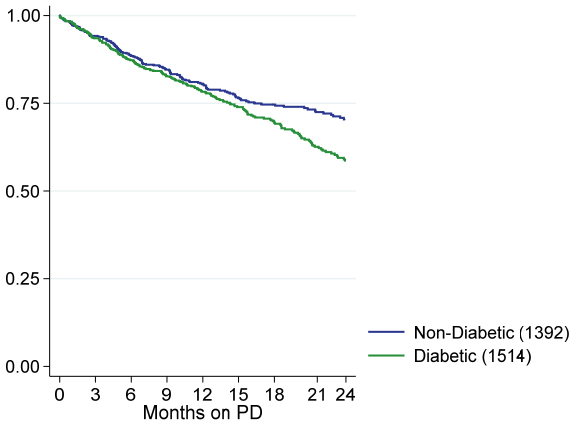


Figure 5.22.2 - First PD treatment to first peritonitis - By diabetic status at RRT entry New Zealand 2012 - 2016



Australian peritonitis registry

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

Figures 5.22-5.26 report the peritonitis rate, expressed as episodes per patient-year on the left y axis and patient-months per episode on the right y axis, according to different categories. The overall peritonitis rate in Australia has dropped considerably over the last few years but has stabilised since 2011 (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).

Figure 5.23 - PD peritonitis rate - Australia 2004-2016

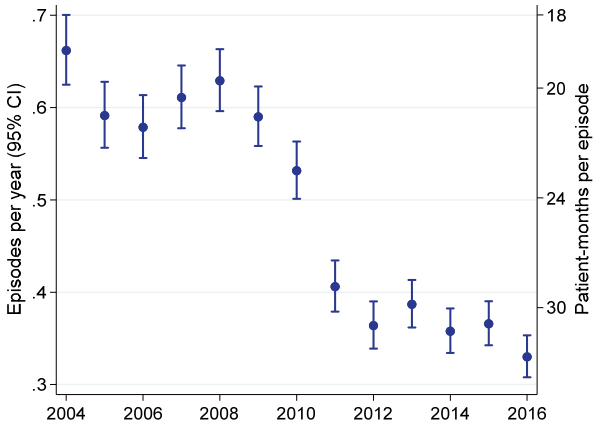


Figure 5.24 - PD peritonitis rate - By state, Australia 2012-2016

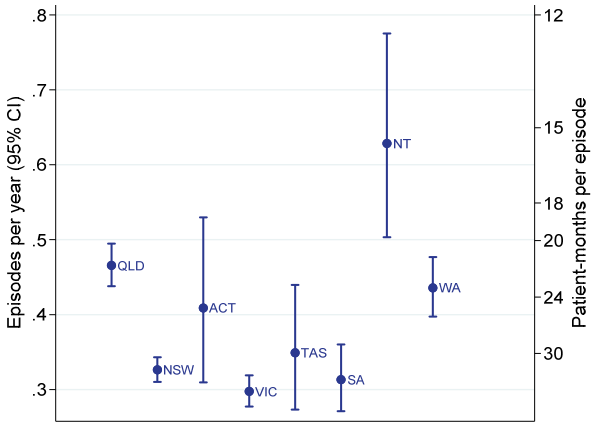


Figure 5.25 - PD peritonitis rate - By state, Australia 2007-2016

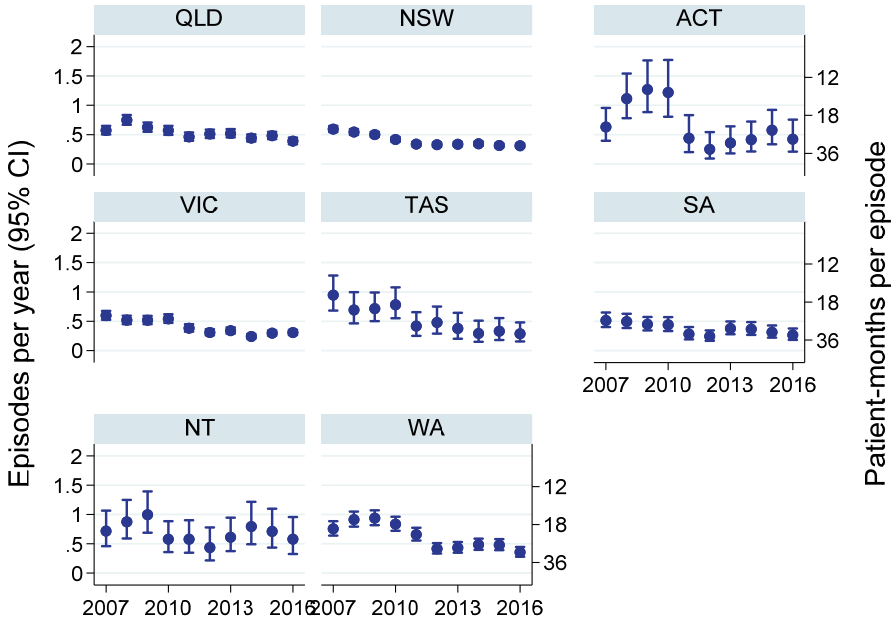


Figure 5.26 - PD peritonitis rate - By treating unit, Australia 2007-2016

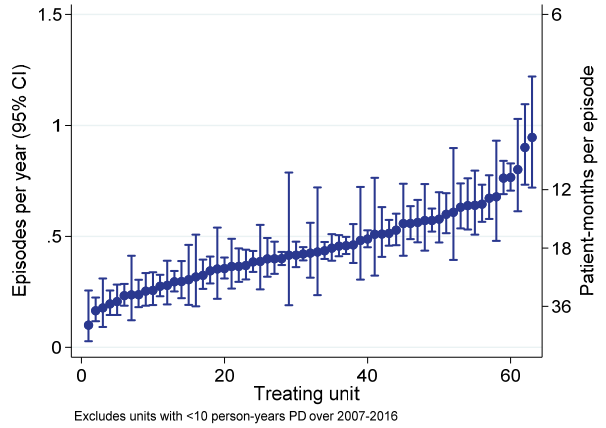
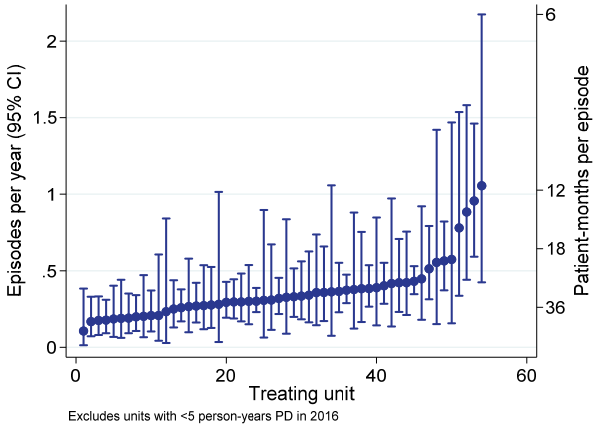


Figure 5.27 - PD peritonitis rate - By treating unit, Australia 2016



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 2016 stratified by state.

Figure 5.28 - Distribution of organisms causing peritonitis - Australia 2007-2016

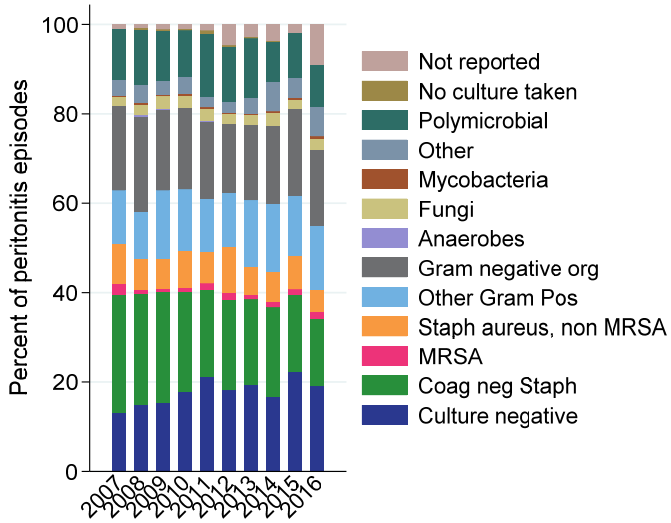
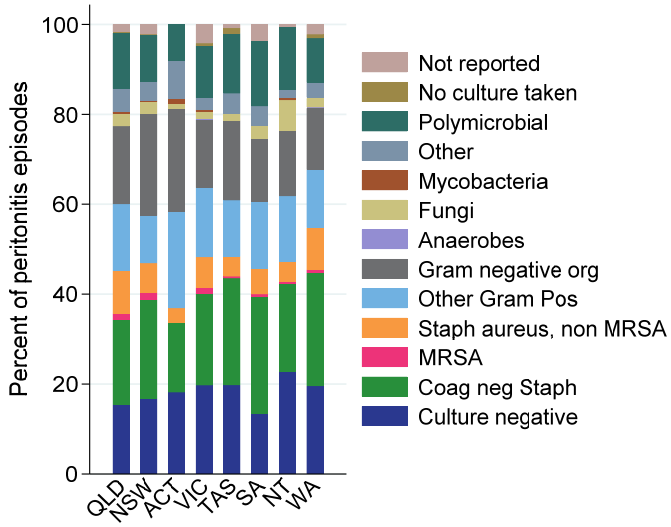


Figure 5.29 - Distribution of organisms causing peritonitis - Australia 2016



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 regime are shown in figure 5.31.

Figure 5.30 - Initial antibiotic regimen - Australia 2007-2016

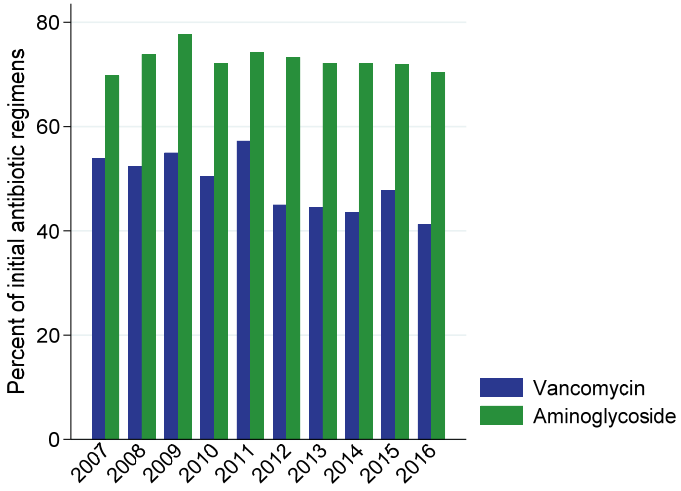
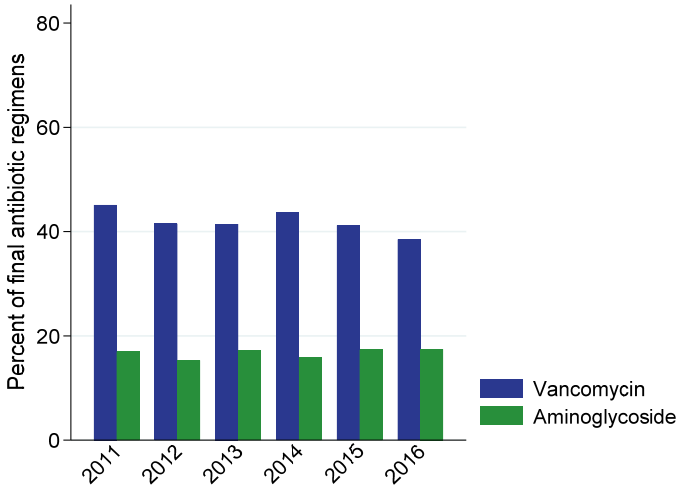
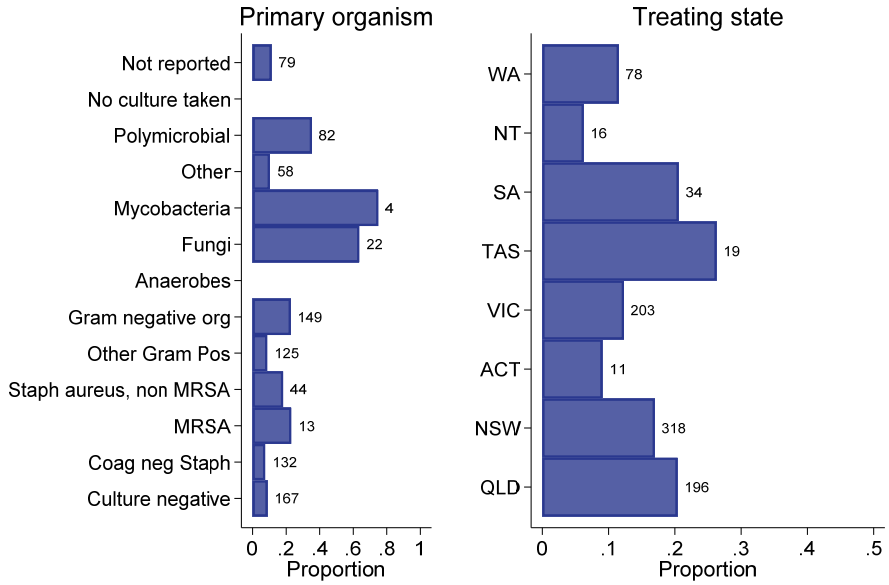


Figure 5.31 - Final antibiotic regimen - Australia 2011-2016



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 2016



Values are total number of peritonitis episodes reported in 2016

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 2014-2016

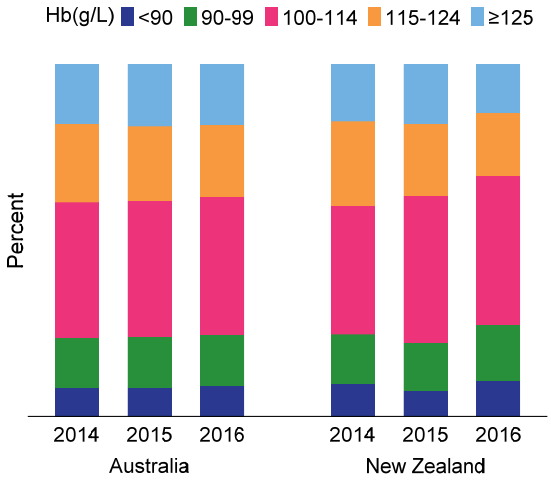


Figure 5.34.1 - Haemoglobin - peritoneal dialysis - By coronary artery disease status Australia, December 2014-2016

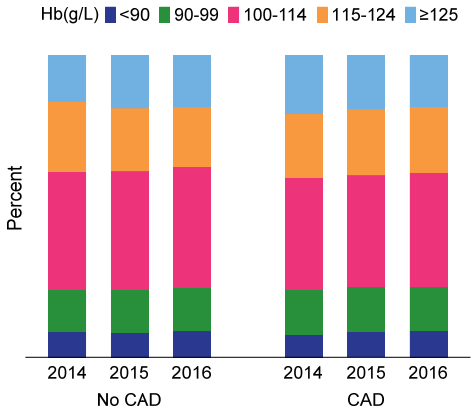


Figure 5.34.2 - Haemoglobin - peritoneal dialysis - By coronary artery disease status New Zealand, December 2014-2016

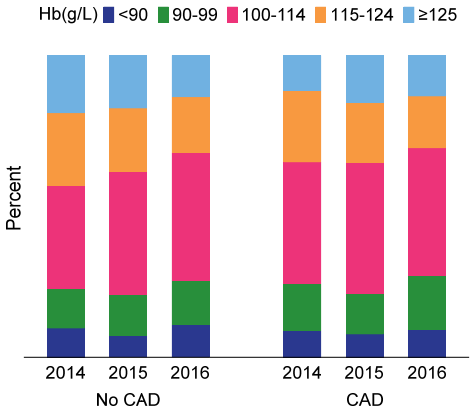


Figure 5.35 shows the variation in Hb between treating hospitals; median Hb ranged from 94 to 122g/L in Australia and 104-112g/L in New Zealand.

Figure 5.35.1 - Haemoglobin in peritoneal dialysis patients - Australia 31 December 2016

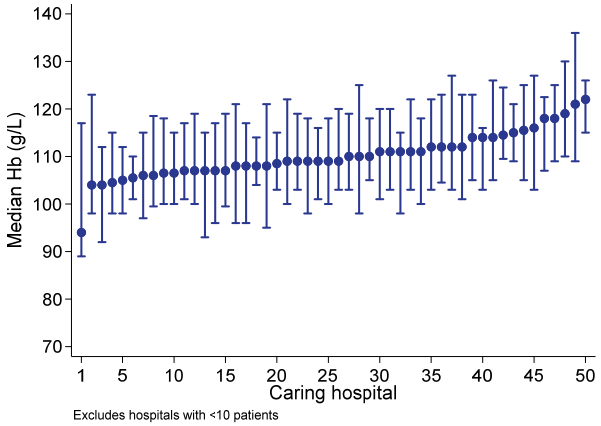


Figure 5.35.2 - Haemoglobin in peritoneal dialysis patients - New Zealand 31 December 2016

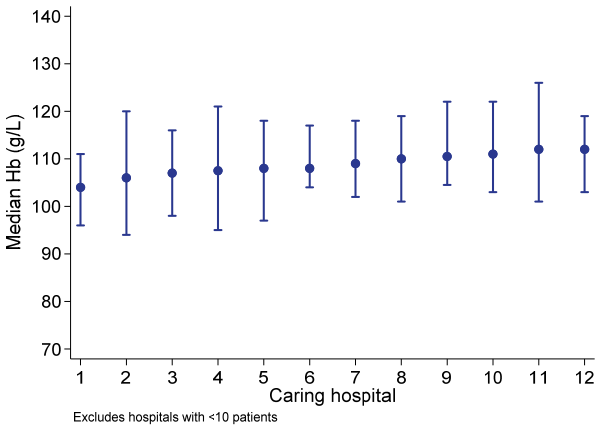


Figure 5.36 shows the proportion of patients with Hb between 110-129g/L; the proportion ranged from 17-73% in Australia and 25-48% in New Zealand.

Figure 5.36.1 - % Peritoneal dialysis patients with Hb 110-129 g/L - Australia 31 December 2016

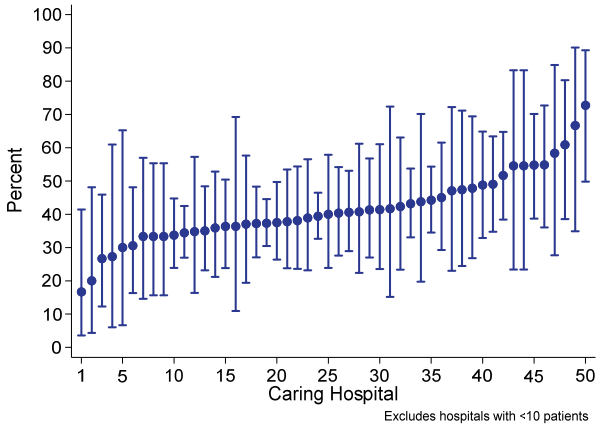
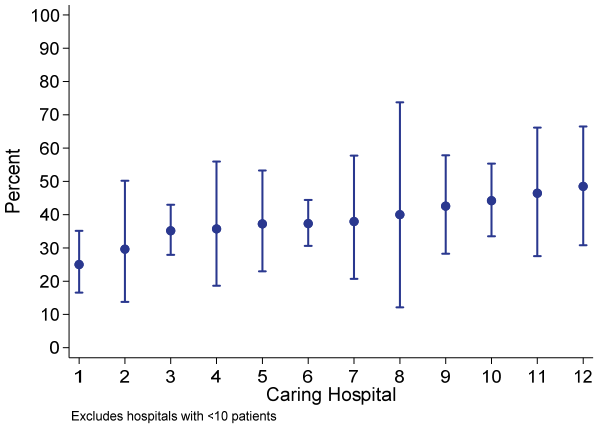


Figure 5.36.2 - % Peritoneal dialysis patients with Hb 110-129 g/L - New Zealand 31 December 2016



Biochemistry

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

Figure 5.37 - Serum calcium - peritoneal dialysis - December 2014-2016

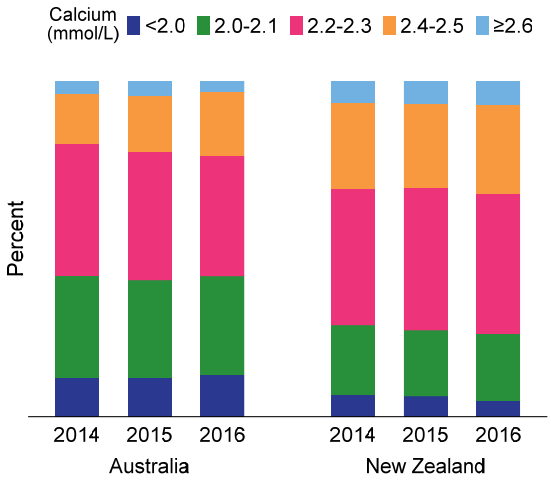


Figure 5.38.1 - % PD patients with Calcium 2.1-2.4 mmol/L - Australia 31 December 2016

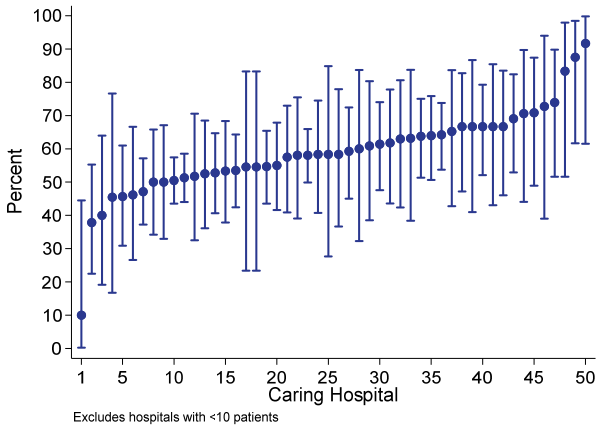


Figure 5.38.2 - % PD patients with Calcium 2.1-2.4 mmol/L - New Zealand 31 December 2016

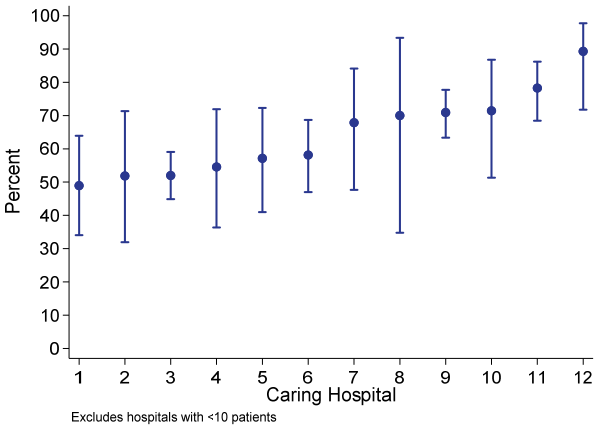


Figure 5.39 - Serum phosphate - peritoneal dialysis December 2014-2016

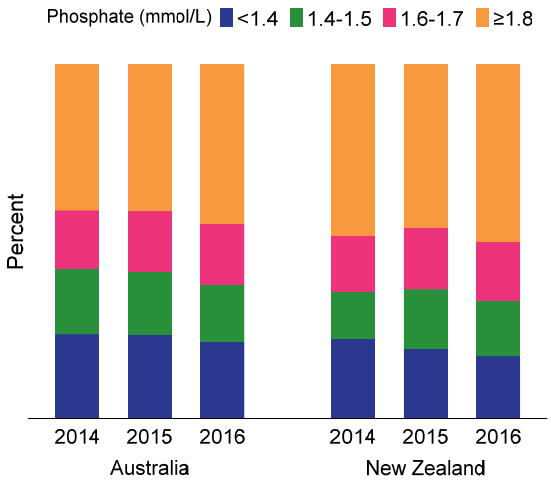


Figure 5.40.1 - % PD patients with Phosphate 0.8-1.6 mmol/L - Australia 31 December 2016

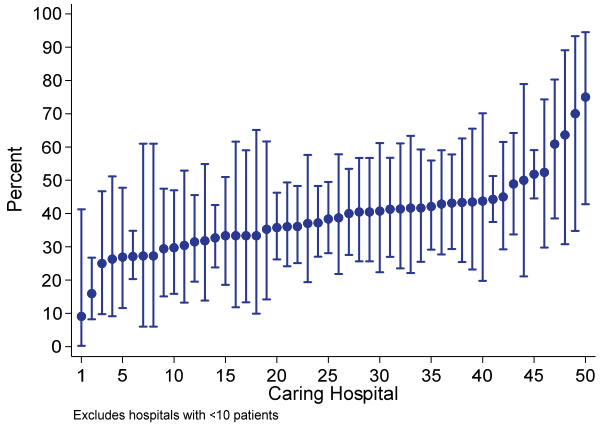


Figure 5.40.2 - % PD patients with Phosphate 0.8-1.6 mmol/L - New Zealand 31 December 2016